L+L SMART DOOR SOLUTIONS

Assembly Instructions

Door drive for guards

TSG V4

Imprint

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Contents

1 About this manual

1.1 Purpose

This mounting manual contains important information on the mounting, commissioning, function and maintenance of the device. Observing the manual helps to avoid hazards, repair costs and downtimes and increases the reliability and life of the device.

1.2 Scope

This mounting manual applies to the following device: door operator TSG V4.

1.3 Version information

The issue status of this mounting manual is stated on the cover page and in the footers on every page.

Always keep and use the current version of all documentation.

If an outdated version of this or the required supplementary documentation is used, this can lead to faulty mounting, commissioning or operation.

1.4 Contact information

See page 2.

1.5 Target group

This mounting manual is directed at end customers of Langer & Laumann Ing.-Büro GmbH.

In addition to reading this mounting manual, the following requirements and previous technical knowledge of the user is required for correct operation of the device:

— comprehensive technical knowledge of the existing facilities

— knowledge of the operating manuals of these facilities

— Classification as skilled personal

1.6 Means of representation

The following presentation formats are used in this mounting manual:

Parameter	Bold and italic print, example: ***P8***.
Parameter values	Typewriter font, example: `05`.
Displays	The content of the 7-segment display is presented as shown in the following examples: "*nL*", "*AA*", "*oS*".
Instructions	Requirements for an instruction are represented with a tick.
	The steps to be carried out are numbered.
	Results of the individual steps are marked by a black arrow. The overall result of an instruction is highlighted by a white arrow in a black circle.

Example

✓ Requirement

1. Instruction (Step 1)

2. Instruction (Step 2)

 ⇨ The interim result or system response to step 2

3. Instruction (Step 3)

⮎ Overall result of the instruction

Lists Lists without a compulsory order are shown as a list with bullet points (en dash).

Example

— Property A

 — Detail 1

 — Detail 2

— Property B

 — Detail 1

 — Detail 2

1.7 Device information

The most important device information is provided on the nameplate.

1.8 Other applicable documents

The following documents are required for work that is not described in this mounting manual:

— Information about components not manufactured and supplied by Langer & Laumann

— Overall operating manual of the facility

2 Safety

2.1 General safety instructions

The door drive may not be mounted, commissioned or maintained without the information in this mounting manual. Before starting any work, the personnel must have read through this mounting manual carefully and understood it.

The safety instructions and other instructions in this mounting manual and the safety instructions and danger warnings attached to the door drive must be observed.

The local accident prevention regulations and general safety provisions that apply at the place of use must be observed.

2.2 Intended use

The door operator TSG V4 is a door drive for the automatic operation of horizontally or vertically moved sliding doors (vertical lift doors) or guards.

2.3 Responsibility of the owner

2.3.1 Obligations of the owner

The owner is responsible for ensuring that the facility is set up, installed, operated and maintained properly.

The owner must ensure safe operation and observe the requirements listed in the operating manual.

During operation of vertically guided doors, guards and other applications, it must be ensured that the weight of the configuration is always balanced along the entire travel distance, for example, by using counterweights or springs. Protection against load suspension system breakage must be provided on site.

During commissioning of the door, the skilled person carrying out the commissioning must check the configuration accordingly. Permanently faultless function must be ensured by controls during operation.

The owner is responsible for ensuring that the safety instructions listed in the ▶ *Product-specific hazards [p. 10]* section, the local accident prevention regulations and the local environmental protection provisions are complied with at all times.

2.3.2 Owner obligations to the personnel

— The owner ensures that only appropriately instructed and authorised personnel work on the facility.

— Unauthorised persons must be kept away from the facility.

— The personnel has the necessary qualification and receives the necessary training.

— The owner ensures that no one whose ability to respond is impaired, for example, by drugs, alcohol, medication or similar works on the facility.

— The owner ensures that the operating, maintenance and servicing personnel have been thoroughly familiarised with all safety instructions and that the safety instructions are followed.

— The personnel can examine the Assembly instructions at any time. The Assembly instructions must be kept near the facility.

— The owner makes sure that the personnel receive and wear the specified personal protective equipment.

2.4 Personnel requirements

2.4.1 Personnel qualification and scope of work

The tasks described in this manual set different requirements for the qualification of the assigned personnel. Inadequately qualified personnel are not able to correctly assess the risks and expose themselves and others to the risk of injuries. It is prohibited for inadequately qualified personnel to be in the working/danger zone. Persons whose ability to respond is influenced, for example, by drugs, alcohol or medication may not work on the facility.

Skilled personnel Work on mechanical components may only be carried out by skilled personnel qualified for this work.

Electrically skilled personnel Work on electrical components may only be carried out by electrically skilled personnel.

2.4.2 Personal protective equipment

Personal protective equipment is used to protect people against health and safety impairments during their work. The specified protective equipment must be worn.

Symbol	Meaning
	Wearing protective work clothing protects against hazards in the work-place.
	Wearing slip-resistant safety footwear protects against injuries to the feet.
	Wearing cut and puncture-resistant protective gloves protects against injuries to the hands.
	Wearing a protective cap protects against head injuries.
	Wearing goggles protects against eye injuries.
	Wearing hearing protection protects against hearing damage.

Table 1:   Personal protective equipment

2.5 Product-specific hazards

2.5.1 Mechanical hazards

Moving parts can entangle and crush or bruise parts of the body.

Parts with sharp edges and pointed corners pose a risk of injury.

— Never touch moving parts.

— Keep the movement area of moving parts clear.

— Before any work on components or individual parts, switch off the TSG V4 and secure it against reconnection.

— Only carry out work on components if they are at a complete standstill.

— After completing the work on components, reattach all covers, threaded fasteners and safety devices immediately.

— Do not bypass, dismantle or manipulated protective devices.

— Wear the specified personal protective equipment.

— Set the parameters according to the relevant standards.

2.5.2 Heat hazards

The motor of the TSG V4 can become hot in continuous operation, thus causing a risk of burns.

— Allow the motor to cool before starting the work.

— Wear the specified personal protective equipment (suitable protective gloves).

2.5.3 Electrical hazards

Touching live parts inside the TSG V4 or in the area of the electrical equipment poses a risk to life.

— Work on the electrical installation may only be carried out by trained electrically skilled personnel.

— Fuse the TSG V4 as shown on the circuit diagram.

— Only use original fuses.

— Always carry out the 5 electrical safety steps:

    — Disconnect completely

    — Secure against reconnection

    — Verify that the installation is dead

    — Carry out earthing and short-circuiting

    — Provide protection against adjacent live parts

2.5.4 Hazards due to improper use

The TSG V4 must only be used as intended. This means observing all instructions in this Assembly instructions in every stage of the life cycle.

Misuses are, for example:

— Carrying out work without adequate qualification/technical knowledge and without instruction

— Structural changes not planned by the manufacturer

— Use of unapproved additional equipment

— Bypassing/removing protective devices

— Commissioning a damaged or non-functional device

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2.6 Warnings

2.6.1 Structure of warning notices

All warning notices in this document are structured as follows:
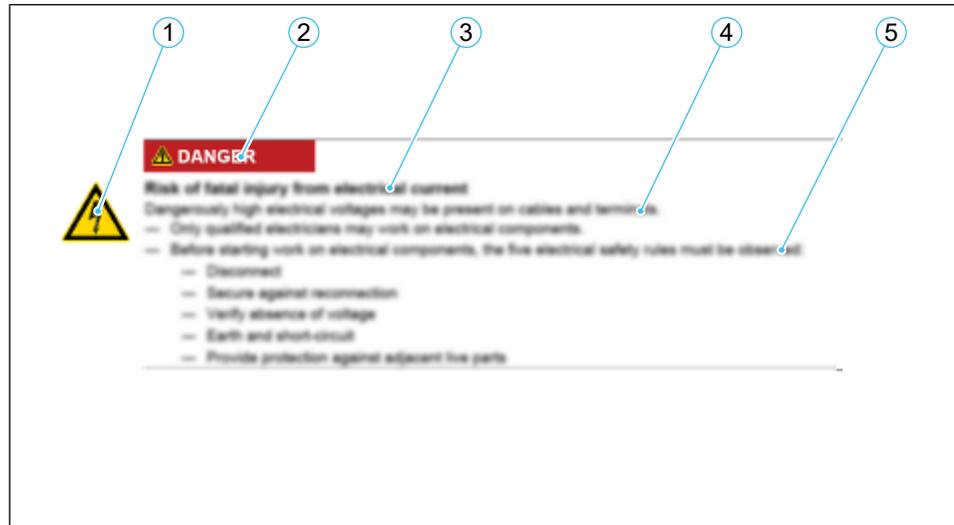
1	Hazard symbol	2	Signal word
3	Type and source of hazard	4	Possible consequences of non-observance
5	Procedure for hazard prevention		

2.6.2 Meaning of the signal words and symbols

The following signal words are used in this document:

Signal word	Meaning, consequences if not prevented
DANGER	Warns of an imminent hazardous situation which results in death or serious injury.
WARNING	Warns of a potential hazardous situation, which could result in death or serious injury.
CAUTION	Warns of a potential hazardous situation, which could result in minor or moderate injury.
ATTENTION	Warns of a hazardous situation, which can result in material damage or environmental damage.

Table 2: Meaning of the signal words

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The following hazard-specific symbols are used in this document:

Symbol	Designation
	Automatic start-up
	Electrical hazard
	Gear wheels
	General warning
	Hot surface

Table 3: Meaning of the hazard-specific symbols

2.7 Illegible signage

During the course of time, labels and signs can become dirty or unrecognisable/ illegible in some other way so that dangers are not recognised and necessary operating instructions cannot be followed. To avoid injuries, all warnings must be kept in a good, legible condition at all times. Damaged signs or labels must be renewed immediately.

3 Product description

3.1 Overview

The TSG V4 door operator is a door drive for automatic operation of horizontally or vertically moved sliding doors (vertical lift doors). Langer & Laumann does not accept any liability for applications outside the defined application. The speeds and accelerations can be adjusted. The door opening is determined by a measurement process.

When operated as a power operated guard, the door operator TSG V4 meets the requirements of EN ISO 13849-1:2015 with category 2/performance level d.

The TSG V4 can be used for up to approx. 20,000 mm travel distance. The door panel weights in the standard configuration must not exceed 400 kg. Speed increases or reductions at the timing belt change the kinetic and static forces, see ▸ *Mechanical transmission [p. 70]*.

3.2 Components

The following figure shows the assembled mechanical components of the device by way of example.
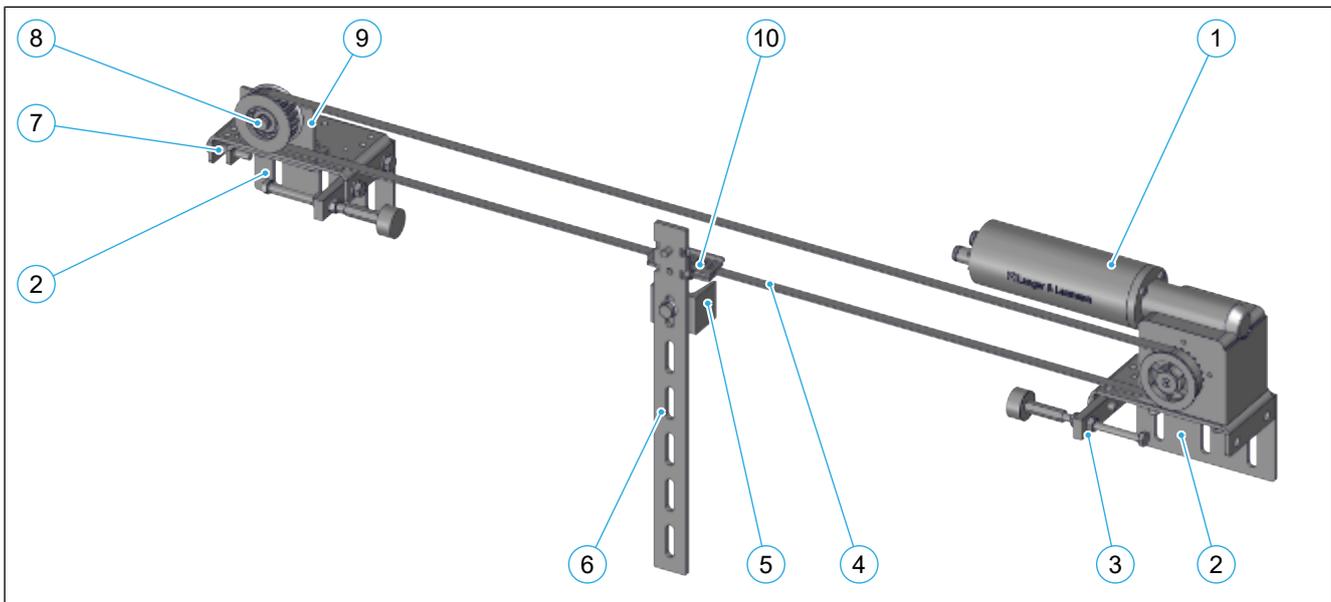
Ill. 1:   Example TSG assembly

Item	Part number	Designation
1	8.20.40010.X1	TSG drive (here: left version)
2	1.20.60040	TSG combined bracket, standard
3	1.20.60030	TSG stop set (incl. buffer)
4	1.20.xxxxx	Timing belt
5	1.20.60020	TSG stop on the door panel coupler
6	1.20.60004	TSG door panel coupler
7	1.20.60110	TSG mounting link
8	1.20.60003	TSG deflection pulley
9	1.20.60013	TSG bracket for deflection pulley
10	1.20.60005	TSG timing belt lock

3.3 Motor position

The TSG drive is available with two different motor positions. The motor position is independent of the opening direction or the opening method of the door or guard to be moved. The TSG drive with output left can, for example, be installed on the right or left-hand side.

