Terminal Description

System PM 100

Standard Barrier LS 100

BASIC and TREND

Version 2.20

DESIGNA

06.06.2000, ICS

Table of Contents

List of Illustrations

Amendment Index:

without version no.,	Eh	Document „Standard Barrier LS 100“ redone
Version 1.0, 18.10.95,	JB	Adaptation of description of Standard Barrier LS 100 (without version number) to LS 100 BASIC.
Version 2.0, 30.05.96,	JB	Addition of description of new control unit SE4 addition of new barrier type LS 100 TREND
Version 2.1, 29.07.96,	Eh	date of issue added in the footing illustrations re-numbered replacement of headlines on pages 2 and 3 extension of function description on page 6 correction of illustration 1 change of §§. 3.4, 4, 6.3.4; in the description exchanged description of the clamps 9 and 10 (page 10) Illustration 6.1; set barrier arm to the back Illustration 6.1; flange shortened Wiring diagram (page 32); fuse removed

1 General Safety Instructions

It may be hazardous to leave the area of barrier arm unattended because of its function as an automatic barrier. When installing the terminal, make sure to take adequate precautions for pedestrians such as setting up special signs, blocks or the like.

As several parts of the terminal move automatically within the casing be very careful when working while the casing is open. Please respect the operation instructions during maintenance works. Close casing upon leaving the terminal to avoid endangering third persons.

2 Barrier Function

The barrier serves to block off or clear lanes of car parks of all kinds. The blocking off is done by a self-supporting barrier arm.

The barrier arm is brought into a horizontal/vertical position with a gear motor installed in the casing and a lever mechanism in the form of a sine drive.

To clear the lane the barrier arm is turned 90° upwards by the gear motor. The closing or opening of the barrier is activated through automatic functions or external control signals.

The barrier is operated with control signals from a control desk (by actuating the appropriate sensor) or via control impulses of a connected parking installation of DESIGNA Verkehrsleittechnik GmbH. The automatic functions are: the closing after leaving the N detector, the automatic closing after expiration of a set time or the opening of the barrier when the function "two way traffic" is activated.

If the barrier arm meets an obstacle (vehicle) when closing, any further movement is stopped by reduced motor output (initiated by the barrier control). The motor is not turned off.
Via an optional sensor strip at the barrier arm the barrier can be motivated to re-open, once the arm touches an object.

The "break of barrier arm" switch integrated in the drive shaft, sends an alarm signal to the data control center respectively to the control desk if the barrier arm is missing or not fixed correctly (e.g. after an accident). This does not interfere with its operation.

The position switches which are actuated by the trip cams on the drive shaft report the position of the barrier arm "OPEN" or "CLOSED" to the connected control.

Normally, a closed and power-supplied barrier cannot be opened by hand.

If the barrier arm is pushed upwards/downwards in a off voltage state with much force, the motor can be moved against its direction of rotation. Afterwards the barrier arm has to be adjusted as described in chapter 6.3.4. This does not cause damage to either the motor or the sine drive.

3 Structure

3.1 LS 100 BASIC (CLASSIC)

The barrier is composed of a lower part (base) and an upper part (hood). The casing is made of stainless steel sheet and is coated with Pantone 320 (turquoise green) as a standard.
The barrier arm is made of anodized aluminum and is contrasted with red reflecting foil.
The arm can be delivered as standard equipment or as an articulated arm (optional).

3.1.1 Casing

The casing serves as a support for the casing hood with the barrier arm. It is fixed to the foundation frame with 4 screws, washers and spring washers and the clamping tracks included in the shipment.

The gear motor as well as the sine drive are in the bottom part of the terminal. All additional options are also installed in the base.

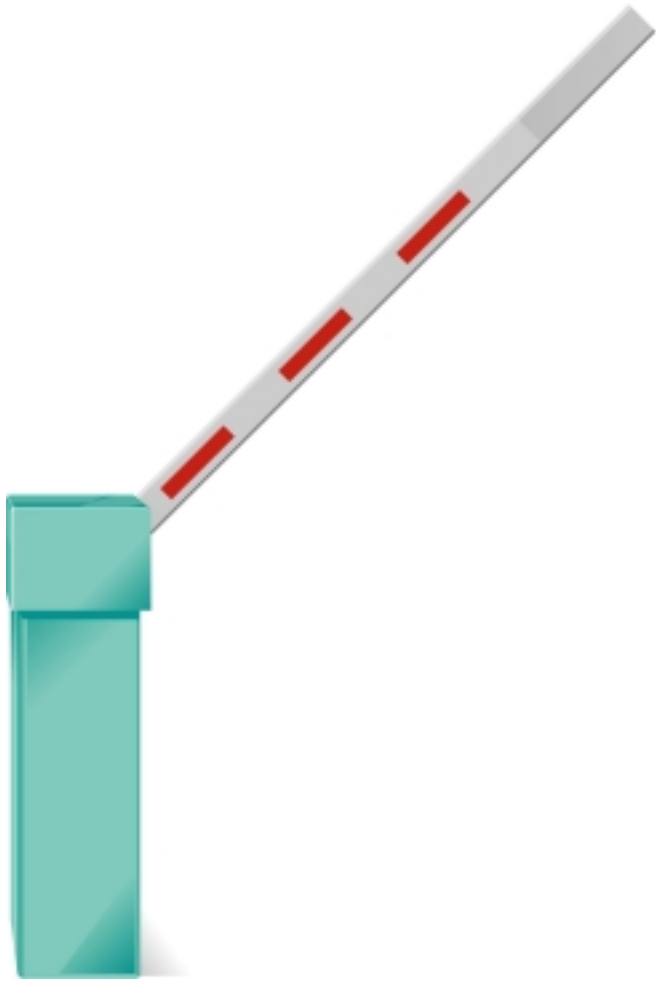


Illustration 3.1: LS 100 BASIC (CLASSIC)

3.2 LS 100 TREND

The barrier of the TREND series equals the technology of the BASIC version. Only the shape of the casing and the allocation of the elements is different.

The casing of the barrier LS 100 TREND stands on a steel post of 100mm Ø and is provided with a cylindrical security lock. The casing is made of stainless steel sheet and is coated in standard color.Pantone 320 (turquoise green),

The casing has a door and a hood closed by a bar. The connection space with the terminal strip and the barrier control is mounted behind the door. The gear motor is built differently (consider this when ordering replacement parts).

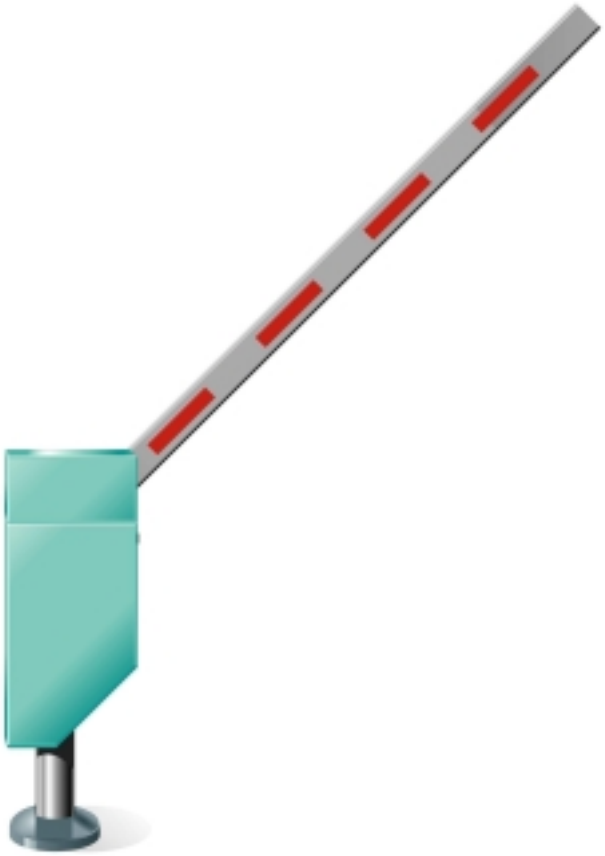


Illustration 3.1: LS 100 TREND

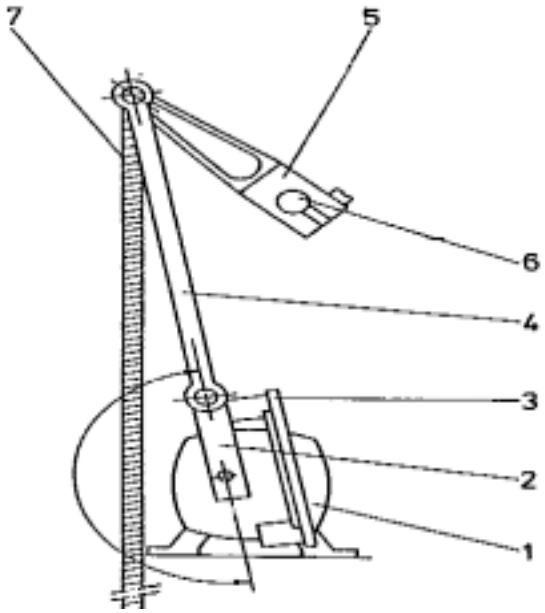
3.3 Gear Motor

The gear motor (see Illustration 3.1: Sine drive) with a power consumption of approx. 100VA serves as drive for the barrier.

