1 Safety instructions

1.1 Understanding of symbols and meaning and safety instructions

The following typographic conventions apply to this document.

Symbol	meaning
	"NOTE:" Includes special information and useful tips concerning the work with the product
	"IMPORTANT:" Danger warnings are designated with this danger sign. It points out existing danger of accident entailing personal injury or property damage if the measures to be taken are not complied with.

1.2 Product liability and Warranty

ipf electronic gmbh rejects any legal warranty concerning the saleability, economic efficiency or suitability of this product for a certain purpose. *ipf electronic gmbh* is not liable for defects of this product or for indirect or direct damages in connection with the delivery, performance or use of this manual. *ipf electronic gmbh* reserves the right to revise and modify the product from time to time without prior notice. The operation of this product is not permitted in the USA and countries with similar legal provisions. Otherwise the General Terms and Conditions of Trade and Delivery of *ipf electronic gmbh apply.*

1.3 Assembly and operating personnel

All chapters of this operating manual include important information for the intended use of the product. These chapters are intended for technically qualified personnel according to VDE 105 or IEC364 that has been specially trained for installation, initial operation, maintenance and repair of lift systems as well as power operated doors and gates that are installed according to the applicable guidelines. It must be ensured that all activities are carried out according to the respective statutory provisions of industrial safety. For installation please observe the applicable accident prevention precautions (UVV). Normally only one fitter is required for the installation.

1.4 Risk assessment

The knowledge and technical realisation of the safety instructions included in this documentation is a prerequisite for a defect-free product. However, this documentation cannot take into account all details of any possible case occurring during the installation. Therefore an element of risk of human failure remains as in any other case. This documentation is intended to limit this residual risk to a minimum.

1.5 Operational safety

In order to ensure a trouble-free operation of the system the instructions contained in the diagrams and plans supplied with the system and the notes on electromagnetic compatibility in these operating instructions must be observed.

2 Scope of performance

- ultra-flat design of only 9mm
- range 5m (optional 10m)
- fully-automatic, fast sensitivity control with fuzzy logic
- very high immunity toward ambient light > 200.000 lux for installations with direct sunlight exposition
- short reaction time of 50 or 140ms
- IP54 or optional IP65 (also with integrated heater for outdoor use)
- programmable on-site (without further accessories)
- short-circuit and reverse polarity proetcted
- electronic relay output, wear-free and potential-free
- NO/NC configurable (by quick change or parameter setting)
- switch-on delay with parametrizable time (door open time)
- switch-off delay with parametrizable time (function "slow light curtain")
- test input +V or 0V (parametrizable)
- LED-grid 20mm, 40mm, 60mm and 120mm
- up to 190 light beams
- beam failure tolerance (parametrizable)
- arbitrary channel suppression on-site (by quick change or parameter setting)
- optionally pluggable, highly flexible halogen-free cable, tested for >50 million door movements
- meets the requirements acc. EN81-70
- high reliability due to 48 hours endurance tests
- high reliability in case of severe soiling

3 Utilisation as intended

3.1 Standard versions

The light curtains of this series are utilised as reversing devices on power-operated doors and gates indoors, in lifts for persons, on access routes of industrial production lines, in automated stores, for monitoring goods loading, etc.

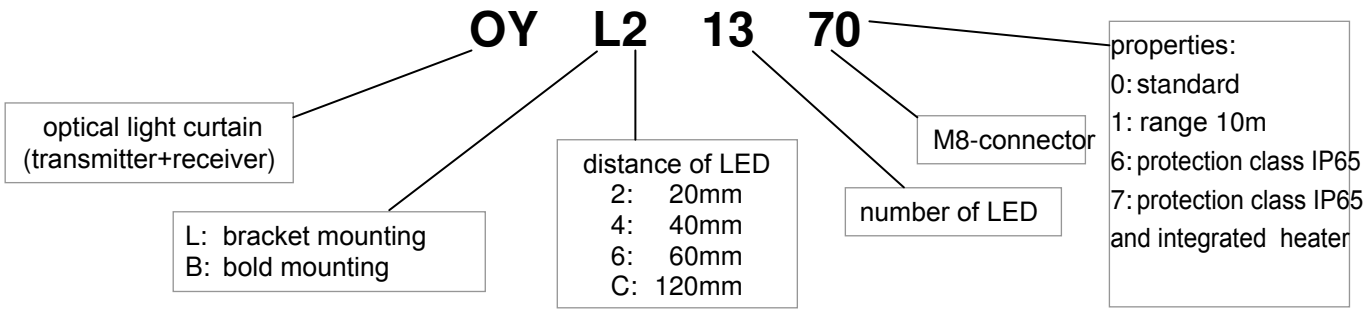
3.2 Versions with heater

The variants with protection system IP65 and built-in thermostatically controlled heater are available for outdoor utilisation.

3.3 Restrictions

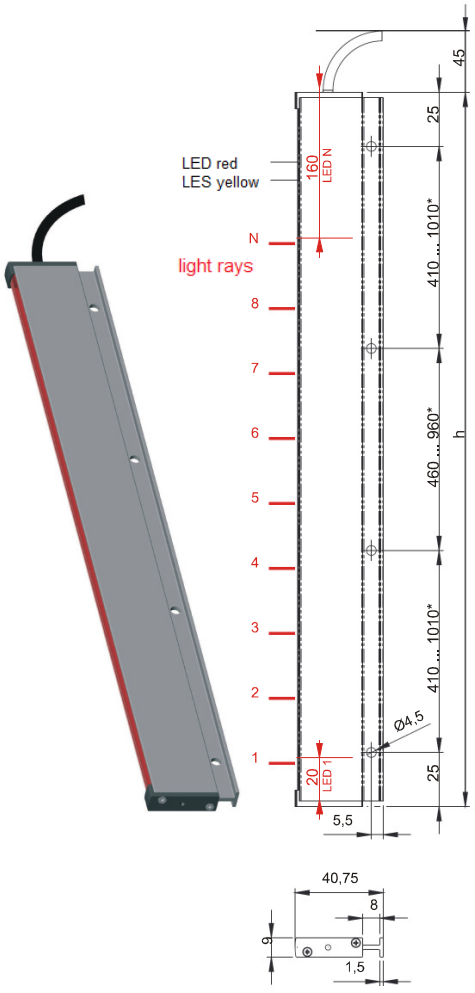
1. Utilisation in applications for which the safety of persons depends exclusively on the device function is not permitted. In such cases so-called safety light curtains must be used.
2. The light curtains must not be used in the vicinity of gases or dusts that are able to explode.
3. Strong smoke production or fog patches interrupt the light path of the light curtain and thus could hold the door or gate open inappropriately. This must be observed when utilising the device together with fire confining control systems, etc.

