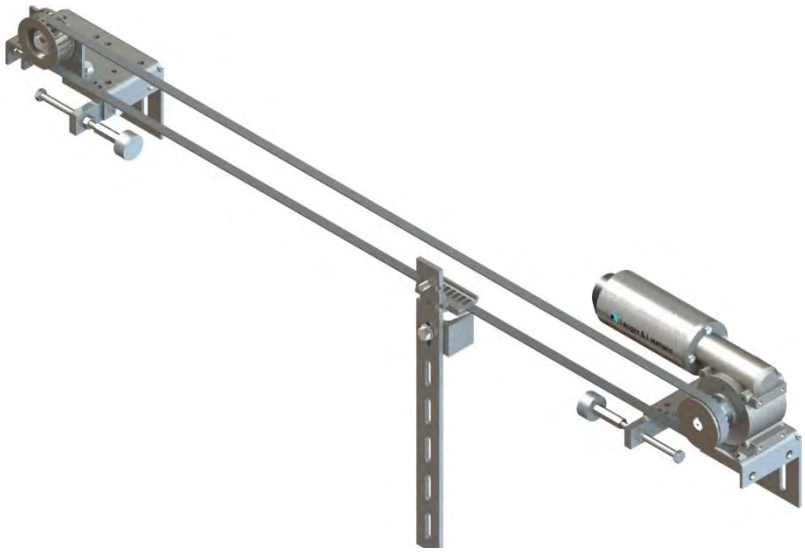
Installation and Operating Instructions

for the device series

Door Operator

TSG V4



Documentation history

No	Ver.	Status	Processed by
1	4.10	14.05.14	CSA
2	4.11	07.08.14	CSA
3	4.12	29.04.15	CSA
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6	4.15	24.11.16	CSA
7	4.16	24.01.17	CSA
8	4.17	09.07.18	AL
9	4.18	25.11.19	CSA

Bedienungsanleitung in **deutsch** durch Scannen des QR-Codes anfordern.

Demandez les instructions d´instruction de montage **en français**, en scannant le code QR.

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1 Original EC declaration of incorporation

The manufacturer:

Langer & Laumann Ing.-Büro GmbH
Wilmsberger Weg 8
48565 Steinfurt
Germany
Tel.: +49 (2552) 92791 0

declares herewith, the following product:

product:	door operator
type / model:	TSG V4
serial number:	040000000 – 040900000
year:	as of 2013

the following complying with all essential requirements of the Machine Directive (2006/42/EG):
annex I, part 1.1.2, 1.1.3, 1.1.5, 1.2.1, 1.2.6, 1.3.2, 1.3.4, 1.3.7, 1.3.9, 1.5.1, 1.5.11, 1.7.1, 1.7.2, 1.7.3, 1.7.4.

The partly completed machinery is in conformity with the EC Directives (2014/30/EU).
The following harmonized standards were applied:

- EN ISO 13849-1: 2015
- EN 81-20: 2014
- EN 81-25: 2014

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of Machine Directive (2006/42/EG).

The manufacturer undertakes to supply, in response to a reasoned by the market surveillance authorities, relevant documents on the partly completed machinery by documentation department in electronically way.

The special technical documentation belonging the machine, referred to in annex VII part B, have been created.

Name of authorized person for documentation: Langer & Laumann Ing. -Büro GmbH.

Address of authorized person for documentation: see address of manufacturer.

Steinfurt, 01.01.2020
place, date

Dipl.-Ing. Martin Platt
managing director

2 About these instructions

2.1 General information

Please read this operating instruction attentively before you install the TSG door operator and put into operation. Note the cap. 3 General safety requirements / page 7. For further using please keep the operating instructions on hand.

The operating instructions are to assist you to mount the TSG door operator and its components and to put into operation. The operating instructions contain important information for safely and correctly to mount the TSG door operator and put into operation.

The operating instructions are applicable for the TSG door operator from hardware version V4.05, line filter 4.04 and software version V4.60.12.

By following this operation instruction, you will avoid danger, costs of repair, downtime, increase reliability and service life of the TSG door operator.

In addition to our recommendations, it is imperative to comply with any local safety regulations that may be in force in the country where the operator is installed.
The manual only applies to components supplied by Langer & Laumann Ing. -Büro GmbH for any other component used, please refer to the supplier's instructions.

The manual describes the standard TSG door operator application only. Due to the wide range of its application, these may not apply to all the application possible. Please consult Langer & Laumann Ing. -Büro GmbH (+49 (2552) 92791 0) for any special application.

2.2 Explanation of symbols

WARNING:
This symbol directs your attention to a possible hazard that could lead to severe bodily injuries or death.

CAUTION:
This symbol directs your attention to a possible hazard that could lead to minor bodily injuries. The same symbol is also used to warn of potential damage to property.

NOTE:
Your attention is drawn to applications and other useful information.

3 General safety requirements

The TSG door operator is designed exclusively for operation of horizontal and vertical sliding doors or removable protection device. The manufacturer assumes no liability for applications that fall outside the defined area of usage. The TSG door operator carries electrical and mechanical hazards. Failure to observe the instructions in these operating instructions may result in death, severe bodily injuries or significant property damage.

The TSG door operator is built according to the state of the art and recognized safety engineering rules and is intended exclusively for normal industrial usage. If it is used for any other purpose, the manufacturer must in every case be consulted. Otherwise no liability is assumed for personal injury or property damage. Any other or more extensive use is considered contrary to designated use and may result in personal injury for the user or third parties as well as damage to property.

WARNING:
When electrical devices are in operation, certain parts of the devices conduct dangerous voltage. Failure to observe the operating instructions may therefore result in serious bodily injuries or property damage! Observance of the warning notices in these operating instructions is absolutely mandatory. While the TSG is starting up, door movements cannot always be controlled externally. During commissioning, an authorized person located at the door must ensure that no other persons can reach the area close to the door. Permissible forces and energy levels must be checked by a qualified person after the door has been commissioned.

WARNING:
The TSG door operator has to be installed so that hazards are excluded to moving points (e.g. installation of protection devices to motor shaft, counter roller, tooth belt).

WARNING:
When operating on a vertically guided door care must be taken to ensure that it cannot lead to uncontrolled movements in the failure of the TSG door operator. This can be prevented by, for example, use of counterweights. It is necessary to provide a customer-supplied mounting protection against means breakage. The exporting specialist must check the structure corresponding to the commissioning at the door.

3.1 Delivery

Using the delivery note and the operating instructions, check the delivered components to ensure completeness. At the same time perform a visual inspection for damage of delivered materials. While unpacking, check:

- Whether there is any visible mechanical damage to components.
- Whether the lengths of the cables included with delivery are correct.

CAUTION:
Electrostatic discharge, mechanical load, moisture and dirt will damage or destroy electronic components.

Leave electronic components in their original packages until they are installed.

If damage occurred during shipping, a claim must be filed immediately with the shipping company.
If components are missing, inform the supplier immediately.

3.2 Safety and accident prevention requirements

In addition to the instructions in these operating instructions, you must also observe safety and accident prevention requirements as specified by law. Persons responsible for the safety of the system must ensure the following:

- Only appropriately qualified personnel are permitted to work on and with the TSG door operator.
- All personnel who work with the TSG door operator must be familiar with all warning signs and measures listed in the description here for installation, control and operation of the TSG door operator.
- Unqualified personnel are prohibited from working on the TSG door operator.
- Personnel must have knowledge of first aid measures and on-site rescue equipment.

3.3 Qualified personnel as defined by VDE 0105

Qualified personnel mean persons who has received by virtue of their training, experience, instructions and knowledge of applicable standards, specifications, accident prevention requirements and operating conditions have been authorized by the person responsible for the safety of the system to perform necessary activities.

3.4 Exclusion of any guarantee when changes or conversions are made or installation of foreign material

Before any work is performed on the electrical or mechanical parts of the system, the TSG door operator must be disconnected from the mains voltage. Unauthorized changes or conversions to or in the TSG door operator, its components or accessories or installation of foreign material will automatically exclude all claims under the warranty. These safety instructions do not claim to be complete. The manufacturer assumes no liability for damages or operating malfunctions which may occur due to failure to observe these operating instructions.

WARNING:
Unauthorized changes to the drive or installation of non-original replacement parts shall exclude any liability on the part of the manufacturer for resulting damages.

WARNING:
By using connecting cable between TSG electronic and TSG motor other than provided from L&L forfeit the examination certificate 44780 130999930301 and the certificate of conformity for equipment manufacturer.

3.5 Safety contacts

The relay outputs of the TSG door operator must not be used as safety contacts to the safety circuit of the higher-level control unit.

WARNING:
If the higher-level control unit undergoes an Emergency Stop or Off, it must be ensured that the TSG door operator will not cause any unintentional, dangerous or uncontrolled door movements.

3.6 Other important safety instructions

The purchaser, designer and/or fitter of the TSG door control unit and its components is responsible for its correct and safe use. He must ensure that all state and local laws and regulations regarding the safety of power-operated doors as well as the relevant state health and safety regulations are observed.

Langer & Laumann Ing. -Büro GmbH is not responsible for accidents and/or consequential damage that could result from the application or use of the door control unit TSG and its components. Our maximum obligation and warranty is limited to the reimbursement of the costs of the sold product.

Langer & Laumann Ing. -Büro GmbH makes no specifications or recommendations for suitability for specific safety gate concepts. The purchaser, designer and/or installer of the TSG door control unit must decide for himself whether the drive is suitable for a given application. Langer & Laumann Ing. -Büro GmbH also declines all responsibility for damage or injury resulting from changes to the drive, including changes to software parameters. Employees of Langer & Laumann Ing. -Büro GmbH are not authorized to modify these conditions without the written consent and legally valid signature of the responsible authorities.

4 Range of service applications for the TSG

The TSG door operator is a door drive for the automatic operation of moving horizontally or vertically sliding doors or removable protection device. The manufacturer assumes no liability for applications that fall outside the defined area of usage. The speed and acceleration settings can be adjusted. The door opening width is determined by a measurement process.

When operating the TSG door operator as removable protection device it meets the requirements of the DIN EN ISO 13849-1:2015 with category 2 / Performance Level d.

The TSG 4xx can be use up to 20.000[mm] travel distance, if the door panels weights 400[kg] not exceed.

CAUTION:
Gear reductions or increases on the TSG toothed belt change kinetic and static forces! When it happens, the door width is no longer valid.

5 Illustrations

5.1 Overview

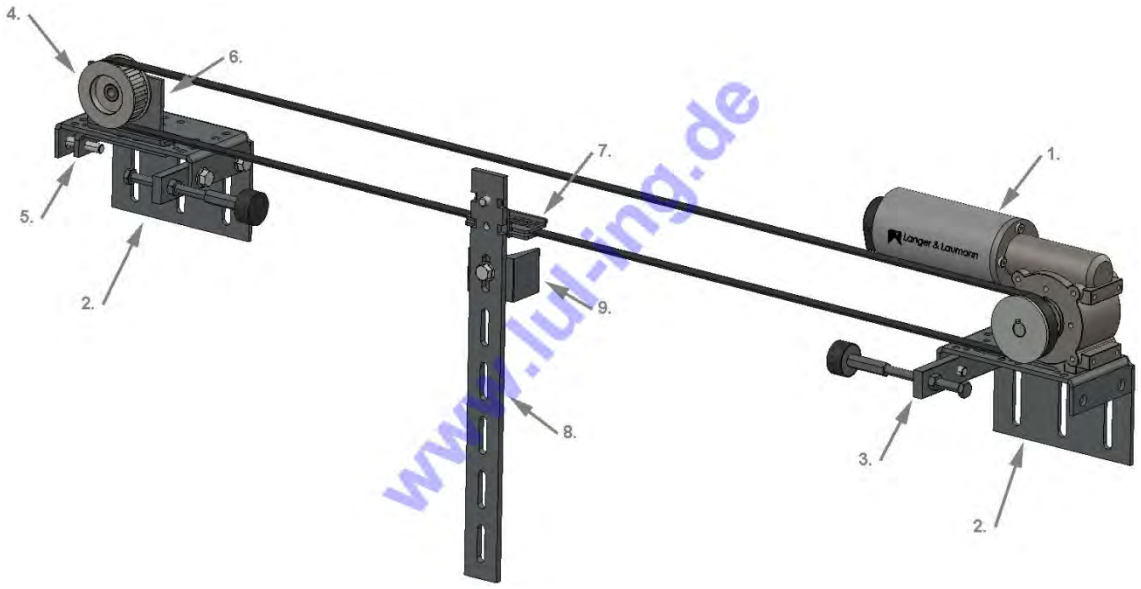


Fig. 1: TSG assembly example

Table 1: Designation of TSG universal kit

No.	Article number	Designation
1.	8.20.40000.X1	TSG drive (shown here: left version)
2.	1.20.60040	TSG standard combination bracket
3.	1.20.60030	TSG stop kit (incl. buffer stop)
4.	1.20.60003	TSG counter roller
5.	1.20.60110	TSG clamping latch
6.	1.20.60013	TSG counter roller support
7.	1.20.60005	TSG toothed belt lock
8.	1.20.60004	TSG door panel carrier
9.	1.20.60020	TSG stop on door panel carrier

5.2 Assembly

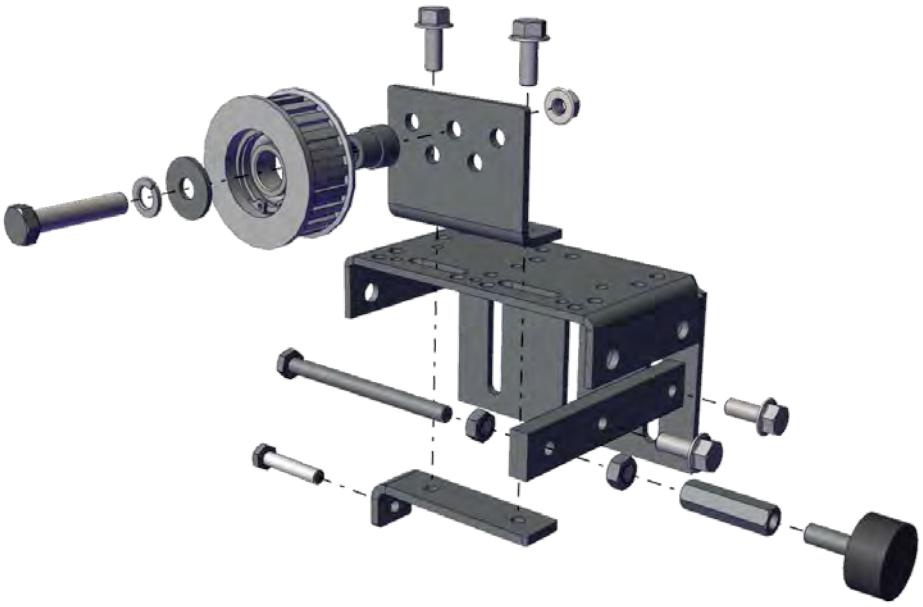


Fig. 2: Assembly TSG counter roller unit

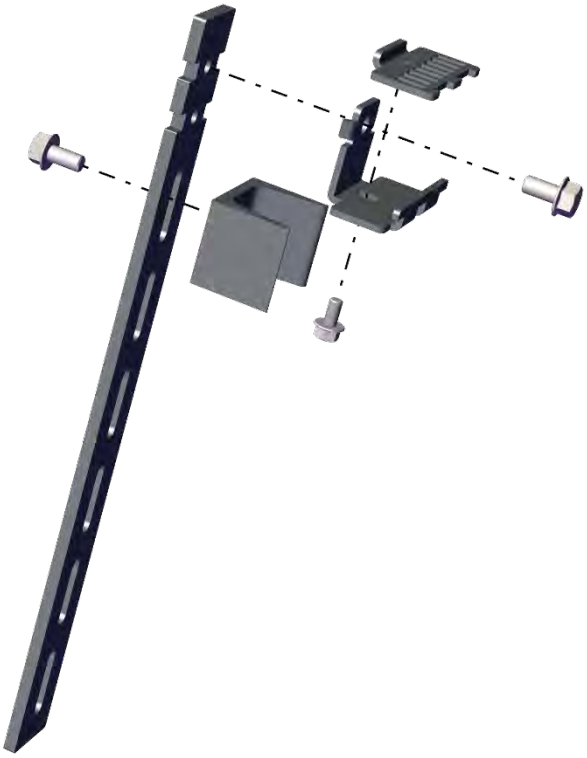


Fig. 3: Assembly TSG door panel carrier unit

Fig. 4: Assembly TSG motor unit

5.3 Mounting of the counter roller

When mounting the counter roller make sure, it is fastened to the side of the pressed-board disk in direction of the holder.