If the barrier arm has reached its final position („OPEN" or "CLOSED"), the output of the motor is reduced to approx. 30% of its maximum output by the barrier control. With this reduced output the barrier arm is held in its actual position. This means a constant heating. An additional heating is not necessary and a condensation of the atmospheric humidity can be prevented.
In case of a voltage loss, the arm is kept in its final position by the sine drive. If necessary the arm can be unlocked by moving it shortly up and down.

3.3.1 Sine Drive

The sine drive (Illustration 3.1:) consists of the following parts:



1. Torque motor
2. Clamp lever
3. Limit stop for clamp lever with rubber buffers
4. Connecting rod
5. Lever
6. Drive shaft
7. Tension spring

Illustration 3.1: Sine drive

The sine drive allows short opening and closing periods of the barrier, without barrier arm oscillation in its final positions. This effect is reached at a constant r.p.m. of the motor through power transmission by motor lever, connecting rod and clamp lever.

In the beginning of each opening and closing process the barrier arm moves very slowly and becomes quicker continually until the barrier arm has reached the 45° position. Then it becomes continually slower until the finish of the opening/closing process. Altogether the opening/closing process takes less than 2 seconds.

The tension spring saves the kinetic energy of the downward movement in order to increase the acceleration during the opening of the barrier. The output of the motor is not sufficient to accelerate the barrier arm against gravity. The tension spring is an important component to guarantee short movement cycles.

3.4 Terminal Strip

The terminal strip mounted in the base of the casing serves to connect the barrier to the 230V mains and the distribution of the mains voltage to the consumers.

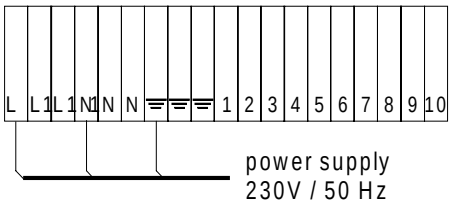


Illustration 3.1 : Terminal strip

10 vacant terminals are installed additionally and can be used when needed.

If further terminals are needed, they can be mounted with an additional mounting rail in the casing. To do so, the mounting rail is fixed on an existing thread bolt (M5x20).

4 Barrier Control unit

The barrier control controls all functions of the barrier and has a double detector. The barrier control is illustrated on page **Fehler! Textmarke nicht definiert.** schematically.

On the circuit board there are 3 fuses for the output part, the electronics part and the external 24V power. The fuses can only be replaced by fuses with the same value and characteristics.

The incoming signals are processed by the barrier control and there is a circuit breaker available for the driving motor. All inputs and outputs are low-active (0V), that means that the functions are activated by connecting a 0V signal. The internal control processes can directly be influenced via the connected loops.

The opening or closing is activated by a control signal of a terminal or by the expiration of the set time basis. The barrier control changes the direction of the rotation of the connected motor and switches to the maximum output. The movement of the barrier arm is then started with the maximum output of the motor.

Once the desired final position is reached, the position micro switch reports this to the barrier control. The motor is then run another 2,5 sec. with maximum output in order to lock the arm safely in the final position. Then the control changes the output to about 30 % of the motor output. This state stays the same until the next control command.

4.1 PCB Layout

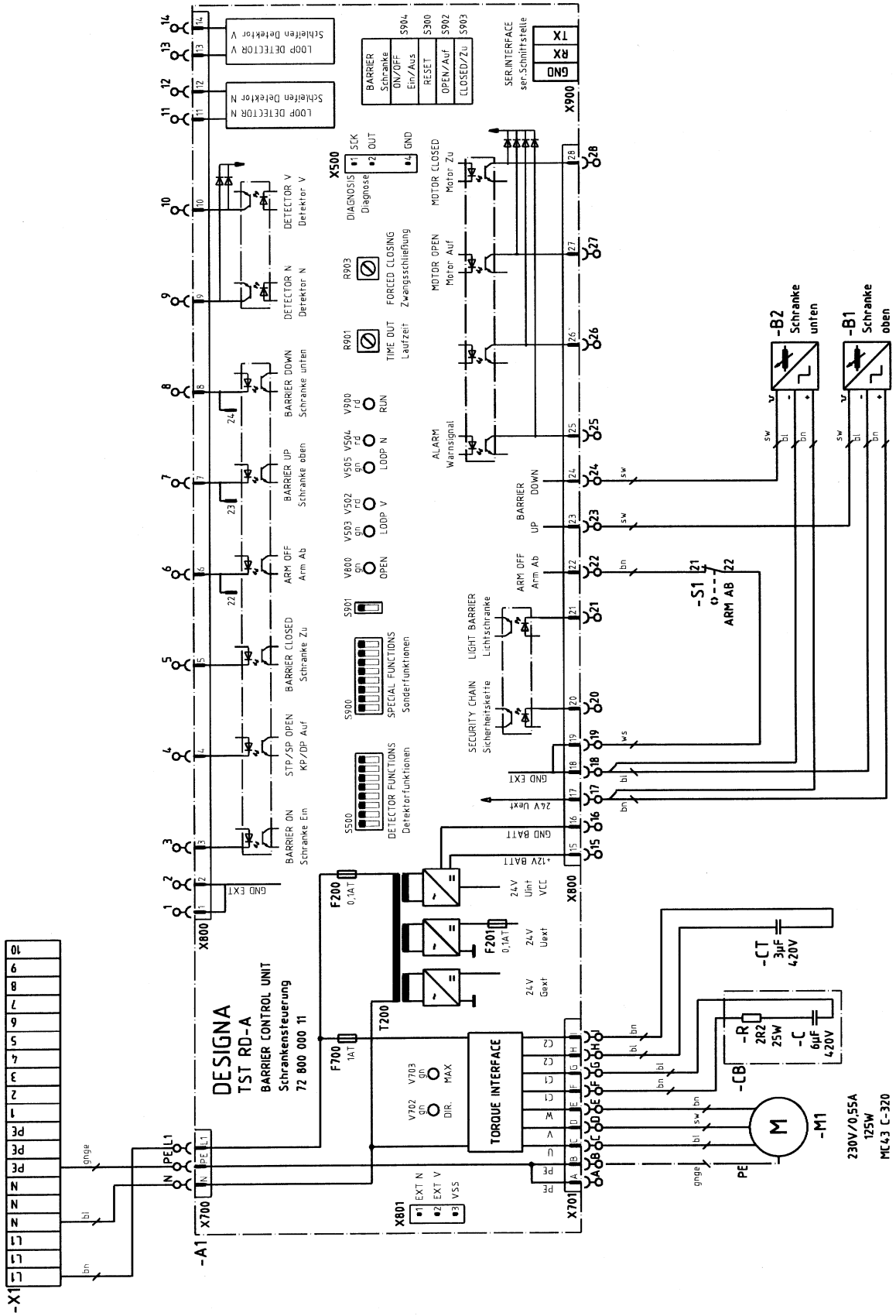


Figure 1: TST RD-A layout (not scaled)