4 Type key

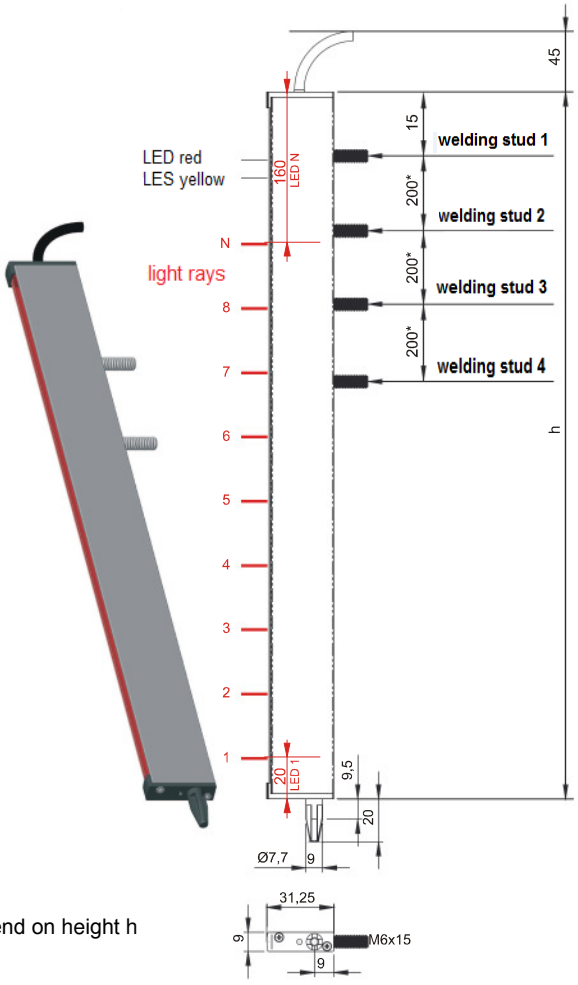


5 Dimensions

bracket mounting



bolt mounting



* dimensions depend on height h

6 Functional principles

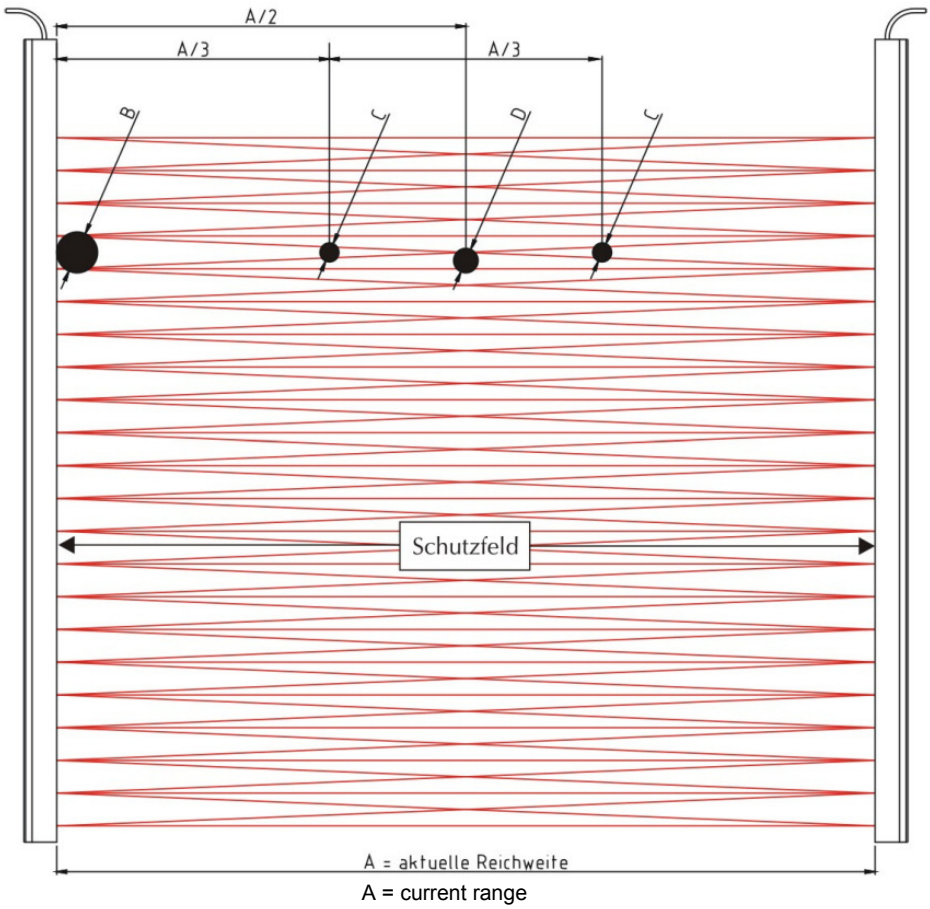
6.1 General

The light curtain consists of a transmitting strip and a receiving strip. The LEDs in the transmitting strip emit infra red light rays in a predefined time sequence, whereby in the crossed beam function each LED transmits 3 times in each cycle. The receiving LEDs in the receiving strip receive this cyclic sequence, where in crossed beams mode each receiving LED receives three times in each cycle, with and without offset with respect to the transmitter. After each cycle the receiver evaluates acceding to the preset parameters, whether an object is present between the transmitting strip and the receiving strip, and switches its output to the corresponding state.. One cycle has a maximum duration of 50 ms or 140 ms (see the technical data). A new cycle starts then, repeatedly. The entire electronics module is incorporated within the sensor strips, and a voltage supply of 10-30V DC means that no separate power supply is required. The "relay" output is floating and electronic, i.e. without mechanical contacts subject to wear. Closing or opening contact function can be configured locally without requiring auxiliary equipment (see under parameter setting).

6.2 Object detection / monitoring grid

The distance of the light beams to each other (resolution) is directly at the sensor strips equal to the distance of the LEDs in the transmitter or receiver strip (channels). The triple crossing of the light beams result in a higher resolution inside the protective field than directly at the sensor strips. In the middle of the protective field the resolution is lamost twice as high, at a distance of 33% and 66% of the current range almost three times as high. The size of the reliably detected objects is indicated in the picture with B, C and D. The following data are thus obtained for the different variants:

version with grid 120mm: **B=125 mm** D=65 mm C=45 mm
version with grid 60mm: **B= 65 mm** D=35 mm C=25 mm
version with grid 40mm: **B= 45 mm** D=25 mm C=18 mm
version with grid 20mm: **B= 25 mm** D=15 mm C=12 mm



Schutzfeld= protective field

A = current range

6.3 Fully automatic sensitivity regulation

The signal strength of the light curtain is automatically controlled by means of fuzzy logic (fuzzy interference). The fuzzy logic is used to evaluate the quality of the signal (shape and power) and to describe the relation to previous signals. This means that an optimal light output is achieved without adjustment work, in the close range, in the limit range and in case of contamination. Even when the light grids travel along the doors or gates, this functionality is maintained up to range "zero", regardless of the door speed.

6.4 Local parameter configuration or "quick change possible"

The light curtain can be re-parameterized on-site without any additional tools (see quick change and parameter setting). Functions as NO/NC, arbitrary channel suppression, inputs active when plus or minus, beam failure tolerance, etc. can be set. Only the transmitter is parameterized. The data is transferred optically to the receiver and stored permanently with both. It must be ensured that transmitter and receiver are within the nominal range and the light path is free during the entire parameterization process.

6.5 Beam failure tolerance

If, during the course of operation, a limited number of light beams are covered for more than 60 seconds, the light curtain assumes a defect or manipulation (chewing gum) of these channels and deactivates them. The light curtain reacts normally again, but indicates the failed beams with the red failure-LED as permanent signal. The monitoring time and the number of beams (max. 9) are parametrizable. The position of the light beams relative to one another is arbitrary. This state is reset after off / on.
Note: An exception is the sync channel, which should not fail.

6.6 Arbitrary channel suppression

If you want to fade out a certain area of the light curtain, place the "interfering" object in the in the light curtain or cover the area at the receiver with light-tight adhesive tape. Then activate the function "channel suppression" (see quick change or parameter setting). The light curtain then excludes the covered channels from the detection. After having exit the menu, the light curtain will work normally, but without the dead zones. This setting is permanently stored, i.e. also after switching the device on and off. If you want to change the settings the process can be repeated or redone as often as required.

6.7 Test input

In order to detect a possible malfunction, the light curtain can be tested for correct function with the test input, e.g. before each door movement. When the signal at this input is received, the transmitter switches off. The receiver output also has to be switched off within the reaction time, which can be controlled by the higher-level control. If the test input is not needed, it can be left open. The test input can be controlled as +10-30V or as 0V-signal (see parameter setting).