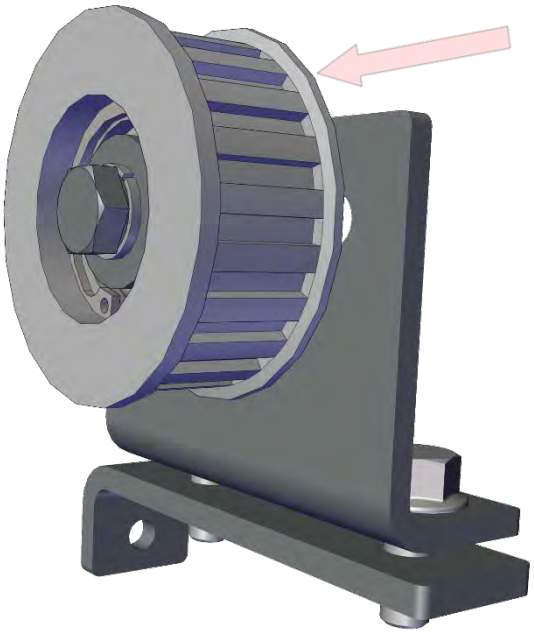


Fig. 5: TSG counter roller - mounted

5.4 Dimensions

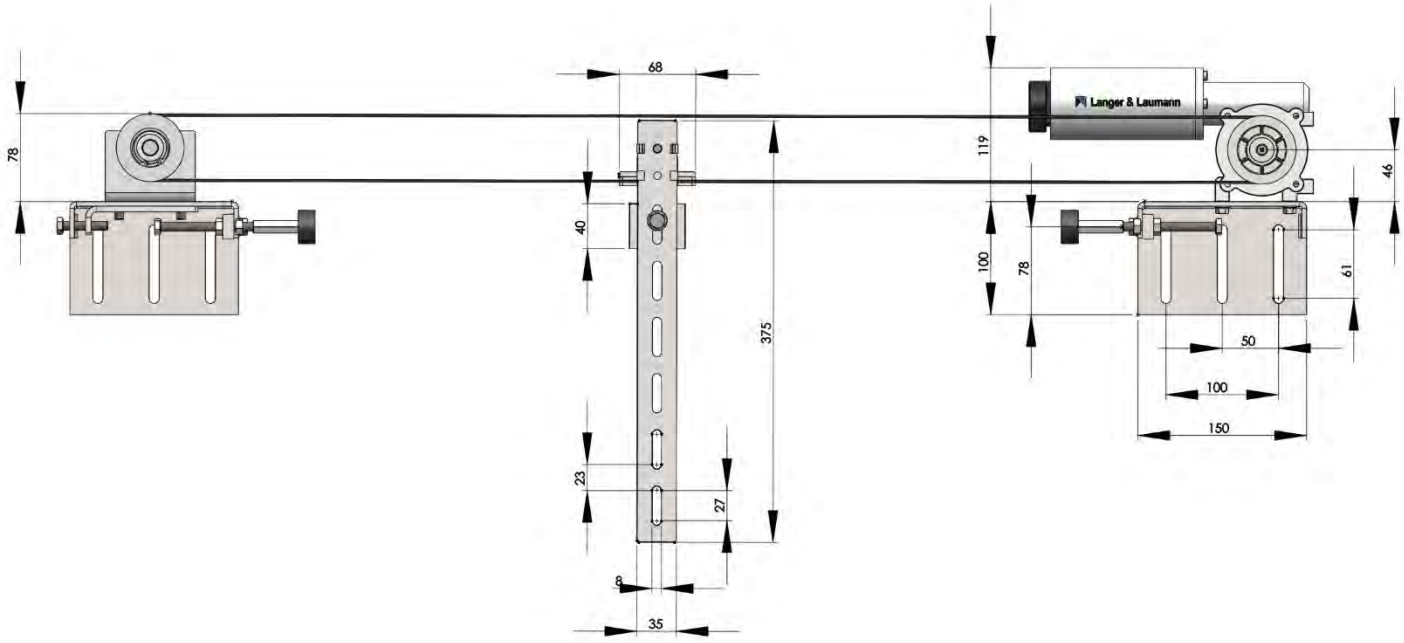


Fig. 6: TSG universal kit - front dimensions

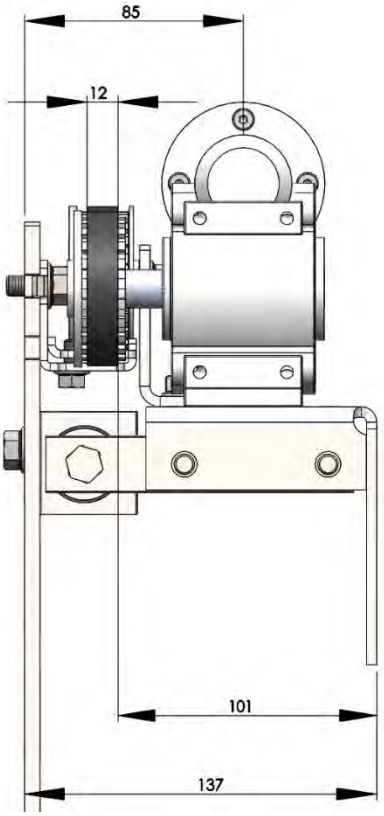


Fig. 7: TSG universal kit - side dimensions

5.5 TSG drive: position of motor

There are two different motor positions available:

The motor position is independent of the direction of opening of the door or the protective device. For example, the TSG drive can be installed on the left or on the right side.

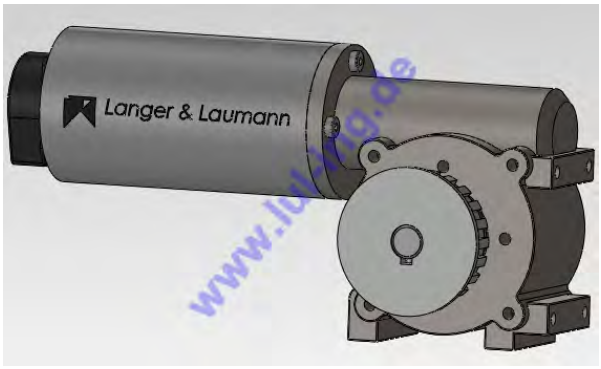


Fig. 8: TSG drive - version left

TSG drive left version (in view of the gear head and foot mounting below is the output of the gear on the left side).

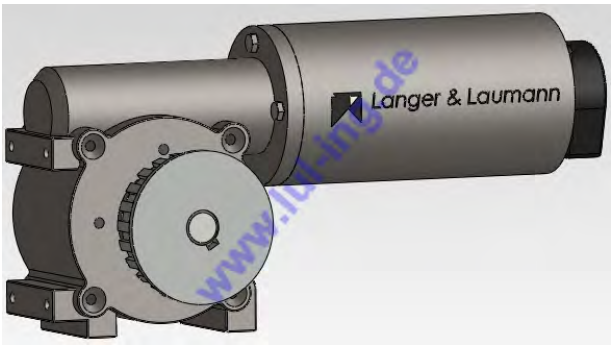


Fig. 9: TSG drive - version right

TSG drive right version (in view of the gear head and foot mounting below is the output of the gear on the right side).

5.6 TSG housing

The TSG electronic is available in two different housing types.

5.6.1 TSG electronic intern

The TSG electronic is available in a cabinet housing. The cabinet version can be directly screwed in the cabinet onto the mounting plate and / or be mounted on a DIN rail (TS35, 35[mm] x 7,5[mm]).

Fig. 10: TSG electronic intern – front view

Fig. 11: TSG electronic intern – contact power

(see also cap. 16.5.5 Terminal assignment power / page 74)

The motor and encoder cable and single wire for the inputs and outputs are introduced from the bottom. The power supply is above and pluggable.

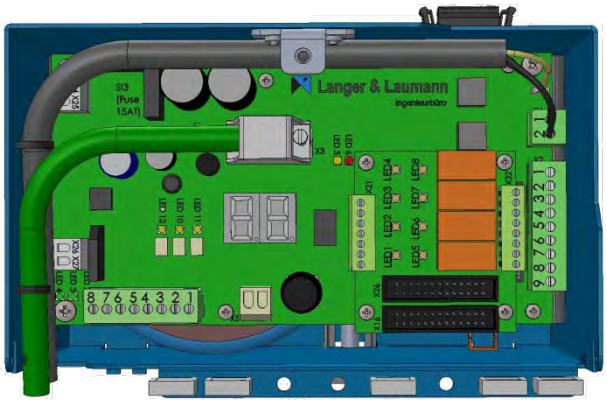


Fig. 12: Guide of the TSG cable in TSG housing

Condition for the use of the cabinet housing is to use a plug-in TSG drive and TSG cable. TSG cables are available in lengths of 2.5, 5.0, 10.0, 15.0 and 20.0[m].

WARNING:
We would like to point out that we do not accept any warranty for errors arising from material supplied by Langer & Laumann Ing. Büro GmbH, in particular motor or encoder cables. The use of non-released cables invalidates the type examination certificate 44780 1309930301 and the certificate of conformity for the manufacturer's equipment.

CAUTION:
The TSG electronic can be placed internally in the cabinet in at least 5[cm] distances between each other and at least 2[cm] next to each other.

Table 2: Dimensions

Outer dimensions TSG cabinet housing	
Width	205[mm]
Height	140[mm]
Depth	160[mm]

Table 3: Weight

Weight of TSG cabinet housing incl. TSG electronic	
Weight	ca. 4,1[kg]

5.6.1.1 Dimensional / mounting drawing

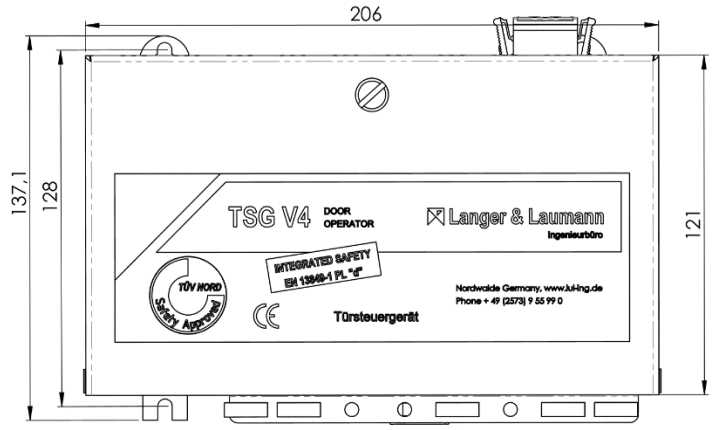


Fig. 13: TSG intern, front view

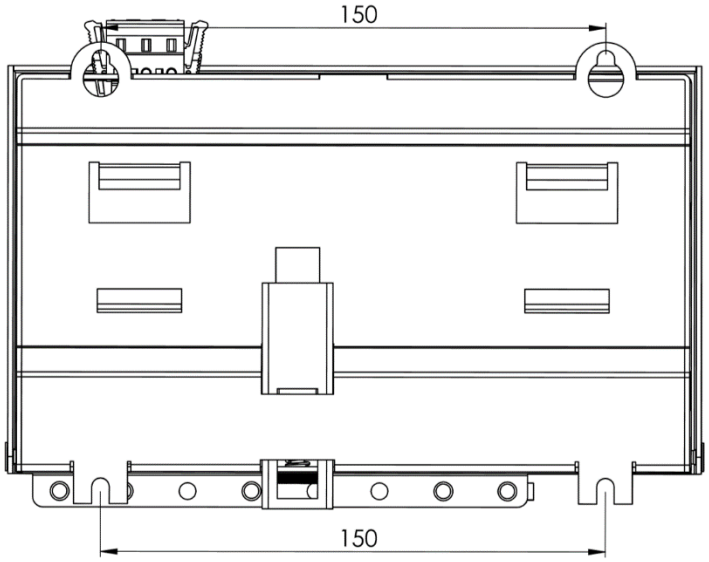


Fig. 14: TSG intern, rear view

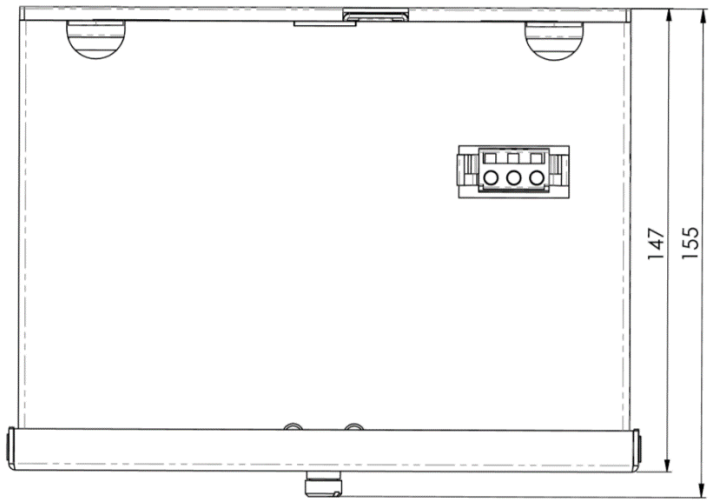


Fig. 15: TSG intern, top view

5.6.2 TSG electronic extern

The TSG electronic is available in a splash-proof housing. The housing is mounted by four screws to an appropriate position near the TSG drive fixed.

Fig. 16: TSG electronic in splash-proof housing

The cables can be optionally inserted through the left or right side with cable glands through pro-punched holes in the housing. The motor and encoder cables use a common, split cable gland.

CAUTION:
When you open the pre-cut holes for the cable glands, ensure that the TSG electronics will not be damaged and no metalic parts enter to it.

CAUTION:
All broken out openings must be closed with the enclosed screw connections in order to maintain the degree of protection.

Table 4: Dimensions

Outer dimensions TSG splash-proof housing	
Width	450[mm]
Height	95[mm]
Depth	155[mm]

Table 5: Weight

Weight of TSG splash-proof housing incl. TSG electronic	
Weight	ca. 4,1…5,8[kg] (weight will vary by equipment)

Table 6: cable diameter glands

Cable diameter for enclosed glands	
Gland M16	5 – 10 [mm]
Gland M20	8 – 13 [mm]