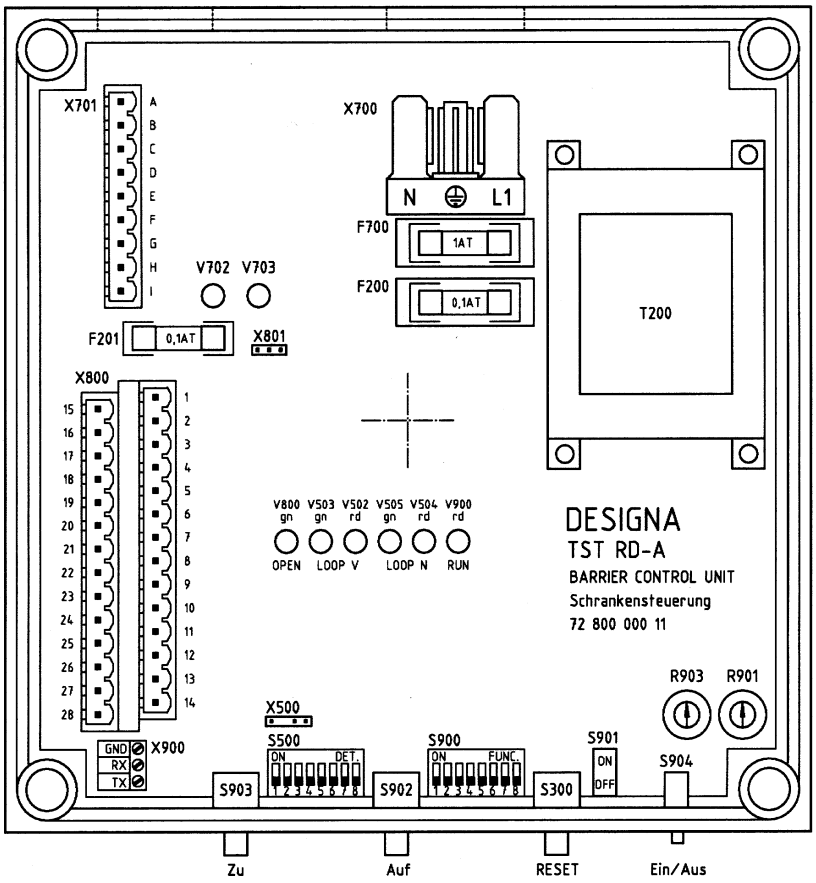


Illustration 4.1: scale model of TST RD-A

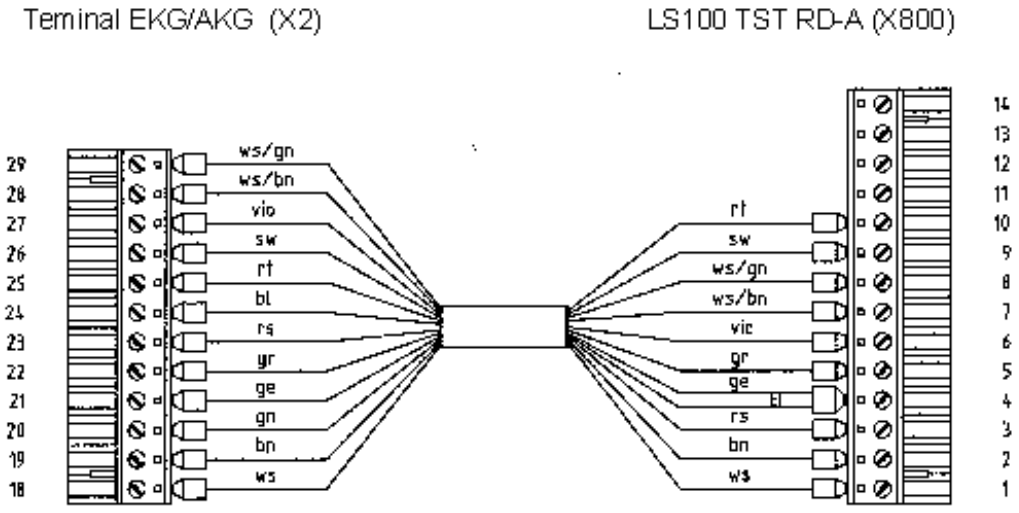


Illustration 4.2: Connection between EKG/AKG and the Barrier LS100

Connectors

4.2 Mains Input

X700 (3pol. male)
Left contact Phase (L1)
Center contact Earth (PE)
Right contact Neutral (N)

4.3 Motor Output

X701 (9pol.male plug in connector with screwed terminals)

Output of the power management

A	Earth (PE)
B	Earth (PE)
C	Motor phase U
D	Motor phase V
E	Motor phase W
F	Operation capacitor
G	Operation capacitor
H	Torque capacitor
I	Torque capacitor

4.4 Signal Input/Output

X800 (28pol. male, 2 row plug in connector with screwed terminals)

Connection to terminal: 1-10			**Internal connection**		
1	0V ext.		**15**	+12V battery	
2	0V ext.		**16**	GND battery	
3	Barrier ON	Input	**17**	+24V external	
4	OPEN STP/SP	Input	**18**	0V	
5	CLOSE barrier	Input	**19**	0V	
6	Arm broken	Output	**20**	Security chain	Input
7	Barrier UP	Output	**21**	Light barrier	Input
8	Barrier DOWN	Output	**22**	Arm off	Input
9	Detector N	Output	**23**	Barrier UP	Input
10	Detector N	Output	**24**	Barrier DOWN	Input
11	Loop N		**25**	Alarm	Output
12	Loop N		**26**		
13	Loop V		**27**	Motor OPEN	Output
14	Loop V		**28**	Motor CLOSED	Output

Pin 11-14: Connection to the loops.

4.5 External Detector

X801 (3pol. male)

Pin 1 Detector N
Pin 2 Detector V
Pin 3 Common
The external detector interface has to be activated with the switch S901!

4.6 Diagnostics Connector

X500 (4pol. special connector)

Connector for the detector diagnostic system.

4.7 Switches / Adjustment

4.8 Switches (usable from outside of the casing)

S902 OPEN Barrier (push button)
S903 CLOSE Barrier (push button)
S300 RESET (push button)
S904 Barrier ON/OFF (slide switch)

4.9 Switches (inside of the casing)

S500 Detector mode (DIP-Switch 8x)

Frequency

4.9.1.1.1.1 4.9.1.1.1 requency	**Detector V SwItch 4**	**Detector N Switch 8**
High	OFF	OFF
Low	ON	ON

Sensitivity

4.9.1.1.1	4.9.1.1.1.1.4 Detector V		4.9.1.1.1.1.5 Detector N	
4.9.1.1.1.1.6 ensitivity	**Switch 1**	**Switch 2**	**Switch 5**	**Switch 6**
1 (lowest)	OFF	OFF	OFF	OFF
2	ON	OFF	ON	OFF
3	OFF	ON	OFF	ON
4 (highest)	ON	ON	ON	ON

Duration of holding time

4.9.1.1.7 4.9.1.1. ime	**Detector V Switch 3**	**Detector N Switch 7**
5 Minutes	OFF	OFF
endless	ON	ON

S900 Barrier mode (DIP-Switch 8x)

S900/1 Reverse
OFF = No reverse mode
ON = Reverse mode activated

S900/2 Light barrier as Detector N
OFF = Light barrier not used
ON = Light barrier is connected to Detector N
(the light Barrier output is not shown at the Detector N Output)

S900/3 forced closing
OFF = No forced closing
ON = Forced closing activated (time out adjustable with R 903)

S900/4 Storage
OFF = No storage
ON = Storage of „OPEN barrier“-impulses while blocked Detector N

S900/5 Warning singal
OFF = No Warning signal
ON = Warning signal output will be activated 5 sec. before barrier closes in forced closing mode.

S900/6 Two way traffic
OFF = No two way traffic (Detector V has no function for the barrier)
ON = Two way traffic activated, Detector V opens the barrier automatically

S900/7 2/3 Loop mode
OFF = 2 loop mode (detector N and detector V in standard mode)
ON = 3 loop mode (detector N and detector V are used both as closing loops)
Please see cap. 3.5.1.1 in the manual LS 100 Basic V 2.1

S900/8 test-mode (this function may be deleted in new versions)
OFF = normal position
ON and all other DIP-switches on = test

S901 Int./ext. Detector (slide switch 1x)
OFF = internal detector active
ON = external detector at connector X801 enabled

Attention: If all adjustments are carried out and no vehicle is on the loop, an adjustment of the detector is released by pressing the RESET button. The same procedure will be executed after a power down.

4.10 Adjustable Resistors

R901 Motor time out
Adjusts the time out for the automatic shut down of the motor (2s...15s)

R903 Time out for forced closing
Adjusts the time out for the automatical foced closing (5s...90s)

Turn left = minimum
Turn right = maximum

4.11 Indicators

V900 red, RUN
Flashing = Controller in function
Off = Controller out of order

On (continuously)	Test, minimum 1 input activ
1 Hz	normal operation (ok)
2 Hz	Test, no input activ
8 Hz	Control Unit switched off
1s On ↔ 1s 2 Hz	Time Out
1s On ↔ 1s 4 Hz	for future use
1s On ↔ 1s 8 Hz	Arm broken active
½s On ↔ ½s 8 Hz	other errors
Off	Power-down or LED broken

4.11.1 V502,V503, V504, V505

V503, green Loop control, detector V	V502, red Loop busy, detector V	V505, green Loop control, detector N	V504, red Loop busy, detector N	Message
OFF	OFF	OFF	OFF	RESET
Flashing	OFF	Flashing	OFF	Adjustment in progress
ON	OFF	ON	OFF	Detector active Loop free
ON	ON	ON	ON	Detector active Loop occupied
OFF	ON	OFF	ON	Loop error
Flashing	OFF	Flashing	OFF	Loop free, after error
Flashing	ON	Flashing	ON	Loop occupied, after error

V800 green, SP/STP OPEN
Indicates the status of the input SP/STP OPEN

V702 green, direction of motor rotation
OFF = direction open barrier
ON = direction close barrier

V703 green, status of motor power
OFF = reduced motor power
ON = maximum motor power

4.12 Default Setting for Standard Usage

Switch **S900**, barrier mode

1	2	3	4	5	6	7	8
ON	OFF	ON	ON	OFF	OFF	OFF	OFF

Switch **S500**, detector mode

1	2	3	4	5	6	7	8
ON	OFF	ON	OFF	ON	OFF	ON	OFF

Terminal Strip 1			
1	0V	**15**	+12V battery
2	0V	**16**	GND battery
3	Barrier ON	**17**	+24V external
4	STP/SP OPEN	**18**	0V
5	Barrier CLOSED	**19**	0V
6	Arm off	**20**	Security chain
7	Barrier UP	**21**	Light barrier
8	Barrier DOWN	**22**	Arm off
9	Detector V	**23**	Barrier UP
10	Detector N	**24**	Barrier DOWN
11	Loop V	**25**	Alarm
12	Loop V	**26**	
13	Loop N	**27**	Motor OPEN
14	Loop N	**28**	Motor CLOSED

Terminal Strip 2	
A	PE
B	PE
C	Motor U
D	Motor V
E	Motor W
F	Torque-capacitor
G	Torque-capacitor
H	Operation capacitor
I	Operation capacitor

4.12.1 Available Special Functions of the Barrier Control

The following options can be activated via DIP switches (option active = DIP switch in position „ON“). The switches are situated below the sensor for the manual operation within the barrier control and are counted from left to right as 1 to 8. To adjust the DIP switches the four screws of the transparent cover are loosened and the cover is removed.