6.8 Switch-on delay (door open time)

If the light path of the light curtain is free again, the device normally switches again with the fastest possible reaction time. However, a switch-on delay can be parameterized (see parameter setting), in order to delay it. Thus you can realize for example when retrofitting the light curtains on older doors a door-open time without further effort.

6.9 Switch-off delay (function "slow light curtain")

If the light path of the light curtain is interrupted, the device normally switches off with the fastest possible reaction time. However, a switch-off delay can be parameterized (see parameter setting), in order to slow down the detection of the interrupted light path.
Example: If a switch-off delay of 1 second is parameterized, the light curtain will not switch off the output until the light beam has been permanently interrupted for at least 1 second. If, for example, the light path is briefly free again within this second, the time measurement starts again when interruption occurs again.

6.10 Heater

This option should always be combined with the protection system IP65. The heater switches on gradually when the temperature drops below +15°C down to +5°C. The light curtain's LED cannot be equipped with this optional heating.

6.11 Factory settings

The devices are delivered with the following factory settings:

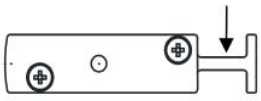
- switching output: NC
- test input: activated by connecting to $+U_B$
- quick change: permitted
- type of beam: triple cross-beam
- sync-channel: see 11.3 parameter list

7 Installation

7.1 Mounting instructions

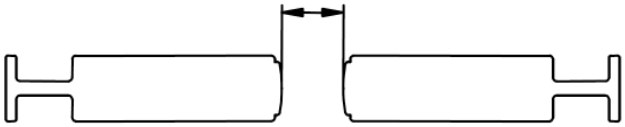
The connection of the sensor strips to the earthed car must be conductive. This is usually already ensured by the standard fastening.

1. The light curtain operates with a modulation frequency of approx. 91 kHz. Please avoid foreign light sources in the vicinity of the light curtain's receiver if they operate with a similar frequency (60 - 120 kHz). If such foreign light sources radiate too strongly into the receiver, incorrect switching operations of the light curtains could take place during the times when these foreign light sources are switched on.
2. It is not admissible to open the sensor strips. Opening them would avoid all warranty and liability of the manufacturer.
3. The sensor strips with mounting strap function have 2 to 4 fixing holes. If you require more holes, you can add them in the same form (see the arrow).

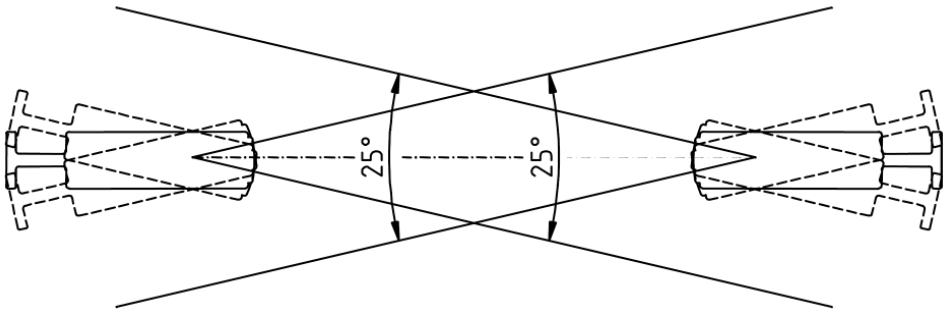


4. No further fixing bolts may be welded onto the sensor strips with bolt attachment. Modifications will be made only by the manufacturer.

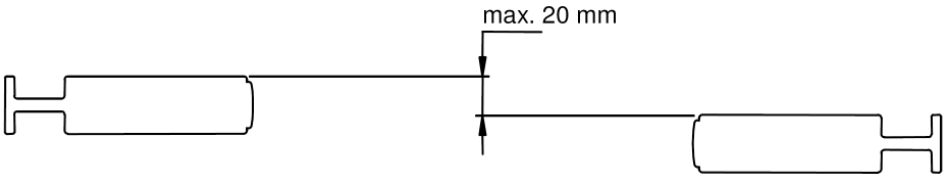
5. Min. permitted separation of the sensor strips:
   Range 5m: min. 250mm
   Range 10m: min. 500mm



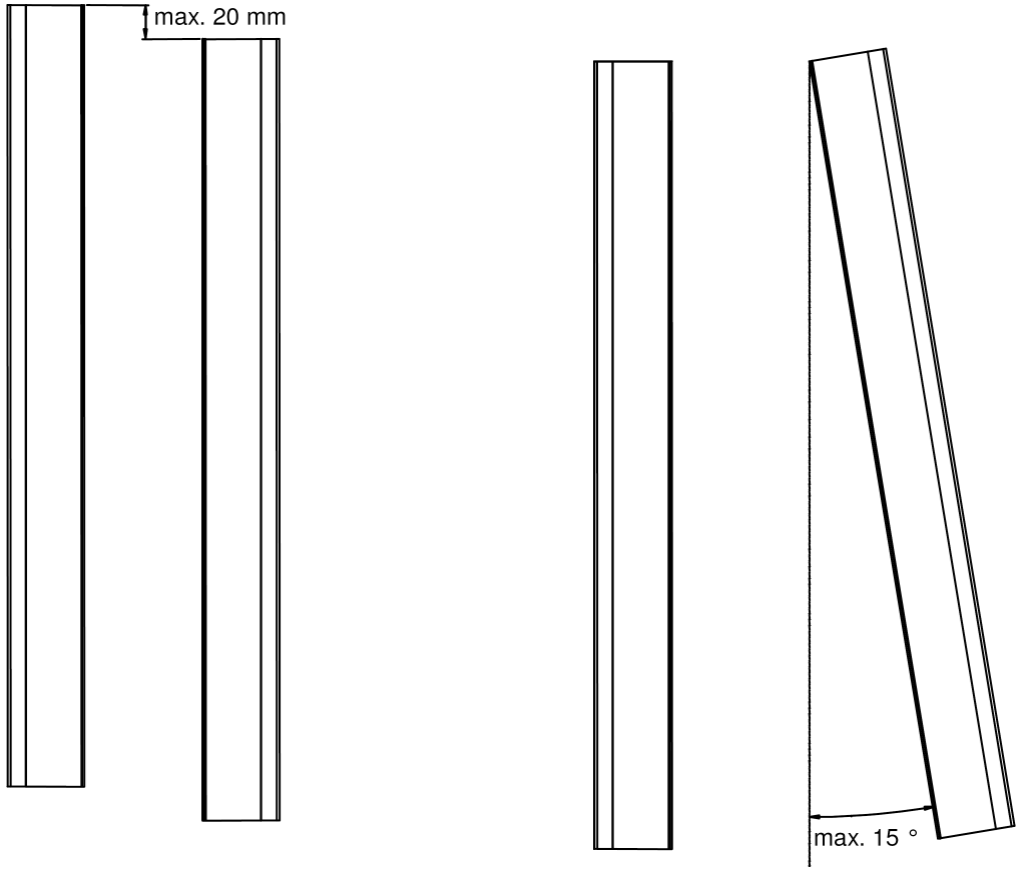
6. Max. permissible rotation (depending on the range)



7. Max. permissible lateral displacement (depending on the range)



8. Max. permissible height displacement and non-parallelism (depending on the range)



9. The limit values specified above must not be reached in combination, i.e. the sensor strips must not be mounted strongly rotated and at the same time not parallel.

7.2 Static mounting

For static mounting the sensor strips are attached to non-moving parts of the door or gate. Thus they do not move with the door. All versions of this series may be utilised in this mode.
A special mounting kit for lifts is available on request. Using this mounting kit, devices with bracket mounting are installed in the door opening area between the cabin door and the shaft door. The light curtain can thus be attached to almost all central and side opening automatic doors.

7.3 Dynamic mounting

In dynamic mounting the sensor strips are attached to moving parts of the door or gate. Thus they travel with the door.