5.6.2.1 Dimensional / mounting drawing

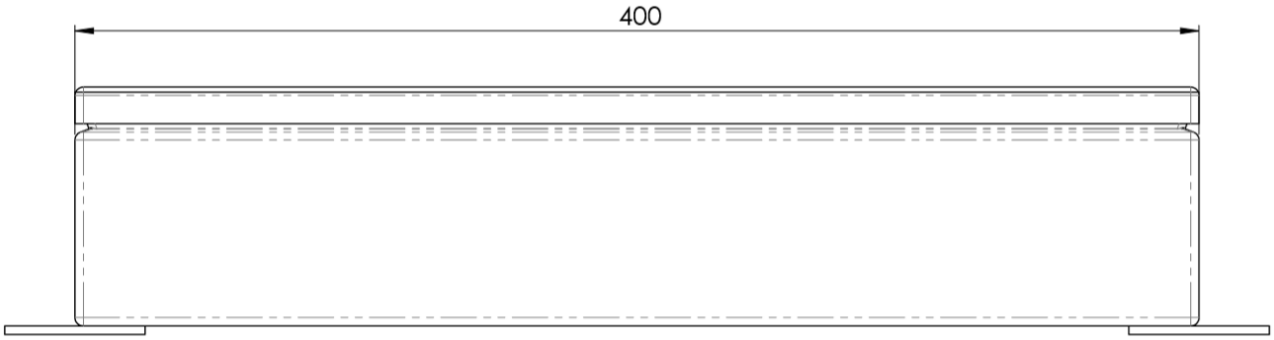


Fig. 17: TSG extern, side view 1

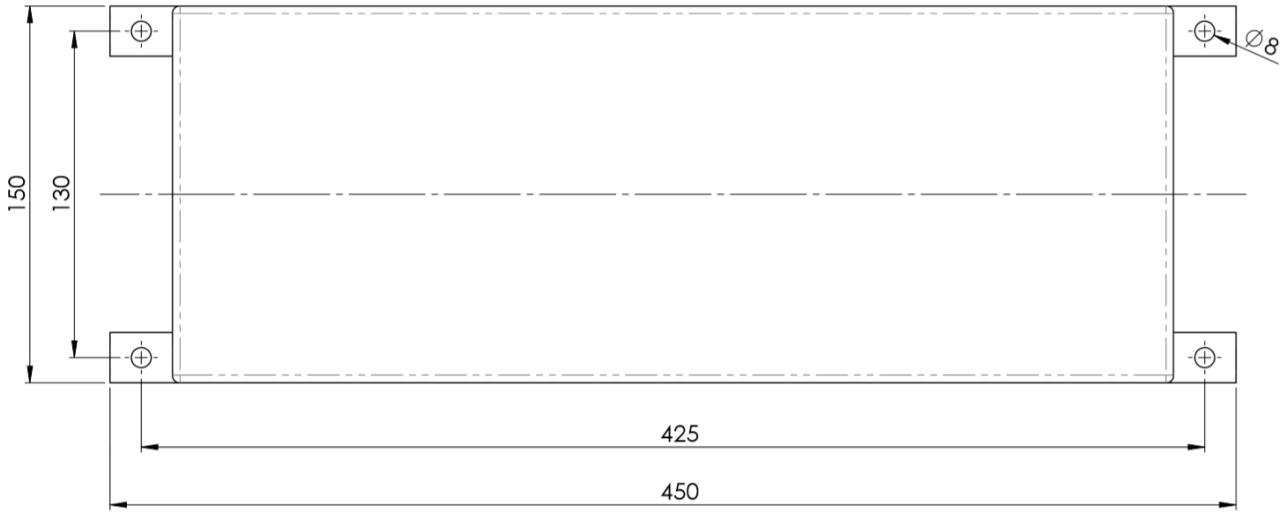


Fig. 18: TSG extern, top view

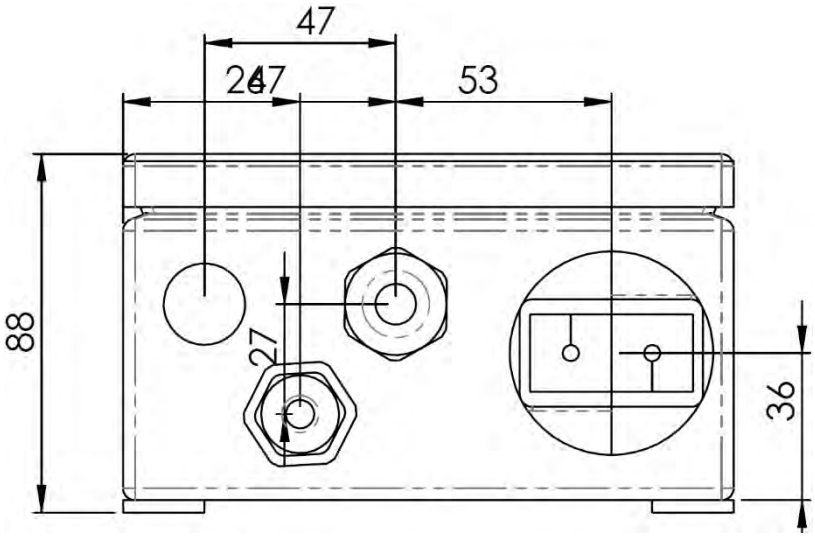


Fig. 19: TSG extern, side view 2

6 Mechanical installation

6.1 Requirements for installation

- The door must have permanently mounted mechanical end stops for the Open and Closed positions that can withstand the energy applied by the TSG door operator.
- The end stops must be located on the car in the immediate vicinity of the TSG toothed belt so that the door width is equally wide at all stopping points.
- If shaft door closing weights are fitted they should be smooth in operation (not judder).
- The car and shaft doors must be easy moving.
- There must be no additional springs (tension or compression springs) installed in the travel path of the door. Springs and/or dampers that were required for previous door drives must be removed when installing the TSG door operator.

6.2 Installation process

1. Mount the TSG drive. It does not matter whether the TSG drive is mounted on the opening or closing side of the door, since the correct travel direction is determined during the initial measurement.
2. Mount the TSG counter roller and clamping station.
3. Set the TSG toothed belt in place and connect it with the TSG toothed belt lock.
4. Tighten the TSG toothed belt (see also cap. 6.3 TSG toothed belt / page 23).
5. Mount the TSG door panel carrier on the fastest door panel and the TSG toothed belt lock.
6. If there are no permanently mounted stops, fasten buffer stops onto the TSG combination brackets. Screw the C rail onto the TSG door panel carrier at the appropriate height as the corresponding piece.
7. Securely position the TSG door control device with housing close to the TSG drive. Make certain the motor and encoder cable can be connected to the TSG electronic with sufficient clearance.
8. The 9-pin connector must be firmly connected to the connector X3 on the TSG electronic. The TSG motor cable attach to terminal strip X4 and shield clamp of the TSG motor cable at X8 on the TSG electronic.

CAUTION:
Only TSG toothed belt locks may be used as the toothed belt (door fastening). Improper fastening may cause a notch effect to be exerted on the TSG toothed belt, which will result in premature cracks in the TSG toothed belt.

6.3 TSG toothed belts

TSG toothed belts must be tensioned to a defined toothed belt tension. This will ensure optimum force transfer and extend the service life of the TSG toothed belt and bearing.

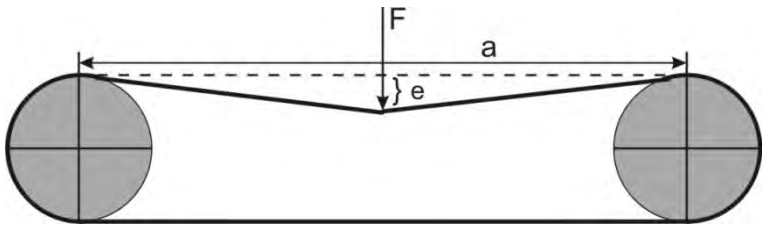


Fig. 20: TSG toothed belt tension

At an axle distance of: **a** = 1[m] (axle center – center)
Deflection should be: **e** = 16[mm]
and force should be: **F** = 18,5[N].

CAUTION:
A too low TSG toothed belt tension may result in premature wear on the toothing of the belt. A jumping belt will cause a changing of the door position.

CAUTION:
A too high TSG toothed belt tension will increase the bearing load and reduce the performance of the TSG door operator. This will also result in premature wear & tear of the TSG toothed belt.

The toothed belt pulleys must be properly aligned. Check in addition to ensure parallel waves. Angular deviation must not exceed **ß = 0,7°**.

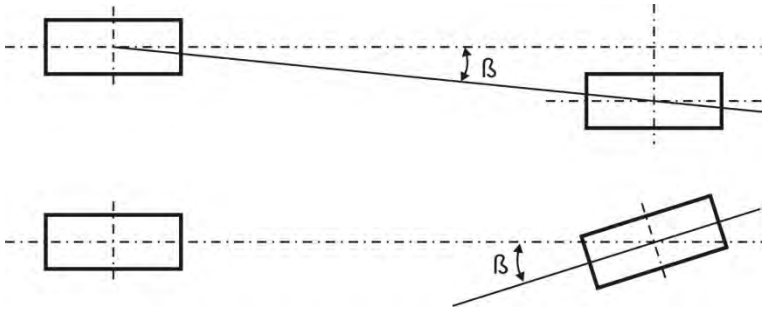


Fig. 21: TSG toothed belt alignment

If the maximum angular deviation is exceeded, running the toothed belt may result in damage to the flanged wheel and premature wear on the edge of the toothed belt. In addition, the uneven load on the tension member will result in premature fatigue, which will significantly shorten the service life.

7 Electrical settings and commissioning

7.1 Display

The TSG electronic unit has a two-digit 7-segment display to indicate the current state and show the menu with parameters and their corresponding values.

Table 7: TSG display

Display	Meaning
	There is no activation.
	The TSG is not calibrated. Manual calibration must be performed. If the TSG electronics detects an incorrect motor or an incorrect motor connection, the display flashes and no calibration is possible. (see also cap. 7.4 Self-Learn Procedure / page 27).
	Open signal is present (**Op**en).
	Close signal is present (**Cl**ose).
	Door is opened (**O**pene**d**).
	Door is closed (**C**lose**d**).
	Door is obstructed (**bl**ocked).
	Intermediate position reached (see also cap. 18.2 Intermediate positions in the travel zone / page 79)
	Reversing range reached (Parameter bd, see also Table 11: b parameters / page 36)
	Triggering light curtain (Light Curtain) (see also section 18.4 Light Curtain Kit / page 81)
	Stop function (see also section 12.3 Stop input / page 54)

NOTE:
If the display is not used for 30 minutes or more, the display switches off automatically. By turning or pressing the jog wheel, the display is switched on again.

7.2 Two-digit 7-segment display

The two-digit 7-segment display can show up to 3-digit values. The front part of the number is output at intervals of seconds, offset in time from the rear part of the number.

Example:
The value 172 is stored in parameter A.C. This value is displayed:

- For one second: "_1"
- Next second: "72".

NOTE:
2-digit values are displayed without clocking.

7.3 Menu structure

There is a jog wheel on the TSG electronic for operating and adjusting the TSG door operator (between the 7-segment display and the relay outputs). Press the jog wheel once from Normal mode to show menu item P0.

Turn the jog wheel clockwise to move UP (increment) through parameters (increments P1, P2, etc.). To move DOWN through parameters (decrement Pn, …P2, P1), turn the jog wheel anticlockwise. Once on a parameter, pressing the jog wheel takes you to the corresponding parameter value.

If you turn the jog wheel clockwise until CC appears and then press the jog wheel, the menu will move one layer back up the menu structure or you exit the menu.

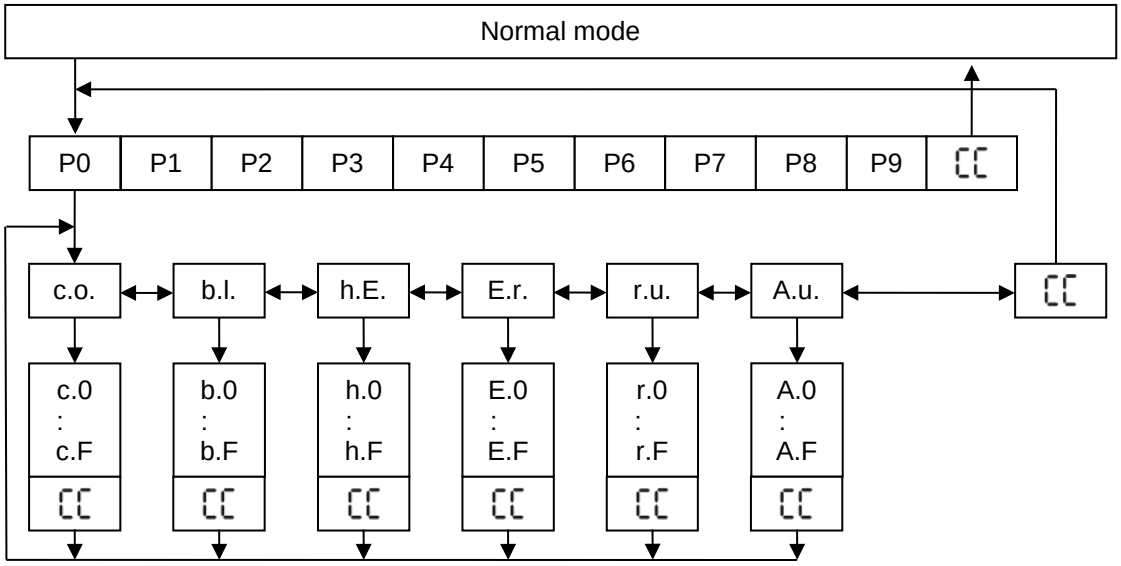


Fig. 22: Menu structure

7.4 Self-Learn Procedure

An initial self-learn procedure must be performed to measure door size.

CAUTION:
Make certain the door can close and open without obstruction. Otherwise inaccurate data will be recorded. The door must not be obstructed bay objects or sluggish (free movement of door panels and rollers)! During the self-learn procedure there are some uncontrolled door movement. For safety keep personnel well away from all moving parts.

1. Move the door manually about half way the opening width where self-learn procedure will start from.
2. Unplug connector X1 (inputs) and connector X2 (relay outputs) to avoid uncontrolled conditions during and immediately after the self-learn procedure.
3. Connect the TSG motor cable with the terminal strip X4 and the shield clamp of the TSG motor cable with X8 on the TSG electronic. Connect the TSG encoder cable with the terminal strip X3 (Sub-D9 connector).
4. Turn on the power supply.
5. Select parameter P9, then press the jog wheel and hold it for about 5 [seconds]. A present value of the total weight of the components to be traversed (door panels, protective device, …) is flashing on the display. Release the jog wheel. By turning the jog wheel, the total weight of the components to be traversed (door panels, protective devices,…) must be set (take into account factor in weight input, see also cap. 7.5 Enter the weight to be traversed / page 28). After adjusting of the correct weight press the jog wheel briefly.
6. The **L**ea**r**n) display appears. The Open direction should be selected first. Turn the jog wheel to open the door, if the door starts closing, turn the jog wheel the opposite way.
7. Once the door has reached the Open position and the result is saved, the door automatically moves. The door will automatically close again.

   Caution: If the wrong position was chosen for the Open direction and the Open position has already been saved, it is no longer possible to reverse the direction of motion! The self-learn procedure must be continued to the end. Then a new self-learn procedure must be started.
8. If the Closed position is reached and the display shows cd, the self-learn procedure has been successfully completed.
9. The TSG is ready to use. The connectors X1 (inputs) and X2 (relay outputs) can now be plugged in.

NOTE:

During the self-learn procedure the display is flashing with nL, the TSG electronic detect a wrong motor or a wrong motor connection. A self-learn procedure is not possible. Please correct the connection and start with self-learn procedure anew.

CAUTION:
If an input signal is present on connector X1, the door will move in the assigned direction!

CAUTION:
If any mechanical adjustment is performed after the self-learn procedure (example tightening the TSG toothed belt or readjusting the end stops or buffer stops) this will affect the saved values of the door measurements. A new self-learn procedure must be carried out every time a mechanical adjustment has been made!

CAUTION:
If the function stop input two channel is switched on (h3=04), the connector X1 must be completely wired when initial self-learn procedure, so that the stop channel is present.

NOTE:
Saved parameters are not reset to default values after a self-learn procedure! Parameter EE is used to reset parameters to their default values (see also Table 13: E parameter / page 43).

7.5 Enter the weight to be traversed

By selecting the parameter P9 the total weight can be read and adjusted.

7.5.1 Press briefly of the jog wheel

The display shows the adjusted total weight. It can't be changed. Another quick press on the jog wheel, the display returns to parameter P9.

7.5.2 Press long of the jog wheel

Press the jog wheel and hold it for about 5 [seconds] you will start with the self-learn procedure (see also cap. 7.4 Self-Learn Procedure / page 27). First, the currently adjusted total weight is flashing in the display. The executive personnel must enter the actual total weight of the components to be traversed (door panel, protective device,).

Table 8: Weight Input

Assignment of the input of actual existing total weight	
01	10[kg]
02	20[kg]
:	:
40	400[kg]

NOTE:
A new changing of the weight can only be made by following new self-learn procedure.

NOTE:
In telescoping doors that is slower by half, the weight of the second door panel must be added only by half.

CAUTION:
The adjusted weight will not be reset when the parameter EE set the other parameters back to standard (see also Table 17: E parameter / page 58). A new changing of the weight can only be made by following new self-learn procedure.

7.6 Manual mode / manual travel

To select Manual mode, choose parameter P1. The Hd display appears. Turn the jog wheel anticlockwise (c.c.w.) until the -O display appears. Pressing the jog wheel and holding it down moves the door in the open direction. Turn the jog wheel clockwise (c.w.) until the -C display appears. Pressing the jog wheel and holding it down moves the door in the closed direction.
When you release the jog wheel the door stops.

Select the Hd display and press the jog wheel to exit manual mode.

NOTE:
Travel while Manual mode is active corresponds to the same drive response as when Door Open or Door Closed signals are present on terminal X1.1 or X1.2.

As long as the operator is in manual mode, no control signals are accepted at terminal strip X1.1 and X1.2. If the pressure function is activated (h3=03), this function can be executed by applying the input signal at X1.3 and simultaneous manual movement in the closed direction.

If an external sensor, two-channel, parameterized (hA=05) and connected, its input signal has priority over the manual mode.

If the stop function is activated during manual mode, manual mode is terminated.

If an error occurs in manual mode, manual mode is terminated. The manual mode cannot be reactivated until the error has been eliminated.