4.12.1.1 Switch 1 - "Three Loop Operation“

At a standard entrance or exit only two induction loops are used. In special cases it may be necessary to install three loops.

In case of such a "three-loop operation" the two loops which are connected to the internal detector are installed below (loop N) and behind the barrier (loop V) (in the direction of the traffic). With this arrangement you can control whether a vehicle actually drove past the barrier. After the opening of the barrier both loops are monitored. The vehicle has to pass both loops and then has to leave first the loop N below the barrier arm. The closing movement is carried out automatically. The occupancy of the loops is also reported to the terminal and is evaluated there.

For the presence loop in front of the entrance/exit terminal a separate single detector is needed which can be installed in the control terminal or in the barrier.

4.12.1.2 Switch 2 - "Forced Closing“

The function "forced closing“ closes the barrier after an set period (5 to 90 seconds) automatically even after a saved „open“ impulse (see 4.12.1.5) if no signals for closing were fixed during the set period and if the loop is not occupied. The period can be set at the potentiometer TV1.

4.12.1.3 Switch 3 - "Reverse“

When the function "reverse" is activated, the detector N is monitored during the closing movement of the barrier arm. A new occupation of the loop during the closing movement leads to an immediate reopening (reverse) of the barrier.
Once the barrier arm has reached its lower final position the passing (by driving onto the loop) does not release an opening impulse.

4.12.1.4 Switch 4 - Two Way Traffic

When the function "two way traffic" is activated, the entrance "detector V" is evaluated as opening signal.
To do so, the loop V (normally the presence loop) is installed in the drive-in direction behind the barrier. When the barrier is closed driving onto the loop V releases the opening process when choosing this function. The barrier closes automatically again when the vehicle leaves the loop N.
If you enter the car park via a connected terminal (e.g. MKS), driving onto the loop V (after driving onto the loop N) is not evaluated as an opening impulse. In this case the barrier also closes after the vehicle has left the loop N.
If the entrance control terminal is equipped with a presence detector, an additional detector has to be installed.

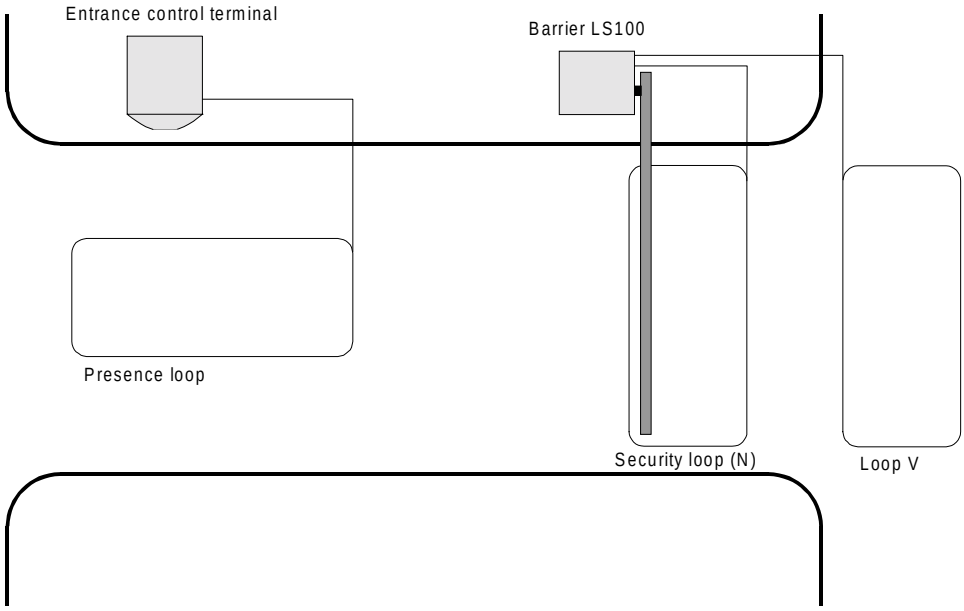


Illustration 4.3: Arrangement of loops for two way traffic

4.12.1.5 Switch 5 - Saving „Open“ Commands

When the function "saving" is activated, the open impulse is saved for a following vehicle (also opening impulses of the detector V at the function "two way traffic") while the vehicle is still on loop N.
The barrier closes automatically as soon as the second vehicle has left the loop N.

4.12.1.6 Switch 6 - Light Barrier as Detector N

With this function the light barrier which is connected to the input "light barrier" is driven in addition to the detector "N".
The information of the light barrier and the detector are evaluated parallel and the barrier only closes when both (light barrier and detector) are not occupied any more.

4.12.1.7 Switch 7 - Warning Signal

When this function is activated, a signal is issued at this output, before the barrier arm is closed.
The output is activated 5 seconds before the start of the closing movement.
The output "warning signal" can trigger a flashing relay and trigger e.g. a warning light by this.

4.12.1.8 Switch 8 - Operation with an External Loop Detector

If the barrier control is to be operated with an external detector the evaluation of the inputs for the external detector can be activated with this function.
The external detector is connected to the three contact studs next to the trimming potentiometers.
The internal detector has to be switched off with the DIP switch 7 (detector sensitivity). To do so, all four switches are set to the position "OFF".

4.12.1.9 LED-Indications in the Barrier Control

LED flashing red	Operation indication, indicates the correct functioning of the micro-controller
LED green (left)	indicates if maximum output is chosen, AN = maximum output
LED green (right)	indicates direction of motor rotation AN = direction of rotation "close"

4.12.2 Internal Traffic Detector

The barrier control contains a 2-channel detector.

One induction loop per channel is installed in the lane (see separate description) and connected to the detector. Each loop is part of an electronic resonant circuit. If the loop installed in the lane is occupied by a vehicle, the resonant circuit is off tune. The detector recognizes this frequency change and sends a signal to the barrier control.
This signal continues as long as a vehicle is on the loop.

4.12.2.1 Operational Elements of the Detector

The detector is operated via two DIP switches.

4.12.2.1.1 Switch 3 - Frequency

With this switch 4 frequencies can be selected separately for each channel to avoid that the detector loops influence each other.

The operative range of the resonant circuits is 40 - 130 k c/s.

The frequencies are assigned to the DIPs as follows:

Frequency	DIP 1 (3)	DIP 2 (4)
low	on	on
lower medium	on	off
upper medium	off	on
high	off	off

4.12.2.1.2 Switch 7- Sensitivity

With this switch, the sensitivity (minimum operating current) of the detector can be changed into three different levels.
If the two switches for a channel are switched "OFF“, the channel is out of operation and has no influence on the barrier control.

Sensitivity	DIP 1 (3)	DIP 2 (4)
channel off	off	off
low	off	on
medium	on	off
high	on	on

4.12.2.1.3 LEDs of the Detector

At the left and at the right of switch 7 LEDs for the selection of the frequencies are mountedwhich signalize the functioning of the detector.

The LEDs are illuminated if the loop is occupied, that means if a vehicle is on the loop.

The LEDs flash slowly while the detector is adjusted.

The LEDs flash quickly if adjustment of the detector is not possible or if an error has occurred.

Attention:

The induction loop must not be occupied by metal pieces or by vehicles during adjustment.

Putting into Operation of the Detector

The power supply of the barrier control supplies the detector with power and is therefore in operation when barrier control is switched on.

The detector is adapted to the architectural design (type of loop, reinforcement in the lane, etc.) by its operating elements. As a support, the adjustment can be checked by the integrated test program.

If all adjustments are carried out and no vehicle is on the loop, an adjustment of the detector is released by the button „RESET“. About 4 seconds later the detector is ready for operation.

4.12.3 Diagnostic Functions of the Internal Detector

4.12.3.1 Loop Testing Frequency

The software has an internal diagnostic function integrated in order to check the test frequency of the induction loops which is activated as follows:

- The operating voltage has to be switched on and a certain sensitivity has to be selected at the switches of the loop to be tested.
- Switch off the loop with the sensitivity switches (turn both switches to OFF)
- The respective LED shows the frequency by blinking. At first there will be a slow blinking signal for the decimal points, then a faster blinking for the single points. Example: 5 x slow blinking and 3 x fast blinking = 53 KHZ.

4.12.3.2 Sensitivity Calibration

There is a test function integrated to get the best sensitivity calibration.