NOTE: Only the versions with M8-connector in connection with the „ipf-SENSORFLEX“-cable sockets can be used for this purpose.

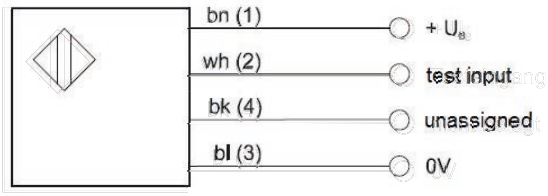
A mounting kit for installing the devices on the door leaves is availale on request.

8 Connection

8.1 General

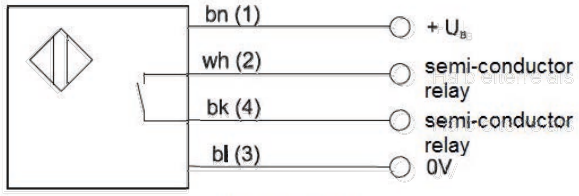
Normally the light curtain is connected directly to the +10...30V DC power supply of the higher level system (current consumption, switching function, etc. see technical data).

transmitter



bn=brown, wh=white, bk=black, bl=blue
terminal markings of cable socket in brackets

receiver



bn=brown, wh=white, bk=black, bl=blue
terminal marking of cable socket in brackets

In order to distinguish between the transmitter and receiver strips, the transmitter is marked with a red dot next to the connector.

8.2 Switching output on the receiver

The switching output between the pins 2 and 4 or between the conductor colours white and black is designed as floating electronic "contact". This output circuit also contains an electronic fuse. When this fuse operates in response to an excessive current drain due to overcurrent or short circuit in the output circuit (see under technical data), the output impedance becomes high (the output opens). The output operates normally again only after removing the excessive current drain and elapse of a waiting time of a few seconds then.

NOTE: In the non-powered state of the light curtain the output is always open, regardless of the configuration as closing or as opening contact.

9 LED status indicators

transmitter	
yellow LED	description (0 = off / 1 = on)
0	transmitter is off (no voltage)
1	transmitter is operating
flashing	test input is active

receiver		
yellow LED	red LED	description (0 = off / 1 = on)
0	0	receiver is off (no voltage)
0	1	light path is interrupted (output is not switched)
1	0	light path is unobstructed (output is switched)
1	1	light path is unobstructed, but beam failure tolerance is activated (output is switched)
0	flashing	dirty, incorrectly adjusted or range limit (output is not switched)
1	flashing	dirty, incorrectly adjusted or range limit (output is switched)

10 Quick change (channel suppression and output)

All parameters of the light curtains have already been set in the factory (see paramer settings). However, if it is necessary to make changes locally, this will be possible by means of the test input on the transmitter without requiring any further auxiliaries. All parameters are permanently stored in the so-called flash memory (the stored values are always preserved, even without applied voltage).
With the function "Quick change" the function 51-14 (channel suppression) and the parameter 13 (output as closing or opening contact) can be activated without having to go to the parameter setting function. This constitutes a quick and convenient local setting possibility for the fitter.

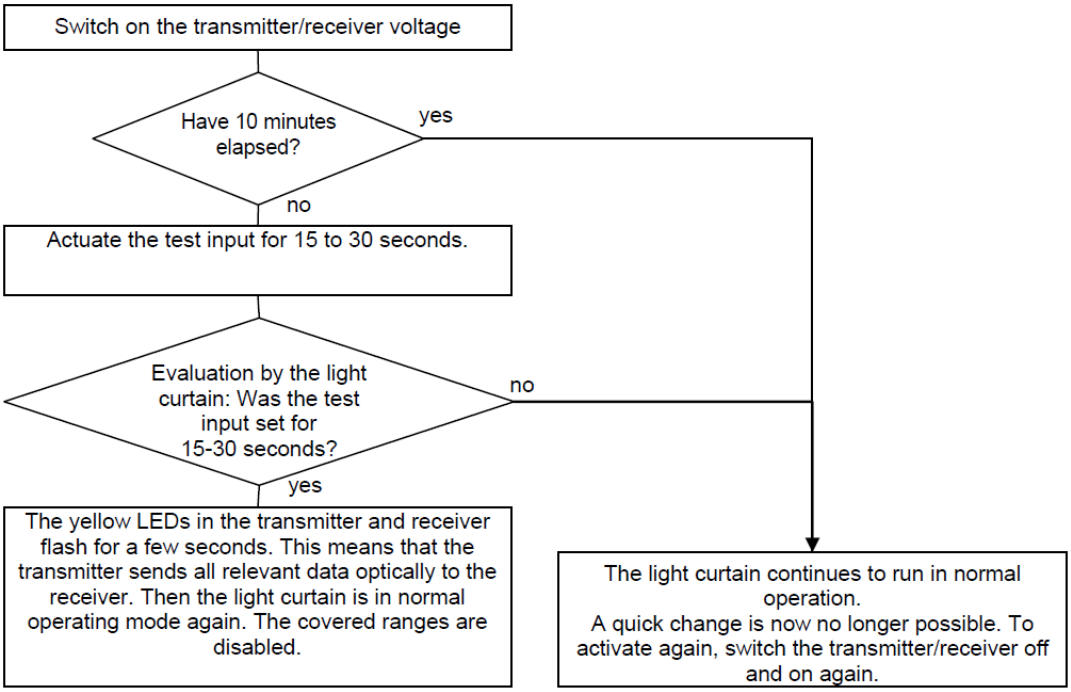
10.1 Instructions and conditions for quick change

- The quick change mode can be activated only within the first 10 minutes after switching on the light curtain.
- The parameter 22 ("allow quick change") must be set to 01 (standard for lift light curtains).
- For parameter setting the transmitter and the receiver must "see each other" and must be operating within the nominal range.
- During code entry at the test input for quick change the light curtain is in normal operating mode, i.e. the test input is also functioning normally for the time being (the transmitter and the receiver also switch off).
- The parameters changed by quick change are saved immediately.
- If you find during quick change that something has come into the light path or that the receiver has not received a value, you can simply switch the light curtain off and on again, and then start from the beginning.