Motor output position left When looking at the gear head with the foot mounting at the bottom, the output is on the left-hand side.	
Motor output position right When looking at the gear head with the foot mounting at the bottom, the output is on the right-hand side.	
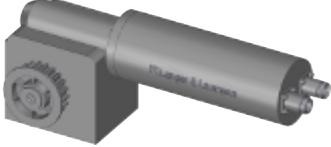
3.4 Housing designs

The TSG V4 electronic components are available in the following housing designs:

— TSG V4-internal electronics

— TSG V4-external electronic components

3.4.1 TSG V4 internal electronic components

This housing design is intended for mounting in a control cabinet. It can be screwed directly onto the mounting plate in the control cabinet or fixed on a mounting rail (TS35, 35 mm × 7.5 mm). If several housings are to be mounted in the control cabinet, a distance of 5 cm between each other vertically and 2 cm next to each other is required.
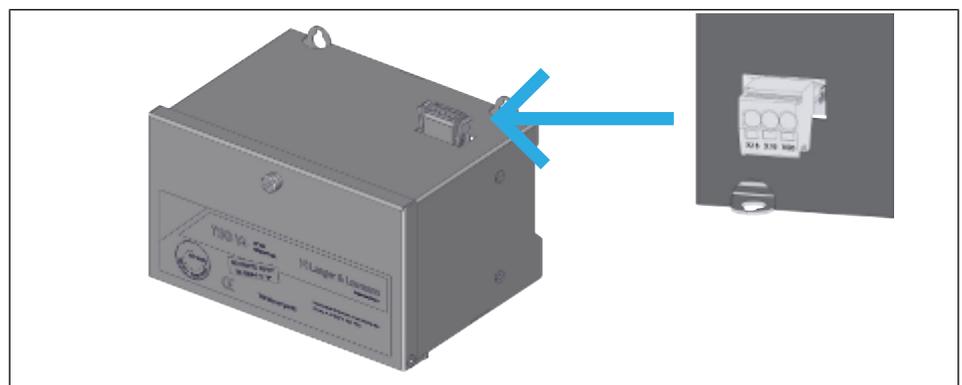
Ill. 2: Front view of the TSG V4 internal electronic components

Cable routing
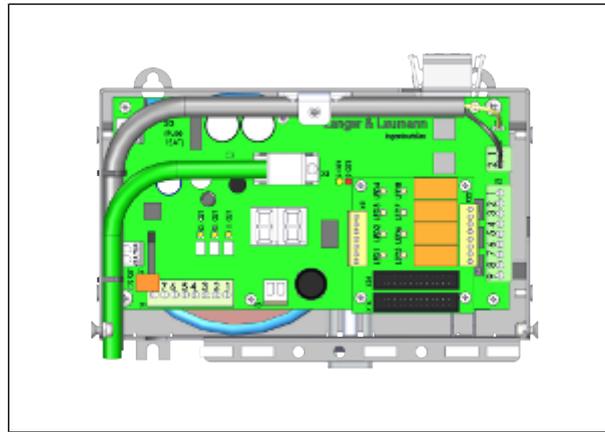
Ill. 3:   Cable routing of the TSG V4 internal electronic components

Dimensioned and assembly drawings
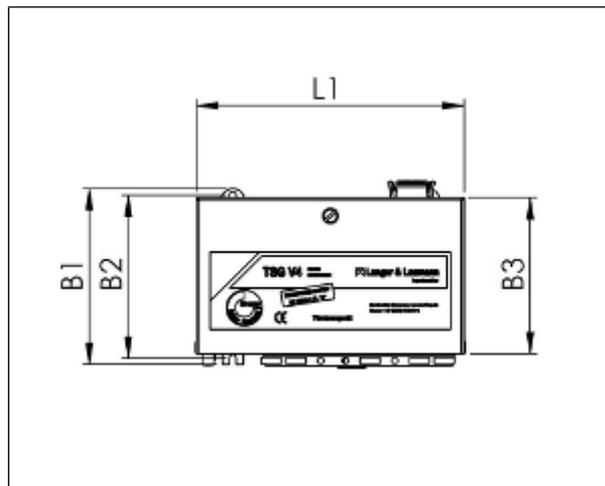
Ill. 4:   Front view with dimensions of the TSG V4 internal electronic components
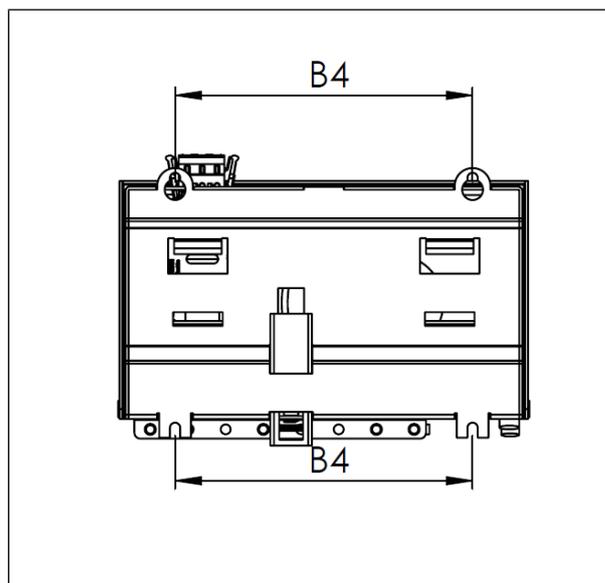
Ill. 5:   Rear view with dimensions of the TSG V4 internal electronic components
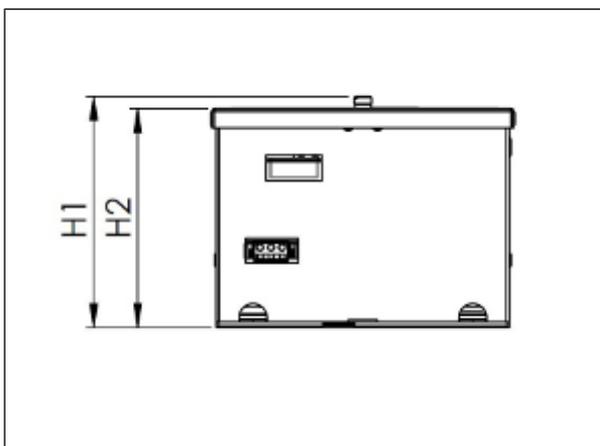
Ill. 6:   Plan view with dimensions of the TSG V4 internal electronic components

Dimensions and weight

Property	Abbreviation	Value
Total length	L1	206 mm
Total width	B1	137 mm
Distance between mounting holes	B2	127 mm
Housing width	B3	121 mm
Distance between mounting holes	B4	150 mm
Connector height	B5	22 mm
Total height	H1	155 mm
Housing height	H2	147 mm
Weight		approx. 4.1 kg

Table 4: Dimensions and weight of the TSG V4 internal electronic components

3.4.2 TSG V4 external electronic components

This housing design is splash-proof and is fixed in a suitable position near the TSG drive with four screws.
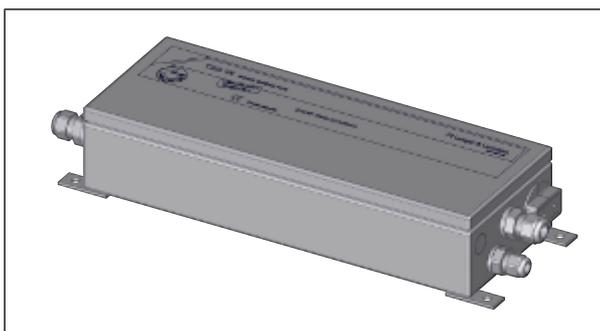
Ill. 7:   Front view of the TSG V4 external electronic components

Cable entry   The cables can be optionally fed in through the left or right side with cable glands through prepunched holes in the housing. The motor and encoder cables use a common dividable cable gland.

ATTENTION

Possible damage

— On opening the prepunched hole, make sure that the TSG V4 electronic components are not damaged and no metal parts get on them.

— Close off all broken out openings using the threaded fasteners provided in order to main the degree of protection.

Dimensioned and assembly drawings
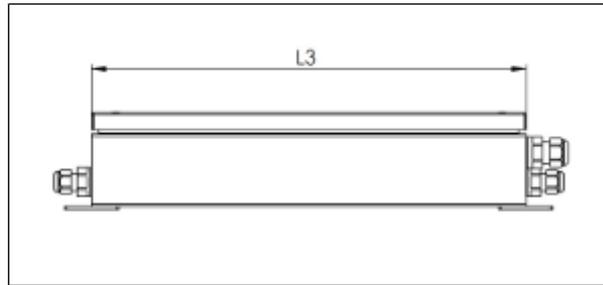
Ill. 8:   Long side view with dimensions of the TSG V4 external electronic components
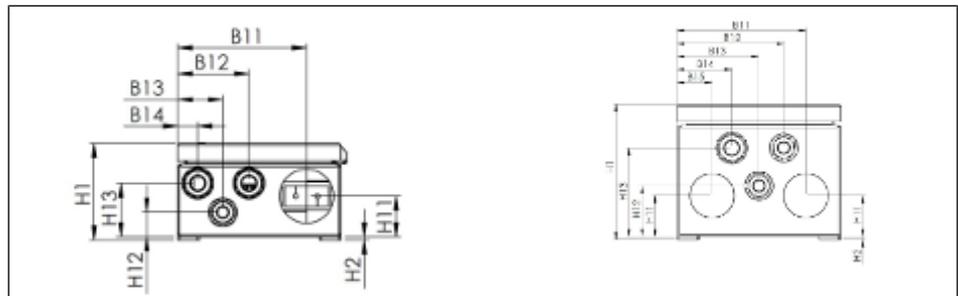
Ill. 9:   Narrow side view with dimensions of the TSG V4 external electronic components (in two different available heights)
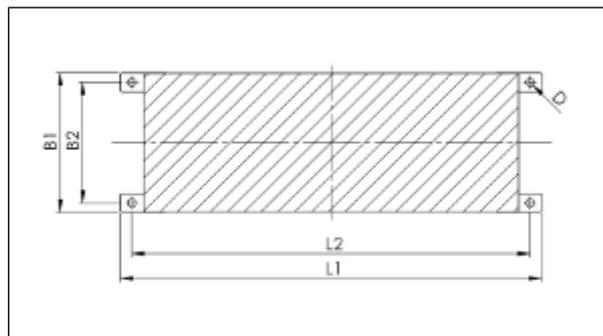
Ill. 10:   Plan view with dimensions of the TSG V4 external electronic components

Dimensions and weight

Property	Abbreviation	Value at H1 = 88 mm	Value at H1 = 125 mm
Housing length	L3	400 mm	
Total length	L1	425 mm	
Total width	B1	150 mm	
Distance between mounting holes	B2	130 mm	
Mounting hole diameter	D	8.5 mm	
Total height	H1	88 mm	125 mm
Height of fastening lugs	H2	3 mm	3 mm
Height of hole, cable gland 1	H11	36 mm	38 mm
Height of hole, cable gland 2	H12	21 mm	47 mm
Height of hole, cable gland 3 and 4	H13	48 mm	82 mm
Hole distance, cable gland 1	B11	121 mm	118 mm
Hole distance, cable gland 2	B12	68 mm	98 mm
Hole distance, cable gland 3	B13	44 mm	75 mm
Hole distance, cable gland 4	B14	21 mm	50 mm
Hole distance, cable gland 5	B15		32 mm
Weight		approx. 4.1 kg…5.8 kg (depending on the equipment)	

Table 5: Dimensions and weight of the TSG V4 external electronic components

Cable gland	Cable diameter
M16	5 mm…10 mm
M20	8 mm…13 mm

Table 6: Cable diameters and cable glands of the TSG V4 external electronic components

3.4.2.1 Housing variant with plug-in connections

A variant with plug-in connections is available as an alternative to the housing variant with cable glands.
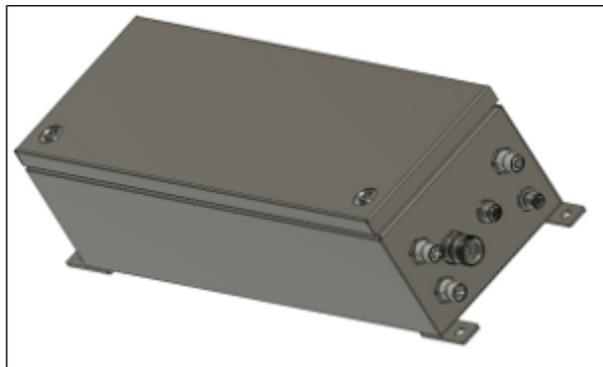
Ill. 11: Front view of the TSG V4 external electronic components (plug-in)

Ill. 12:   Plan view of the TSG V4 external electronic components (plug-in)

Ill. 13:   Connector designations of the TSG V4 external electronic components (plug-in)
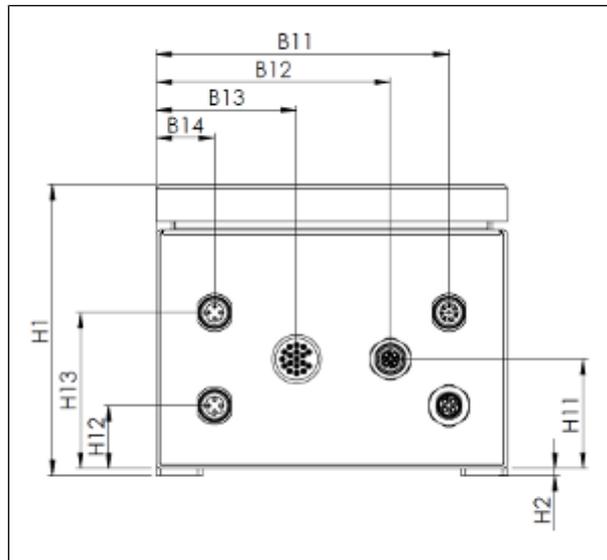
Ill. 14:   Narrow side view with dimensions of the TSG V4 external electronic components (plug-in)

Dimensions and weight

Property	Abbreviation	Value
Total length	L1	450 mm
Distance between mounting holes	L2	425 mm
Total width	B1	150 mm
Hole distance of connectors XP3 and XP6	B11	125 mm
Hole distance of connector XP4	B12	100 mm
Hole distance of connector XP5	B13	60 mm
Hole distance of connectors XP1 and XP2	B14	25 mm
Total height	H1	125 mm
Height of fastening lugs	H2	3 mm
Height of hole, cable gland 1	H11	47 mm
Height of hole, cable gland 2	H12	27 mm
Height of hole, cable gland 3 and 4	H13	67 mm
Weight		approx. 7.5 kg

Table 7: Dimensions and weight of the TSG V4-external electronic components (plug-in)

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XP1 and XP2: Ethernet connection

— M12 bush

— D coded

— 4-pole

— Shielded cable

— Transfer parameters: CAT4, Class D (ISO/IEC 11801:2002), EN 50173-1)

— Data transfer rate: max. 100 Mbit/s

Delivery from the factory: XP2 protected with dummy plugs against contamination.

XP3: encoder connection

— M12 socket

— A coded

— 8-pole

— Shielded cable

Signal	M12 pin
+5 V DC	1
Channel B	2
Channel A	3
Motor ID	4
–	5
–	6
–	7
GND	8
–	–
Shield	placed on the connector housing

Table 8: XP3 assignment

XP4: motor connection

— M12 socket

— S coded

— 4-pin

— Shielded cable

Signal	M12 pin
Phase A	1
Phase B	3
PE	PE
–	2
Shield	placed on the connector housing

Table 9: XP4 assignment

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XP5: signal connection

— M23 connector

— 19-pin

M23 pin	TSG signal	Designation
1	X1.1	Open door
2	X1.2	Close door
3	X1.3	Stop function, channel 2
4	X5.1	Stop function, channel 1
5	X5.2	Stop function, channel 1
6	24VDC	Supply of the inputs and outputs of the door operator
7	X2.3	Door open, NO
8	X2.6	Door closed, NO
9	X2.8	Door blocked, NC
10	IN1	Dependent on functions and parameters, see *1.20.91551_TSG_ExpansionBoard _electronic_InstructionsForUse_V2.10_en*
11	IN2	Dependent on functions and parameters, see *1.20.91551_TSG_ExpansionBoard _electronic_InstructionsForUse_V2.10_en*
12	PE	PE
13	IN3	Dependent on functions and parameters, see *1.20.91551_TSG_ExpansionBoard _electronic_InstructionsForUse_V2.10_en*
14	IN4	Dependent on functions and parameters, see *1.20.91551_TSG_ExpansionBoard _electronic_InstructionsForUse_V2.10_en*
15	OUT1	Dependent on functions and parameters, see *1.20.91551_TSG_ExpansionBoard _electronic_InstructionsForUse_V2.10_en*
16	OUT2	Dependent on functions and parameters, see *1.20.91551_TSG_ExpansionBoard _electronic_InstructionsForUse_V2.10_en*
17	OUT3	Dependent on functions and parameters, see *1.20.91551_TSG_ExpansionBoard _electronic_InstructionsForUse_V2.10_en*
18	OUT4	TSG ready
19	GND	Reference potential of the inputs and outputs of the door operator

Table 10:   XP5 assignment

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XP6: mains connection

— M12 connector, S-coded, 4-pin

— Unshielded cable, 3 × 1.5 mm²

M12 pin	Signal (230 V version)	Signal (400 V version)
1	L	L1
PE	PE	PE
3	N	L2
2	not used	not used

Table 11:   XP6 assignment

3.5 Dimensions

The following figures show the most important dimensions of the mechanical part of the door drive.