- Set the lowest sensitivity at the loop to be tested (see chart 3.5.2.1.2)
- Position a barely recognizable vehicle at an unfavorable spot of the loop
- Switch to OFF (OFF / ON / OFF) within 2 seconds with switch 2 or 4 (according to loop to be tested.
- The respective LED shows the exact sensitivity calibration by blinking
  - 1 x blinking = low sensitivity is sufficient
  - 2 x blinking = medium sensitivity is sufficient
  - 3 x blinking = high sensitivity is sufficient
  - 20 x fast blinking = no reliable recognition possible

After the diagnosis has been finished, a reset of the terminal should be done for safety reasons to return to the normal operation function.

5 Technical Data

Power Supply

Power supply	230 VAC, 50 c/s
Power consumption	0,120 kW
Control voltage	24 VDC , max. 350 mA
Control inputs	0V active, type 15 mA, 300 ms

Motor

Capacitor motor with gear, little self-impediment
integrated thermal circuit breaker

Operating voltage	230 VAC, 50 c/s
Power consumption	0,098 kW
Duty cycle	continuous duty

Running Time of one Movement

< 2 sec.

Ambient Temperature

Storage	-25 to +70°C
Operation	-20 to +50°C

Type of Protection

IP 54 (witch closed casing)
Open mains voltage at the inside

Noise Level

< 70 dB(A)

Weight

With standard barrier arm	approx. 45 kg
With articulated arm	approx. 50 kg

Measurements

see next page

BASIC (CLASSIC)

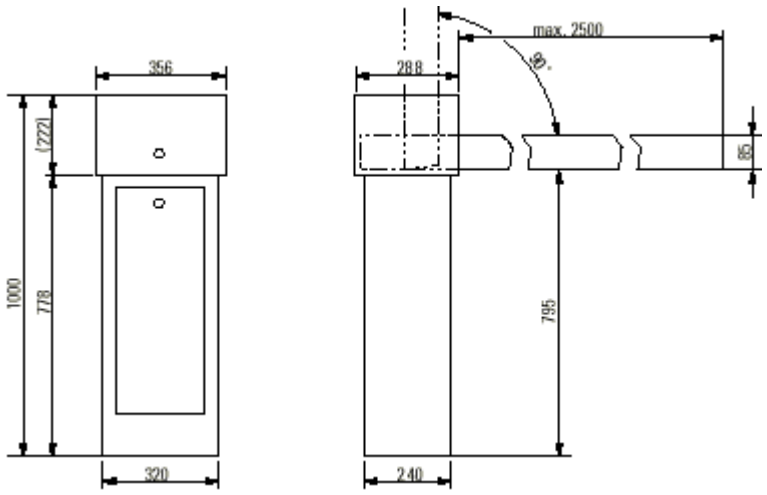


Illustration 5.1: Measurements LS 100 BASIC (CLASSIC)

TREND

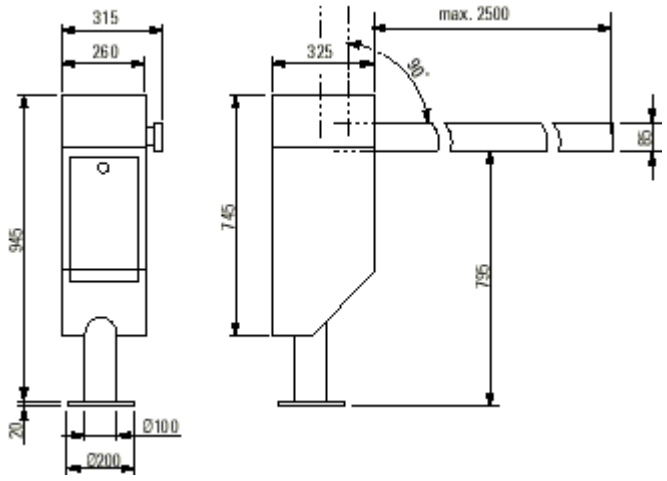


Illustration 5.2: Measurements LS 100 TREND

6 Mounting

Introduction
The mounting of the standard barrier LS 100 is divided into 4 parts which are described below:

- Mounting of foundation frame (not necessary at the LS 100 TREND)
- Mounting of barrier casing
- Mounting of barrier arm
- Electrical connection

6.1 Setting Up LS 100

In order to guarantee a safe footing of the barrier, the barrier has to be placed on a solid concrete foundation. For the BASIC barrier a foundation frame is available, on which the barrier can easily be mounted. To do so, the hot-galvanized foundation frame is inserted into the foundation which has to be created and is embedded in the concrete.

No foundation frames are available for the TREND barrier because of fabricational reasons. This barrier is fixed to the foundation with the enclosed chemical compound plugs. The drilled holes are copied directly from the flange plate of the barrier pillar.
The concrete quality of the foundation should have a strength of W=25N/mm² for both barrier types (concrete BH PC 250). The foundation has to be fixed with the proper reinforcement.

The surface of the foundation has to be smoothed and must correspond with the surface of the foundation frame.

For the direction of the installation of the rectangular foundation frame check Illustration 6.1 on page 25. The front edge of the foundation frame is to be aligned in a straight line with the lane.

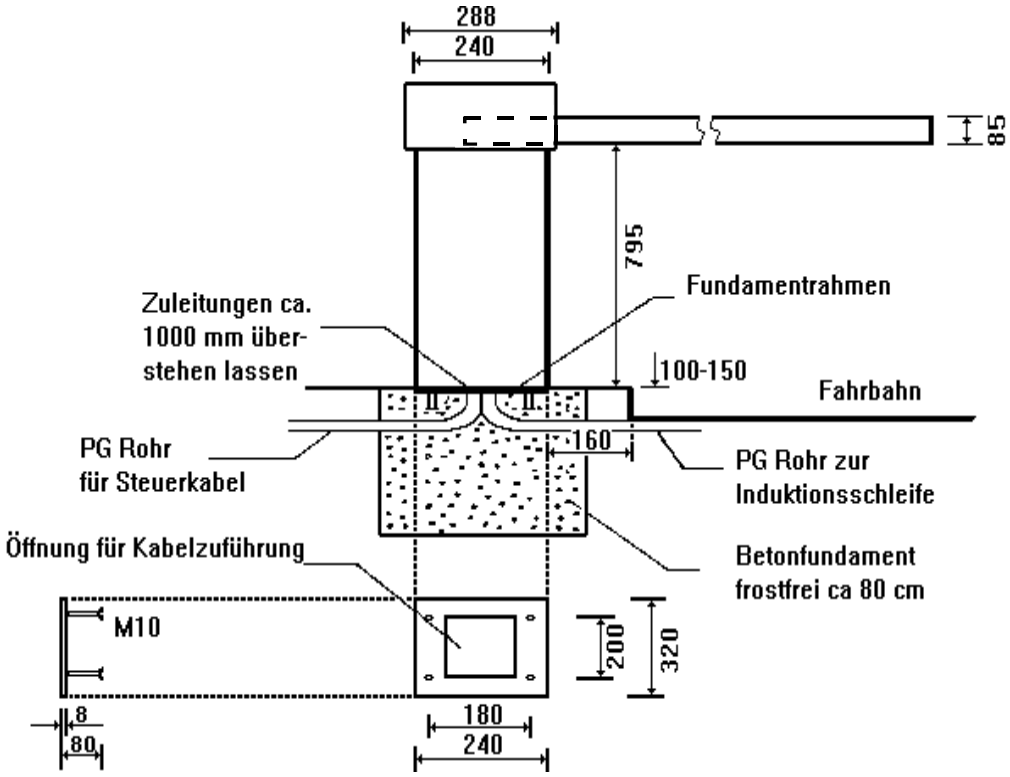


Illustration 6.1: Mounting the foundation frame

If it is not possible to set a foundation frame, the barrier can be mounted on the even concrete basement with chemical compound plugs (e.g. UPAT UKA3 EAP). To do so, holes of 14 mm Ø and a depth of 110 mm are drilled. For the position of the holes check Illustration 6.1.

6.2 Barrier Casing

The barrier casing has to be placed onto the foundation frame which was mounted according to Illustration 6.1: and has to be held at a slant, pull the connecting cables through the opening in the bottom of the casing.

Set down the casing and position it so that the holes in the bottom of the casing match the thread holes of the foundation frame.

Place the steel sheets onto the bottom of the casing, pass the screws through the holes together with the washers and the spring washers and pull them tight. When tightening the screws be careful that the casing does not get warped because of an uneven ground.

After the curing of the chemical compound plugs the TREND barrier is placed above the thread bolts of the chemical compound plugs. Before doing so, the connecting cables have to be pulled through the post. You can correct the perpendicular positioning of the barrier with a stud in the flange. When the barrier is in the right position, the nuts (with washer and spring washer) on the thread bolts have to be pulled tightly. The bolts should protrude the nuts very little, otherwise the flange cover cannot be mounted.

6.3 Barrier Arm

The assembly kit for the standard barrier arm or the articulated barrier arm is in a plastic bag at the hub flange.