NOTE:
If the TSG is to be moved again over the entire control signals at X1, manual mode must be terminated.

NOTE:
As long as the operator is in manual mode, the LED10, LED11 and LED12 continue to indicate the applied control signals (see Chapter 16.1Overview of TSG electronic / Page 66), however, they are not executed, since manual mode has priority.

c.w. = clock wise
c.c.w. = counter clock wise

8 Default parameters

8.1 Drive curves with default parameters

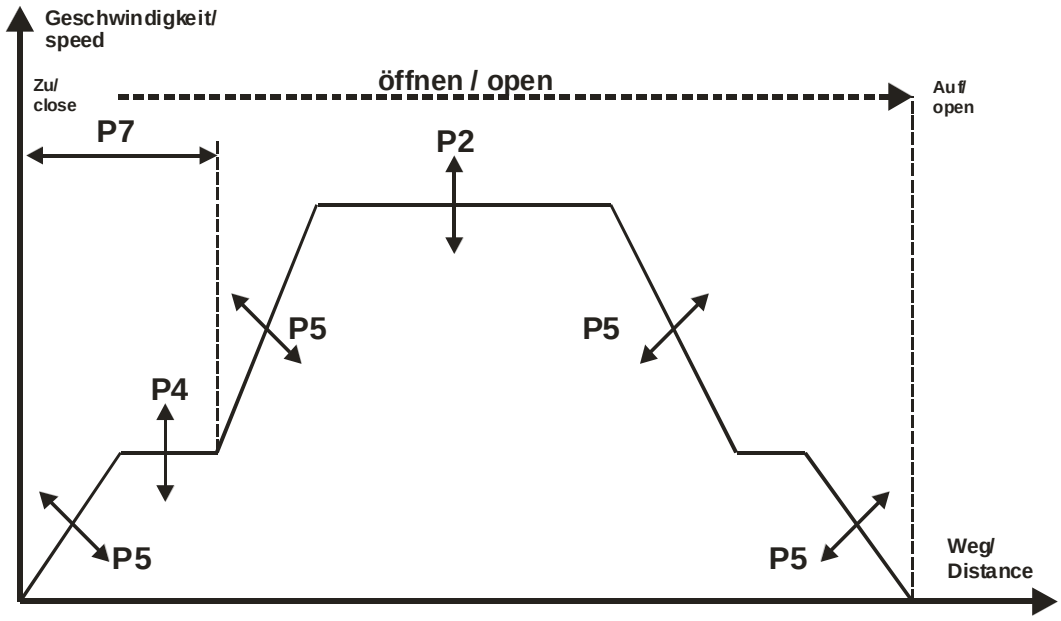


Fig. 23: „Open“ door curve with P parameters

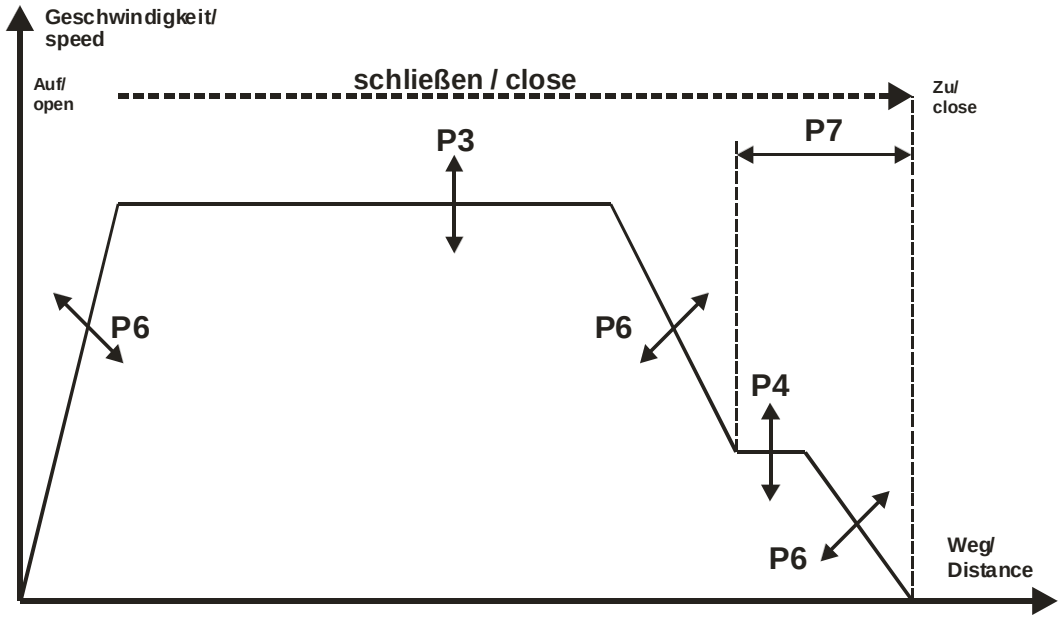


Fig. 24: „Close“ door curve with P parameters

8.2 Basis settings

The TSG default parameters are pre-configured. Normally the default parameter's settings do not need to be changed.

WARNING:
The adjusted parameters, the maximum speed limit, force and energy are to be checked and recorded at the closing and shearing edges after commissioning or changing of parameters at the door by the executive personnel (see also cap. 11 Setting for force limiting / page 51).

8.3 User setting – P parameters

P parameters are used to set drive values quickly.

If you press the jog wheel, the TSG will switch to the Parameter menu. The first appearing menu item is P0. Turning the jog wheel clockwise (c.w.) increases the parameter menu, while turning it anticlockwise (c.c.w.) reduces the menu.
To see the values of the relevant parameter, press the jog wheel briefly.

Table 9: P parameters

	Function	Note	Min	Default	Max	Factor	Unit
P0	Return to special functions	(see also cap.9.2 Advanced menu / page 35)					
P1	Manual mode	(see also cap. 7.6 Manual mode / manual travel / page 30)					
P2	Max. Open speed		01	50	99	0,01	[m/s]
P3	Max. Close speed		01	30	99	0,01	[m/s]
P4	Locking and unlocking speed	Creep speed shortly before Door Closed end position	01	05	P3	0,01	[m/s]
P5	Acceleration and braking in Open direction		01	07	50	0,1	[m/s²]
P6	Acceleration and braking in Close direction		01	07	50	0,1	[m/s²]
P7	Locking and unlocking distance	Creep distance shortly before Door Closed end position	00	03	99	1	[cm]
P8	Limit value „Obstructed detection“ in Close direction		0.1	4.0	9.9	1	
P9	Activation of self-learn procedure	(see also cap. 7.4 Self-Learn Procedure / page 27)					
CC	Exit the menu.	Select CC and press the jog wheel to leave the P-parameter menu.					

After the value is set, press the jog wheel to save the displayed value and exit parameters.

If you select CC and press the jog wheel, the menu will skip one step back.

NOTE:
All parameters that have been changed are permanently saved in the memory, where they will be available even after a power failure.

NOTE:
If a value is set and stored by pressing the jog wheel, an internal review about the successful acquisition of the value will be made. If the acceptance of the value has not been successful, the operator is alerted by the flashing of the display.

9 Advanced parameters

9.1 Drive curves with advanced parameters

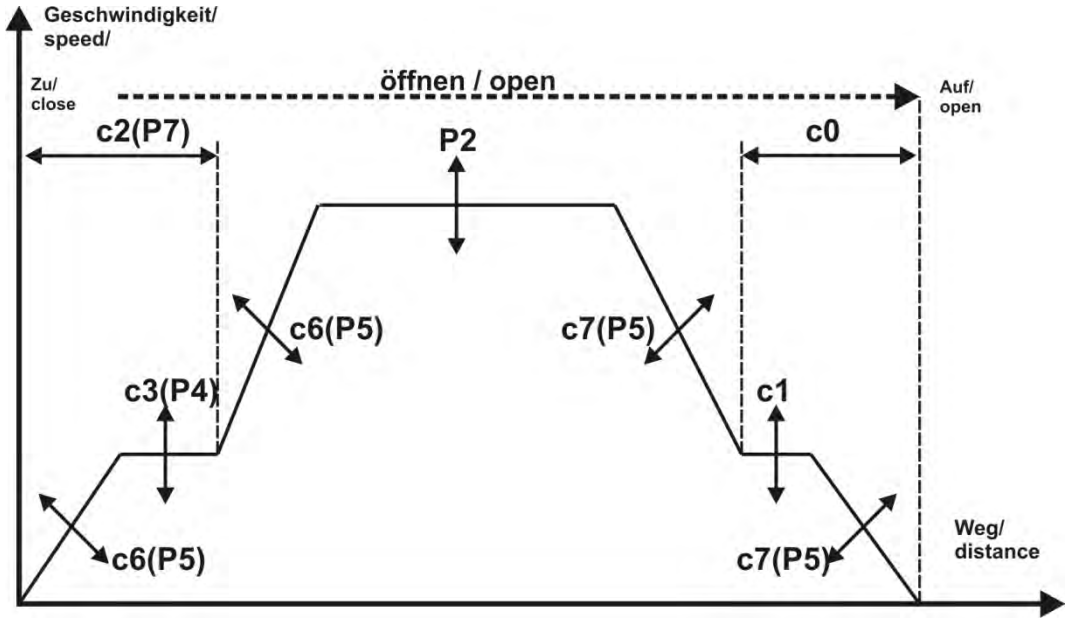


Fig. 25: „Open“ door curve with c parameters

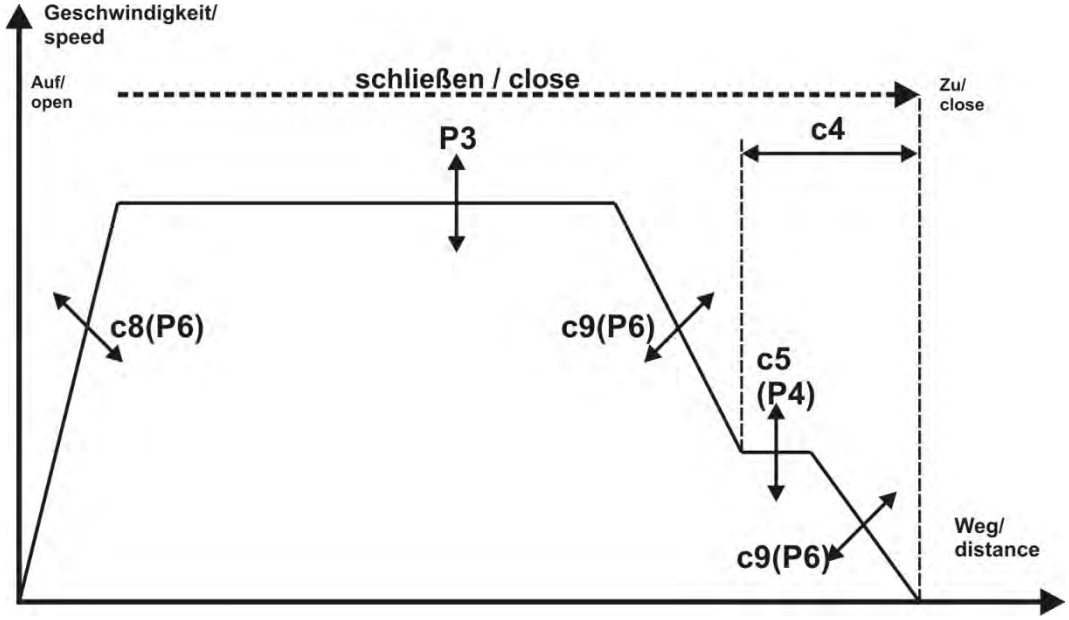


Fig. 26: „Close“ door curve with c parameters

9.2 Advanced menu

To go to the advanced menu mode, select parameter P0 and hold down the jog wheel for about 5 [seconds]. Then you can turn the jog wheel to select parameters c, b, h, E, r and Au (see also Fig. 20: Menu structure / page 26).

CAUTION:
In certain cases, changing the value of a “P” parameter will automatically change some of the “C” parameter values (see also Fig. 25: or Fig. 26: / page 34). This means that the value which is set in the P parameter automatically enters in the corresponding C parameters.

9.2.1 User setting – c parameters

The c parameters can be set individually.

Table 10: c parameters

	Function	Note	Min	Default	Max	Factor	Unit
c0	Length of creep distance in Open direction		00	00	(internal calculation)		[cm]
c1	Creep speed in Open direction		01	05	P2: Open speed	0,01	[m/s]
c2	Length of unlocking distance in Open direction		00	03	(internal calculation)		[cm]
c3	Unlocking speed in Open direction		01	05	P2: Open speed	0,01	[m/s]
c4	Length of unlocking distance in Close direction		00	03	(internal calculation)		[cm]
c5	Locking speed in Close direction		01	05	P3: Close speed	0,01	[m/s]
c6	Acceleration in Open direction		01	07	50	0,1	[m/s²]
c7	Braking in Open direction		01	07	50	0,1	[m/s²]
c8	Acceleration in Close direction		01	07	50	0,1	[m/s²]
c9	Braking in Close direction		01	07	50	0,1	[m/s²]
cC	Holding torque in Open direction without input signal "Open door"		0.0	1.0	2.5		[A]
cd	Holding torque in Close direction without input signal "Close door"		0.0	1.0	2.5		[A]
cE	Holding torque in Open direction with input signal "Open door"		0.0	1.0	2.5		[A]

	Function	Note	Min	Default	Max	Factor	Unit
cF	Holding torque in Close direction with input signal "Close door"		0.0	1.0	2.5		[A]
CC	Exit the menu.	Select CC and press the jog wheel to leave the c-parameter menu and return to c.o.					

9.2.2 User setting – b parameters

Table 11: b parameters

	Function	Note	Min	De-fault	Max	Factor	Unit
b2	Limit value of Obstruction detection in Close direction	EN 81 safety, measurement EN 953	2.0	4.0	9.9		[A]
b3	Response of relay output "Door obstructed" in Close direction	oF = Continuous on = Pulse When the limit value for Obstruction detection is engaged in Close direction, the "Obstruction output" is set. The "Door obstructed" output is set when the Opened position is reached.	oF	oF	on		
b4	Response of the door drive for obstruction in Close direction	oF = if door is obstructed, the drive will stop immediately. If the input signal changes to "Open door", the door opens. on = automatic reversing for input signal "Close door" until the Opened position is reached. If the input signal "Close door" is still present, the door will then close again immediately.	oF	oF	on		
b5	Activation of Obstructed detection in Open direction	oF = Off on = On	oF	on	on		
b6	Blocked detection in the first 30% of the opening path.	oF = Obstructed detection in the first 30% of the Open distance off. on = Obstructed detection in the complete Open distance on.	oF	on	on		
b7	Limit value of Obstructed detection in Open direction		2.0	9.5	9.9		[A]

	Function	Note	Min	De-fault	Max	Factor	Unit
b8	Response of relay output "Door Obstructed" in Open direction	oF = Continuous on = Pulse	oF	on	on		
b9	Response of the door drive for blocking in Open direction	oF = if door is obstructed the drive will stop immediately. If the input signal changes to "Close door", the door closes. on = automatic reversing for input signal "Open door" until the Closed position is reached. If the input signal "Open door" is still present, the door will then open again immediately.	oF	oF	on		
bA	Length of the output pulse on relay output "Door Obstructed" in Open and Close direction	Only in effect if b3 and/or b8 = on	0.1	1.0	2.0		[seconds]
bb	Catch range for Door Closed position	**Caution:** Obstructed detection is not active in this range!	01	05	50		[mm]
bC	Catch range for Door Opened position	**Caution:** Obstructed detection is not active in this range!	01	10	50		[mm]
bd	Distance of reversing	Effective for obstacle detection and sensor monitoring. 1. Obstacle detection: If the door is blocked, the TSG reverses by the set value. If the value is set to 00 or 99, a complete reversal takes place. **Attention:** Only active if parameter b4 or b9 has been activated. Attention: The smallest reversing range to be carried out is 5[cm]. 2. Sensor monitoring: If the sensor is triggered when closing, the TSG reverses by the set value. If the value is set to 99, a complete reversal takes place. **Attention:** The smallest reversing range to be carried out is 5[cm].	00	99	99		[cm]
bE	Slow travel when door blocked.	If the door is blocked in the close direction, the TSG will drive slowly on the next closing run until it reaches the position of the blockage.	oF	on	on		
CC	Exit the menu.	Select CC and press the jog wheel to leave the b-parameter menu and return to c.o.					