10.2 Channel suppression

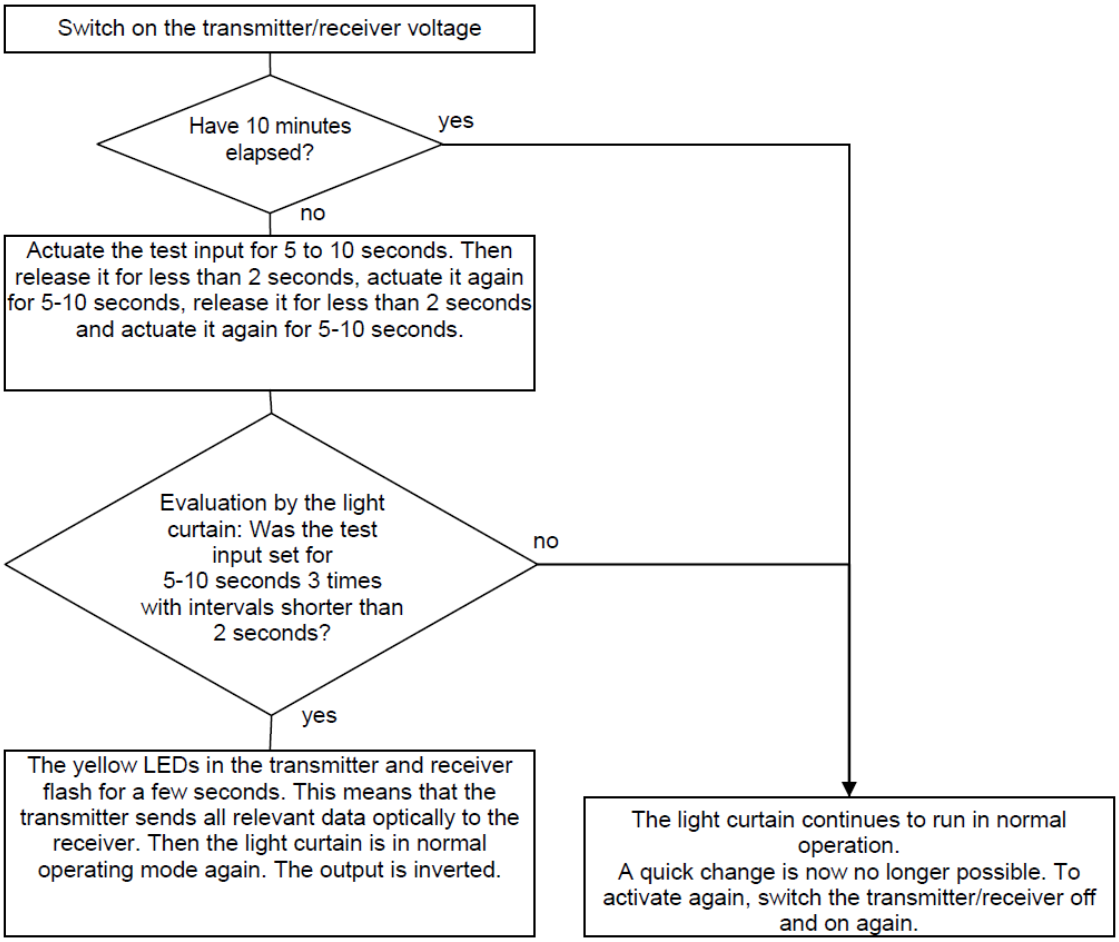
On activation the free channels are read in and the obstructed channels are permanently deactivated.

- Bring the disturbing object into the light path or cover the LEDs at the receiver with adhesive tape.
- The sync channel must not be obstructed. If it is necessary to cover it, too, the quick changes cannot be used. The sync channel must first be shifted to a position of the light curatin that can remain free. The sync channel can be shifted with parameter 11 (see the parameter setting section).
- The position of the covered channels is in other respects arbitrary. You can thus also suppress several regions simultaneously.
- At least 2 channels must be left active, namely the sync channel and any one other channel.
- If a neighbouring channel with respect to a still active channel is deactivated, of course the crossed beam function to this deactivated channel is inactive.



10.3 Changing the output as closing contact or as opening contact

On activation the output is inverted, i.e. a closing contact becomes an opening contact, and an opening contact becomes a closing contact.



11 Parameter setting

All parameters have already been set in the factory. However, if it is necessary to make changes locally, this will be possible by means of the test input on the transmitter without requiring any further auxiliaries. All parameters are permanently stored in the so-called flash memory (the stored values are always preserved, even without applied voltage).
See also the quick change section if only a few monitoring areas of the light curtain are to be suppressed or the output is to be inverted.

11.1 Instructions and conditions for parameter setting

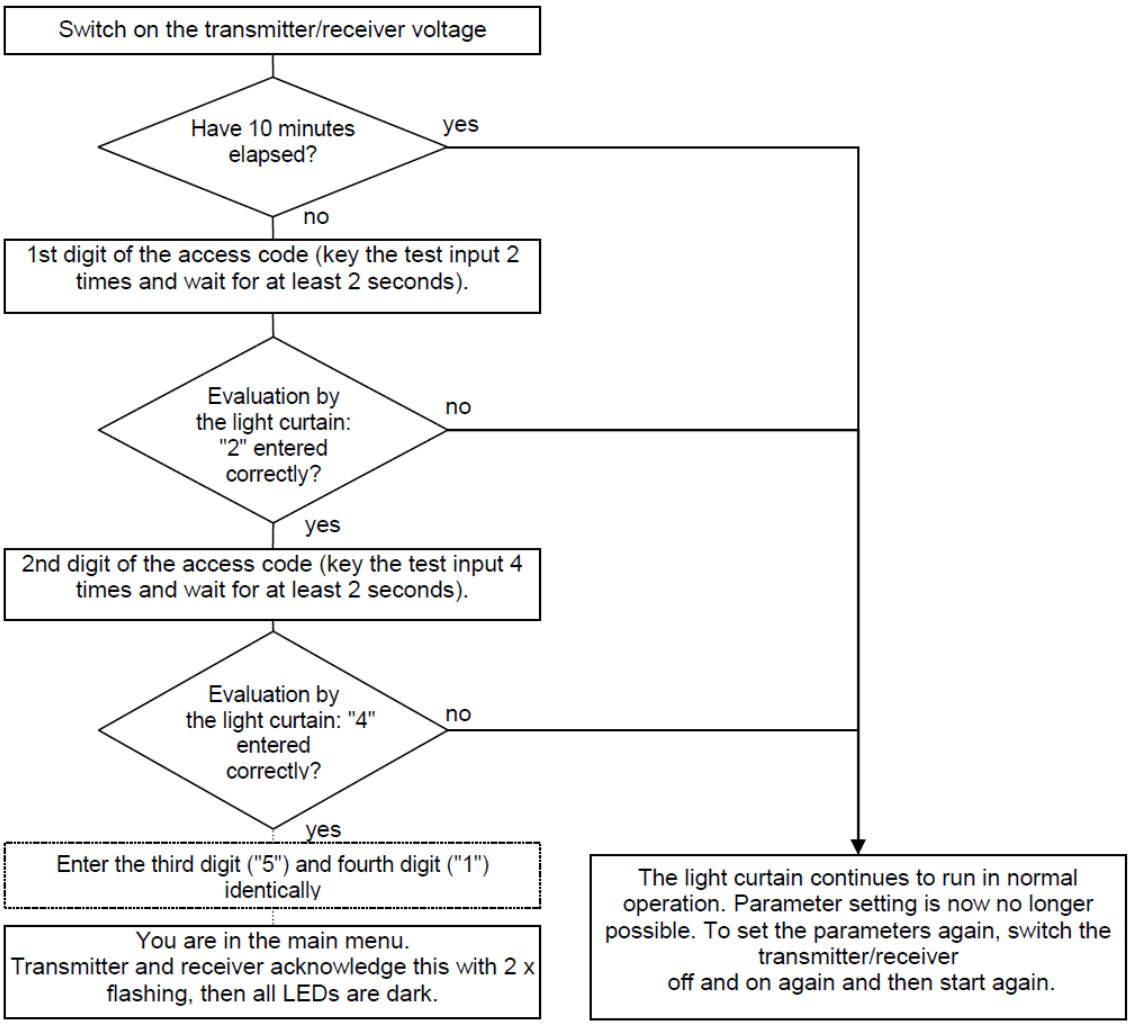
- The parameter setting mode can be activated only within the first 10 minutes after switching on the light curtain
- If you wish to activate the parameter setting mode, the test input must not be switched previously otherwise.
- For parameter setting the transmitter and the receiver must "see each other" and must be operating within the nominal range.
- During code input for activating the parameter setting mode the light curtain is in normal operation, i.e. the test input also functions normally for the time being (transmitter and receiver switch off too).
- If an incorrect digit is entered during the code input, the light curtain will wait for a new code sequence. This must then be entered from the beginning.
- For the subsequent counting of channels (LED No.), counting is always from the top (on the cable side) to the bottom. For the light curtains with 20mm, 40mm and 60mm LED grid the LEDs count 1, 2, 3, 4, …, for the light curtains with 120 mm grid the LEDs count 2, 4, 6, 8, … .
- The changed parameters are saved immediately when the value is correct.
- The access code is the same for all devices and cannot be changed. Since access to the connecting cables must always also be possible to enter the code, extensive protection against abuse is given in connection with the access code.
- When no further entries are made during parameter setting, the transmitter and receiver automatically revert to normal operation after 10 minutes.
- If you find during parameter setting that something has come into the light path or the receiver has not received a value (it does not acknowledge, or the transmitter is back in the main menu, but not the receiver), simply switch the light curtain off and on again, type in the access code again and then re-enter the same parameter.