Ill. 15: Dimensioning of the door drive's mechanics (front view) (all dimensions in mm)

Ill. 16: Dimensioning of the door drive's mechanics (side view) (all dimensions in mm)

3.6 TSG V4 electronic components

3.6.1 Interfaces and displays of the TSG V4 electronic components
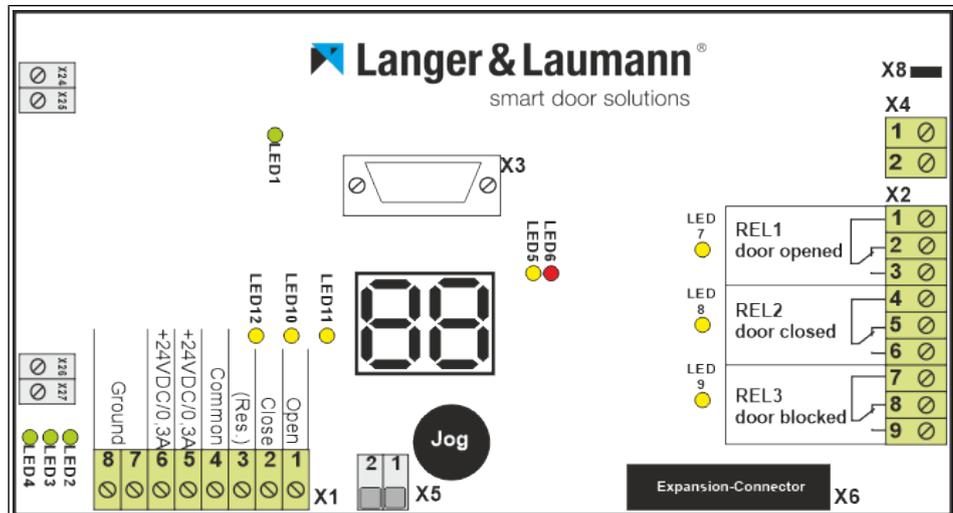
Ill. 17:   Position of the interfaces and displays of the TSG V4 electronic components

Designation	Meaning
X1	Inputs
X2	Outputs
X3	Motor encoder
X4	Motor
X5	Stop input (see also ▶ *Connection for the stop function (X5) [p. 38]*)
X6	Expansion connector
X8	Motor shield
X24/25	Internal power supply
X26/27	Internal power supply

Table 12:   Interfaces of the TSG V4 electronic components

Designation	Meaning
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. The uniform flashing of the LED indicates that the processor is working. If the LED has gone out or if it is lit continuously, a defect exists.
LED 6	Overload. The LED indicates that an unusually high motor current is flowing. This occurs while checking the end positions or just before a blockage, for example, due to a sluggish door. If the door weight is set too low, if the blockage detection is set too low, the LED reacts more sensitively.
LED 7	"Door is open" output signal
LED 8	"Door is closed" output signal
LED 9	"Door is blocked" output signal

Designation	Meaning
LED 10	"Close door" input signal
LED 11	"Open door" input signal
LED 12	Input signal (reserve)

Table 13:   Displays of the TSG V4 electronic components

3.6.2 Technical data of the TSG V4 electronic components

Property		Value
Connection voltage (input characteristics)		
115 V version		
	Connection voltage	115 VAC ±15 % (L, N, GRD)
	Power consumption	1.8 A
	Number of phases	1 (AC)
	Frequency	50/60 Hz
	Short-circuit current	4.0 A (internal fusing)
200 V version		
	Connection voltage	200 VAC ±15 % (L, N, GRD)
	Power consumption	1.1 A
	Number of phases	1 (AC)
	Frequency	50/60 Hz
	Short-circuit current	2.0 A (internal fusing)
230 V version		
	Connection voltage	230 VAC ±15 % (L, N, GRD)
	Power consumption	0.9 A
	Number of phases	1 (AC)
	Frequency	50/60 Hz
	Short-circuit current	1.25 A (internal fusing)
400 V version		
	Connection voltage	400 VAC ±10 % (L1, L2, GRD)
	Power consumption	0.5 A
	Number of phases	2 (AC)
	Frequency	50/60 Hz
	Short-circuit current	1.25 A (internal fusing)
480 V version		
	Connection voltage	480 VAC ±10 % (L1, L2, GRD)
	Power consumption	0.4 A
	Number of phases	2 (AC)
	Frequency	50/60 Hz
	Short-circuit current	1.25 A (internal fusing)

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Property	Value
Motor connection (X4, output characteristics)	
Voltage range	0 VDC…38 VDC
Current	2.5 A
Peak current	12 A
Number of phases	2
Frequency	16 kHz
Fusing on site	
115 V version	10 A, tripping characteristic B or C
200 V version	10 A, tripping characteristic B or C
230 V version	10 A, tripping characteristic B or C
400 V version	5 A per phase, tripping characteristic B or C
480 V version	5 A per phase, tripping characteristic B or C
Power consumption at rest, without applied input signal, not in the end position	approx. 3 W
Maximum power consumption	
115 V version	1.8 A
200 V version	1.1 A
230 V version	0.9 A
400 V version	0.5 A
480 V version	0.4 A
Depending on the door weight and parameter setting, short-term (< 1 s) higher currents can flow.	
Maximum length of the cable to the motor or encoder	20 m
Allowable storage/transport temperature	−20 °C…+60 °C
Maximum change	20 K/h
Allowable average ambient operating temperature (for nominal data, no direct sunshine)	−20 °C…+60 °C
Installation altitude	Up to 1000 m above sea level without limitation 1000 m to 2000 m above seal level with reduced performance
Degree of protection	
TSG V4-external electronic components	IP54
TSG V4-internal electronics	IP20
Ambient requirements	
Overvoltage category	III
Pollution degree	2
Relative humidity	10 %…90 %, noncondensing

Table 14:   Technical data of the TSG V4 electronic components

The TSG V4 electronic components are suitable for use in an electric circuit that can supply no more than 5000 A_{RMS} at maximum 480 V, if this is protected by a circuit-breaker with an interrupting rating of not less than 10,000 A_{RMS} at maximum 480 V.

For use in the USA: integrated semi-conductor short-circuit protection does not provide any protection for branch cables. The branch circuit must be protected in compliance with the manufacturer's instructions, the National Electrical Code and additional local regulations.

For use in Canada: integrated semi-conductor short-circuit protection does not provide any protection for branch cables. The branch circuit must be protected in compliance with the Canadian Electrical Code, Part I.

3.6.3 Mains connection

The TSG V4 is available for different mains connection voltages. The mains voltage connectable at the device is stated on the nameplate. The following figures show the position of the mains connection terminals for the two housing variants.
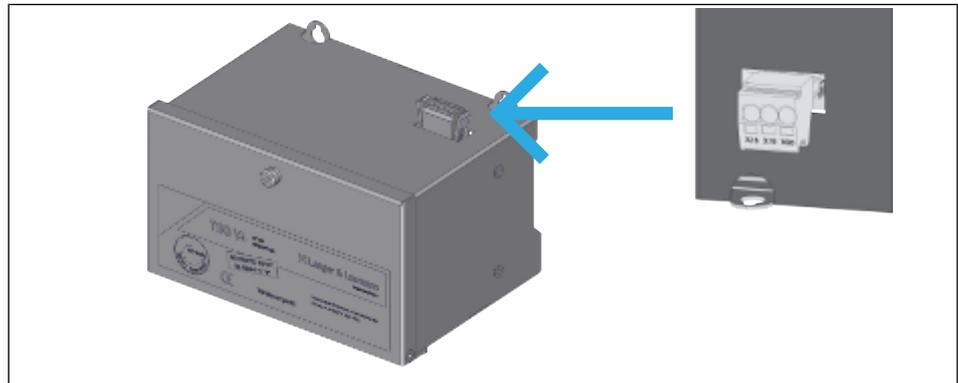
Ill. 18: Mains power connection of the TSG V4 internal electronic components
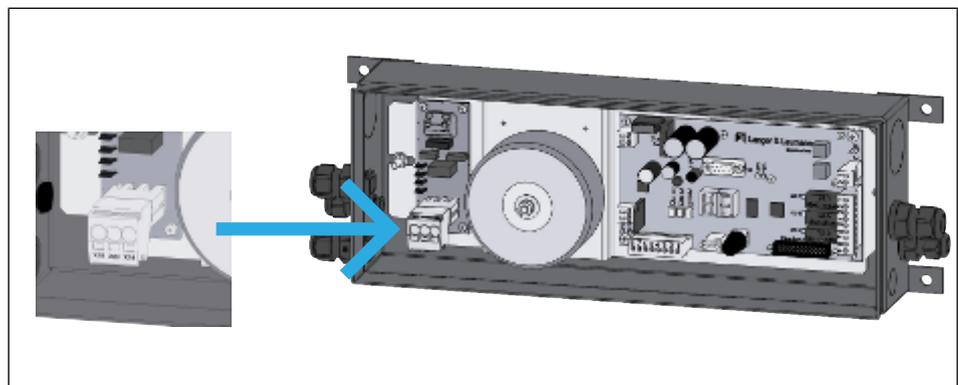
Ill. 19: Mains power connection of the TSG V4 external electronic components

⚠ DANGER

Danger of death from electric shock

Dangerously high electric voltages are applied to terminals X18 and X19 inside the device.

— Work on electrical components may only be carried out by electrically skilled personnel.

— Before starting any work on the electrical components, complete the five electrical safety steps:

    — Disconnect completely

    — Secure against reconnection

    — Verify that the installation is dead

    — Carry out earthing and short-circuiting

    — Provide protection against adjacent live parts

Pin	Assignment		
115 V version			
X18	L		115 VAC ±15 %
X19	N		50/60 Hz
X20-GRD	GRD	Protective conductor connection	
200 V version			
X18	L		200 VAC ±15 %
X19	N		50/60 Hz
X20-GRD	GRD	Protective conductor connection	
230 V version			
X18	L		230 VAC ±15 %
X19	N		50/60 Hz
X20-GRD	GRD	Protective conductor connection	
400 V version			
X18	L1		400 VAC ±10 %
X19	L2		50/60 Hz
X20-GRD	GRD	Protective conductor connection	
480 V version			
X18	L1		480 VAC ±10 %
X19	L2		50/60 Hz
X20-GRD	GRD	Protective conductor connection	

Table 15: Terminal assignment of the mains connection

Version	3-pin connector with push-in spring connection
Rigid/flexible conductor cross-section (min/max)	1.5 mm^2/2.5 mm^2
Stripped length	10 mm
Flexible conductor cross-section with wire end ferrule with/ without plastic sleeve (min/max)	1.5 mm^2/2.5 mm^2
AWG conductor cross-section (min/max)	15/12

Table 16: Connection data of the mains connection

Use copper cables only for the connection. For UL-compliant operation, design the cable insulation for a maximum temperature of 60 °C.

3.6.4 Internal fusing

Designation	Function	Fusing
SI2	Control section fuse (18 VAC)	4 A
SI3	Power section fuse (26 VAC)	15 A

Table 17: Fuses of the TSG V4 electronic components

Fuses SI2 and SI3 are not replaceable. If they blow, it is only possible for the TSG V4 electronic components to be replaced by Langer & Laumann.

3.6.5 Inputs and outputs

3.6.5.1 Signal inputs (X1)

Connection of the signal inputs (X1)

The inputs for the "Open door" (X1.1), "Close door" (X1.2) and Reserve (X1.3) input signals are connected with a (nominal) voltage of 24 VDC. All inputs have a common potential, i.e., the same voltage must always be applied to all three inputs.

Pin	Assignment	
X1.1	"Open door" input signal	16 VDC…28 VDC, min 10 mA
X1.2	"Close door" input signal	16 VDC…28 VDC, min 10 mA
X1.3	Input signal (reserve)	16 VDC…28 VDC, min 10 mA
X1.4	Counter potential für input signals	(Common)
X1.5	Auxiliary voltage output + Can only be used to control the TSG input signals X1.1, X1.2 and X1.3.	24 VDC ±20 % — limited voltage — not stabilised — fluctuates with the mains voltage — 300 mA max load capacity
X1.6	Auxiliary voltage output +	24 VDC ±20 % — limited voltage — not stabilised — fluctuates with the mains voltage — 300 mA max load capacity
X1.7	Auxiliary voltage output –	0 VDC
X1.8	Auxiliary voltage output –	0 VDC

Table 18:   Terminal assignment of the signal inputs (X1)

The following table shows the connection and wiring options for the input signals X1.1 and X1.2.

With internal 24-VDC power supply	
With external 24-VDC power supply and common plus	
With external 24-VDC power supply and common minus	

Table 19:   Connection options for the input signals

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Version	8-pin connector with push-in spring connection
Rigid/flexible conductor cross-section (min/max)	0.2 mm^2/2.5 mm^2
Stripped length	10 mm
Flexible conductor cross-section with wire end ferrule with/ without plastic sleeve (min/max)	0.25 mm^2/2.5 mm^2
AWG conductor cross-section (min/max)	24/12
2 conductors with the same cross-section, flexible with TWIN-AEH with plastic sleeve (min/max)	0.5 mm^2/1.5 mm^2
AWG according to UL/CUL (min/max)	26/12

Table 20:   Connection data of the signal inputs (X1)

Use copper cables only for the connection. For UL-compliant operation, design the cable insulation for a maximum temperature of 60 °C.

> ### ATTENTION
>
> **Possible damage**
>
> The auxiliary voltage output at X1.5/X1.6 may not be connected to an external voltage potential. If an external voltage potential is connected to X1.5/X1.6, this can irreparably damage the device.

Standard operation of the signal inputs (X1)

In this mode, a signal applied to the respective input (X1.1, X1.2 or X1.3) is executed as long as it is applied. If the input signal is removed, the command is no longer executed.

If an input signal is applied to the two inputs X1.1 and X1.2 at the same time, then the door is opened.

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

Standard operation of the signal inputs is active if parameter *h1* is set to 00.

Pulsed operation of the signal inputs (X1)

In this mode. a pulse at least 0.2 seconds long triggers the required action at the respective signal input.

Pulsed operation of signal inputs X1.1 and X1.2 is active if parameter **h1** is set to **02**, **03** or **04**. Signal input X1.3 cannot be changed to pulsed operation and remains in standard operation.

Variant 1   Variant 1 enables pulsed operation at inputs X1.1 and X1.2. To select variant 1, set parameter **h1** to **02**.

If the closing force limitation triggers during closing the door stops. If it is to continue closing, the subsequent closing must be retriggered by a pulse at input X1.2. If automatic reversing is set (parameter **b4** = **on**), the door opens completely. A new pulse must then be applied at input X1.2 to close the door.

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

The following figure uses an example to show how the door is controlled over time by the application of pulses at inputs X1.1 and X1.2.
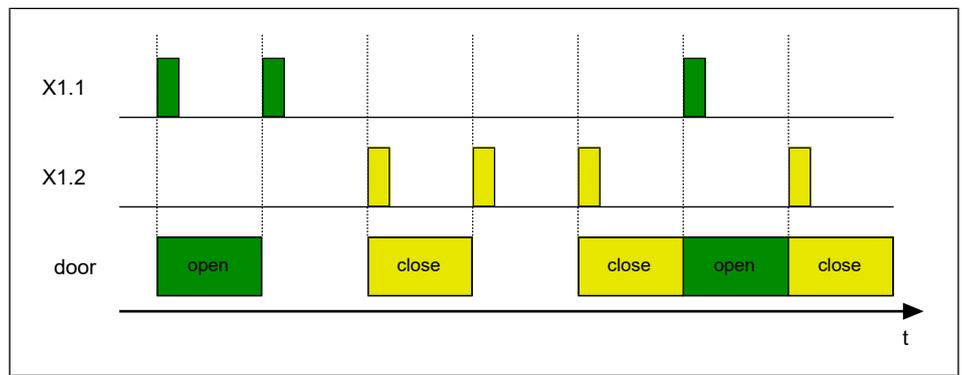
Ill. 20:   Pulsed operation time sequence (variant 1)

Variant 2   Variant 2 enables pulsed operation at input X1.1, input X1.2 is deactivated. After the time set in parameter **h5**, the door is closed automatically in compliance with the closing force limitation set.

If the closing force limitation triggers during closing, the door stops. The closing starts again after around five seconds. If automatic reversing is set (parameter **b4** = **on**), the door opens completely. The following closing is retriggered after the time set in parameter **h5** has expired.

If the door was opened by a pulse the remaining time in the open position is shown in the display.

If input X1.3 triggers reversing during closing, the following closing is triggered again after the time in parameter **h5** has expired. If the time set in parameter **h5** has expired and input X1.3 continues to trigger, then the door remains stopped in the open position until input X1.3 releases the door again.