9.2.3 User setting – h parameters

Table 12: h-parameters

	Function	Note	Min	De-fault	Max	Factor	Unit
h0	Long-term test: Open door / close door / Adjusting baud rate CAN	The door opens and closes repeatedly. Input signals are ignored. Between the drives is a pause of 5[seconds]. If hA=09, 10, 16, 17 or 18: Adjusting the baud rate in CAN-mode. The long-term test of inputs and outputs X1, X2 is not possible in CAN mode.	00	00	03		
h1	Test: Inputs and outputs / Adjusting door number CAN	00: no function 01: Test operation of inputs and outputs. - Input X1.1 switches relay output X2.2 or X2.3, - Input X1.2 switches relay output X2.5 or X2.6, - Input X1.3 switches relay output X2.8 or X2.9. 02: Pulse operation of inputs X1.1 and X1.3 (pulse width: at least 0.2[second]). 03: Pulse operation of input X1.1 (pulse width: at least 0.2[second]). Input X1.2 is not evaluated. Door opens when complete pulse is applied and closes automatically after the set time in h5. If hA=09, 10, 16, 17 oder 18: Adjusting the door number in CAN-mode. The test and pulse operation are not possible in CAN mode.	00	00	03		
h2	Leading limit switch	The relay outputs for “Door is open”, “Door is closed” (plug X2) can be set leading. According to the configuration the limit switch switches before the end position is reached (see also cap. 12.4 Leading limit switch / page 57)	00	00	31		

	Function	Note	Min	De-fault	Max	Factor	Unit
h3	Function input X1.3	00: no function 01: Light Curtain "normally open" If LED 12 is lit open the door 02: Light Curtain "normally closed" If LED 12 is not lit open the door 03: Nudging (see also cap. 12.2 Nudging / page 53) 04: Stop unction two channel (see also cap. 12.3.2 Stop input two channel / page 56) 05: Light curtain "low active (when LED 12 goes out, the door stops, effective in both directions) **Caution:** the setting of the parameter h3 (function of input X1.3) is not reset to default (see also Table 17: E parameter / page 58)! **Note:** If parameter h3 is set to 01 or 02, the distance of reversing can be set via parameter bd and reverse time via parameter h5.	00	00	05		
h4	Adjusting Node-ID CAN	Adjusting the Node-ID in CAN-mode.	00	00	124		
h5	Reverse time	If the function "Light curtain" (h3=01 or 02), "Automatic reversing" (b4=on) or pulse mode X1.1 (h1=03) is active, the door remains open for the set value. If the value is 00, the door closes again immediately. If the door is open, the time is counted back and the residual value is shown in the display.	00	00	30		[seconds]
h6	Speed during calibration and after power is restored	Speed when searching for both end position following power failure and during the learning procedure (see also P9).	01	09	25	0,01	[m/s]
h7	Opening time of the TSG Sinus Drive	Only with additional board TSG Sinus Drive and hA=01, 03, 06, 16, 17 or 18.	00	50	80		[1/100 seconds]
h8	Force for verifying the end position in CLOSED		0.1	3.5	9.9		[A]

	Function	Note	Min	De-fault	Max	Factor	Unit
h9	Force for verifying the end position in OPEN		0.1	1.0	9.9		[A]
hA	Selection mode of operation	Only for use with optional add on boards. 00: Opportunity to move to the intermediate position and Ready for Operation (usable with add on board 4E/4A relays or 4E/4A electronic) 01: control TSG Sinus Drive (usable with add on board TSG Sinus Drive) 02: can be used with additional board 4E/4A relay 03: control TSG Sinus Drive with emergency power supply (usable with add on board TSG Sinus Drive) 04: enabling mode (usable with add on board 4E/4A electronic) 05: external sensor, two channels (usable with add on board 4E/4A electronic) 06: control TSG Sinus Drive for shaft hinged doors (usable with add on board TSG Sinus Drive) 07: Connection set TSG in Otis DCSS5/AT120 (can be used with additional Otis adapter board) 08: customer-specific (can be used with additional board SL adapter) 09: customer-specific (can be used with additional board SL adapter CAN). 10: CANopenLift or ThyssenFx Bus-communication active (can be used with additional board CANopenLift). 11: customer-specific (can be used with additional board MxP101 adapter)	00	00	18		

	Function	Note	Min	De-fault	Max	Factor	Unit
		12: Profinet communication aktive (can be used with additional board Profinet). 13: Otis-Multidrop aktive (can be used with additional board Otis-Multidrop). 14: Profinet communication and ZS-operation aktive (can be used with additional board Profinet + 4E/4A electronic). 15: Profinet communication and external sensor, two channel (can be used with additional board Profinet + 4E/4A electronic) 16: CANopenLift- or ThyssenFx - Bus-communication and TSG Sinus Drive (usable with add on board CAN and TSG Sinus Drive) 17: CANopenLift- or ThyssenFx - Bus-communication and TSG Sinus Drive with emergency power supply (usable with add on board CAN and TSG Sinus Drive) 18: CANopenLift- or ThyssenFx - Bus-communication and TSG Sinus Drive for shaft hinged doors (usable with add on board CAN and TSG Sinus Drive)					
hb	Closing time of the TSG Sinus Drive	Only with additional board TSG Sinus Drive and hA=01, 03, 06, 16, 17 or 18.	01	50	80		[1/100 seconds]
hC	Pause between opening of the TSG Sinus Drive and opening of the door	Only with additional board TSG Sinus Drive and hA=01, 03, 06, 16, 17 or 18.	01	50	99		[1/100 seconds]
hd	Torque to find the end position in Close direction while teaching (see also note below the table)		0.1	5.0	9.9		[A]
hE	Torque to find the end position in Open direction while teaching and reference (see also note below the table)		0.1	5.0	9.9		[A]

	Function	Note	Min	De-fault	Max	Factor	Unit
hF	Suppression of Blockage detection in the last 0mm to 50mm (maximum) in the close direction.	The maximum setting of 50mm is a combination of parameters bb + hF for example: if bb = 10mm then hF -> = 40mm (Max) **Warning:** in this distance the blockage detection is disabled.	00	00	50		[mm]
CC	Exit the menu.	Select CC and press the jog wheel to leave the h-parameter menu and return to c.o.					

CAUTION:
If the parameters **hd** and/or **hE** reduced, a new self-learn procedure must be performed subsequently (see also cap. 7.4 Self-Learn Procedure / page 27)!

9.2.4 Errors – E parameters

Table 13: E parameters

Parameter	Function	Min	Standard	Max	Unit	Ready for operation	Reset
E0	Travel not limited	00	00	99	[Number]	No	Automatically after 15[seconds] or power-on reset.
E1	Travel path locked	00	00	99	[Number]	No	Automatically after 15[seconds] or power-on reset.
E2	EEPROM errors	00	00	99	[Number]	No	power-on reset
E3	Obstructed for reversing	00	00	99	[Number]	No	Automatically after 15[seconds] or power-on reset.
E4	Encoder signals are not unique or do not exist	00	00	99	[Number]	No	Automatically after 15[seconds]. After a few attempts without changing the drive, stop the Power-On-Reset.
E5	Monitoring for current sensor has been trig-gered	00	00	99	[Number]	No	Automatically after 15[seconds]. After a few attempts without changing the drive, stop the Power-On-Reset.
E6	TSG internal monitoring	00	00	99	[Number]	No	Automatically after 15[seconds]. After a few attempts without changing the drive, stop the Power-On-Reset.
E7	Obstructed after switch-ing on again	00	00	99	[Number]	No	Automatically after 15[seconds] or power-on reset.
E8	Number of starts	00	00	99	[Number]	Yes	--
E9	Monitoring stop input, amplifier, self-diagnosis	00	00	99	[Number]	No	Automatically after 15[seconds]. After a few attempts without changing the drive, stop the Power-On-Reset.
EA	Overload current in standstill	00	00	99	[Number]	No	Automatically after 15[seconds] or power-on reset.
Eb	Error voltage	00	00	99	[Number]	No	Automatically after 15[seconds] or power-on reset.

Parameter	Function	Min	Standard	Max	Unit	Ready for operation	Reset
EC	Motor not ok	00	00	99	[Number]	No	Automatically after 15[seconds]. After a few attempts without changing the drive, stop the Power-On-Reset.
Ed	Motor detection faulty	00	00	99	[Number]	No	Restart directly possible if motor is detected.
EE	Load Default Settings and clear Error Count	oF	oF	on	oF = Off on = On	--	--
EF	Clear Error Count	oF	oF	on	oF = Off on = On	--	--
CC	Exiting the E-parame-ters	Select and press the jog dial to exit the E-parameters and return to c.o.					

NOTE:
See also cap. 13 Troubleshooting / page 58.

9.2.5 Operating state – r parameters

Table 14: r parameters

Parameter	Function	Unit	Comments
r0	Actual speed	[m/s]	Shows the current speed.
r1	Target speed	[m/s]	Shows the given speed.
r2	Current motor current	[A]	Shows the current motor current
r3	Operating voltage of end stage	[VDC]	Shows the current voltage on the end stage.
r4	Mains power voltage	[VAC]	Shows the current mains power voltage. (Note: the display shows the last two places of mains power voltage. For example, display: 30 means the mains power voltage present is 230 [VAC])
r5	Temperature	[°C]	Shows the current temperature on the end stage.
r6	Door width (xx0000)	[m]	Shows the measured door width in meters.
r7	Door width (00xx00)	[dm]	Shows the measured door width in decimeters.
r8	Door width (0000xx)	[mm]	Shows the measured door width in millimeters.
r9	Current door status (xx0000)	[m]	Shows the current door status in meters.
rA	Current door status (00xx00)	[dm]	Shows the current door status in decimeters.
rb	Current door status (0000xx)	[mm]	Shows the current door status in millimeters.
rC	Operating hours (xx0000)	[hours]	Shows the number of operating hours completed.
rd	Operating hours (00xx00)		
rE	Operating hours (0000xx)		
rF	attrition	[A]	
CC	Exit the r-parameter menu	Select CC and press the jog wheel to leave the r-parameter menu and return to c.o	

9.2.6 User setting – Au parameters

Table 15: Au parameters

Parameter	Function	Note	Min	Default	Max	Factor	Unit
A0	Intermediate position	Only with additional board that can be optionally fitted, 4E/4A relay or 4E/4A electronic Is the value > 00, the intermediate position is active. The tolerance around the intermediate position is adjustable: 01: ± 0,5[cm] 02: ± 1,0[cm] 03: ± 2,0[cm] 04: ± 3,0[cm] 05: ± 4,0[cm] **Caution:** only usable, if hA = 00.	00	00	05		
A1	Reversing brake value	Active, if the "Close door" input is removed or reversed.	01	15	50	0,1	[m/s²]
A2	Max. Open speed in enable mode*		P2: Open speed	80	80	0,01	[m/s]
A3	Acceleration in in Open direction in enable mode*		c6: Acceleration in Open direction	07	50	0,1	[m/s²]
A4	Braking in Open direction in enable mode*		c7: Braking in Open direction	07	50	0,1	[m/s²]
A5	Max. Close speed in enable mode*		P3: Close speed	60	99	0,01	[m/s]
A6	Acceleration in Close direction in enable mode*		c8: Acceleration in Close direction	07	50	0,1	[m/s²]
A7	Braking in Close direction in enable mode*		c9: Braking in Close direction	07	50	0,1	[m/s²]
A8	Mechanical, additional transmission ratio	See cap. 12.5 Mechanical transmission adjustment / page 58)	0.5	1.0	8.0		

Parameter	Function	Note	Min	De-fault	Max	Factor	Unit
A9	Enable parameter A8 (mechanical, additional ratio)	See cap. 12.5 Mechanical transmission adjustment / page 58)	00	00	01		
AA	User-defined parame-ter sets		00	00	99		
Ab	Reset IP address in TVis web interface to 172.16.1.150		X	X	X	X	X
AC	IP0	(read only)	X	X	X	X	X
Ad	IP1	(read only)	X	X	X	X	X
AE	IP2	(read only)	X	X	X	X	X
AF	IP3	(read only)	X	X	X	X	X
CC	Exit the Au-parameter menu.	Select CC and press the jog wheel to leave the r-parameter menu and return to c.o.					

NOTE:
See also manual:
1.20.91550 Documentation for TSG expansion board 4E/4A relay and
1.20.91551 Documentation for TSG expansion board 4E/4A electronic
(* enable mode: German: ZS-Betrieb: **Z**u**S**timm-**Betrieb**).

10 TSG signal connectors

The terminal markings for power supply, inputs and outputs are independent of the package type.

10.1 Inputs X1

The inputs for signals "Open door" (X1.1), "Close door" (X1.2) and (reserved) (X1.3) can be wired with a voltage of 24 [VDC/AC] (see also Table 21: X1 inputs / page 70).

CAUTION:
All inputs have a common potential, which means that the **same voltage** must always be applied to all three inputs!

10.1.1 Standard operation inputs X1

An applied input signal is executed as long as it is applied. If an input signal falls off, the command is not executed anymore.

If the door is to be opened or closed completely, the corresponding signal must be present until the corresponding relay output is set at X2.

The standard operation of inputs X1 is active if parameter h1 = 00 is set.

NOTE:
If a signal is applied simultaneously to inputs X1.1 and X1.2, the door is opened first.

10.1.2 Impulse operation inputs X1

An applied signal is executed on a pulse. The pulse length must be at least 0.2[second].

Pulse operation of inputs X1.1 and X1.2 is active if parameter h1 = 02 or 03 is set. Input X1.3 remains in standard operation and cannot be changed to pulse operation.

10.1.2.1 Impulse operation variant 1

Variant 1 supports pulse operation at inputs X1.1 and X1.2.

Fig. 27: chronological sequence impulse operation (with parameter h1 = 02)

If the closing force limitation is triggered during the closing process, the door stops. If it is to close further, the subsequent closing process must be triggered again by a pulse at input X1.2. If Automatic reversing is set (parameter b4 = on), the door opens completely. A new impulse must then be given at input X1.2 to close the door.

If input X1.3 triggers a reversing during the closing process, the subsequent closing process must be triggered again by a pulse at input X1.2.

10.1.2.2 Impulse operation variant 2

Variant 2 supports pulse operation at input X1.1, input X1.2 is deactivated. The door is closed automatically after the set time in parameter h5, taking into account the set closing force limitation.

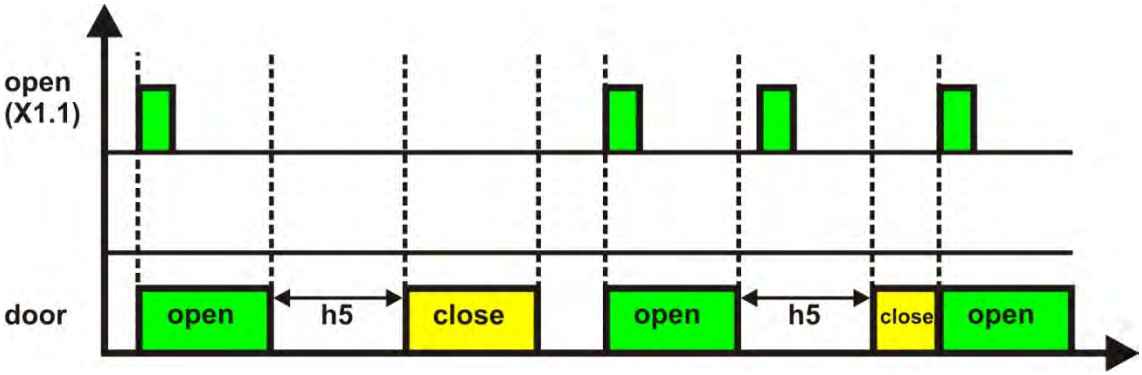


Abb. 28: chronological sequence impulse operation (with parameter h1 = 03)

If the closing force limitation is triggered during the closing process, the door stops. After approx. 5[seconds] the closing process starts again.

If automatic reversing is set (parameter b4 = on), the door opens completely. The following closing procedure is triggered again after the time in parameter h5 has elapsed.

If the door is opened by an impulse, the remaining time in the open position is shown in the display.

If input X1.3 triggers a reversing during the closing process, the following closing process is triggered again after the time in parameter h5 has elapsed. If the time in parameter h5 has elapsed and input X1.3 continues to trip, the door remains in the open position until input X1.3 releases the door again.

10.2 Outputs X2

There are three relay outputs on the TSG electronic unit to display or report door status, each with a change-over contact that has contacts terminated on the X2 terminal strip (see also Table 23: X2 relay outputs / page 71).