11.2 Action sequence of parameter setting

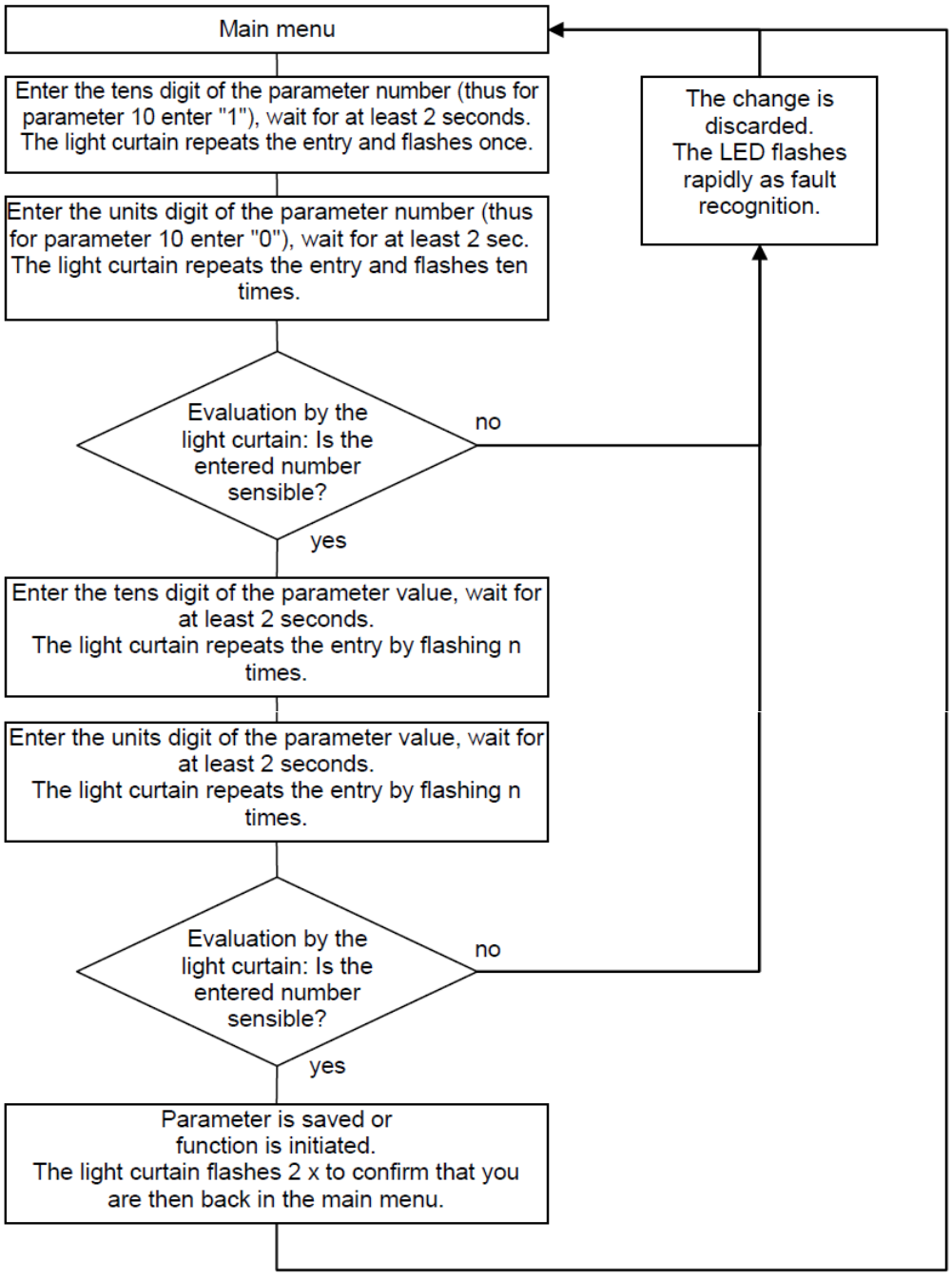
- Use the test input on the transmitter for entering all digits. A digit must be entered at the test input with a keying rate of 100 ms to 1.5 s (thus for a 5 you must hold the keying input 5 times in succession briefly on +24V, or for low active inputs 5 times on 0V). You must then wait for at least 2 seconds. If a typed-in digit was plausible, the transmitter and receiver repeat the entered digit as confirmation. You can then enter the next digit in the same manner, and so on.
- A "0" is entered by pressing 10 times. A leading "0" for the value "01" must be entered (i.e. for this press 10 times, wait for 2 seconds, press once, wait for 2 seconds).
- The access code for all devices is the digit sequence "2451".
- During parameter setting (i.e. after entering the access code) the receiver acknowledges each value with its yellow LED after the entry.
- At the same time as with the LED, the receiver also acknowledges the value with its output. This means that you can also make the parameter settings of the light curtains with the help of the higher-level control system (PLC) and thereby receive the return message via the normal receiver output. Note: If parameter 13 = 00, the output will acknowledge with contact closing pulses. If parameter 13 = 01 it will acknowledge with contact opening pulses
- The transmitter additionally acknowledges the value with its yellow LED (also after the entry).
- Always look at the yellow LED of the receiver while setting parameters.

- The transmitter additionally acknowledges the value with its yellow LED (even after the input).
- During the parameterization you always look exclusively at the yellow LED of the receiver.

11.2.1 Entering the access code



11.2.2 Changing parameters / function initiation



11.3 Parameter list

No.	Description	Value	Description
11	sync channel No.	01 - N	01 = highest channel (on the side of the connecting cable) N = lowest channel (for OYL21670 also 16) With crossed-beam function (see chaper 14) settings in the range 2 and N-1 are allowed. With parallel beam function settings in the range 1 to N are allowed. **Note:** Transmitter and receiver synchronize each other with the help of the sync channel. Through this channel, also the data transfer takes place during the parameterization. The sync channel must remain always enabled. factory settings: grid 20,40,60: OYLx037x to OYLx087x: channel 02 OYLx097x to OYLx167x: channel 07 OYLx177x to OYLx647x: channel 14 grid 120: OYLC037x to OYLC087x: channel 04 OYLC097x to OYLC167x: channel 14 OYLC177x to OYLC647x: channel 28
12	polarity of the inputs e.g. test input	00 01	00 = input activated with 0V at the input ("low active" / "common anode") 01 = input activated with +10-30V at the input ("high active" / "common cathode")
13	output closing contact / opening contact	00 01	00 = NC-contact („light-on mode“) 01 = NO-contact („dark-on mode“) **Note:** The output is always open when the light curtain is not powered up
14	beam type	00 01	00 = parallel beams 01 = triple crossed beams Note: The maximum response time of the light curtain is 50 ms for parallel beams and 140 ms for crossed beams
15	---		Reserved for later applications
16	---		Reserved for later applications
17	time for beam failure toleration		00 = off 01 – 60 = time in 10-second steps Example: 06 means that a defective LED will be gated out after 60 seconds
18	maximum number of beams for beam failure tolerance		For parallel beams: 01 = 1 light beam 02 = 2 light beams 03 = 3 light beams Factory setting: 02 For crossed beams: 01 = 3 light beams 02 = 6 light beams 03 = 9 light beams Factory setting: 02
19	switch-on delay (door open time		00 = Off 01 – 60 = time in one-second steps Example: 03 means that the light curtain switches on again only when 3 seconds have elapsed after the light path has become unobstructed
20	energy saving mode		The current drain (without heater) of the light curtain is reduced by approx. 10% for each increment of the numerical value **Attention:** At the same time the maximum response time becomes smaller by the set factor, thus as follows depending on the set beam mode (see Par.14): - crossed beams: Value x 110 ms + 30 ms - parallel beams: Value x 38 ms + 12 ms

21	switch-off delay (function "slow light curtain")		00 = off 01 – 99 = time in 100-ms steps Example: 10 means that the output of the light curtain switches off only when the light beams have been interrupted since 1 second
22	allow or forbid quick change		00 = not allowed 01 = allow, i.e. "Output closing/opening contact" and "Channel suppression" can be changed without normal parameter setting, see chapter "quick change"
51	function activation	10-14	10 = end of the parameter setting 11 = reset to the factory settings 12 = channel suppression 13 = output all parameters as flashing code 14 = copy all parameters of the transmitter to the receiver (any set channel suppression, parameter 51 12, is not copied either) 15 = transmission of a set of parameters by a PLC

For 10) The light curtain reverts to normal operation. Can take place alternatively by switching the power supply voltage off and on again.