The following figure uses an example to show how the door is controlled over time by the application of pulses at input X1.1.
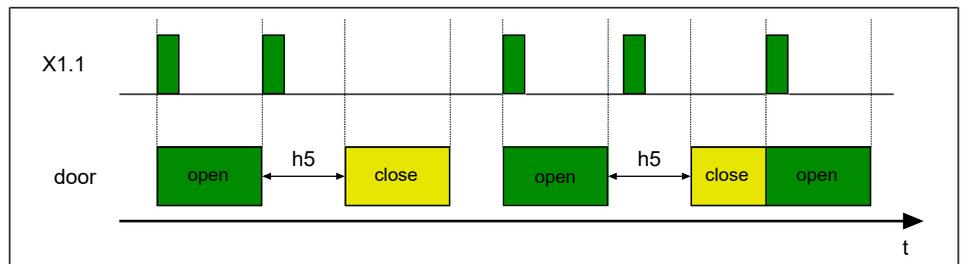
Ill. 21:   Pulsed operation time sequence (variant 2)

Variant 3 If machines are retrofitted with an automatic door drive, the user is dependent on existing signals. One type of signals available are those provided by a button, similar to a garage door drive.

Definition of the functions:

— Press 1 x: open door starts

— Press 1 x: door stops

— Press 1 x: close door starts

— Press 1 x: door stops

— Press 1 x: open door starts

— usf.

The signal is acquired at input X1.1. Signal acquisition for the function is activated via the parameter *h1* = **04**.

3.6.5.2 Relay outputs (X2)

Three relay outputs, each with a changeover contact, are present on the TSG V4 electronic components in order to display or signal the door statuses. The contacts are located on terminal block X2.

Pin	Assignment
X2.1	"Door open" output signal, potential supply
X2.2	"Door open" output signal, break contact
X2.3	"Door open" output signal, make contact
X2.4	"Door closed" output signal, potential supply
X2.5	"Door closed" output signal, break contact
X2.6	"Door closed" output signal, make contact
X2.7	"Door blocked" output signal, potential supply
X2.8	"Door blocked" output signal, break contact
X2.9	"Door blocked" output signal, make contact

Table 21:   Terminal assignment of the relay outputs (X2)

Connection data

If relays/contactors are switched with the relay outputs, they must be equipped with a freewheeling diode for direct voltage and with an RC combination for alternating voltage.

Version	9-pin connector with push-in spring connection
Rigid/flexible conductor cross-section (min/max)	$0.2\ mm^2$/$2.5\ mm^2$
Stripped length	10 mm
Flexible conductor cross-section with wire end ferrule with/without plastic sleeve (min/max)	$0.25\ mm^2$/$2.5\ mm^2$
AWG conductor cross-section (min/max)	24/12
2 conductors with the same cross-section, flexible with TWIN-AEH with plastic sleeve (min/max)	$0.5\ mm^2$/$1.5\ mm^2$
AWG according to UL/CUL (min/max)	26/12
Power data (UL/CSA)	
Make contact (NO)	1 A/50 VAC
	1 A/24 VDC
Break contact (NC)	1 A/50 VAC
	1 A/24 VDC
Power data (VDE)	
Make contact (NO)	1 A/230 VAC
	1 A/230 VDC
Break contact (NC)	1 A/230 VAC
	1 A/230 VDC

Table 22:   Connection data of the relay outputs (X2)

Use copper cables only for the connection. For UL-compliant operation, design the cable insulation for a maximum temperature of 60 °C.

ATTENTION

Possible damage

Voltages of different systems must not be connected to the relay outputs (e.g. 24 V and 80 V at the same time).

3.6.5.3 Connection for the stop function (X5)

> ⚠ **CAUTION**
>
> **Risk of injury and possible damage from unintentional door movements**
>
> External voltage at terminals X5.1 or X5.2 can cause unintentional door movements or irreparable damage to the TSG V4 electronic components.
>
> — Do not connect any external voltages to terminals X5.1 or X5.2.

The TSG V4 electronic components are equipped with a stop function (see ▸ *Stop function [p. 68]*). In normal operation and without use of the stop function there is a jumper wire between terminals X5.1 and X5.2.

After resetting the stop input, the door drive does not restart automatically by use of pulsed operation at input X1. The drive does not start until after the pulse at input X1 has been triggered.

If the stop function is triggered, the limit switches activated at X2 remain active as long as the door is in the respective end position.

Pin	Assignment	
X5.1	Potential-free contact	0 VDC…24 VDC
X5.2	Potential-free contact	

Table 23:   Terminal assignment of the connection for the stop function (X5)

Version	2-pin printed board terminal
Rigid/flexible conductor cross-section (min/max)	0.5 mm^2/1.5 mm^2
Stripped length	5 mm
Flexible conductor cross-section with wire end ferrule with/ without plastic sleeve (min/max)	0.5 mm^2/1.5 mm^2
AWG conductor cross-section (min/max)	20/15

Table 24:   Connection data of the connection for the stop function (X5)

Use copper cables only for the connection. For UL-compliant operation, design the cable insulation for a maximum temperature of 60 °C.

3.6.6 Motor connection

3.6.6.1 Encoder connection (X3)

Version: 9-pin D-sub

Pin	Assignment		Cable core (motor version K)	Cable core (motor version K)	Motor terminal
1…4	Not connected				
5	Motor ID				
6	GND		Yellow	Brown	1
7	Channel B		Green	White	5
8	Channel A		Brown	Yellow	3
9	+5 VDC		White	Green	4

Table 25: Terminal assignment of the encoder (X3) with fixed cable on the motor

Pin	Assignment	Pin at the encoder connector
1…4	Not connected	
5	Motor ID	6
6	GND	4
7	Channel B	10
8	Channel A	2
9	+5 VDC	9

Table 26: Terminal assignment of the encoder (X3) with plug-in cable set

ATTENTION

Possible damage

Before plugging in or unplugging the encoder connector, switch off the power supply.

3.6.6.2 Motor connection (X4)

Version: 2-pin screw/plug-in

Pin	Assignment	Core colour
1	Motor +	Brown
2	Motor –	White
X8	Motor shield via cable lug 4.8 × 0.8	Housing

Table 27: Terminal assignment of the motor connection (X4)

ATTENTION

Possible damage

— Before plugging in or unplugging the motor connection connector, switch off the power supply.

— Do not change the assignment of the motor connection. Incorrect assignment is detected by the TSG V4 electronic components and leads to an interruption in operation and an error message.

3.6.7 External control voltage

ATTENTION

Possible damage
— Only connect the external control voltage after consulting Langer & Laumann.

The control voltage supplied by the internal transformer can be replaced by an insulated connection on site. This external control voltage then supplies the logic of the TSG V4 electronic components and the encoder of the drive. The load section of the TSG V4 electronic components continues to be supplied by the mains connection. If an external control voltage is connected, the two cores of the internal power supply must then be removed from terminals X26 and X27 and properly insulated by the customer against short-circuit.

Pin	Assignment	
X26 ▸ *mains power connection of the TSG internal electronic components [p. 30]*	+	21.6 VDC…27.6 VDC or 16.2 VAC…20.0 VAC 3.9 A max. The maximum fusing of the control circuit must not exceed 4 A.
X27 ▸ *mains power connection of the TSG internal electronic components [p. 30]*	–	
GRD	GRD	

Table 28:   Terminal assignment of the connection for external control voltage

Version	9-pin printed board terminal
Rigid/flexible conductor cross-section (min/max)	0.5 mm^2/1.5 mm^2
Stripped length	5 mm
Flexible conductor cross-section with wire end ferrule with/ without plastic sleeve (min/max)	0.5 mm^2/1.5 mm^2
AWG conductor cross-section (min/max)	20/15

Table 29:   Connection data of the connection for external control voltage

Use copper cables only for the connection. For UL-compliant operation, design the cable insulation for a maximum temperature of 60 °C.

3.7 TSG options

On request, the TSG V4 is available with various extension options.

3.7.1 TSG web interface

With the optionally available additional TSG web interface components and the TVis-Web software, the TSG V4 can be connected to a PC, notebook or tablet. The connection between a PC, notebook or tablet and the TSG web interface can, depending on the scope of supply, either be hard-wired or connected wirelessly via WLAN (WiFi).

TVis-Web is software for visualisation of the TSG V4, which can be started directly without installation with a browser (e.g. Microsoft Edge or Mozilla Firefox).

The system supports the following functions:

— Monitoring TSG V4 (remote control, travel profile display, error memory, …)

— Settings (parameter changes, additional settings, …)

— System settings (IP address, door values, export/import of the parameters, …)

For further information see *TVis-Web documentation (1.20.91500)*.

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4 Transportation and storage

ATTENTION

Possible damage

Improper transport and improper storage can damage the TSG V4.

— Only transport and store the device in the original packaging.

— Do not remove the required components from the packaging until just before they are mounted.

4.1 Transportation

Check the delivery to ensure it is complete and intact. If you identify any transportation damage or if the delivery is not complete, please inform your distributor.

4.2 Packaging

Environmentally friendly materials only are used for the packaging. Packaging materials are valuable raw materials and can be reused and recycled. Therefore, add the packaging materials to the recycling cycle. Where this is not possible, dispose of the packaging materials according to the local regulations.

4.3 Storage

Store the TSG V4

— in the original packaging

— not outdoors

— dry, frost and dust-free

— protected against aggressive media and direct sunshine

5 Mechanical mounting

5.1 Requirements

— The door must have fixed mechanical end stops for the "open" and "closed" positions, which withstand the applied energy of the TSG V4

— The end stops must be in the immediate vicinity of the timing belt.

— Any closing weight present must not jump.

— The doors must be easy moving.

5.2 Procedure

5.2.1 Assembly
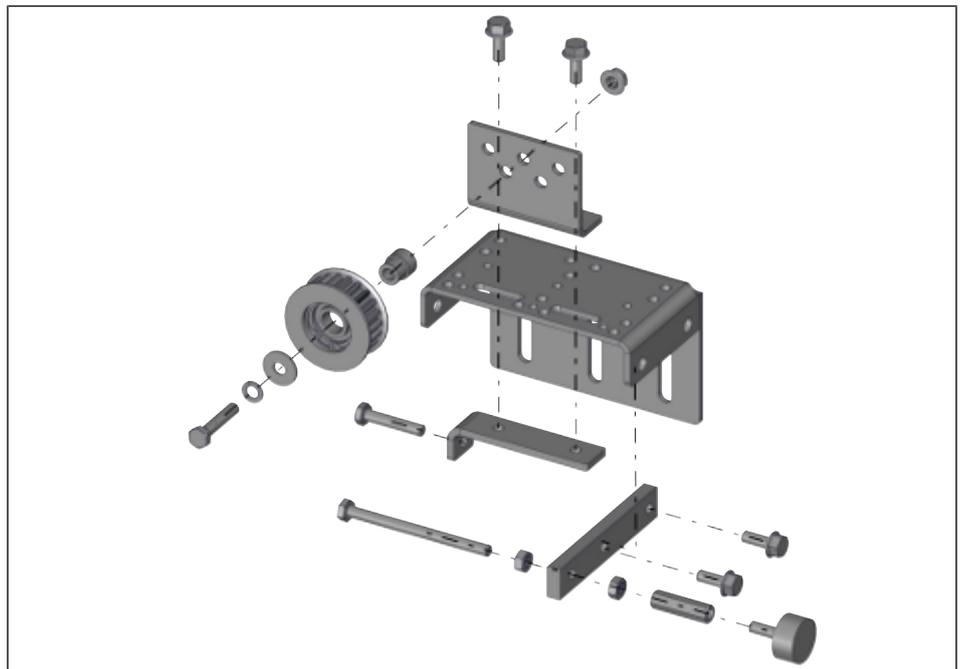
Ill. 22: Assembly of the deflection unit
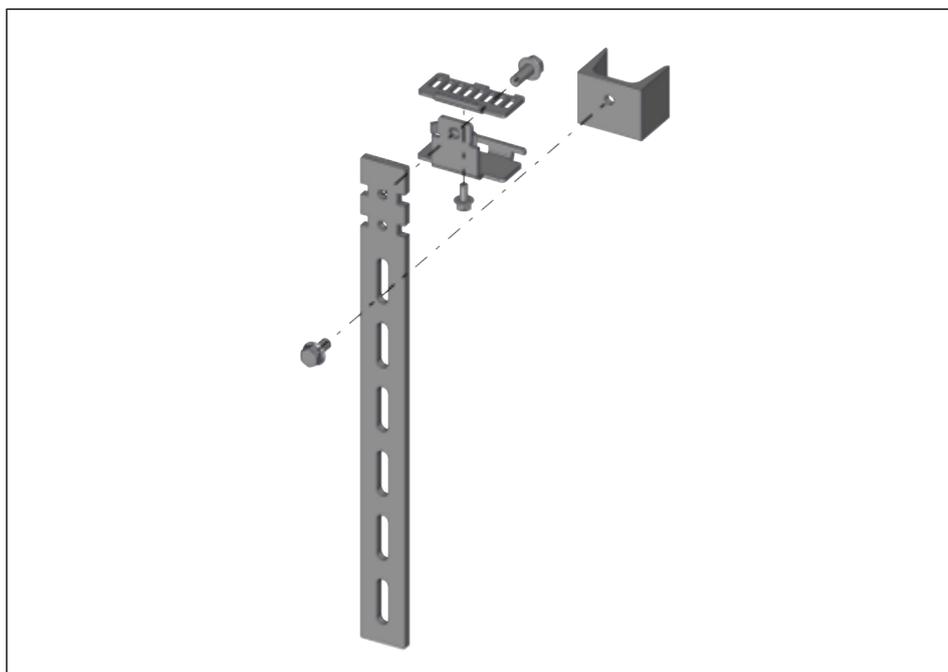
Ill. 23:   Assembly of the coupler unit
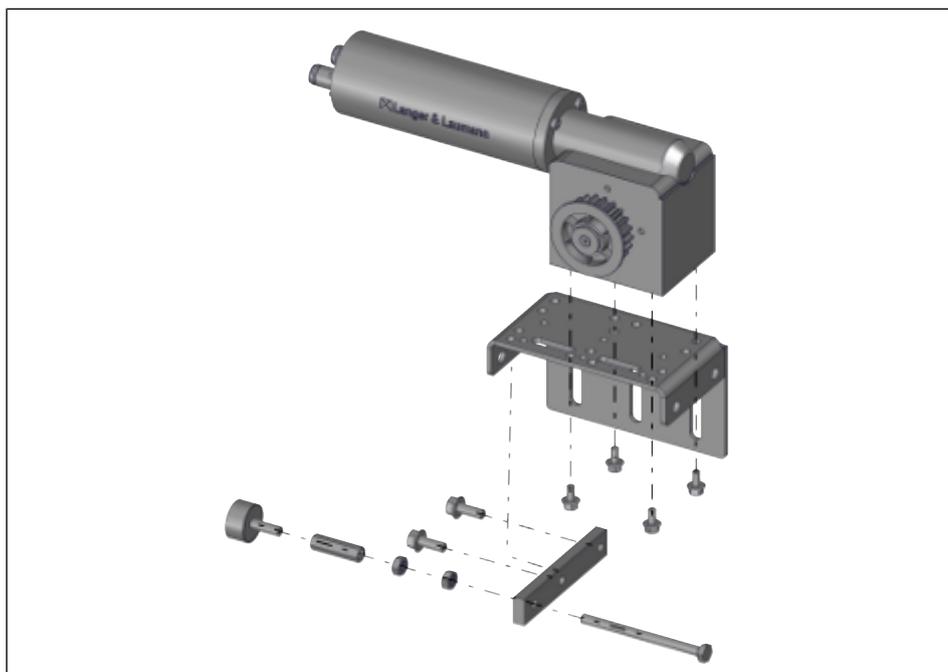
Ill. 24:   Assembly of the drive unit

5.2.2 Mounting on the door

1. Mount the motor of the door drive. It is not important whether the motor is mounted on the open or close side of the door, as the correct travel direction is determined when measuring.

2. Mount the deflection pulley and the tensioning station.

3. **ATTENTION**
   Only use the TSG timing belt locks as timing belt lock (door mounting). Unsuitable mountings can exert a notch effect on the timing belt, which leads to premature tearing of the timing belt.
   Fit the timing belt and connect with the timing belt lock.