Message	Contacts
„Door is Open“	X2.1/2/3
„Door is Closed“	X2.4/5/6
„Door is Obstructed“	X2.7/8/9

11 Setting for force limiting

The maximum speed limit, force and energy are to be checked and recorded at the closing and shearing edges after commissioning or changing of parameters at the door by the executive personnel.

11.1 Maximum kinetic energy

According to the relevant standards, the maximum kinetic energy W_{kin} to the closing and shear edges 10[J] must not be exceeded. This requires to know the actual total weight of the components to be traversed (door panel, protective device,…) and be entered before start the self-learn (see also cap. 7.4 Self-Learn Procedure / page 27).

The maximum speed to be set is calculated with:

$$v = \sqrt{\frac{2 \cdot \mathrm{Wkin}}{m}} \quad \rightarrow \quad v\,[\frac{m}{s}] = \sqrt{\frac{2 \cdot 10[J]}{Masse\,[kg]}}$$

when:

v:	maximum allowed speed [m/s],
W_{kin}:	kinetic energy [J],
m:	mass [kg].

11.2 Maximum static force

According to the relevant standards, the maximum static force F to the closing and shear edges 150[N] must not be exceeded.
The parameter P8 (or parameters b2 / b7) represents the value for the maximum allowable static force. By increasing the value of P8 (or b2 or b7), this allowable static force will increase.

11.3 Obstruction detection in Closed direction

If the door is obstructed in the Closed direction and obstruction detection is activated (see also Table 11: b parameter / page 36), the door remains stopped as long as the "Close door" signal is present. At the same time the relay switches for "Door Obstructed". If no other control is initiated and the "Close door" signal is still present, the door continues to move in the Closed direction after 5 [seconds].
If other control is initiated (the "Open door" signal is present), the door opens under control. The relay for "Door Obstructed" is turned off as soon as the Open position is reached. The position at which the door was obstructed is saved in the TSG for the next movement. If the "Door closed" signal is issued again, the door moves up to about 5 [cm] in front of the obstruction at normal speed and then continues moving at slow speed (adjustable parameter h6). If the obstruction is eliminated, the door continues moving at normal speed to about 5 [cm] after the obstruction. The function of speed change at the Obstructed position can be turned off and on with parameter bE.

If parameter b4 = on, the door is automatically reversed when it is obstructed. After it reaches the Open position, the door closes again. The distance of reversing can be set by adjusting the parameter bd. Is bd > 00, the door is reversed 5[cm] minimum. Is bd = 00, the door is reversed completely.

If parameter b3 = on, the obstructed relay is only activated by a pulse. The length of the pulse can be set with parameter bA.

The threshold for the amount of obstruction detection (maximum 150 [N]) in closing direction can be set with the parameter P8 or b2 and should be checked by competent person at the time of test once the door operator is installed.

11.4 Obstruction detection in Open direction

If the door is obstructed in the Open direction and obstruction detection is activated (see also Table 11: b parameters / page 36), the door remains stopped as long as the "Open door" signal is present. At the same time the relay switches for "Door Obstructed". If no other control is initiated and the "Open door" signal is still present, the door continues to move in the Open direction after 5 [seconds]. If other control is initiated (the "Close door" signal is present), the door closes under control. The relay for "Door Obstructed“ is turned off as soon as the Closed position is reached. If an "Open door“ signal is issued, the door continues moving at normal speed.

The obstruction detection in Open direction is in default active and be switched off with parameter b5 = oF. Is the obstruction detection in Open direction active, the detection will be active on the whole distance.
In the first 30% of distance in Open direction you can switch off the obstruction detection with parameter b6 = oF.

If parameter b9 = on, the door is automatically reversed when it is obstructed. After it reaches the closed position, the door opens again. The distance of reversing can be set by adjusting the parameter bd. Is bd > 00, the door is reversed 5[cm] minimum. Is bd = 00, the door is reversed completely.

If parameter b8 = on, the obstructed relay is only activated by a pulse. The length of the pulse can be set with parameter bA.

The limit value for the amount of the 150 [N] detection in open direction can be set with parameter b7.

In addition, obstruction detection can be turned off with parameter b5 = oF.

12 Special features

12.1 Holding torque in the end positions

A holding torque can be set in the end positions. The holding torque causes the door to be held in the corresponding end position by an adjustable force. A determination is made whether or not a signal is present at the inputs ("Open door" or "Close door").

If the holding torque acts in the end position, a value of approx. 35[N/A] can be assumed as a guide value for the static force (setting parameter cC, cd, cE, cF) (prerequisites: no external force effect, no mechanical transmission, TSG drive with 24V nominal voltage).

12.1.1 Holding torque without an input signal present

If no signal is present on the TSG door control device, a holding torque can be set so that the door will be held in place.
Holding torque parameter in Closed position without signal "Open door":cC
Holding torque parameter in Open position without signal "Close door": cd

Example:
The higher-level control unit issues the "Close door" signal and the door closes. Once the door is closed, the signal is removed from the control unit and the door is without current. It is possible when passing through the shaft that the door slowly opens due to vibrations and/or mechanical tension in the system and the safety circuit is opened. To prevent this, the holding torque can be set variably (see also Table 10: c parameter / page 35).

CAUTION:
The holding torque should not be set so high that it has a negative effect on the service life of the motor!

12.1.2 Holding torque with an input signal present

If a signal is present on the TSG door control device, a holding torque can be set so that the door will be held in place.
Holding torque parameter in Closed position with signal "Open door": cE
Holding torque parameter in Open position with signal "Close door": cF

CAUTION:
The holding torque should not be set so high that it has a negative effect on the service life of the motor!

12.2 Nudging

The nudging function is used in order to push an obstacle that blocks the path in the closing direction at reduced speed out of the way.
The nudging is executed when both inputs X1.2 and X1.3 are on. As a prerequisite, the parameter must be set h3 = 03.

The door drives with slow speed when the input for Closing and Nudging are present at the same time. If the obstacle is reached, the force is switched to a fixed value after about 1[second].

12.3 Stop input

The TSG door operator has a separate input for stop. The stop input can be carried out single channel or two channels. In normal operation, there is a wire bridge present between X5.1 and X5.2.

CAUTION:
No external voltage may be connected to terminals X5.1 and/or X5.2. Doing so will cause irreparable damage to the TSG electronic and may result in uncontrolled door movements!

NOTE:
See also cap. 16.7 Stop-function connection / page 77.

12.3.1 Stop input single channel

The stop input single channel corresponding with the standard EN ISO 13849-1: 2015 PL“b“.

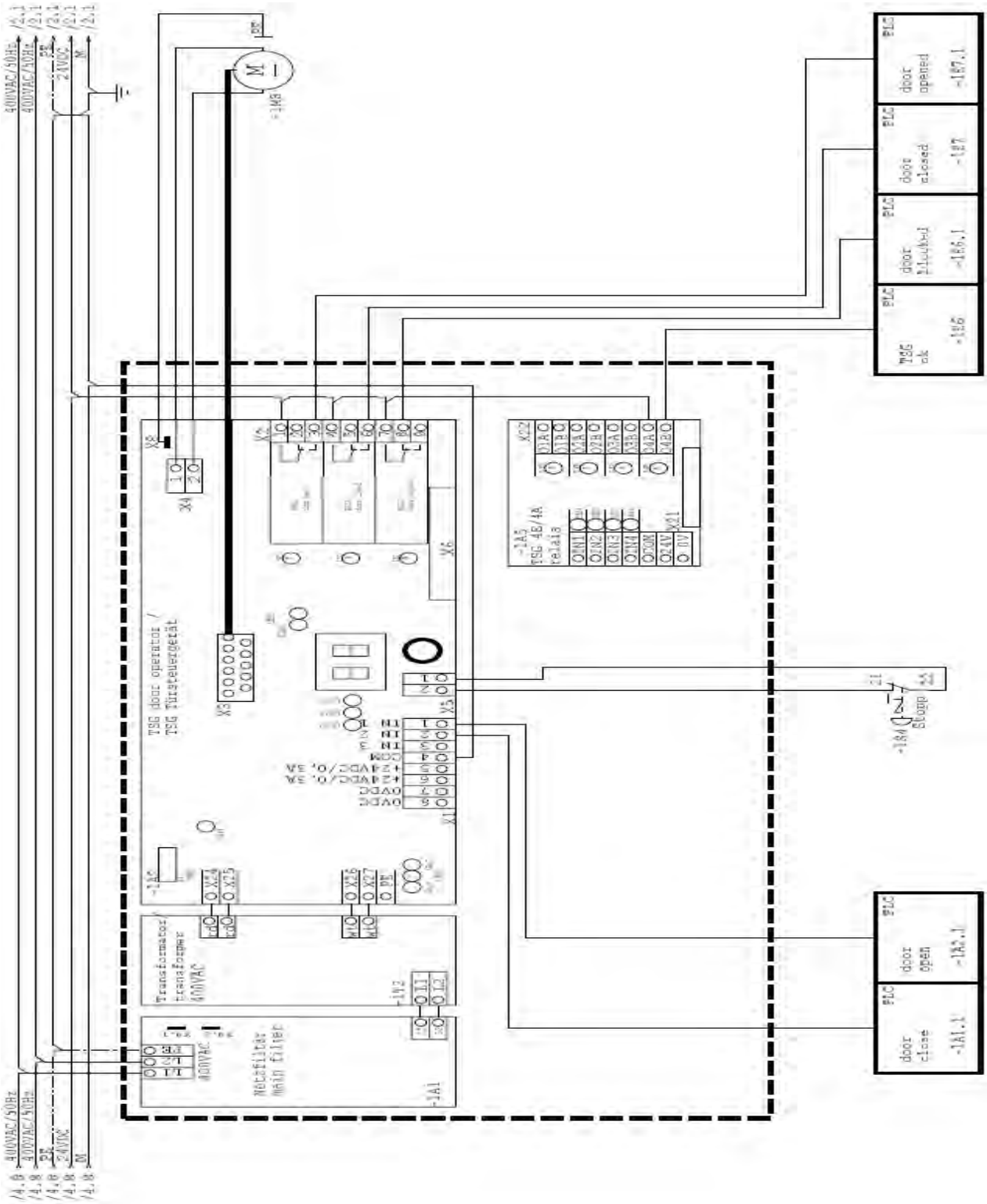


Fig. 29: example circuit Stop Kat 0, PL"b"

If the connection to the terminal strip X5 between 1 and 2 is open, the motor coasts to stop. It appears in the display AA. After reconnecting the TSG door operator restarts in normal mode.

12.3.2 Stop input two channel

The stop input two channels corresponding with the standard EN ISO 13849-1: 2015 PL“d“.

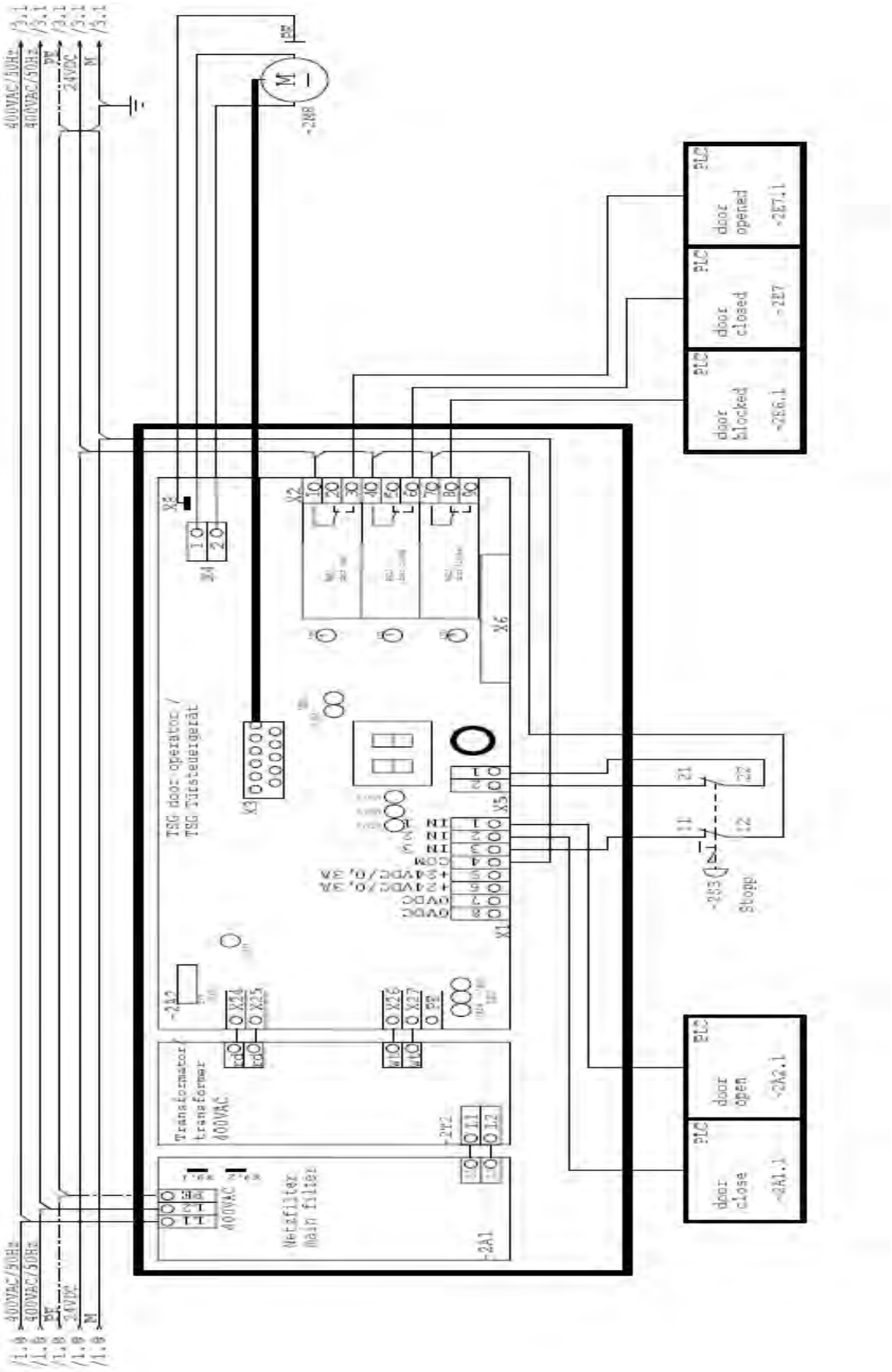


Fig. 30: example circuit Stop Kat 0, PL"d"

If the connections to the terminal strip X5 between 1 and 2 and the connection to terminal strip X1.3 are open, the motor coasts to stop. It appears in the display AA. After reconnecting the TSG door operator restarts in normal mode.

Both signals must reach the same state at enable or disable within 0,5[seconds]. If this does not happen or X5 or X1.3 are severed, there will be an error message, the display AA flashes and the message of TSG OK disappears. To correct the error, first the circuit needs to be corrected, and then the circuit turns off and again turns on.

NOTE:
To activate the function, the parameter must be set according to h3 (see Table 12: h-parameter / page 38).

12.4 Leading limit switch

The relay outputs for “Door is open”, “Door is closed” (plug X2) can be set leading. According to the configuration the limit switch switches before the end position is reached.

Table 16: adjusting parameter h2

adjusting parameter h2	Leading „Door is opened“ [cm]	Leading „Door is closed“ [cm]	adjusting parameter h2	Leading „Door is opened“ [cm]	Leading „Door is closed“ [cm]
00	0	0	16	3	3
01	0	0	17	5	0
02	0	1	18	10	0
03	1	0	19	15	0
04	1	1	20	0	5
05	0	2	21	5	5
06	2	0	22	10	5
07	1	2	23	15	5
08	2	1	24	0	10
09	2	2	25	5	10
10	0	3	26	10	10
11	3	0	27	15	10
12	1	3	28	0	15
13	3	1	29	5	15
14	2	3	30	10	15
15	3	2	31	15	15

12.5 Mechanical transmission adjustment

A permanently set gear ratio is stored in the TSG door control unit as standard. A changed mechanical transmission has the consequence that the forces, the speeds and the accelerations are different from the expected ones. To compensate for the difference, the existing mechanical transmission ratio in the TSG door control unit can be adapted.

NOTE:
See also the manual:
1.20.91515 TSG Application Note Mechanical Ratio

13 Troubleshooting

In case of a fault, the TSG door operator will indicate a fault on the display (see also Table 13: E parameter / page 43).