For 11) The transmitter and the receiver set themselves back to their respective factory settings.

For 12)
- When activated the covered channels are permanently disabled.
- All relevant receiver LEDs must have been covered previously in a lightproof manner, or the object which is to be suppressed must be in the light path.
- The sync channel must not be obstructed. If it has to be covered too, it must first be moved to a position of the light curtain that can remain unobstructed. The sync channel is moved with chapter 11.
- The position of the covered channels is in other respects arbitrary. You can also deactivate several ranges.
- At least 2 channels must be left active, namely the sync channel and any one other channel.
- If a neighbouring channel with respect to a still active channel is deactivated, of course the crossed beam function to this deactivated channel is inactive.

For 13) All stored parameters are output successively. The transmitter and the receiver output their values independently of each other. If in doubt, therefore, let this function run twice and write down the values separately. They must always agree, otherwise the light curtain will not function correctly.
After the "3" of the entered "13" has also been acknowledged, the parameter output commences:
X = Value of the parameter 11 (tens digit)
X = Value of the parameter 11 (units digit)
X = Value of the parameter 12 (tens digit)
X = Value of the parameter 12 (units digit)
…
X = Value of the parameter 21 (tens digit)
X = Value of the parameter 21 (units digit)
Example: 0 4 … means that parameter 11 is set to the value 04, etc.

For 15) A higher level PLC could imitate the parameters of the light curtain, adjustable with a corresponding convenient user interface, or could have placed predetermined sets of parameters in your memory. This set of parameters can then be transferred to the light curtain by calling up the function 51 15. To be able to use the function, the light curtain test input must be connected directly to a PLC output, and the light curtain output must be connected to a PLC input.

The following action sequence must be maintained:
All numerals should be transmitted with a speed of 150ms pulse duration and 150ms pause duration; a waiting time of 2.5s must be interposed between the numerals.
First of all transmit the access code 2451. Then await the main menu confirmation of the light curtain (2 x flashing of the light curtain's output with 300ms rhythm). Transmit function 51 (the light curtain acknowledges in each case the numerals at its output with 300 ms rhythm). Now transmit the parameters in the same sequence as described under 51 13, thus first parameter value 11 tens digit, wait for 1.5s (here shorter allowed), parameter value 11 units digit, … parameter value 21 units digit. After each complete parameter (i.e. always after 2 digits), the light curtain checks whether this value was allowed. If a value is not allowed, the device issues at its output 5 x flashing with 70ms rhythm. If everything was correct after keying in the last parameter, the output flashes twice with 300ms rhythm and saves the data. In the case of an error, the light curtain flashes 5 times with 70 ms rhythm.
It is then possible to exit the menu by keying in 51 10 (again in each case with 2.5 s pause between the numerals. After exit from the menu, the device functions normally immediately, using the new parameter values.

12 The most frequent errors

symptom	**With dynamic mounting the light curtain sometimes interrupts when opening and closing the door / the gate.**
possible cause	1. the sensor strips are not adjusted properly according to the instructions 2. severe EMC disturbance of the door/gate drive 3. an object is sporadically present in the light path
solution	For 1 check the adjustment (see the mounting instructions) For 2 check the earthing of the sensor strips. The housing of the transmitter strip and of the receiver strip must be earthed. Check the feeder cables. No lines for voltages <30V should be located together with lines for voltages >30V in the same cable, e.g. 230VAC and 24VDC signals. For 3) Please check whether, for example, a cable, loose sticker or other such object can come into the light path while the door/gate is running

symptom	**With dynamic mounting the light curtain interrupts shortly before reaching the open state of the door or gate.** **With static mounting the light curtain always interrupts.**
possible cause	1. the sensor strips are not adjusted properly according to the instructions 2. the filter discs are dirty 3. an object is present in the light path 4. the device is defective
solution	For 1. check the adjustment (see the mounting instructions) For 2. clean the filter discs of the transmitter strip and of the receiver strip (see chapter maintenance). Possibly the filter discs are scratched or blind due to improper cleaning. For 3 check that there is really not an object in the light path For 4. the device must be replaced (see the instructions for replacement).

symptom	**With dynamic mounting the light curtain interrupts when the door or gate is almost closed.**
possible cause	1. the sensor strips are not adjusted properly according to the instructions 2. the sync channel is set differently at the transmitter and at the receiver after replacing a sensor strip
solution	For 1. check the adjustment (see the mounting instructions) For 2. the transmitter and receiver must always be replaced as a ,matched pair (see instructions for replacement). Alternatively: Set the sync channel such that it is matched at the transmitter and receiver (see under parameter setting).

symptom	**The red LED at the receiver does not switch off, but the device is functioning normally**
possible cause	this is the indication of beam failure tolerance (see under beam failure tolerance)
solution	Switch the light curtain off and on again. If the device then does not switch active immediately, but only after about 60 s (depending on the parameter settings), exactly one LED is still obstructed or defective. Immediate replacement of the light curtain is not necessary.

symptom	**The red LED on the receiver flashes with a period of 1 s, but the light curtain is functioning normally**
possible cause	This is the indication of weak signal detection, i.e. the range limit is nearly reached. Possible causes for this are: 1. incorrect adjustment 2. dirty filter discs
solution	For 1. see the mounting instructions for adjustment For 2. clean the filter discs if necessary (see under maintenance)

symptom	**No LED is lit on the transmitter and/or: No LED is lit on the receiver**
possible cause	1. no power supply voltage 2. the device is defective
solution	For 1. Check the connection (correct conductor colors?). Measure the voltage at the terminals of the light curtain (see under connections) For 2 replace the light curtain pair (see the instructions for replacement)

symptom	**During initial operation, the yellow LED is lit on the transmitter, but only the red LED is lit on the receiver. The light curtain does not switch to the active state.**
possible cause	1. the transmitter and the receiver do not match 2. the parameter settings of the transmitter and of the receiver are different
solution	For 1) Please check the rating plates on the transmitter and receiver. As omne pair has the same article number, the type key on both devices has to provide the same number. For 2) see under parameter settings

symptom	**The receiver does not switch to the activated state (the yellow LED is off), and the yellow LED is flashing on the transmitter**
possible cuase	The test input on the transmitter is active
solution	Check the test input. If it is configured to "high active", it must lie at 0V potential or be open. If it is configured to "low active", it must lie at +10-30V potential or be open (see under parameter setting)