4. Tighten the timing belt.

5. Mount the door panel coupler on the fastest door panel and on the timing belt lock.

6. If no fixed stops are present, mount buffers on the combined bracket. Screw the C-profile at a suitable height onto the door panel coupler as a mating part.

7. Securely attach the TSG V4 electronic components. Make sure that the motor and encoder cables can be connected with sufficient clearance at the TSG V4 electronic components.

8. Connect the 9-pin D-sub connector with socket X3 on the TSG V4 electronic components. Plug the motor cable onto terminal block X4 and the shielded terminal of the motor cable on terminal X8 on the TSG V4 electronic components.

5.3 Deflection pulley

When mounting the deflection pulley, make sure that it is fixed with the side of the pressed on flanged washer in the direction of the bracket.
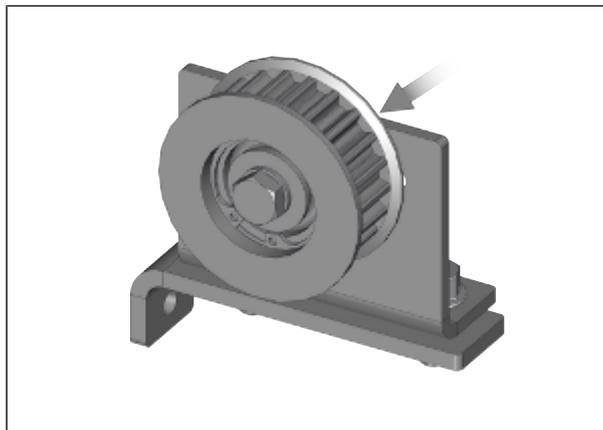
Ill. 25:   Deflection pulley mounted

5.4 Timing belt

The timing belt must be tightened with a specified timing belt tension. This ensures optimum force transfer and protection of the timing belt and the bearing.
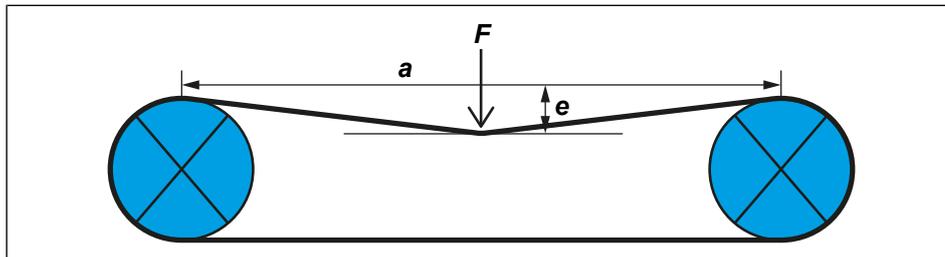
Ill. 26:   Determination of the timing belt tension

At a centre-to-centre spacing **a** of 1 m (centre-to-centre of the axes), the deflection **e** should be 16 mm and the force **F** 18.5 N.

If the timing belt tension is too low it can cause premature wear of the toothing on the timing belt. In addition, the timing belt can jump on the drive gear or the gear at the deflection pulley and therefore cause a changed position of the door. If the timing belt is too high, the load on the bearing is increased, the door drive power is reduced and leads to premature wear of the toothing on the timing belt.

The timing belt pulleys (motor and deflection pulley) must be aligned for good alignment. Equally, the shaft parallelism must be checked. The angle deviation must not exceed β = 0.7°.
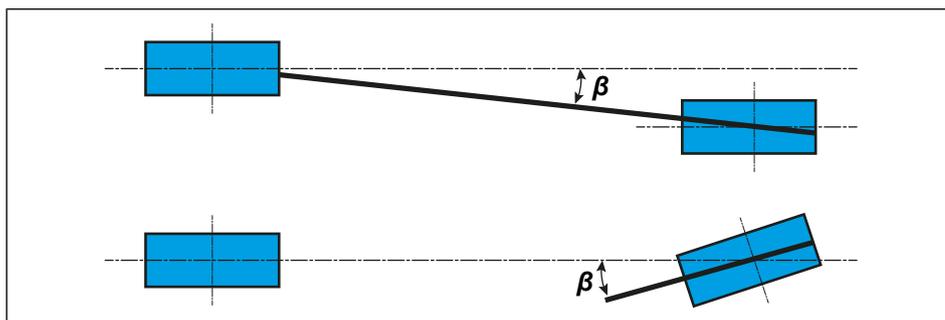
Ill. 27:   Timing belt alignment

If the maximum angle deviation is exceeded the timing belt can rub against the flanged washers and can cause damage and premature wear to the timing belt edge. In addition, the uneven loading of the tension strand which impairs the life considerably.

6 Electric setting, parameterisation and commissioning

6.1 Overview

This section describes the diverse setting options of the TSG V4.

The settings of the parameters and the allowable closing forces (kinetic energy, static force) on the main and secondary closing edges must be checked and recorded by the skilled person carrying out the work after the commissioning or after changing parameters (see also ▶ *Setting the force limitation [p. 65]*).

6.2 7-segment display

On the TSG V4 electronic components there is a two-digit 7-segment display to show the applied state and to present the menu with the parameters and their values.

Display	Meaning
--	No control is present.
nL	The TSG is not measured, manual measuring is required. If the TSG V4 electronic components detect an incorrect motor or an incorrect motor connection, the display flashes and a measurement is not possible (see also ▶ *Manual measuring [p. 49]*).
oP	The "open" signal is applied.
cL	The "close" signal is applied.
od	The door is open.
cd	The door is closed.
bL	The door is blocked.
o1	An intermediate position has been reached (see also).
o5	The reversing distance has been reached (parameter *bd*, see also ▶ *Using setting of the b parameters [p. 56]*)
AA	Triggering of the stop function (see also Stop function)
LC	Triggering of external sensor

Table 30:   Display

The 7-segment display switches off automatically if the jog wheel is not used for 30 minutes. The display is switched on again by turning or pressing the jog wheel.

The two-digit 7-segment display can display up to three-digit values. The front and rear part of the number to be displayed are displayed alternately every second. Two-digit values are displayed without cycling.

Example   The parameter *A.C* contains the value **172**. The display shows "_ /" for a second and "72" in the next second.

If the optionally available emergency power supply is installed, then the dot in the right-hand part of the display informs about the operating state.

Emergency power supply status display

Dot in right-hand part	State	Description
Off	TSG V4 Is switched off.	Mains power voltage not available and batteries exhausted or not connected.
Flashes (0.5 s intervals)	Battery mode	Mains power supply not available and the batteries supply the TSG V4 electronic components.
Flashes (1 s intervals)	Charging mode	Mains power supply available, batteries are being charged.
Lights up	Trickle charging mode	Mains power supply available, batteries are charged, charge is maintained (trickle charging).

Table 31:   Emergency power supply status display

6.3 Menu structure

The TSG V4 is operated and set with a jog wheel located on the TSG V4 electronic components.

Pressing the jog wheel once from normal mode displays the menu tart item "$P0$". Turning the jog wheel clockwise displays the next higher menu item, turning it counterclockwise displays the next lower menu item. Briefly pressing the jog wheel causes a jump to the displayed menu item. If the jog wheel is pressed briefly while "CC" is displayed the display switches to the next higher menu level. Pressing the jog wheel for around five seconds opens setting mode in which the parameter values can be changed by turning the jog wheel. If the required value is displayed, the setting mode is ended by briefly pressing the jog wheel.

If a value is set and saved by pressing the jog wheel, an internal check of successful adoption of the value takes place. If the adoption of the value was not successful, the operator's attention is drawn to this fact by the flashing of the display.

All parameters are saved permanently and are still present after a power failure.
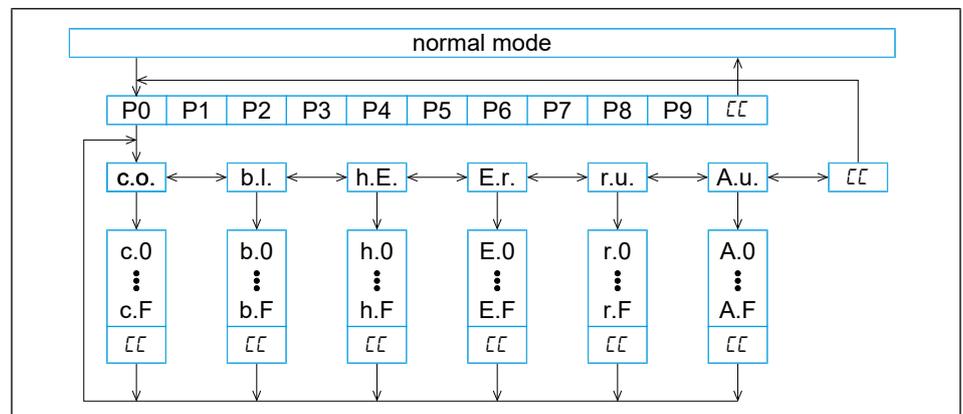
Ill. 28:   Menu structure

6.4 Manual measuring

⚠ **CAUTION**

Risk of injury
After successful ending of the measuring journey the drive is completely ready.
— During the measuring journey, keep parts of your body away from all moving parts.

After the mechanical mounting, a manual measurement of the TSG V4 must be carried out. At the same time, make sure that the door can close and open unobstructed and thus the determined data are not distorted. The door must not be obstructed by objects or sluggishness.

After each mechanical change (for example, tensioning of the timing belt, adjustment of the end stops or buffers), the travel distance can change. Therefore, after each change of the mechanics, a new manual measurement is required.

Preparation for the first commissioning

1. Make sure that the mains power supply is switched off on the input side.

2. Make sure that the connectors X1 (inputs) and X2 (relay outputs) are not plugged into the TSG V4 electronic components.

3. Plug the TSG motor cable onto terminal block X4, the shielded terminal of the TSG motor cable onto terminal block X8 and the encoder cable onto terminal block X3.

4. Switch on the mains power supply (input side) at the TSG V4.

Procedure

1. Use your hand to push the door roughly into the middle of the travel distance.

2. Use the jog wheel to select the parameter **P9**. Keep the jog wheel pressed for around five seconds. The preset value of the total weight of the component to be moved (door panels, guard) appears. Turn the jog wheel to set the correct total weight of the component to be moved in increments of 10 kg, note ▶ *Table 32 [p. 50]*. For telescopic doors, only half the weight of the second door panel that is half as much slower is added to the weight. If the correct value is displayed, briefly press the jog wheel to confirm.

   ⇨ " Ir " appears in the display.

Display	Total weight [kg]
"$O\,I$"	10
"$O2$"	20
…	…
"99"	990

Table 32: Weight input

⬛ ATTENTION

If the wrong position has been selected for the "Open" direction and the "Open" position has already been saved, then it is no longer possible to reverse the travel direction with the jog wheel. The measuring must be continued to the end and then a new measurement started.

---

3. Select the "open" direction first by turning the jog wheel in one direction. If the door moves in the "Close" direction instead of the "Open" direction, then turn the jog wheel in the opposite direction to reverse the direction of movement of the drive.

   ⇨ If the door has reached and saved the "open" position, the door moves to the "closed" position automatically.

➲ If the "Close" position is reached and the "cd" display is shown, then the measuring is successfully completed and the connectors X1 (inputs) and X2 (relay outputs) can be plugged in.

➲ If "nL" appears in the display, the measuring was not successful and must be repeated. If an error message is displayed, the fault must be removed first (see ▶ *Troubleshooting [p. 76]*).

If the parameters are reset to standard with the parameter **EE**, the last set weight is retained. Renewed input of the weight is only possible with subsequent manual measuring.

6.5 Manual mode/manual travel

1. Use the jog wheel to select the parameter *P1*.

   ⇨ "*Hd*" appears in the display.

2. Turn the jog wheel counterclockwise and the "*-o*" display appears. If the jog wheel is pressed and held, the door then moves in the "Open" direction. Turn the jog wheel clockwise and the "*-c*" display appears. If the jog wheel is pressed and held, then the door moves in the "Close" position. Let go of the jog wheel to stop the door.

3. To end manual mode, turn the jog wheel until the "*Hd*" display appears and then press the jog wheel.

Moving in manual mode corresponds to the same travel behaviour caused by applying input signals to terminals X1.1 or X1.2.

As long as the TSG V4 is in manual mode, input signals at terminals X1.1 and X1.2 are ignored. If the TSG V4 is to be moved again via input signals at terminal block X1, manual mode must be ended.

If an external two-channel sensor is parameterised (*h5* = 05) and connected, then its input signal has priority over manual mode.

If the stop function is activated in manual mode the manual mode is then ended. If an error occurs in manual mode the manual mode is also ended. It cannot be reactivated until the error has been removed.

As long as the TSG V4 is in manual mode, LED 10, LED 11 and LED 12 continue to indicate the applied input signals (▸ *Interfaces and displays of the TSG V4 electronic components [p. 26]*); however, the input signals are ignored.

6.6 Standard parameters

6.6.1 Basic setting

The TSG V4 is delivered with an executable basic setting, which generally does not have to be changed.

6.6.2 Travel profiles with default parameters

The following diagrams show schematically which parameters affect which sections of the travel profiles.
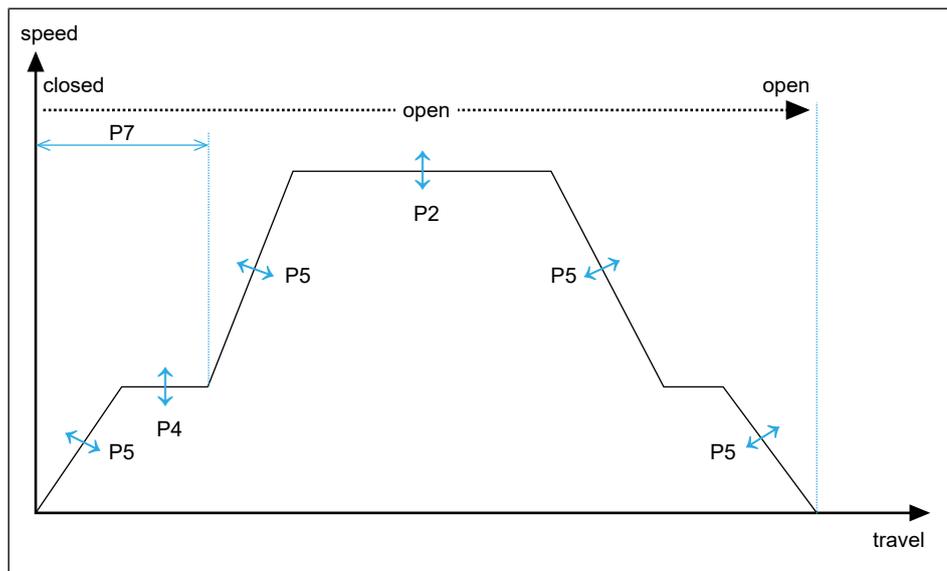
Ill. 29:   "Open" travel profile with default parameters
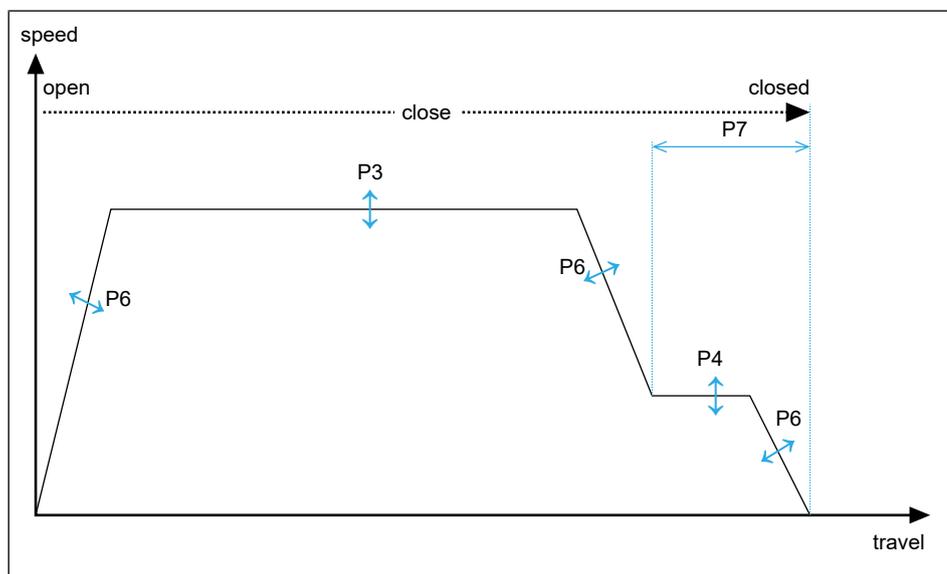
Ill. 30:   "Close" Travel profile with default parameters

6.6.3 User setting of the P parameters

The default parameters (P parameters) enable fast adjustment of the most important properties of the TSG V4 and thus fast setting of the travel values.