Table 17: E parameters - error elimination

Fault/Error	Function	Meaning	Cause	Remedy
E0	Door travel not limited	The travel of the door is not limited or no end position found.	End position in open direction is not defined.	Check the mechanic of the door.
			End position in close direction is not defined.	Check the mechanic of the door.
			Toothed belt failed.	Check the mechanic of the door.
E1	Door travel path locked	The door does not move. This error occurs outside the range of "Obstructed detection“! Within the range of "Obstructed detection", the "Obstructed output" is set and "bl" appears in the display. The current door travel distance is less than the programmed door width. (see parameter set "b.l".)	The door lock has not been unlocked.	Check the door mechanics.
			There is an obstruction in the door.	Check the door travel path. Remove the obstruction.
			The initial measurement movement of the door is incorrect or has not been performed.	Start the self-learn procedure (see also 7.4 Self-Learn Procedure / page 27)
			The buffer-type stops for the "Closed position“ or "Opened position" are missing or have been incorrectly adjusted.	Start the self-learn procedure (see also 7.4 Self-Learn Procedure / page 27)

Fault/Error	Function	Meaning	Cause	Remedy
		This error is reset after 15 seconds. During this time, the door drive does not respond to input drive signals. If input drive signals are present, the door drive starts with a reference movement at slow speed.	The toothed belt tension has been changed.	Start the self-learn procedure (see also 7.4 Self-Learn Procedure / page 27)
E2	EEPROM errors	If an EEPROM error occurs, the drive is brought to a stop.	Hardware may be faulty.	Replace TSG electronic.
E3	Obstructed for reversing	The door drive has detected an obstacle and reversed itself. The door was obstructed during reversing.	There is an obstruction in the door.	Check the travel path. (see also E1)
		The door drive reverses due to the triggering of the external sensor. The door was also blocked during the reversion.		
		The door drive has detected an obstacle and reversed in the open direction. During reversing, the external sensor is also triggered.		
E4	Encoder signals are not unique or do not exist.	No signal from the encoder	Cable to the incremental encoder is not connected.	Connect the cable with the incremental encoder.
			Cable to the incremental encoder damaged.	Replace the incremental encoder cable.
			Cable to the motor is not connected.	Connect the cable with the motor.
			Cable to the motor damaged.	Replace the motor cable.
			Assignment of the motor connection changed.	Check motor connection (see also Table 28: X4 motor connection / page 73)

Fault/Error	Function	Meaning	Cause	Remedy
			End stage faulty.	Replace TSG electronic.
			Wrong voltage	Check power supply.
			Incremental encoder damaged.	Replace the drive.
			Cable to the motor is not connected.	Connect the cable with the motor.
E5	Monitoring triggered current sensor		Cable to the motor damaged.	Replace the motor cable.
			Current sensor faulty.	Replace TSG electronic.
			Wrong voltage	Check power supply.
			CPU, RAM, ROM faulty.	Replace TSG electronic.
E6	TSG internal monitoring	Check CPU, RAM, ROM	Check the travel path.	(see also E1)
E7	Obstructed after switching on again	Door was obstructed after power was restored.	Mains power voltage failure. The device will perform a restart.	Check the supply line. Check the back-up fuse. Check the fuse on the TSG electronic. Replace TSG electronic.
E8	Mains power start-ups	Counter for the number of mains power start-ups.	Stop input X5 not correct connected.	Check Stop input X5.
E9	Monitoring Stop input, end stage, self-diagnose		End stage faulty.	Replace TSG electronic.
			Adjusted parameters are not correct.	Check parameters and set correctly.
EA	Overload current in standstill	The motor is using too much current.	Current sensor faulty.	Replace TSG electronic.
			End stage faulty.	Replace TSG electronic.
			Wrong voltage	Check power supply.
Eb	Error voltage	The various operating voltages on the TSG electronic are monitored and evaluated.	Internal voltage faulty.	Check the fuses. Replace if necessary TSG electronic.

Fault/Error	Function	Meaning	Cause	Remedy
				Replace motor.
EC	Motor not ok	The connected motor is defective.	Incorrect door motor is connected to the TSG electronic.	Replace motor.
Ed	Motor recognition error			The default settings are loaded **Caution**: all changes will be reset to default! **Caution**: before loading the default settings, a currently executed trip is interrupted. **Caution**: If the mechanics are changed at the same time, a new calibration run must be started. **Caution**: The weight set before calibration is not reset to the standard (see also 7.5 Enter the weight to be traversed /page 28). **Caution**: parameter h3 (function input X1.3) is not reset to standard (see also Table 12: h-parameters table / page 38). **Caution**: the parameter hA (additional board selection) is not reset to standard (see also Table 12: h-parameters table / page 38). **Caution**: the parameters A8 and A9 (mechanical ratio setting) are not reset to standard (see also Table 15: Au parameters / page 46)

Fault/Error	Function	Meaning	Cause	Remedy
EE	Load default settings	Reset device parameters to their factory settings.		
EF	Delete error counters	All error counters will be deleted.		Replace drive. **Caution:** the display EH is only shown as long as the error is present. No error counter is available. A readout is not possible!
EH	Temporary warning message: Motor not ok	The connected motor is defective.		Replace drive. **Caution:** the display EL is only shown as long as the error is present. No error counter is available. A readout is not possible!
EL	Temporary warning message: Motor not ok	The connected motor is defective.		Check the CAN bus line and connections. Control the CAN bus master. **Caution:** the display En is only shown as long as the error is present. No error counter is available. A readout is not possible!

Fault/Error	Function	Meaning	Cause	Remedy
En	CAN bus communication is interrupted or disturbed.	The CAN bus connected to the additional board is interrupted or disturbed.		Check TSG electronics and additional board. **Caution:** the display Eu is only shown as long as the error is present. No error counter is available. A readout is not possible!
Eu	Communication of additional board is interrupted or disturbed.	The communication to the connected add-on board is interrupted or disturbed.		

Table 18: other causes and troubleshooting

Fault	Cause	Remedy
Drive does not run.	TSG has no voltage	Turn on the mains power voltage. Check LED 1, LED2, LED3 and LED4.
	Stop input interrupted.	There must be a connection between X5.1 and X5.2 (see also cap. 12.3 Stop input / page 54).
The travel path is free, but an obstruction is detected.	Too much friction.	The door mechanics must move freely and easily. Clean the mechanics.
Drive will not run after power failure and re supply.	Light curtain is configured (parameter h3) and has been activated during the learning run.	Remove obstruction from light curtain.

14 Service and maintenance

Maintenance of the TSG door operator is limited to a minimum amount due to the concept and design. Components that are subject to wear during operation must also be included in the service and maintenance measures.

WARNING:
It is essential to ensure during maintenance work that the drive cannot be turned on and that no electrical voltages can accidentally be applied to exposed parts. After these measures are complete, safety and protective equipment on the drive must be reinstalled.

It is mandatory to check the operation of the TSG regularly, at least every 3 months. The following items must be checked:

- Check doors, drives and the electronic unit for visible damage or defects
- Ensure the door moves easily
- Check the toothed belt (for wear, tension, etc.)
- Check the functions of the system (safety equipment, inputs, outputs, etc.)

CAUTION:
If damage and/or defects are discovered in the system, it must be taken out of operation immediately. The damage and/or defects must be eliminated before the system is started up again.

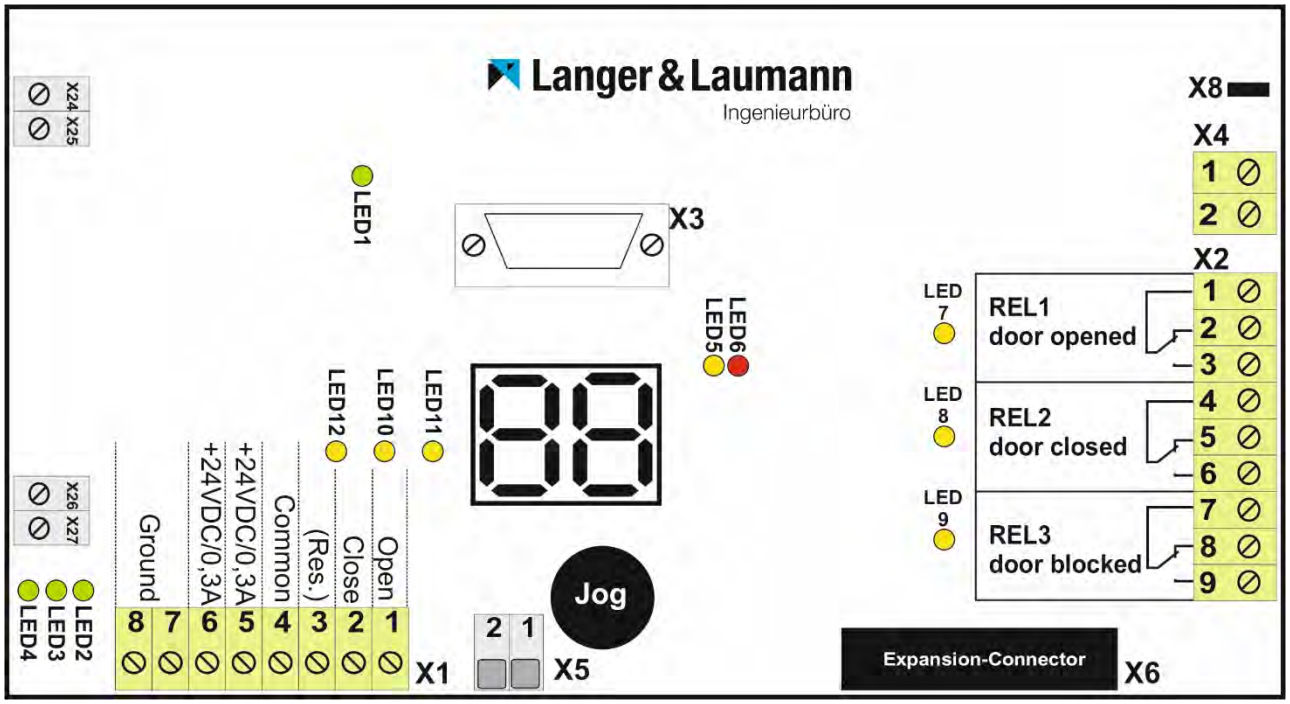
15 Disposal

Applicable provisions must be observed for disposal:

- Oil must be disposed of according to the (German) Used Oil Regulation (for example it must not be mixed with solvents, cold cleaners or paint residue)
- Separate components for recycling by category:
    - Scrap iron
    - Electronic waste
    - Aluminum
    - Non-ferrous metal (worm gears, motor windings)

16 Technical data for TSG electronic

16.1 Overview of TSG electronic



X1: Inputs

X2: Outputs

X3: Motor Encoder

X4: Motor

X5: Stop input (see also cap. 12.3 Stop input / page 54)

X6: Expansion Connector

X8: Motor Shield

X24/25: internal voltage

X26/27: internal voltage

LED 1: Operating voltage 38[VDC]
LED 2: Operating voltage 5[VDC]
LED 3: Operating voltage 12[VDC]
LED 4: Operating voltage 24[VDC]

LED 5: Check LED
LED 6: Overload

LED 7: "Door is Open" output
LED 8: "Door is closed" output
LED 9: "Door is Obstructed" output

LED 10: "Close door" input
LED 11: "Open door" input
LED 12: Input (Reserve)

16.2 Technical data

Table 19: Technical data

Technical data for TSG electronic	
Connection voltage 115V version: 200V version: 230V version: 400V version: 480V version:	Input ratings Voltage: 115[VAC] ± 15% (L, N, GRD) Current: 1.8[A] No. of phase: 1AC Frequency: 50/60[Hz] Short circuit current: 4.0[A] (internally fused) Voltage: 200[VAC] ± 15% (L, N, GRD) Current: 1.1[A] No. of phase: 1AC Frequency: 50/60[Hz] Short circuit current: 2.0[A] (internally fused) Voltage: 230[VAC] ± 15% (L, N, GRD) Current: 0.9[A] No. of phase: 1AC Frequency: 50/60[Hz] Short circuit current: 2.0[A] (internally fused) Voltage: 400[VAC] ± 10% (L1, L2, GRD) Current: 0.5[A] No. of phase: 2AC Frequency: 50/60[Hz] Short circuit current: 1.25[A] (internally fused) Voltage: 480[VAC] ± 10% (L1, L2, GRD) Current: 0.4[A] No. of phase: 2AC Frequency: 50/60[Hz] Short circuit current: 1.25[A] (internally fused)
Motor output X4	Output ratings Voltage range: 0-38[VDC] Current: 2.5[A] max. Peak current 12[A] No. of phase: 2 Frequency: 16[kHz]
Fuse protection provided by customer 115V version: 200V version: 230V version: 400V version: 480V version:	 10[A] / Tripping characteristic B or C 10[A] / Tripping characteristic B or C 10[A] / Tripping characteristic B or C 5[A] / Tripping characteristic B or C (per phase) 5[A] / Tripping characteristic B or C (per phase) Suitable for use in a circuit that delivers no more than 5000[A] effective at the respective supply voltage. Fuse protection must comply with UL489.
Power consumption in inactive state (without input signal present, not in end position)	ca. 3[W]

Technical data for TSG electronic	
Maximum power consumption 115V version: 200V version: 230V version: 400V version: 480V version:	 1.8[A] 1.1[A] 0.9[A] 0.5[A] 0.4[A] Note: Higher currents can flow briefly (< 1[sec.]) depending on the door weight and parameter settings.
Allowable storage / transport temperature	0 [°C]...60[°C]; maximum change: 20[K/h]
Permissible average operating ambient temperature	5 [°C]...40[°C] at rated values, no direct sunlight.
Operating altitude	Up to 1.000[m] above mean sea level without limitation; 1.000 up to 2.000[m] above mean sea level with power derating
IP protection class	TSG electronic extern: IP54 TSG electronic intern: IP20
Environment	Overvoltage category III, degree of pollution 2
Humidity	Relative humidity 10% to 90%, condensation must not be allowed to form
Short Circuit Current rating	480[VAC], 5000[A]
Application instructions	Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 480[V] Maximum, when protected by a circuit breaker having an interrupting rating not less than 10,000 rms symmetrical amperes, 480[V] Maximum. Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Manufacturer Instructions, National Electrical Code and any additional local codes". CSA: For Canada: Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Canadian Electrical Code, Part I.

16.3 Restart after power off and restoration of mains power

After power off, when power is restored, the TSG door operator searches for the programmed end positions. For this the TSG door operator drives with slow speed until both end positions are reached and identified. The value for the speed is set in parameter h6.

CAUTION:
Please ensure that the path of the door is free from obstruction during the referencing run after power failure.

NOTE:
If the travel path is not free during a reference run, the obstacle is detected and E7 is output in the display (see also Table 13: E parameters / page 43). The referencing begins again.

16.4 Internal fuse protection

Table 20: Fuses for TSG electronic

Name	Function	Fuse
SI2	Micro fuse, control section (18[VAC]) **Caution:** SI2 is not replaceable. If it is interrupted, only an exchange of TSG electronic at manufacturer is possible!	4[A]
SI3	Power unit fuse (26[VAC]) **Caution:** SI3 is not replaceable. If it should interrupt, only an exchange of the TSG electronics at the manufacturer is possible!	15[A]
SI200	Blade-type fuse, power stage emergency power supply (normally not fitted)	5[A]

16.5 Plug / terminal assignment of TSG electronic

16.5.1 Terminal assignment signal inputs

Table 21: X1 inputs

X1 inputs (8-pin push-in spring connection)**:**		
X1.1	"Open door" input	16 – 28 [Vdc] / min. 10mA
X1.2	"Close door" input	16 – 28 [Vdc] / min. 10mA
X1.3	(Reserved) input	16 – 28 [Vdc] / min. 10mA (see also parameter h3 Table 12 / page 38)
X1.4	Common for inputs	(Common)
X1.5	Auxiliary voltage output + (**can only be used to activate TSG inputs X1.1, X1.2 and X1.3**)	24[VDC] ±20% - limited voltage - not stabilized - fluctuates with mains voltage - max. 300[mA] loadable
X1.6	Auxiliary voltage output + (**for supply of external devices, for example, light curtain**) **CAUTION:** In emergency power supply mode, there is no voltage on X1.6!	24[VDC] ±20% - limited voltage - not stabilized - fluctuates with mains voltage - max. 300[mA] loadable
X1.7	Auxiliary voltage output -	0[VDC]
X1.8	Auxiliary voltage output -	

NOTE:
A connection must be created between X1.7 / X1.8 (auxiliary voltage output -) and GRD.

s

Table 22: X1 - connection data

X1 inputs (8-pin push-in spring connection)**:**	
Conductor cross section solid/flexible (min./max.) (stripping length: 10[mm])	0,2 / 2,5 [mm²]
Conductor cross section flexible, with ferrule with/without plastic sleeve (min./max.)	0,25 / 2,5 [mm²]
Conductor cross section AWG (min./max.)	24 / 12
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve (min./max.)	0,5 / 1,5 [mm²]
AWG according to UL/CUL (min./max.)	26 / 12
Use 60[°C] copper conductors only.	