symptom	**The read and yellow LEDs flash irregularly, partly furiously. Reducing the range brings improvement, but sporadic interruptions persist even with small ranges.**
possible solution	1. Condensation is present inside the light curtain's housing, i.e. the circuit boards have become moist. There is (partial) condensation on the inside of the red filter discs. 2. When connecting / during initial operation of the higher-level control system or of the devicve an error has occurred. A voltage > 63V was connected between the 0V supply line of the light curtain and earth. Some control systems permit brief false terminal connections during initial operation (e.g. a short circuit between the 230V phase line and the 24VDC signal voltage). This makes a 230VAC voltage appear between 0V and ground and destroys the internal protection capacitors of the device and possibly also other electronic devices, without this becoming immediately apparent. The devices then behave unstable with respect to EMC disturbances. 3. A fault has occurred in operation of the higher-level control system or in operation of the device. A voltage >63V appeared between the 0V supply line and earth (see 2.)
solution	For 1) Check whether the protection system of the transmitter strip and receiver strip is IP54 or IP65. Protect IP54 strips against weather influence, rapid temperature changes, fog, etc. If this is impossible, at least the protection system IP65 must be provided. If the light curtain is utilised outdoors, also consider using the variant with heater. The variant with heater must also not be exposed directly to the weather. Protect this variant too, e.g. with a rain roof. For 2+3) Measure the potential difference between 0V and earth, also when the lift is running or the door/gate is moving. Normally there should be no potential difference, not even briefly. The 0V line should normally be connected to earth in the control system (see the circuit diagram of the higher level control system). If there is any doubt, power down the plant and then measure the resistance between the 0V line and earth. The ideal value is 0 Ohms. After checking and remedying the fault, the light curtain pair must be replaced (see the instructions for replacement).

symptom	**The output of the light curtain does not close. But the yellow status LED indicates the switching state correctly.**
possible cause	1. There is an electronic fuse in the output circuit. When this fuse operates in response to an excessive current drain due to over-current or short circuit in the output circuit (see technical data), the output impedance becomes high (the output opens). 2. The output circuit is defective
solution	For 1. The output operates normally again only after removing the excessive current drain and elapse of a waiting time of a few seconds then. For 2. The output circuit has possibly been destroyed by a voltage that was too high. Replace the light curatin (transmitter and receiver, see the instructions for replacement). Before the next switch-on of the control system check whether the output was closed correctly and that no excessively high voltage can appear (see the technical data).

symptom	**The beam covering is not taken over correctly at the time of parameter setting.**
possible cause	1. the transmitter and the receiver are too close together 2. the transmitter and the receiver are too far apart 3. the rays that are to be suppressed are not covered unambiguously 4. the sync channel is partially covered
solution	For 1. move the transmitter and the receiver further apart For 2. bring the transmitter and the receiver closer together For 3. it is best to cover the rays with a broad black object or insulating tape directly over each ray that is to be suppressed For 4. remove the covering of the sync channel or move the sync channelor move the to a different ray before execution

symptom	**The access code for parameter setting is not accepted.**
possible cause	1. more than 10 minutes have elapsed since switching on the transmitter or receiver 2. the light path between the transmitter and receiver is obstructed 3. the distance between the transmitter and receiver is too great 4. The polarity of the test input is + (i.e. test input active with +10-30VDC) but you are trying to enter the code by keying/bridging to 0V. You can determine the polarity setting as follows: If the light curtain is functioning normally while the test input is connected to 0V, you must key-in the code with +, (and conversely). 5. the polarity of the test input is - (i.e. the test input is active with 0V), but you are trying to enter the code by keying/bridging to +
solution	For 1. follow the instruction in the parameter setting section For 2. follow the instruction in the parameter setting section For 3. follow the instruction in the parameter setting section For 4. - For 5. -

13 Technical data

General	
range	5m (optional 10m)
ambient temperature	standard version: operating: -25 ... +55°C, storage: -40 ... +70°C (no icing or condensation permitted) version with heater: operating: -25 ... +55°C, storage: -40 ... +70°C
humidity	operating: 35 ... 85%, storage: 35 ... 95%
electrical connection	M8-connctor, 4-pin
max. reaction time for configuration „cross-beam“ (standard) (regardless of number of LED)	light path interrupted: 140ms light pass free: 220ms test input set: 180ms test input free: 260ms readiness delay: 300ms
max. reaction time for configuration „parallel beam“ (regardless of number of LED)	light path interrupted: 50ms light pass free: 72ms test input set: 90ms test input free: 112ms readiness delay: 300ms
fitting position	arbitrary
housing material	body: aluminum front screen: transparent red plastic end pieces: black plastic
protection class acc. EN 60529	IP54, optional IP65
Optic	
wave length of light beams	880nm
pulse rate of light neams	91kHz
anle of beam spread (light beams)	± 15°
ambient light resistance	> 200.000 lux at 20°
Electronics	
operating voltage	standard version: 10 ... 30V DC, residual ripple 10% version with heater: 11 ... 30V DC, residual ripple 10%
max. current consumption / pair	standard version with 16 channels 120mA with 32 channels 160mA with 48 channels 220mA with 64 channels 280mA for the versions with heater the current consumption increases of 200mA per 8 channels (voltage 24V DC).
max. switching voltage (ohmic)	35V AC/DC
max. switching current (ohmic)	150mA bei 20°C / 100mA bei 55°C
contact resistance typ. /max.	4Ω / 12Ω
max. leakage current with open contact	0.001mA
switching behavior (programmable)	1 NC, floating: electronic contact closed with free light path 1 NO, floating: electronic contact closed with interrupted light path

14 Maintenance

14.1 Safety instructions

The light curtain can only be used in technically perfect condition. Keep all documentation included in the delivery such as this manual ready at hand and constantly at the site of operation. Keep the documentation always current. This especially applies to modifications of the higher-ranking control system carried out later. Please observe all safety and danger notes of the system and always keep them legible.

1. If there are changes to the environmental influences such as temperature, humidity or a potentially explosive atmosphere during the operating time of the system or storage period of
2. Only the manufacturer's original spare parts must be used.
3. Do not perform repairs on control units or sensor strips independently! A failure to comply with these instructions or changes to the light curtain can cause additional danger excluding the liability of the manufacturer for damages resulting from this.

14.2 General maintenance intervals

The light curtain is designed and constructed to function trouble-free and with low maintenance. However, it is mandatory to check the functions of the light curtain at regular intervals.

14.3 Cleaning the sensor strips

Depending on the degree of dirt accumulation on the plant, the filter discs of the sensor strips must be cleaned at corresponding intervals. However, only clean the discs with a soft, moist cloth, if necessary, with a small amount of detergent.
Do not use any abrasives or additives that attack plastics. Do not rub in the dry state, because this can make the plastic discs go blind and thus reduce the range.

15 Instructions for replacement

1. Always replace the complete light curtain consisting of the transmitter strip and the receiver strip. Make sure that the replaced pair is returned together for repair.
2. If a light curtain has to be replaced, please check whether the present parameter settings have been noted (see under parameter setting). If not, please check whether the light curtain's transmitter is still functioning to the extent that the parameter settings can be read out. Note these parameter settings in the table in the parameter setting section.
3. After replacement it may be necessary to make parameter settings in the new device (see under parameter setting). The factory settings are also noted on every light curtain's transmitter strip and receiver strip. Only transmitters and receivers that have the same parameter settings will function properly as pair.
4. Make sure that the type designations on the transmitter and receiver do not differ.
5. The version of the transmitter and of the receiver must be the same.
6. Bolt the transmitter again on the door/gate side on which the transmitter was mounted previously.

16 Storage

1. Only store the units at an admissible temperature (see technical data) under normal broader storage conditions for electrical appliances.
2. Check the condition of the units when removing them from storage. They must not show any severe contamination with dirt, mechanical damage or deformation.

17 Packing and disposal

The customer is responsible for disposing of the delivered goods after termination of their service life at his own expense and in accordance with the statutory regulations, and to hold ipf electronic gmbh free from obligations according to § 10 Section 2 ElektroG (Manufacturer's take back obligation) and third party claims in connection therewith.