Par.	Function	Note	Min	Standard	Max	Factor	Unit
P0	Access to the extended menu	See also ▸ *Extended parameters [p. 54]*					
P1	Manual mode	See also ▸ *Manual mode/manual travel [p. 51]*					
P2	Maximum opening speed		01	50	99	0.01	m/s
P3	Maximum closing speed		01	30	99	0.01	m/s
P4	Locking and unlocking speed	Creep speed just before the end position (closed)	01	05	*P3*	0.01	m/s
P5	Acceleration and braking in the opening direction		01	03	50	0.1	m/s²
P6	Acceleration and braking in the closing direction		01	03	50	0.1	m/s²
P7	Locking and unlocking distance	Creep distance just before the end position (closed)	00	03	99	1	cm
P8	"Blocked detection" threshold value in closing direction		0.1	4.0	9.9	1	
P9	Activating reference journey	See also ▸ *Manual measuring [p. 49]*					
CC	Ext the current level of the menu.						

Table 33:   P parameters

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6.7 Extended parameters

6.7.1 Travel profiles with extended parameters

The following diagrams show schematically which parameters affect which sections of the travel profiles.
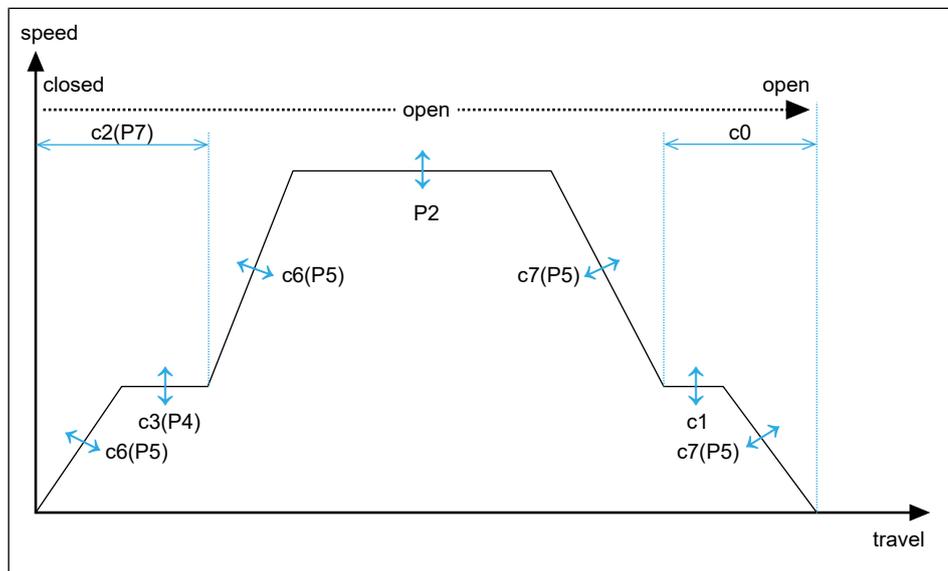
Ill. 31:   "Open" travel profile with extended parameters
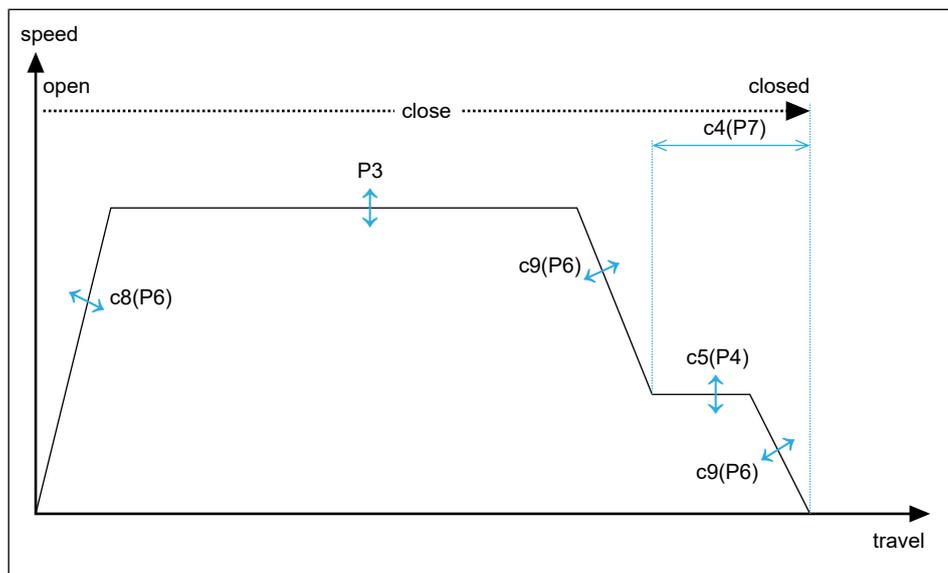
Ill. 32:   "Close" Travel profile with extended parameters

6.7.2 User setting of the c parameters

The travel values can be set using the c parameters to adjust the travel values individually to the respective use case. It must be noted that when some P parameters are changed, several c parameters are also changed at the same time. This means that the value to which a P parameter is set is automatically entered in the corresponding c parameter.

Par.	Function	Note	Min	Standard	Max	Factor	Unit
c0	Creep distance length in opening direction		00	02	(internal calculation)		cm
c1	Creep speed in opening direction		01	05	0,25 or P2: opening speed	0.01	m/s
c2	Length of the unlocking distance in the opening direction		00	03	(internal calculation)		cm
c3	Unlocking speed in the opening direction		01	05	0,25 or P2: opening speed	0.01	m/s
c4	Length of the locking distance in the closing direction		00	03	(internal calculation)		cm
c5	Locking speed in the closing direction		01	05	0.25 or P3: maximum closing speed	0.01	m/s
c6	Acceleration in the opening direction		01	03	50	0.1	m/s²
c7	Deceleration in the opening direction		01	03	50	0.1	m/s²
c8	Acceleration in the closing direction		01	03	50	0.1	m/s²
c9	Deceleration in the closing direction		01	03	50	0.1	m/s²
cC	Holding torque in opening direction without the "Open door" input signal		0.0	1.0	2.5		A
cd	Holding torque in closing direction without "Close door" input signal		0.0	1.0	2.5		A
cE	Holding torque in opening direction with "Open door" input signal		0.0	1.0	2.5		A
cF	Holding torque in closing direction with "Close door" input signal		0.0	1.0	2.5		A
CC	Ext the current level of the menu.						

Table 34:   c parameters

6.7.3 Using setting of the b parameters

Par.	Function	Note	Min	Standard	Max	Factor	Unit
b2	Threshold value for obstacle detection in the closing direction	Closing force measurement	2.0	4.0	9.9		A
b3	Reaction of the "Door blocked" relay output in the closing direction	**oF**: continuously **on**: pulse On activating the threshold value for obstacle detection in the closing direction the "Door blocked" output is set. The "Door blocked" output is reset when the "Open" position is reached.	oF	oF	on		
b4	Reaction of the door drive in case of blocking in the closing direction		oF	oF	on		
		oF: if the door is blocked, the drive stops immediately. Opening of the door if the input signal changes to "Open door". **on**: automatic reversing also with "the "Close door" input signal until the "open" position is reached. If the "Close door" input signal is still applied the door then closes again immediately. The parameter *h5* can be used to set the hold-open time (▸ *User setting of the h parameter [p. 57]*).					
b5	Activation of the blocked detection in the opening direction	**oF**: off **on**: on	oF	on	on		
b6	Blocked detection in the first 30 % of the opening distance	**oF**: blocked detection off in the first 30 % of the opening distance **on**: blocked detection on in the whole opening distance	oF	on	on		
b7	Threshold value for the blocked detection in the opening direction		2.0	9.5	9.9		A
b8	Reaction of the "Door blocked" relay output in the opening direction	**oF**: continuously **on**: pulse	oF	on	on		
b9	Reaction of the door drive in case of blocking in the opening direction		oF	oF	on		
		oF: if the door is blocked, the drive stops immediately. Closing of the door when the input signal changes to "Close door". **on**: automatic reversing even with "Open door" input signal until the "closed" position is reached. If the "Open door" input signal is still applied the door then opens again immediately.					
bA	Length of the output pulse at the "Door blocked" relay output in the opening and closing direction	Only effective if *b3* and/or *b8* = **on**	0.1	1.0	2.0		s
bb	Capture range for the "door closed" position	The obstacle detection is not active in this area.	01	05	50		mm
bC	Capture range for the "door open" position	The obstacle detection is not active in this area.	01	10	50		mm

Par.	Function	Note	Min	Standard	Max	Factor	Unit
bd	Reversing distance	Effective for obstacle detection and sensor monitoring.	00	00	99		cm
		Obstacle detection If the door is blocked, the TSG V4 reverses by the set value. If the value is set to 00 or 99, complete reversing takes place. Only active if the parameter *b4* or *b9* has been activated. The smallest reversing distance to be carried out is 5 cm. **Sensor monitoring** If the sensor is triggered on closing, the TSG V4 reverses by the set value. If the value is set to 99, complete reversing takes place. The smallest reversing distance to be carried out is 5 cm.					
bE	Slow movement to blocked position	If the door was blocked in the closing direction, the TSG V4 moves slowly to the blocked position with the next closing movement.	oF	on	on		
CC	Ext the current level of the menu.						

Table 35:   b parameters

6.7.4 User setting of the h parameter

Par.	Function	Note	Min	Standard	Max	Factor	Unit
h0	Continuous test: Open door/close door		00	00	03		
		The door opens and closes continuously. The input signals at X1 are ignored. There is a pause of 5 seconds between the individual travel movements.					
h1	Inputs and outputs setting		00	00	08		
		00, 01: has no function 02: pulsed mode of inputs X1.1 and X1.2 (pulse length at least 0.2 s). 03: pulsed mode of input X1.1 (pulse length at least 0.2 s). Input X1.2 is not evaluated. When the pulse is applied the door opens completely and closes automatically after the time set with *h5* has expired. 04: Signal acquisition for pulsed operation of input X1.1. 05: Parallel reception of the input signals via terminal X1 (pulse mode such as *h1* = 04) and connected expansion board (e.g. PROFINET). 06: Parallel reception of the input signals via terminal X1 (pulse mode such as *h1* = 03) and connected expansion board (e.g. PROFINET). 07: Parallel reception of the input signals via terminal X1 (pulse mode such as *h1* = 02) and connected expansion board (e.g. PROFINET). 08: Parallel reception of the input signals via terminal X1 (hold to run operation such as *h1* = 01) and connected expansion board (e.g. PROFINET).					
h2	Leading limit switch		00	00	31		
		The relay outputs for "Door open" or "Door closed" (terminal block X2) can be set to be leading. In keeping with the configuration, they switch before the teached-in end position has been completely reached (see ▶ *Leading limit switch [p. 69]*).					
h3	Input X1.3 function		00	00	06		
		00: stop function, one-channel▶ *Stop function, one channel [p. 68]* (see Stop function) 01, 02: has no function 04: stop function, two-channel (see ▶ *Stop function, two-channel [p. 68]*) 05: stop function, the door stops if the input signal is interrupted. 06: remeasuring function (see ▶ *Remeasuring the door distance [p. 72]*) The parameter *h3* is **not** reset to default on loading the default settings (see also ▶ *Error with displayed error code [p. 77]*).					

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Par.	Function	Note	Min	Standard	Max	Factor	Unit
h5	Reversing time		00	00	99		s
		If the "External sensor" (*hA* = 05 or 15), "Automatic reversing" (*b4* = on) or "Pulsed operation X1.1" (*h1* = 03) function is active, the door remains open for the set value. If the value is 00, the door closes again immediately. If the door has arrived in the reversing position, the time is counted back and the remaining value is shown in the display.					
h6	Speed after return of mains power supply and speed while measuring.	Speed on referencing the two end positions after voltage return and during the measuring (see also ▸ *User setting of the P parameters [p. 53]*, P9).	01	09	25	0.01	m/s
h7	Support mode/initiation of the door		00	00	99		
		01: support mode (▸ *Power-assisted sliding of the door [p. 71]*) 02: initiation of the door (▸ *Initiating the door [p. 71]*) 03: Activation of the braking function in case of too fast manual movements (▸ *Braking function in case of too fast manual movements [p. 71]*) All other values except 01, 02 and 03 lead to deactivation of the functions described under 01, 02 and 03.					
h8	Force for checking end position in CLOSED		0.1	3.5	9.9		A
h9	Force for checking end position in OPEN		0.1	1.0	9.9		A
hA	Mode selection (see ▸ *Mode setting with parameter hA [p. 59]*)	Only if the corresponding optional additional circuit board is used.	00	00	99		
hb	Part of the "Power-assisted sliding of the door" function (▸ *Power-assisted sliding of the door [p. 71]*), is only effective if the function is activated via h7 = 01.	00: speed detection is not active, the function is switched off. 01…99: the larger the value, the slower the door must be moved so that the power assistance becomes effective.	00	0	99	1	%
hC	Part of the "Power-assisted sliding of the door" function (▸ *Power-assisted sliding of the door [p. 71]*), is only effective if the function is activated via h7 = 01.	00: power assistance is not possible, the function is switched off. 01…99: the larger the value, the larger the power assistance on moving the door.	00	0	99	1	%
hd	Force for checking the end position when measuring in CLOSED	If the parameter is reduced, renewed measuring must then take place.	0.1	3.0	9.9		A
hE	Force for checking the end position when measuring and referencing in OPEN	If the parameter is reduced, renewed measuring must then take place.	0.1	3.0	9.9		A

Par.	Function	Note		Min	Standard	Max	Factor	Unit
hF	Suppression of blocked detection in the last (maximum) 50 mm of the closing travel.	The maximum 50 mm is made up of the values of the parameters **bb** and **hF**. Example: **bb** = 10 mm => **bb** = maximum 40 mm. In The blocked detection is not active in this area.						
CC	Ext the current level of the menu.							