6.3.1 Standard Barrier Arm

The barrier arm is fixed to the hub flange at each side with two screws and two washers. The barrier arm which is pre-mounted with screws, is pressed into the flange so that the "barrier broken" switch is actuated.

The screws in the oblong holes (see Illustration 6.1: Drive shaft with flange on this page) should be pulled with max. 12Nm, so that the barrier arm can be pushed out of the hub flange in the direction of the traffic. If the barrier arm is hit by a vehicle, only little damage is caused due to this fact. The motor, the drive and maybe also the barrier arm stay undamaged.
This allows the arm to be removed quickly and easily in case of emergency.

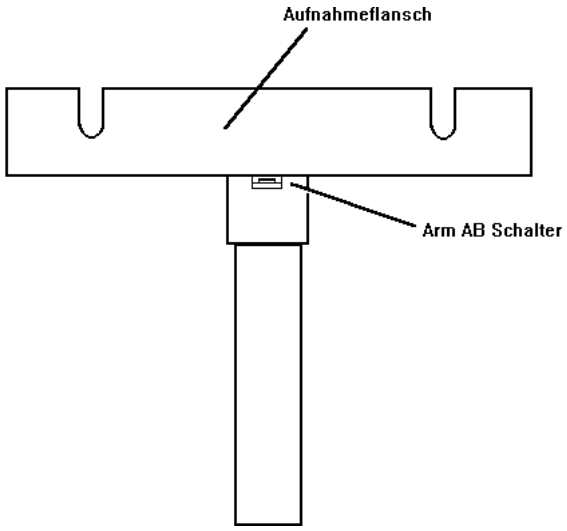


Illustration 6.1: Drive shaft with flange

6.3.2 Articulated Arm

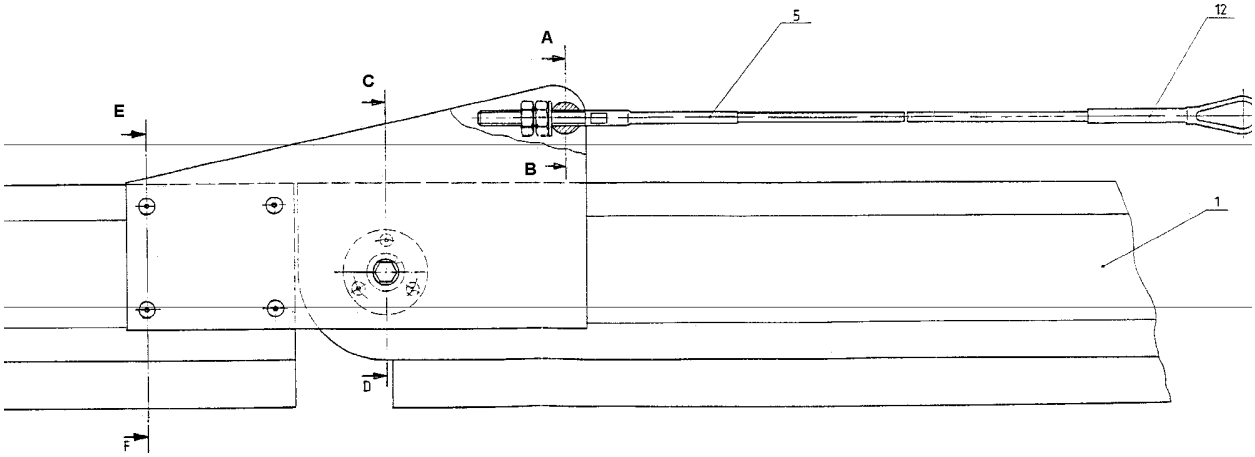
The articulated arm is fixed in the same way as the standard arm on the flange.

If the barrier arm is not prefabricated, the bearing rings (7) are fixed at the base of the barrier by 3 collar rivets each (21). The journal bearings are then inserted into the opening (for the position numbers in brackets check Illustration 6.1:).

Insert the shaft (10) into the drilled hole of the barrier base (do not forget to grease it).

Place the upper part of the barrier (2) above the shaft. The upper part is fixed with the washers (18) and the screw (16).

The articulation is covered in order to avoid injuries.



The metal sheets of the articulated arm were changed in order to fulfill the CE-regulation. The functionality was not changed.

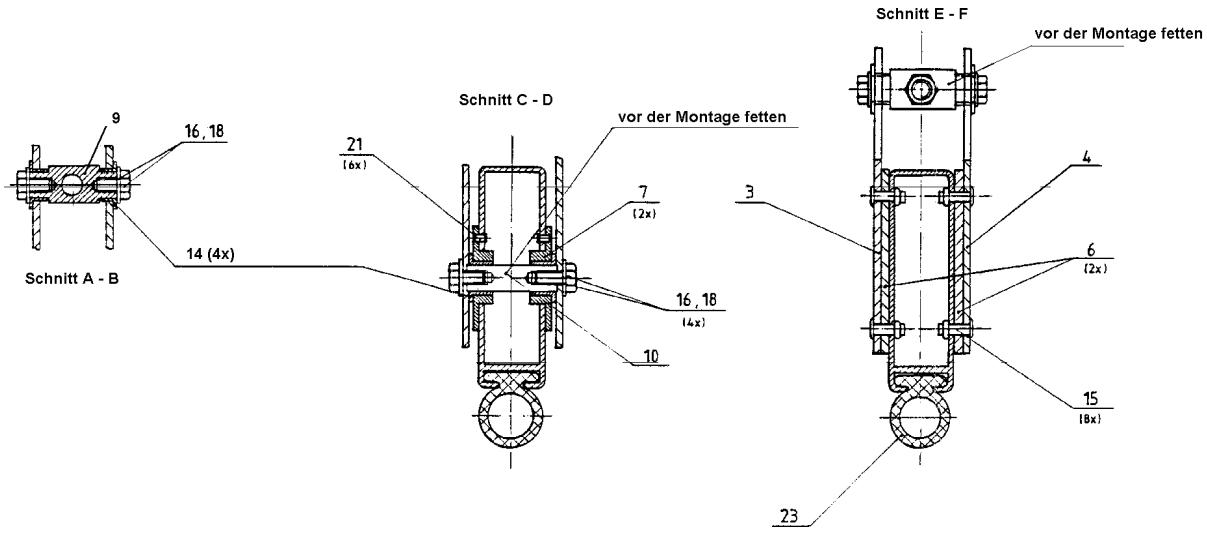


Illustration 6.1: Mounting the articulated arm

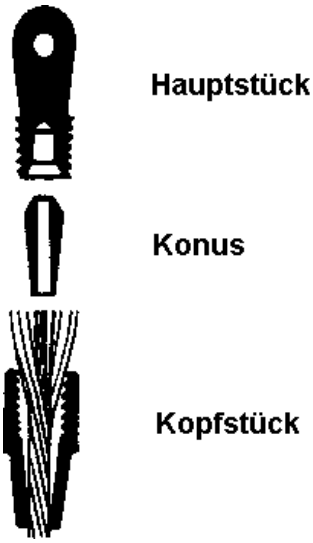
6.3.2.1 Mounting the Pull Rope

The knuckle pin is fitted into the mounting gab plates.

The journal bearing is mounted with the ring and the hexagonal nut.

The pull rope is threaded through the drilled hole of the knuckle pin (thread bolt points to the upper part of the barrier while doing so) and is secured by 2 nuts. The nuts are screwed halfway onto the bolt.

Lift the upper part of the barrier arm and support it, so that the upper and the lower part form a straight horizontal line.



The main part of the rope clamp is pushed onto the axle of the mounting and the head of the clamp is unscrewed (careful, the small cone can easily be lost).

In the actual position the rope is pulled into the direction of the rope clamp and is shortened at the end of the main part.

The head piece is pulled over the rope (Illustration 6.2: , part 1).

The exterior wire strands are divided from the interior ones with a screw driver or something similar (Illustration 6.2: , part 2).

Illustration 6.1: Parts of the rope clamp

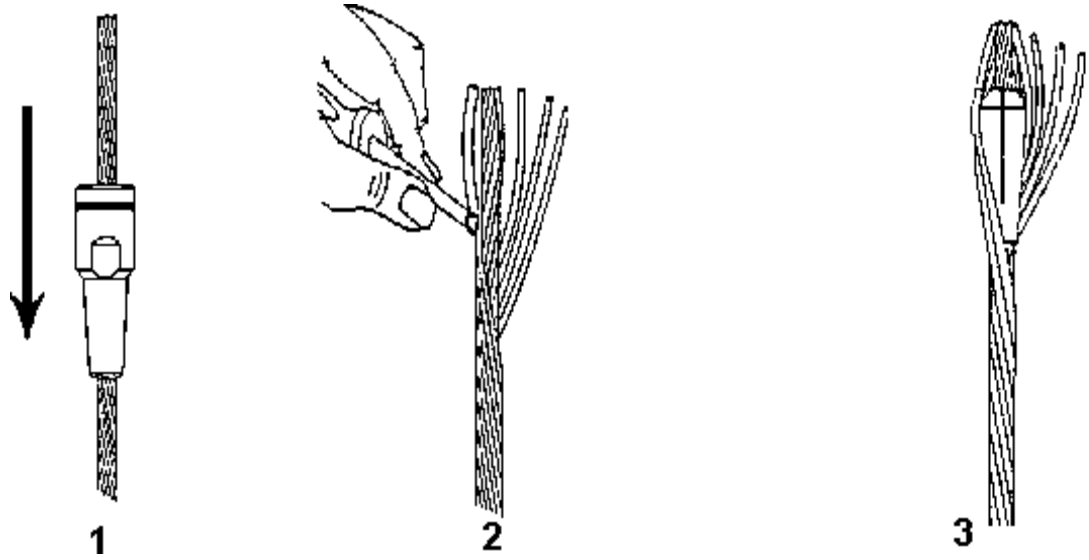


Illustration 6.2: Mounting the rope clamp, step 1-3

Pull the cone over the wire strand in the middle until about 4 mm of the strand protrude (Illustration 6.2, part 3).