CAUTION:
The auxiliary voltage output on X1.5 / X1.6 must not be connected with an external voltage potential. Connecting an external voltage potential to X1.5 / X1.6 may cause the device to be destroyed!

16.5.2 Terminal assignment relay outputs

Table 23: X2 relay outputs

X2 relay outputs (9-pin push-in spring connection)**:**		
X2.1	"Door is Open" output – common	
X2.2	"Door is Open" output - n.c.	(normally closed contact)
X2.3	"Door is Open" output - n.o.	(normally open contact)
X2.4	"Door is Closed" output – common	
X2.5	"Door is Closed" output - n.c.	(normally closed contact)
X2.6	"Door is Open" output – common	(normally open contact)
X2.7	"Door is Obstructed" output – common	
X2.8	"Door is Obstructed" output - n.c.	(normally closed contact)
X2.9	"Door is Obstructed" output - n.o.	(normally open contact)

Table 24: X2 relay outputs, power rating

Relay outputs X2, switching capacity	**UL /CSA**	
	Normally open:	1[A] / 50[VAC], 1[A] / 24[VDC]
	Normally closed:	1[A] / 50[VAC], 1[A] / 24[VDC]
	VDE	
	Normally open:	1[A] / 230[VAC], 1[A] / 230[VDC]
	Normally closed:	1[A] / 230[VAC], 1[A] / 230[VDC]

WARNING:
If relays or contactors are switched with relay outputs, they must be equipped with an RC combination for DC voltage with a freewheeling diode or for AC voltage.

Table 25: X2 - connection data

X2 relay outputs (9-pin push-in spring connection)**:**	
Conductor cross section solid/flexible (min./max.) (stripping length: 10[mm])	0,2 / 2,5 [mm²]
Conductor cross section flexible, with ferrule with/without plastic sleeve (min./max.)	0,25 / 2,5 [mm²]
Conductor cross section AWG (min./max.)	24 / 12
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve (min./max.)	0,5 / 1,5 [mm²]
AWG according to UL/CUL (min./max.)	26 / 12
Use 60[°C] copper conductors only.	

CAUTION:
No voltages of different mains power supplies may be connected to the relay outputs (for example 24 V and 80 V at the same time)!

16.5.3 Terminal assignment encoder

Table 26: X3 Incremental encoder assignment – fixed cable on motor

X3 incremental encoder (9-pin SubD)**:**				
1	(free)			
2	(free)			
3	(free)			
4	(free)			
5	(free)			
6	GND	Cable wire motor version K: Yellow	Cable wire motor version D: Brown	(motor side: 1)
7	channel B	Cable wire motor version K: Green	Cable wire motor version D: White	(motor side: 5)
8	channel A	Cable wire motor version K: Brown	Cable wire motor version D: Yellow	(motor side: 3)
9	+ 5 [VDC]	Cable wire motor version K: White	Cable wire motor version D: Green	(motor side: 4)

Table 27: X3 Incremental encoder assignment – pluggable cable set

X3 incremental encoder (9-pin SubD)**:**		
pin X3	**description**	**pin Hummel-plug incremental encoder**
1	(free)	
2	(free)	
3	(free)	
4	(free)	
5	motor-ID	6
6	GND	4
7	channel B	10
8	channel A	2
9	+ 5[VDC]	9

CAUTION:
Before connecting or disconnecting the incremental encoder plug, the power supply must be turned off first!

16.5.4 Terminal assignment motor

Table 28: X4 motor connection

X4 motor connection (2-pin screw connector)**:**		
1	Motor +	Brown
2	Motor -	White
X8	Motor shield via cable lug 4.8x0.8	Housing

CAUTION:
Before connecting or disconnecting the motor connection plug, the power supply must be turned off first!

CAUTION:
The assignment of the motor connection from Table 28 / page 73 must not be changed. A wrong connection is recognized by the TSG electronic and the unit shut down.

16.5.5 Terminal assignment power

The TSG door control unit is available with different mains supply voltages. The mains voltage that can be connected to the device is indicated on the respective nameplate of the device.

TSG electronics external version:

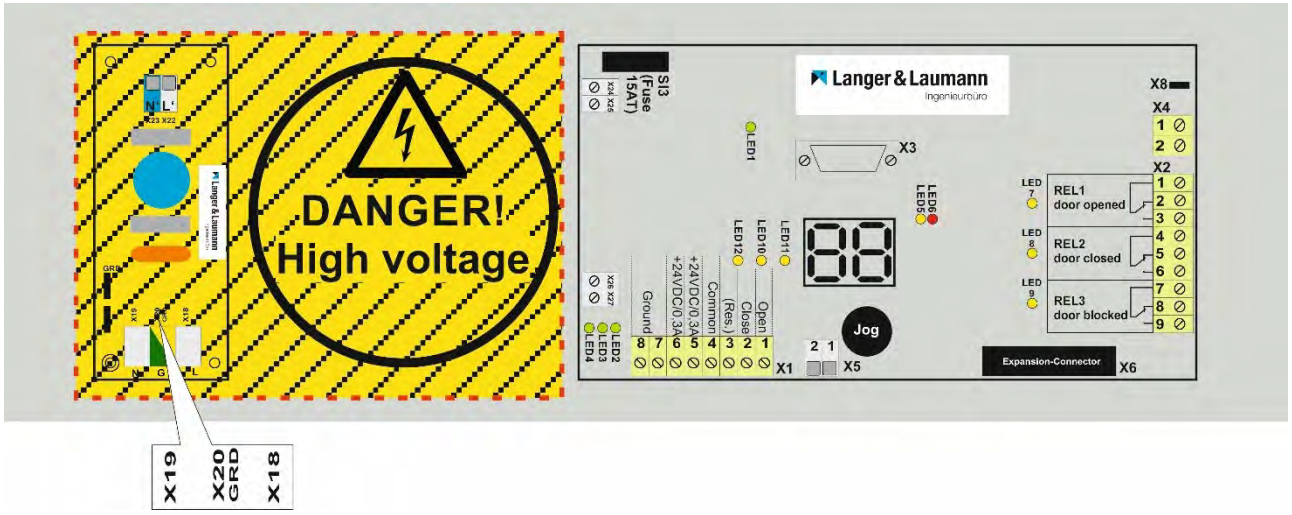


Fig. 31: TSG Electronic external - Mains voltage connection

TSG electronics internal version:

Fig. 32: TSG Electronic internal - Mains voltage connection

WARNING:
A life-threatening voltage is present at terminals X18 and X19.
This is only allowed to be connected when the power supply is switched off.

Table 29: Mains power connection 115VAC

Main power connection 115V-Version:		
X18	L	115[VAC] ± 15% **/** 50/60[Hz]
X19	N	
X20GRD	GRD	protective conductor terminal

Table 30: Mains power connection 200VAC

Main power connection 230V-Version:		
X18	L	200[VAC] ± 15% **/** 50/60[Hz]
X19	N	
X20GRD	GRD	protective conductor terminal

Table 31: Mains power connection 230VAC

Mains power connection 230V version:		
X18	L	230[VAC] ± 15% **/** 50/60[Hz]
X19	N	
X20GRD	GRD	protective conductor terminal

Table 32: Mains power connection 400VAC

Mains power connection 400V version:		
X18	L1	400[VAC] ± 10% **/** 50/60[Hz]
X19	L2	
X20GRD	GRD	protective conductor terminal

Table 33: Mains power connection 480VAC

Mains power connection 480V version:		
X18	L1	480[VAC] ± 10% **/** 50/60[Hz]
X19	L2	
X20GRD	GRD	protective conductor terminal

Table 34: Mains connection - Connection data

Mains connection (3-pole push-in spring connection plug connector):	
Conductor cross-section rigid/flexible (min./max.) (Stripping length: 10[mm])	1,5 / 2,5 [mm²]
Flexible conductor cross-section with wire end ferrule with/without plastic sleeve (min./max.)	1,5 / 2,5 [mm²]
Wire gauge AWG (min./max.)	15…12
Use 60[°C] copper conductors only.	

16.6 Connection of external control voltage

It is possible to replace the internal transformer supplied standard control voltage through customer connection. The control voltage supplies the logical part of the TSG electronic and the encoder of the TSG motor. The main part of the TSG electronic continues to be supplied from the power supply.

Table 35: Connection of control voltage

Connection of control voltage:		
X26	+	21.6[Vdc] - 27.6[Vdc] or 16.2[Vac] - 20.0[Vac] 3.9[A] Max. The maximum fuse rating of the control circuit must not exceed 4[A].
X27	-	
GRD	GRD	

Table 36: Control voltage connection - Connection data

Control voltage connection (3-pole PCB terminal):	
Conductor cross-section rigid/flexible (min./max.) (Stripping length: 5[mm])	0,5 /1,5 [mm²]
Flexible conductor cross-section with wire end ferrule with/without plastic sleeve (min./max.)	0,5 / 1,5 [mm²]
Wire gauge AWG (min./max.)	20…15
Use 60[°C] copper conductors only.	

CAUTION:
If external control voltage is connected, the two wires of the internal power supply must be removed from the terminals X26/X27 and customer professionally isolated against short circuit.

16.7 Stop-function connection

The TSG electronics has a stop function, which can be designed as single-channel or dual-channel. During normal operation and without using the stop function, there is a wire bridge between X5.1 and X5.2.

Table 37: Stop-function X5

Connection of the stop function X5:		
X5.1	Potential-free contact	0[Vdc] – 24[Vdc] / 10mA
X5.2	Potential-free contact	

Table 38: Control voltage connection - Connection data

Connection of the stop function X5 (2-pole PCB terminal):	
Conductor cross-section rigid/flexible (min./max.) (Stripping length: 5[mm])	0,5 /1,5 [mm²]
Flexible conductor cross-section with wire end ferrule with/without plastic sleeve (min./max.)	0,5 / 1,5 [mm²]
Wire gauge AWG (min./max.)	20…15
Use 60[°C] copper conductors only.	

CAUTION:
No external voltage may be connected to terminals X5.1 and/or X5.2. This leads to irreparable damage to the TSG electronics and can lead to unintentional door movements!

17 Connection circuit diagram for TSG inputs

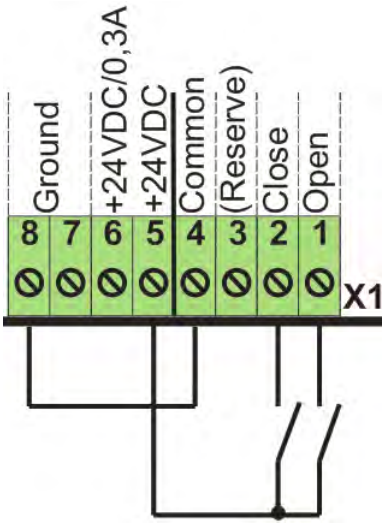


Fig. 33: Connection option with internal 24[VDC] power supply voltage

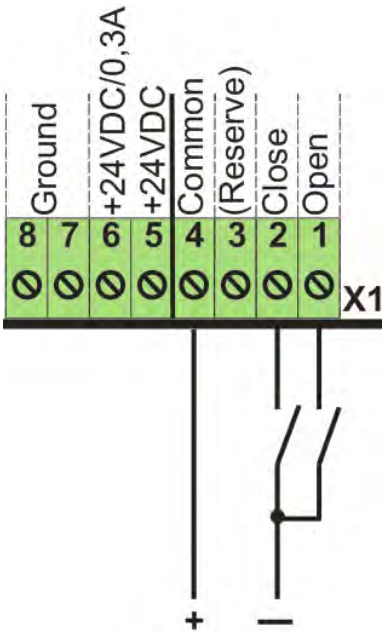


Fig. 34: Connection option with external 24[VDC] power supply voltage and common positive

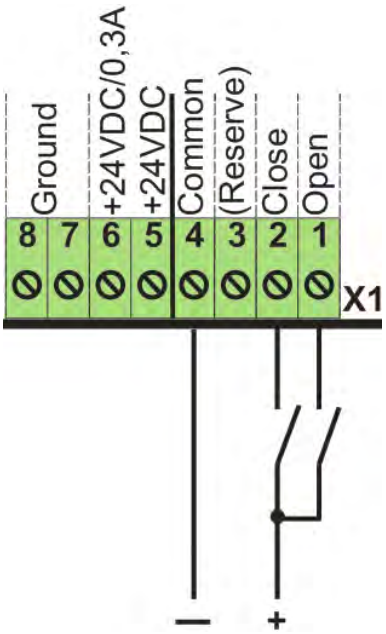


Fig. 35: Connection option with external 24[VDC] power supply voltage and common negative

18 TSG options

18.1 TSG webinterface

The TSG web interface is an additional electronic module (optionally available) that can be used together with the TVis-Web software to connect the TSG door control device with a PC or notebook.

TVis-Web is a program for visualising the TSG door control device on a PC or notebook. You don't have to install software on your PC. You start the TVis-Web only by using the Windows® Internet Explorer® or comparable software by another manufacturer.

The system supports the following functions:

- Monitoring of the TSG door control device (remote control, drive curve display, error memory, etc.)
- Settings (parameter changes, additional settings, etc.)
- System settings (IP address, door width, export/import of parameters, etc.)

For additional information see also: 1.20.91500 TSG TVis-Web documentation.

18.2 Intermediate positions in the travel zone

An intermediate position can be stored and approached through separate inputs. To do this, the TSG expansion board (optionally available) must be installed on the TSG electronic.

When the intermediate position is reached, the display shows: 

For additional details on settings and for this function and starting it up, see manual:
1.20.91550 Documentation for TSG expansion board.

18.3 Emergency power supply

The TSG electronic is optionally available with an emergency power supply. The emergency power supply consists of an additional electronic part on the TSG board and two batteries (NiMh).

In case of main power failure, the door can be opened or closed. The number of trips and the speed depends on the weight and the smoothness of the door to be traversed. Normally, a reduced speed can be expected. When the mains power voltage is present in the TSG electronic again, the system switches back to normal mode.

If the batteries are connected correctly, the main power is on and the TSG electronic is ok the decimal point on the right hand 7-segment display will flash every 1 second when the batteries are fully charged. It remains lit if the batteries are fully charged and the TSG electronic is in maintenance mode.

If the main power is off and the batteries are connected the point of the right 7-segment display flashes fast (about 0.5 seconds intervals). If the batteries are exhausted, the TSG is switched off.

Table 39: State of the point of right hand 7-segment display

Display	Function	Meaning
Off	TSG switched off.	Main power is not present, exhausted batteries. Main power is not present, batteries are not connected.
Flashing 0,5[sec-phase]	Battery mode	Main power is not present, batteries supply TSG electronic.
Flashing 1[sec-phase]	Charge mode	Main power is present, batteries are charged.
On	Maintenance mode	Main power is present, batteries are charged, charging is obtained.

CAUTION:
No voltage is on X1.6 when the TSG is in emergency power supply mode!

18.4 Light Curtain Kit

The TSG can be equipped with an additional light curtain. The light curtain consists of a transmitter and receiver bar which monitor the door opening for obstructions. To simplify the assembly, the TSG Light Kit is fitted with pre-wired plug-in cables. Thus, the assembly time is significantly reduced.

The signals from the light curtain can either be connected to the TSG control board via the elevator control system or directly to the TSG control board.

If the light curtain is directly attached to the TSG control board (input X1.3), parameter h3 must be configured accordingly (see also Table 12: h-parameters / page 38). The signal from the light curtain can either be set as "normally open" or "normally closed". If a signal to open the door is sent by the light curtain to the TSG electronic, it will open the door as long as the light curtain is interrupted.

NOTE:
After a power off and recovery, the door will stop when the light curtain is a signal to open and the door is not yet referenced.

CAUTION:
The TSG will not recognize any signal at input X1.3, when the door is in the range of the parameter bb (capture range for door closed position, see also Table 11: b parameter / page 36).

WARNING:
Do not connect a safety light curtain on input X1.3!

Further information on the electrical connection and installation can also be found in the manual for the TSG Light Kit.

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