Table 36: h parameter

6.7.5 Mode setting with parameter hA

Value	Function	Accompanying documents
00	Operation of the TSG V4 with discrete control and the following functions: — Intermediate position — Referenced message — Ready message	*1.20.91550_TSG_ExpansionBoard_relay_InstructionsForUse* *1.20.91551_TSG_ExpansionBoard_ElectronicComponents_InstructionsForUse*
01	reserved	
02	reserved	
03	reserved	
04	Operation of the TSG V4 with discrete control and safety function: — ZS operation, two-channel	*1.20.91551_TSG_ExpansionBoard_ElectronicComponents_InstructionsForUse*
05	Operation of the TSG V4 with discrete control and safety function: — Connection of external sensor, two-channel	*1.20.91551_TSG_ExpansionBoard_ElectronicComponents_InstructionsForUse*
06	reserved	
07	reserved	
08	reserved	
09	reserved	
10	reserved	
11	MxP50/MxP101 substitute	*1.20.91492_TSG_for_MxP50_V1.01_en*
12	Operation of the TSG V4 with control via PROFINET/EtherCAT/CAN	*1.20.91518 TSG EtherCAT application note* *1.20.91519 TSG EtherCAT Slave quick guide* *1.20.91516 TSG PROFINET application note* *1.20.91517 TSG PROFINET quick guide* *1.20.91522 TSG CAN CNC quick guide* *1.20.91550_TSG_ExpansionBoard_relay_InstructionsForUse* *1.20.91551_TSG_ExpansionBoard_ElectronicComponents_InstructionsForUse*
13	reserved	
14	Operation of the TSG V4 with control via PROFINET/EtherCAT and safety function: — ZS operation, two-channel	*1.20.91518 TSG EtherCAT application note* *1.20.91519 TSG EtherCAT Slave quick guide* *1.20.91516 TSG PROFINET application note* *1.20.91517 TSG PROFINET quick guide* *1.20.91551_TSG_ExpansionBoard_ElectronicComponents_InstructionsForUse*

Value	Function	Accompanying documents
15	Operation of the TSG V4 with control via PROFINET/ EtherCAT and safety function: — Connection of external sensor, two-channel	*1.20.91518 TSG EtherCAT application note* *1.20.91519 TSG EtherCAT Slave quick guide* *1.20.91516 TSG PROFINET application note* *1.20.91517 TSG PROFINET quick guide* *1.20.91551_TSG_ExpansionBoard_ElectronicComponents_InstructionsForUse*
16	reserved	
17	reserved	
18	reserved	
19	reserved	
20	reserved	
21	reserved	
22	reserved	
23	reserved	
24	reserved	
25	Operation of the TSG V4 with discrete control and safety function: — ZS operation, two-channel, only active in closing direction	*1.20.91551_TSG_ExpansionBoard_ElectronicComponents_InstructionsForUse*
26	Operation of the TSG V4 with control via PROFINET/ EtherCAT and safety function: — ZS operation, two-channel, only active in closing direction	*1.20.91518 TSG EtherCAT application note* *1.20.91519 TSG EtherCAT Slave quick guide* *1.20.91516 TSG PROFINET application note* *1.20.91517 TSG PROFINET quick guide* *1.20.91551_TSG_ExpansionBoard_ElectronicComponents_InstructionsForUse*
27	reserved	
28	reserved	
29	reserved	
30	Operation of the TSG V4 with discrete control and safety functions: — Safety fence operation — Manual operation, control of the door according to EN ISO 16090 5.1.3.3 b)	*1.20.91551_TSG_ExpansionBoard_ElectronicComponents_InstructionsForUse*
31	Operation of the TSG V4 with control via PROFINET/ EtherCAT and safety functions: — Safety fence operation — Manual operation, control of the door according to EN ISO 16090 5.1.3.3 b)	*1.20.91518 TSG EtherCAT application note* *1.20.91519 TSG EtherCAT Slave quick guide* *1.20.91516 TSG PROFINET application note* *1.20.91517 TSG PROFINET quick guide* *1.20.91551_TSG_ExpansionBoard_ElectronicComponents_InstructionsForUse*

Table 37:   Mode setting with parameter hA

6.7.6 Error codes (E parameters)

Par.	Function	Min	Standard	Max	Unit	Ready	Reset
E0	Travel not limited	00	00	999	Quantity	No	Automatically after 15 s or Power on reset
E1	Travel disabled	00	00	999	Quantity	No	Automatically after 15 s or Power on reset
E2	EEPROM error	00	00	999	Quantity	No	Power on reset
E3	Blocked on reversing	00	00	999	Quantity	No	Automatically after 15 s or Power on reset
E4	Encoder signals not clear or not available	00	00	999	Quantity	No	Automatically after 15 s. Shutdown of the drive after several attempts without change. Power on reset.
E5	Current sensor monitoring triggered	00	00	999	Quantity	No	Automatically after 15 s. Shutdown of the drive after several attempts without change. Power on reset.
E6	TSG internal monitoring	00	00	999	Quantity	No	Automatically after 15 s. Shutdown of the drive after several attempts without change. Power on reset.
E7	Blocked after switching back on	00	00	999	Quantity	No	Automatically after 15 s or Power on reset
E8	Number of restarts	00	00	999	Quantity	Yes	–
E9	Monitoring of stop input, end stage, self diagnosis	00	00	999	Quantity	No	Automatically after 15 s. Shutdown of the drive after several attempts without change. Power on reset.
EA	Overcurrent in standstill	00	00	999	Quantity	No	Automatically after 15 s or Power on reset
Eb	Voltage error	00	00	999	Quantity	No	Automatically after 15 s or Power on reset
EC	Motor not ok	00	00	999	Quantity	No	Automatically after 15 s. Shutdown of the drive after several attempts without change. Power on reset.
Ed	Motor detection is faulty	00	00	999	Quantity	No	Restart directly possible if the motor is detected
EE	Load default settings	oF	oF	on	oF: off on: on	–	–
EF	Delete error counter	oF	oF	on	oF: off on: on	–	–
CC	Ext the current level of the menu.						

Table 38: E parameters

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6.7.7 Operating state (r parameters)

Par.	Function	Unit	Note
r0	Actual speed	m/s	Displays the momentary speed.
r1	Setpoint speed	m/s	Displays the specified speed.
r2	Current motor current	A	Displays the current motor current.
r3	End stage operating voltage	VDC	Displays the current voltage in the end stage.
r4	Mains voltage	VAC	Displays the last two digits of the mains voltage. Example: Display 30: mains voltage = 230 VAC.
r5	Temperature	°C	Displays the current temperature in the end stage.
r6	Door width (xx0000)	10 m	Displays the measured door width in multiples of ten metres.
r7	Door width (00xx00)	dm	Displays the measured door width in decimetres.
r8	Door width (0000xx)	mm	Displays the measured door width in millimetres.
r9	Current door status (xx0000)	10 m	Displays the current door status in multiples of ten metres.
rA	Current door status (00xx00)	dm	Displays the current door status in decimetres.
rb	Current door status (0000xx)	mm	Displays the current door status in millimetres.
rC	Operating hours (xx0000)	h	Displays the operating hours achieved.
rd	Operating hours (00xx00)	h	Displays the operating hours achieved.
rE	Operating hours (0000xx)	h	Displays the operating hours achieved.
rF	Friction	A	
CC	Exit the current menu level		

Table 39:   r parameters

6.7.8 User setting of the Au parameters

Par.	Function	Note	Min	Standard	Max	Factor	Unit
A0	Intermediate position	See *Instructions for Use 1.20.91551 "TSG-ExpansionCircuit-Board_ElectronicComponents"* and *Instructions for Use 1.20.91550 "TSG-ExpansionCircuit-Board_relay"*.	00	00	05		
		Only if the optional additional circuit board 4E/4A relays or 4E/4A electronic components are used and if **hA** = 00. If a value > 00 is set the intermediate position is active. The tolerance for the saved intermediate position is set: **01**: ± 0.5 cm **02**: ± 1.0 cm **03**: ± 2.0 cm **04**: ± 3.0 cm **05**: ± 4.0 cm					
A1	Reversing brake value	Active if the "Close door" input signal is removed or is reversed.	01	15	50	0.1	m/s²
A2	Maximum opening speed in enable mode	Effective in various modes, see *Instructions for use 1.20.91551 "TSG ExpansionBoard_ElectronicComponents"*, *Application note 1.20.91516 "PROFINET"* and *Application note 1.20.91518 "EtherCAT"*.	*P2* (maximum opening speed)	80	99	0.01	m/s
A3	Acceleration in opening direction in enable mode	Effective in various modes, see *Instructions for use 1.20.91551 "TSG ExpansionBoard_ElectronicComponents"*, *Application note 1.20.91516 "PROFINET"* and *Application note 1.20.91518 "EtherCAT"*.	*c6* (acceleration in opening direction)	07	50	0.1	m/s²
A4	Braking in opening direction in enable mode	Effective in various modes, see *Instructions for use 1.20.91551 "TSG ExpansionBoard_ElectronicComponents"*, *Application note 1.20.91516 "PROFINET"* and *Application note 1.20.91518 "EtherCAT"*.	*c7* (braking in the opening direction)	07	50	0.1	m/s²

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Par.	Function	Note	Min	Standard	Max	Factor	Unit
A5	Maximum closing speed in enable mode	Effective in various modes, see *Instructions for use 1.20.91551 "TSG ExpansionBoard_ElectronicComponents"*, *Application note 1.20.91516 "PROFINET"* and *Application note 1.20.91518 "EtherCAT"*.	**P3** (maximum closing speed)	60	99	0.01	m/s
A6	Acceleration in closing direction in enable mode	Effective in various modes, see *Instructions for use 1.20.91551 "TSG ExpansionBoard_ElectronicComponents"*, *Application note 1.20.91516 "PROFINET"* and *Application note 1.20.91518 "EtherCAT"*.	**c8** (acceleration in closing direction)	07	50	0.1	m/s²
A7	Braking in closing direction in enable mode	Effective in various modes, see *Instructions for use 1.20.91551 "TSG ExpansionBoard_ElectronicComponents"*, *Application note 1.20.91516 "PROFINET"* and *Application note 1.20.91518 "EtherCAT"*.	**c8** (braking in the closing direction)	07	50	0.1	m/s²
A8	Additional mechanical transmission	See ▶ *Mechanical transmission [p. 70]*.	05	1.0	8.0		
A9	Release of the parameter **A8**	See ▶ *Mechanical transmission [p. 70]*.	00	00	01		
AA	User-defined parameter sets; change only after consulting the support of Langer & Laumann		00	00	99		
Ab	Reset IP address in TVis web interface to `172.16.1.150`.		X	X	X	X	X
AC	IP0		X	X	X	X	X
Ad	IP1		X	X	X	X	X
AE	IP2		X	X	X	X	X
AF	IP3		X	X	X	X	X
CC	Ext the current level of the menu.						

Table 40:   Au parameters

6.8 Setting the force limitation

6.8.1 Basic principles

The maximum allowable speeds, forces and energy values must be checked and recorded by the skilled person carrying out the work at the closing and shear edges after commissioning or after changing parameters at the door. A closing force measuring device for determining dynamic and static forces can be borrowed from Langer & Laumann.

6.8.2 Maximum kinetic energy

According to the relevant standards, the maximum kinetic energy W_{kin} at the closing and shear edges must not exceed 10 J. To this end, it is necessary to know the actual total weight of the component to be moved (door panels, guard, …) and to enter them before the measuring (see also ▶ *Manual measuring [p. 49]*).

On exceeding the specified value for the kinetic energy the speed must be lowered so that the limits can be met. The maximum speed to be set is calculated as follows:

$$ v = \sqrt{\frac{2 \cdot W_{kin}}{m}} \qquad \longrightarrow \qquad v \; [m/s] = \sqrt{\frac{2 \cdot 10 \; J}{m \; [kg]}} $$

Where

— v: maximum allowed speed [m/s]

— W_{kin}: kinetic energy [J]

— m: weight [kg]

6.8.3 Maximum static force

According to the relevant standards, the maximum static force F at the closing and shear edges must not exceed 150 N. The parameter *P8* (or *b2* closing direction, *b7* opening direction) sets the values for the maximum static force. By increasing the value in *P8* (or *b2* closing direction, *b7* opening direction), the threshold value for obstacle detection is increased.

6.8.4 Obstacle detection in closing direction

If the door is blocked in the closing direction and the obstacle detection is activated, the door remains stopped as long as the "Close door" input signal is still applied. At the same time, the relay for "Door blocked" switches. If the "Close door" input signal is still applied, the door continues moving in the closing direction after 5 s.

If it is rerouted (the "open door" input signal is applied), the door moves open in a controlled way. The relay for "door blocked" is switched off as soon as the "open" position is reached. The position at which the door was blocked is saved in the TSG V4 for the next journey. If the "Close door" input signal is applied again, the door travels with normal speed up to approx. 5 cm in front of the obstacle and continues travelling with slow speed (parameter to be set *h6*). If the obstacle is removed, the door continues moving to approx. 5 cm after the obstacle with normal speed. The function of the speed change at the blocked position must be switched off or on by the parameter *bE*.

If the parameter **b4** = on, the door is reversed automatically in case of blocking. After reaching the "open" position the door closes again. The reversing distance can be set using the parameter **bd**. If **bd** is larger than 00, the door reverses by at least 5 cm. If **bd** = 00, complete reversing takes place.

If the parameter **b3** = on, the blocked relay is controlled with only one pulse. The length of the pulse is set with parameter **bA**.

The threshold value for the height of the obstacle detection in the closing direction can be set with the parameter **P8** or **b2** and must be checked at the installed door machine.

6.8.5 Obstacle detection in opening direction

If the door is blocked in the opening direction and the obstacle detection is activated, the door remains stopped as long as the "Open door" input signal is still applied. At the same time, the relay for "Door blocked" switches. If the "Open door" input signal is still applied, the door continues moving in the opening direction after 5 s. If it is rerouted (the "Close door" input signal is applied), the door moves in a controlled way, the relay for "Door blocked" is switched off as soon as the "closed" position is reached. If a "Open door" input signal is give again, the door continues moving with normal speed.

The obstacle detection in the opening direction is switched on by default and can be switched off with the parameter **b5** = oF. If the obstacle detection is switched on in the opening direction it is active in the whole travel.

In the first 30 % of the travel of the opening direction the obstacle detection can be switched off by the parameter **b6** = oF.

If the parameter **b9** = on, the door is reversed automatically in case of blocking. After reaching the "closed" position the door opens again. The reversing distance can be set using the parameter **bd**. If **bd** is larger than 00, the door reverses by at least 5 cm. If **bd** = 00, complete reversing takes place.

If the parameter **b8** = on, the blocked relay is controlled with only one pulse. The length of the pulse is set with parameter **bA**.

The threshold value for the height of the 150 N detection in the opening direction can be set with the parameter **b7**.

6.9 Special functions

6.9.1 Holding torque in the end positions

A holding torque can be set in the end positions. The holding door causes the door to be held in the respective end position with a force to be set. A differentiation is made between whether an input signal is applied at the inputs ("Open door" or "Close door") or not.

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

ATTENTION

A holding torque that is too high reduces the life of the motor.

— Only set the holding torque as high as absolutely required.

6.9.1.1 Holding torque without applied input signal

A holding torque can be set so that the door is held in the end position even if an input signal is not applied at the TSG V4. The holding torque in the "open" position without "Open door" signal is set with the parameter *cC*, the holding torque in the "closed" position without "Close door" signal with the parameter *cd*.

Example The higher level control system issues the "Close door" input signal, the door moves closed. If the door is closed, the input signal is removed by the control system and the door is de-energised. On travelling through the well, it is now possible for the door to slowly stop due to vibrations or mechanical stress in hte system and the safety circuit is opened. The holding torque can be variably set to prevent this.

6.9.1.2 Holding torque with applied input signal

A holding torque can be set so that the door is held in the end position even if an input signal is applied at the TSG V4. The holding torque in the "open" position without "Open door" signal is set with the parameter *cE*, the holding torque in the "closed" position with "Close door" signal with the parameter *cd*.

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6.9.2 Stop function

6.9.2.1 Stop function, one channel

The following figure shows the required external wiring of terminal block X5.
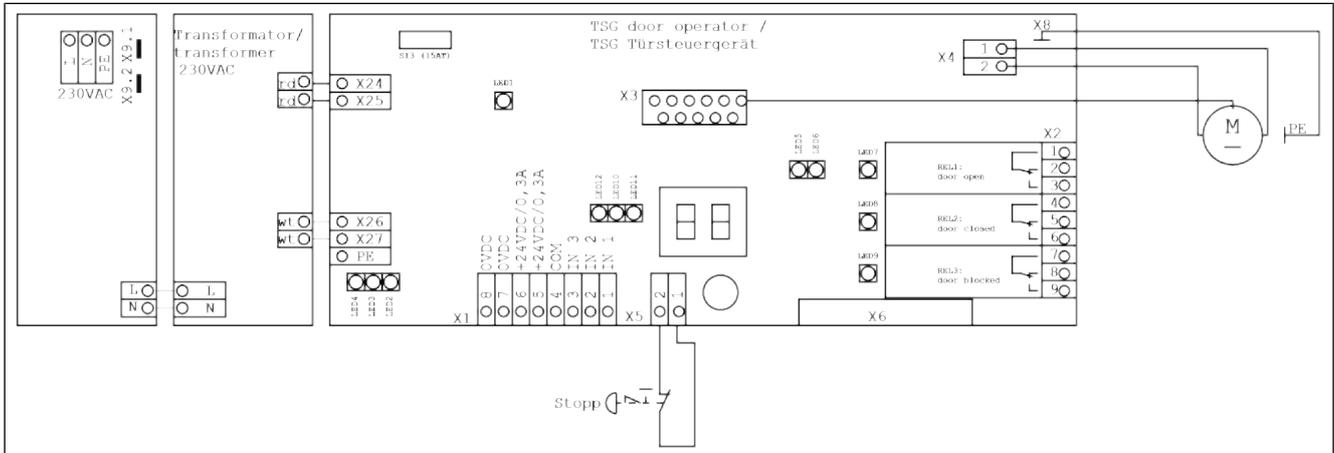
Ill. 33:   Example stop function, one-channel wiring

If the connection between terminals 1 and 2 of terminal block X5 is opened, the motor coasts to a stop. "$\Pi\Pi$" appears in the display.