Now the exterior wire strands are laid around the cone separately. The end of the rope then looks like Illustration 6.3: , part 4.

Make sure that the cone stays in its correct position.

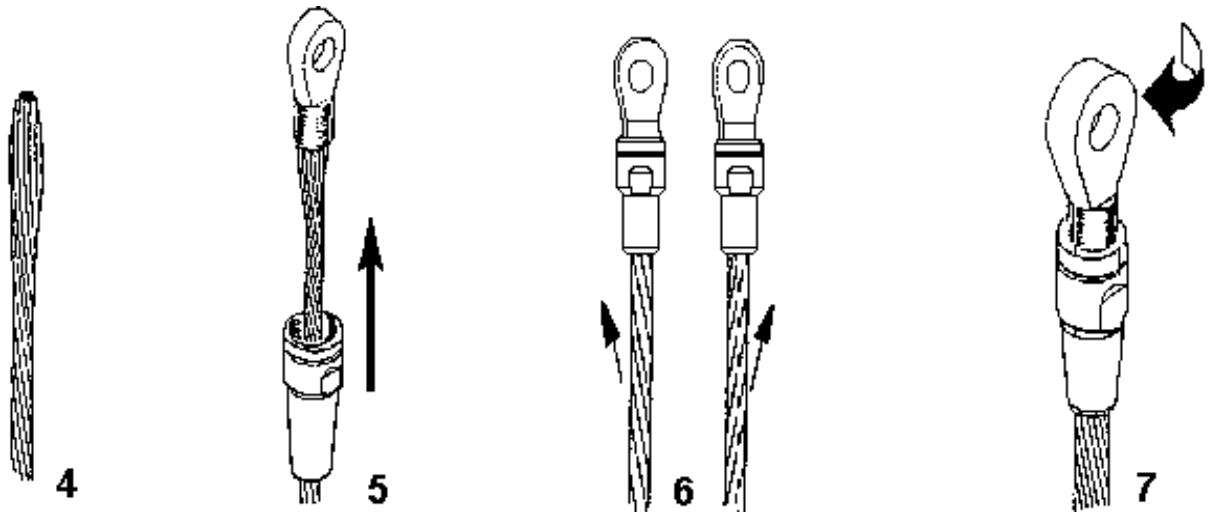


Illustration 6.3: Mounting the rope clamp, step 4-7

Both parts of the rope clamp are joined and screwed together (Illustration 6.3: , part 5). The direction of the twist of the cable determines which part (main part or head piece) is turned.

In the left picture of part 6 the head piece and in the right one the main part is turned.

Attention:
Do not pull too tight ! The efficiency of the connection cannot be increased this way and the thread could be damaged.

Screw off the head piece once again and check the internal mounting. The exterior wire strands should be arranged evenly around the cone.

Fill the interior of the rope clamp completely with corrosion-resistant sealing material and screw the set together as described above. Wipe off excess material.

Once the rope clamp is fixed at the axle with a nut and a washer (do not forget to grease), the length of the rope can be regulated with the two nuts at the thread bolt (9).

6.3.3 Tension Spring

After mounting the barrier arm, the tension spring of the sine drive has to be adjusted at its lower fixing point with the hexagonal nut, so that the barrier arm finds its level at a position of 45°.

Attention:
During the adjustment of the tension spring the voltage must be turned off

Afterwards fix the hexagonal nut by a lock nut or secure it against loosening otherwise.

6.3.4 Adjustment of Barrier Arm

With force the motor can be twisted out of position when it is off voltage. The barrier arm is then not horizontal/vertical anymore.

It is also possible that the foundation below the barrier is not exactly horizontal. This results in the barrier casing leaning to one side. This means that the closed barrier arm is not exactly horizontal. Its position should be corrected to create an ideal optical impression

First the tension spring has to be released in order to avoid a sudden lever move.

Open the hood first, loosen (don't remove!) the hexagonal nuts at the red lever at the drive shaft. Either another person or a stand should support the barrier arm in the meantime. Now the barrier arm can be positioned with a spirit level.

Afterwards tighten the screws at the lever again. If the screws are not tightened, the barrier arm could jiggle within its set position during operation.

As the mechanics of the barrier only allow a barrier arm movement of 90°, an adjustment of the upper position is not necessary.

6.4 Connection of Voltage and Control Lines

Attention

The voltage and control lines should only be installed by a specialist and only when voltage is turned off.

Pull power supply and control cables to the terminal strips first.

Connect cables according to enclosed wiring diagram (see page 32) and the inscription of the terminal strips.

If all cables are fixed correctly the power supply for the barrier can be switched on.

As soon as a car park terminal or a barrier control is connected, the functions of the barrier can be controlled.

If a terminal is notf connected the barrier can be put into operation by occupying the input "barrier ON" with a 0V-level. The barrier can be opened/closed with the buttons at the barrier control.

Attention:
The barrier is not operational without the set signal "barrier ON".

The control of the adjustment of further functions can be carried out according to the description of the barrier control (section "barrier control").

After the test lock hood and front door of the barrier.

6.4.1 Wiring Diagram

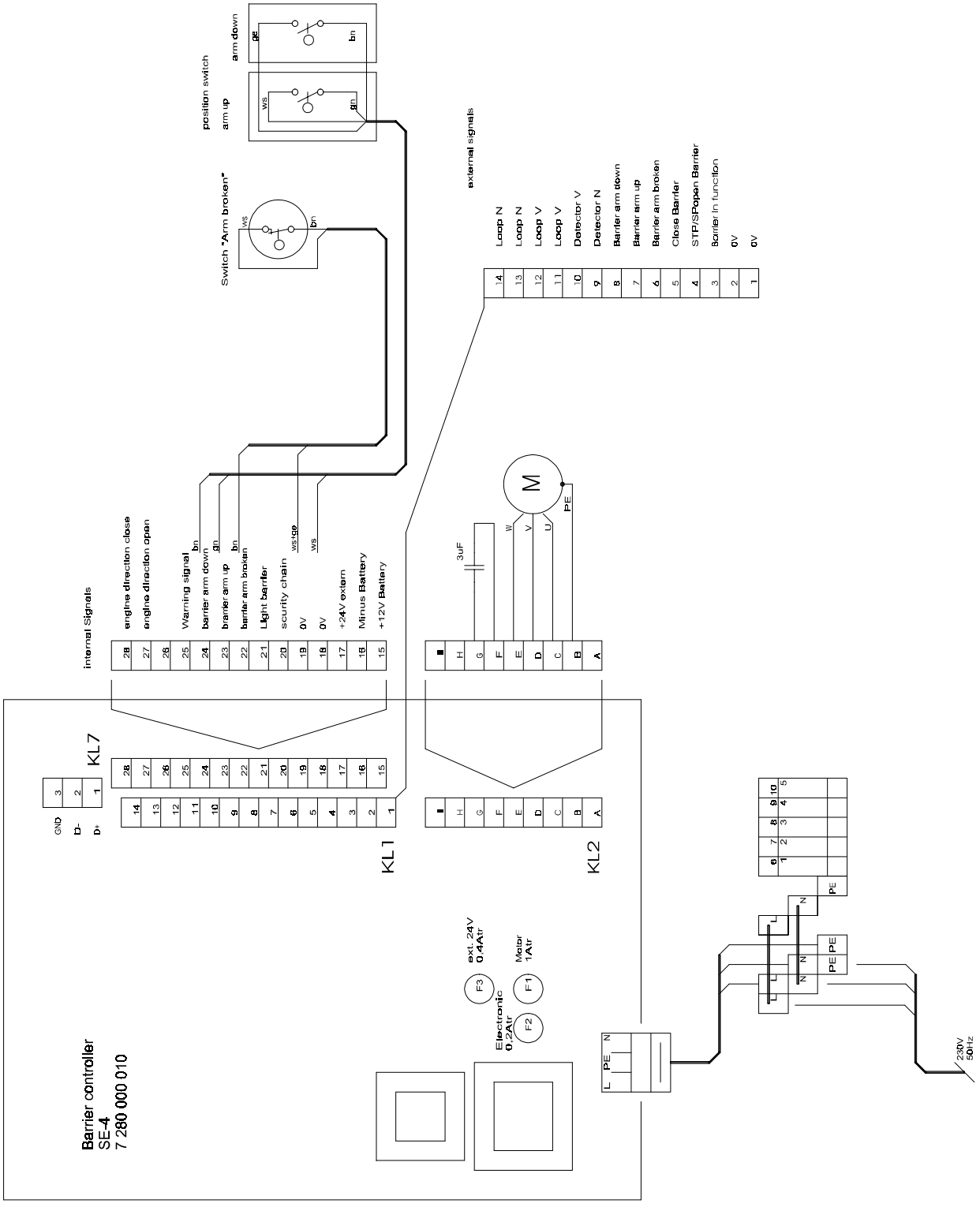


Illustration 6.1: Wiring diagram LS 100

7 Maintenance and Repair

7.1 Maintenance

The maintenance relates to all parts of the barrier subject to wear (bearing, spring...).

- At each maintenance the mechanical parts have to be cleaned and lubricated sufficiently.
- Checked all connections for their proper fixing.
- Control the spring for possible damage:
  - the spring itself (e.g. extensions, cracks)
  - the ring eye at the drive lever (material wear at the sleeve) and
  - the thread bar (material wear, cracks) in the barrier base.

7.2 Maintenance Intervals

The barrier should be maintained approx. every 50.000 movement cycles.

A short visual check is advised at each exchange of the ticket containers at the entrance or approx. every 5.000 cycles.

7.3 Troubleshooting and Correction

Attention!

When troubleshooting it may be necessary to supply the barrier with both mains voltage 230 V and the control voltage of 24 V.

During the work on the upper part of the barrier please be extremely careful and always keep a sufficient distance to the barrier arm and the sine drive (clothes and body).

Accident risk

7.4 For troubleshooting use the wiring diagram on page 32.

Trouble Shooting Table for Standard Barrier

Error	Reason	Removal
1. Barrier does not open	1. Lack of mains voltage 230 V	1. Replace fuse in the barrier control
	2. Lack of control voltage	2. Replace fuse in the barrier control
	3. Barrier control defective (LED does not flash)	3. Replace barrier control
	4. Barrier locked by hand (Switch on barrier control)	4. Unlock via slide switch
Barrier does not close	1. Lack of mains voltage 230 V	1. Replace fuse in the barrier control
	2. Lack of control voltage	2. Replace fuse in the barrier control
	3. Barrier control defective	3. Replace barrier control
	4. "OPEN" signal is on	4a. External "OPEN"- signal is connected (e.g. "OPEN LOCKED" from control desk)
		4b. At automatic opening by the detector: Detector has switched.
	5. Barrier locked manually (Switch on barrier control)	5. Unlock via slide switch
2. Barrier closes automatically when reaching the "OPEN" position	1. "CLOSE"-signal is connected	1. External "CLOSED"-signal is connected (e.g. "hand-CLOSED" from control desk)

Error Correction

Attention!

To prevent accidents the barrier always has to be off voltage before starting any kind of repair.
Pull the power plug out of barrier control unit.

Attention!

There is still mains voltage at the clamps. When working at the supply cables the fuse in the distributor box of the car park has to be switched off.

Danger

7.4.1 General Information

a) Open the main lock with the key and tilt the hood backwards. Disconnect the barrier off voltage by loosening the connectors.

b) If necessary also open the front door with the key and remove the door from the barrier base.

c) After completing the repairs turn the power supply back on.

d) Check functioning of the barrier.

e) Close the hood, insert the front door and lock both.

7.4.2 Exchange of Barrier Arm

The exchange of a barrier arm is explained in section "Barrier arm" from page 26 on.

7.4.3 Exchange of the Position Switches

The position switches are fixed on the mounting frame below the drive shaft in the upper part of the casing.

The position switches are necessary for a trouble-free functioning of the barrier, as they report the position of the barrier arm and the barrier control can then reduce the output of the motor .

Loosen the fixing screws of the position switches with a screw driver. Pull the switches outside through the front door and catch the two screws, the two washers and the two spring washers. Put the plate with the thread drilled holes aside.

Unscrew the bottom (transparent cover) of the plastic casing at the defective position switch, unsolder the lines and solder the lines to the soldering lugs of the new switch.
Screw the casing back together (attention, cover breaks easily).
Reinstall the switch together with the thread plate in the barrier. Pull the screws on only lightly as the switches still have to be adjusted.

Adjust the height of the position switches in a way that they switch audibly when the barrier arm is close to the final position „Up“ or „Down“.

Now tighten the fixing screws so that the switches don’t move during operation.

7.4.4 Exchange of „Barrier Broken“ Switch

Unscrew the barrier arm/articulated barrier arm first.

Pull the „barrier broken“ contact to the front out of the hub flange. Push the cable through at the side of the shaft. Loosen the lines at the switch and connect them onto the new „barrier broken“ switch.

Plug the new "barrier broken" contact in the drive shaft. The silicone hood has to be in the right position. Pull out the line from the side of the shaft again so the switch cannot be pushed out again.

Mount the barrier arm again as described in section "Barrier arm", page 26.

7.4.5 Exchange of Barrier Control

Attention:
Turn off voltage when exchanging the barrier control.

The barrier control is fixed to two angle brackets with 4 cylinder head screws (M4x12).

Loosen the screws of the transparent casing cover and take off cover. Pull the plugs out of the multipoint connector.
Loosen the screws of the barrier control (in the thread holes of the transparent cover).

Fix the new barrier control with the cylinder-head screws. Close the transparent cover again and plug the plugs into the multipoint connector again.

7.4.6 Exchange of Sine Drive

Attention:

These works must be carried out only by trained service staff.

8 Optional Equipment

8.1 Key Operated Switch

The key operated switch is installed in the casing below the drive flange. The switch has a sensor and a stop function. In the stop function and in the neutral position the key can be pulled off. The following functions can be controlled with the key operated switch.

8.1.1.1 Sensor Function Barrier CLOSED:

The sensor integrated in the key operated switch sends a "CLOSED" signal to the control, and the barrier closes.

8.1.1.2 Switch Function Barrier OPEN:

The click stop switch integrated in the key switch sends a "hand OPEN" signal to the control and the barrier opens. The barrier stays in this position until the contact is opened again and a "CLOSED" signal is given. The key operated switch can be loosened by removing the two slotted-head screws at the round cover on the closing cylinder. Now the metal casing of the key operated switch can be pulled out of the barrier.

8.2 Light sensor

The light sensor has an impact parallel to detector N (closing detector). As the light sensor also detects objects not made of metal, it offers an additional protection against unwanted automatic closing of the barrier arm.

The function of the light sensor is comparable to that of the detector N. Only when the ray is interrupted and comes back to the receiver, the barrier control releases the closing process.

8.2.1 Reflex Light sensor

The reflex light sensor is mounted at a special angle below the flange on the outside of the barrier base.

A reflector, part of the reflex light sensor, has to be mounted opposite the light sensor. A post or e.g. an already existing grid or something similar can be used. Once the light sensor is adjusted, the integrated LED glows red (if the ray is not interrupted).

When using a reflex light sensor in truck lanes, please be careful that the reflectors mounted on the trucks for safety in traffic do not release the barrier. In these cases the ray is directed slightly diagonally to the detector loop and the lane.

8.2.1.1 Data

Operation voltage	230 VAC
Range	6m
Switch lead	50W/60 VA
Frequency	20 c/s

8.2.2 Transmitter/Receiver - Light sensor

The receiver of this light sensor is mounted at a special angle below the flange on the casing. The transmitter is fixed at the opposite at a post or something similar. The transmitter is supplied with 230 VAC and sends a focused IR-ray.

The receiver must be positioned in a way that the ray meets exactly its optics. Once the receiver is positioned, the integrated LED glows red (if the ray is not interrupted).

8.2.2.1 Data

Operation voltage transmitter/receiver	230 VAC
Range	120m
Switch lead	50W/60 VA
Frequency	20 c/s

8.3 High Frequency Remote Control

The high frequency remote control makes it possible to open or to close the barrier manually with small hand controls. The remote controls work with 1024 different adjustable codes (no misuse in other systems) and can be used at a distance of about 10 m around the barrier.

The necessary receiver (1 or 2 channels) is mounted on a mounting track in the casing and is supplied with 230 VAC. The relay outputs of the receiver are connected to the inputs "STP/SP OPEN“ and "barrier CLOSED" at the barrier control. The circuit switching potential is 0V.

If the user presses the respective button of the hand control, a relay is connected in the receiver which releases the desired control command.

8.3.1.1 Data

Receiver
- Operating voltage 230 VAC
- Capacity 5 A
- Receiving frequency 40 Mc/s

Transmitter
- Supply 9V-compound battery
- Transmission frequency 40 Mc/s

8.4 Relay

The relays are installed in the base on tracks. The relays are plugged in an outlet locked on the tracks.

The relay is controlled by the inputs and outputs of the barrier control unit and normally has 3 switch contacts with a carrying capacity of 250V/10A each. This provides all kinds of floating signals.