After restoring the connection the TSG V4 restarts in normal mode.

6.9.2.2 Stop function, two-channel

The following figure shows the required external wiring of terminal block X5.

For activation, the parameter *h3* must have value **04**.

Ill. 34:   Example stop function, two-channel wiring

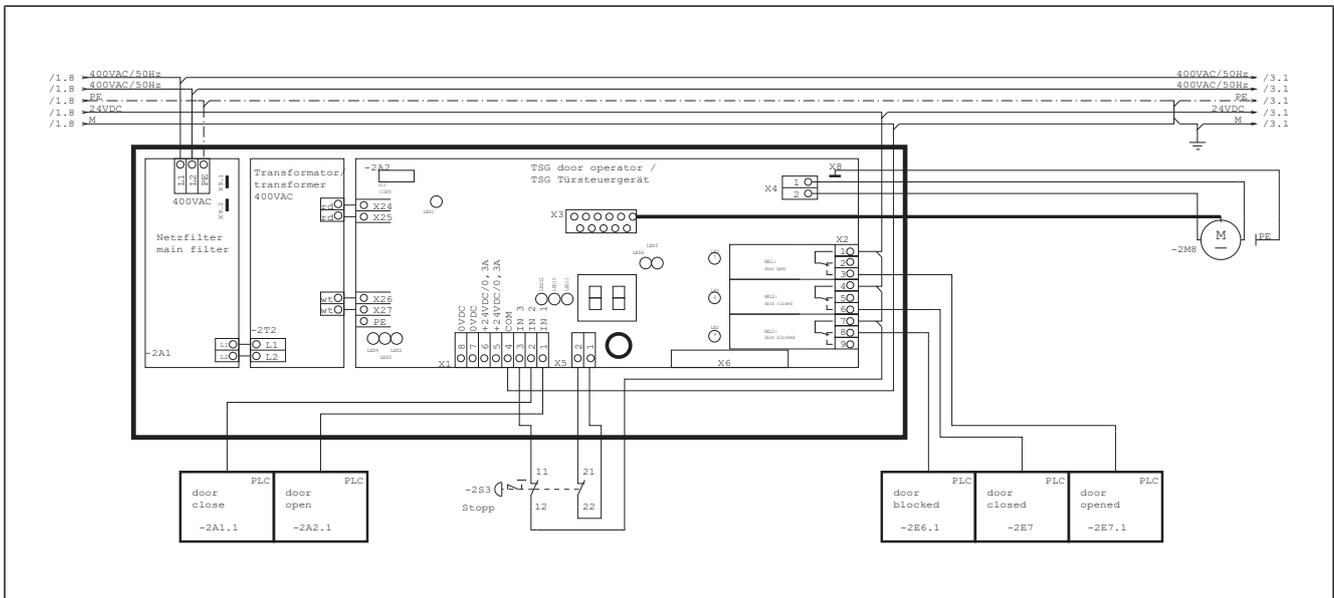If the connections between terminals 1 and 2 on terminal block X5 and the connection to terminal 3 on terminal block X1 are opened, the motor coasts to a stop. "$\Pi\Pi$" appears in the display.

After restoring the connections the TSG V4 restarts in normal operation.

On activation or deactivations, both signals must reach the same state within 0.5 s. If this does not occur or if X5 or X1.3 are disconnected, an error message is issued, "RR" flashes in the display and the ready message goes out. To correct the error, the wiring must be corrected first, the switched on and switched off again.

6.9.3 Leading limit switch

The output signals for "Door open" and "Door closed" (terminal block X2) can be set to be leading. In keeping with the configuration, they switch before the teached-in end position has been completely reached. The door drive continues moving the door until the teached-in end position has been completely reached, even if the input signal recedes. Any connected protective device within the set area is disregarded.

The following table shows which leading is achieved with which setting of the parameter **h2**.

Parameter h2	Leading			Parameter h2	Leading		
	Door open [cm]	Door closed [cm]			Door open [cm]	Door 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	

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6.9.4 Mechanical transmission

6.9.4.1 Description

This section applies to the TSG V4 software version V4.60.12 and higher

A fixed set gear transmission ratio is stored in the default setting in the TSG V4. However, in several applications, speed increases or reductions are desired. A changed mechanical transmission causes the forces, the speeds and the accelerations to be different to those expected. To level out the difference, the existing mechanical transmission can be adjusted in TSG V4.

6.9.4.2 Parameter

To set a changed mechanical transmission, the parameters *A8* and *A9* must be adjusted accordingly.

Par.	Function	Note	Min	Standard	Max	Factor	Unit
A8	Additional mechanical transmission		0.5	1.0	8.0		
A9	Release of the parameter *A8*		00	00	01		
CC	Ext the current level of the menu.						

When the parameter *A8* is changed and released by parameter *A9*, all speed, acceleration and braking parameters are automatically changed accordingly.

When the default settings are loaded, parameters *A8* and *A9* are not reset to the defaults.

When the default settings are loaded, all speed, acceleration and braking parameters are changed depending on the set mechanical transmission.

6.9.4.3 Example

If the mechanical layout differs from the standard layout, a different mechanical transmission exists.

Sequence

1. Commission the system with a measurement process.
2. Determine the transmission to be set.
   – Read off the measured door width from the TSG web interface or in the parameters *r6* to *r8*. **Example:** 5.0 m
   – Measure the existing door width manually (from end stop to end stop, not including the width of the door panel coupler). **Example:** 2.0 m
   – Calculate the transmission: transmission = door width in the TSG / real door width. **Example:** 5.0 m/2.0 m = 2.5
3. Enter the calculated transition in the parameter *A8*. **Example:** *A8* = 2.5
4. Activate the changed transmission with the parameter *A9* = 01.
⮌ The TSG updates the internal travel data based on the new transmission.

6.9.5 Power-assisted sliding of the door

If the door is at a standstill and is moved in one of the two possible directions manually, this is detected and limited power assistance is activated. If manual movement of the door is set, the TSG V4 also sets the power-assisting effect.

For activation, parameter *h7* must have value 01.

The parameter *hb* is used to set the sensitivity of detection on moving the door.

— If *hb* = 00, speed detection is not active, the function is switched off.

— If 00 < *hb* <= 99: the larger the value, the slower the door must be pushed so that the power assistance is effective.

The parameter *hC* is used to set the level of power assistance on moving the door.

— If *hC* = 00, power assistance is not possible, the function is switched off.

— If 00 < *hC* <= 99: the larger the value, the larger the power assistance on moving the door.

6.9.6 Initiating the door

If the door is pushed in a certain direction from a standstill, this is registered by the TSG V4. The TSG V4 then sets an internal movement command in the registered direction of movement and starts the movement as if a movement command has been created by the higher-level control system. When the door arrives at the end position, the movement command is deactivated.

For activation, parameter *h7* must have value 02.

6.9.7 Braking function in case of too fast manual movements

In case of too fast manual movement of the guard, intervention occurs via the door control unit, which actively counteracts the movement. The aim is to reduce the movement speed of the guard.

For activation, parameter *h7* must have value 03. Intervention threshold: exceedance of a speed of approx. 0.1 m/s.

Recommended area of use: vertical guards.

Valid from: TSG firmware version V4.60.25

6.9.8 Remeasuring the door distance

The door distance is teached-in again with the help of the "remeasuring" function. The directions of rotation are retained.

The remeasuring can be started in two ways:

1. Start via a discrete input

2. Start via the PROFINET or EtherCat connection, refer to the documents:
   — *1.20.91516 TSG PROFINET_Vx.xx_en application note*, chapter: "Remeasuring the TSG" or
   — *1.20.91518 TSG EtherCAT_ApplicationNote_Vx.xx_en*, "Remeasuring the TSG" section

The functional sequence via the discrete input is described in the following:

The input X1.3 is used to start the "remeasuring" function.

1. Set parameter *h3* to `06` => remeasuring possible via X1.3.

2. If X1.3 is operated > 1s and
   — no error currently exists
   — the stop function is not active
   — test operation is not active
   — configuration mode via PROFINET is not active
   — the time set with *h5* is not active
   — the door is not currently moved via signals
   — *P9* is currently not used for measuring in
   — the door has already been measured once

   starts the remeasuring process.

3. The door opens and then closes.

4. If the door has been closed and the limit switch is active, the process is ended.

5. If an error occurs during the sequence, the door drive stops with an error.
   — The display shows "*nL*".
   — It is possible to restart the remeasurement function via X1.3.

6. The remeasuring is interrupted if the function of input X1.3 drops off during the sequence.
   — The drive then stops with message "*nL*" in the display and is no longer ready to function.
   — It is possible to restart the remeasurement function via X1.3.

7 Operation

7.1 Restart after power failure and restored mains

After a power failure and mains recovery, the TSG V4 checks the teached-in positions (reference journey). To do so, the TSG V4 moves with reduced speed until both end positions are reached and detected. This speed can be set with the parameter *h6*.

The travel must be free of obstacles during the reference journey. IF this is not the case, the obstacle is detected and is output in the display of the TSG V4 electronic components "$E\,7$" (see also ▸ *Error codes (E parameters) [p. 61]*). The referencing then begins again.

7.2 Normal operation

In normal operation the TSG V4 works automatically according to the set parameters.

8 Maintenance

8.1 Maintenance safety instructions

⚠ **DANGER**

Risk of fatal injury from electrical current

Dangerously high electrical voltages may be present on cables and terminals.

— Only qualified electricians may work on electrical components.

— Before starting work on electrical components, the five electrical safety rules must be observed:

   — Disconnect

   — Secure against reconnection

   — Verify absence of voltage

   — Earth and short-circuit

   — Provide protection against adjacent live parts

⚠ **WARNING**

Risk of injury from moving parts

Error and problem solving (troubleshooting) and maintenance and repair work that is carried out by unauthorised or unqualified personnel can lead to serious accidents due to their lack of relevant technical knowledge and skills. Moving parts can cause injury.

— Wear the prescribed personal protective equipment.

— Allow authorised skilled personnel of Langer & Laumann only to correct errors and solve problems.

— Allow Langer & Laumann only to set, repair or replace safety-related components.

— If you have any questions or problems, contact the customer service of Langer & Laumann.

⚠ **CAUTION**

Risk of burning on the motor

The motor of the TSG V4 can get very hot in continuous operation, thus causing a risk of burns.

— Allow the motor to cool before starting the work.

— Wear the specified personal protective equipment (suitable protective gloves).

8.2 Regular checks

The following checks must be carried out at regular intervals, however, at least every three months:

1. Check the doors, the drives and the electronics for identifiable damage and defects.

2. Check the easy movement of the door.

3. Check the timing belt for wear and mechanical tension.

4. Check the function of the facility (safety devices, inputs and outputs).

5. After completing the checks, restart all protective and safety devices.

If damage and/or defects are found, the facility must be taken out of service immediately. All damage and defects must be removed before renewed commissioning.

9 Troubleshooting

9.1 Troubleshooting safety instructions

> ⚠ **DANGER**
>
> **Risk of fatal injury from electrical current**
> Dangerously high electrical voltages may be present on cables and terminals.
> — Only qualified electricians may work on electrical components.
> — Before starting work on electrical components, the five electrical safety rules must be observed:
>   — Disconnect
>   — Secure against reconnection
>   — Verify absence of voltage
>   — Earth and short-circuit
>   — Provide protection against adjacent live parts

> ⚠ **WARNING**
>
> **Risk of injury from moving parts**
> Error and problem solving (troubleshooting) and maintenance and repair work that is carried out by unauthorised or unqualified personnel can lead to serious accidents due to their lack of relevant technical knowledge and skills. Moving parts can cause injury.
> — Wear the prescribed personal protective equipment.
> — Allow authorised skilled personnel of Langer & Laumann only to correct errors and solve problems.
> — Allow Langer & Laumann only to set, repair or replace safety-related components.
> — If you have any questions or problems, contact the customer service of Langer & Laumann.

> ⚠ **CAUTION**
>
> **Risk of burning on the motor**
> The motor of the TSG V4 can get very hot in continuous operation, thus causing a risk of burns.
> — Allow the motor to cool before starting the work.
> — Wear the specified personal protective equipment (suitable protective gloves).

9.2 Error with displayed error code

If the TSG V4 electronic components detect an error, an error code appears on the display (see also ▶ *Error codes (E parameters) [p. 61]*). The following table lists possible causes and troubleshooting actions for each error code.

Par.	Function	Meaning	Possible cause	Remedy
E0	Travel not limited	The door is outside the teached-in door distance by at least 5 cm.	Timing belt tension has changed.	Tighten the timing belt. Start measuring journey. [1]
			Travel incorrectly measured.	Start measuring journey. [1]
			Door mechanics have been changed.	Check the mechanics. Start measuring journey. [1]
			No defined end stops available.	Retrofit end stops on the car. Start measuring journey. [1]
E1	Travel disabled	The door does not move. This error occurs <u>outside</u> the area of the blocked detection. The blocked detection is set <u>within</u> the area of the blocked detection and "*bL*" appears in the display. The current door travel is shorter than the door width teached-in during the reference journey. This error resets itself after 15 seconds. During this time, the door drive does not respond to input signals at X1. If input signals exist at X1, the door drive starts with a reference journey with slow speed.	Timing belt tension has changed.	Tighten the timing belt. Start measuring journey. [1]
			Landing door limits the travel.	Uncouple the landing door from the car door. Start measuring journey. [1]
			Blocking occurs within the area in which the blocked detection is switched off.	Check the door travel.
			The door is blocked at least three times consecutively during the opening.	Check the door travel.
			The door is blocked at least ten times consecutively during the closing.	Check the door travel.
			Door locking device has not unlocked.	Check the mechanics of the door.
			Door measuring journey was faulty or was not carried out.	Start measuring journey. [1]
E2	EEPROM error	The drive is stopped if an EEPROM error occurs.	Possible hardware defect.	TSG V4 Replace electronic components.
E3	Blocked on reversing	The door drive has detected an obstacle and reverses. The door was also blocked on reversing.	There is an obstacle in the door.	Check the door travel.
		The door drive reverses due to the triggering of the external sensor. The door was also blocked on reversing.		
		The door drive has detected an obstacle in the opening direction and reverses. During the reversing the external sensor also triggers.		

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Par.	Function	Meaning	Possible cause	Remedy
E4	Encoder signals not clear or not available	The encoder (encoder at the motor) does not send any values to the TSG V4.	Display of *E4* flashes fast and regularly: cable to the encoder is not connected.	Connect cable to the encoder.
			Display of *E4* flashes fast and regularly: cable to the encoder is damaged.	Replace the cable to the encoder.
			Display of *E4* flashes fast and regularly: cable to the motor is not connected.	Connect cable to the motor.
			Display of *E4* flashes fast and regularly: Cable to the motor is damaged.	Replace the cable to the motor or the motor.
			Display of *E4* flashes on for 0.5, off for 1.5 seconds: motor connection cores are twisted.	Test motor protection cores and correct the connection.
			Display of *E4* flashes on for 0.5 seconds, off for 1.5 seconds: encoder connection cores are twisted.	Check the encoder connection cores and correct connection.
			Display of *E4* flashes on for 1.0 seconds, off for 1.0 seconds: end stage is defective.	TSG V4-Replace electronic components.
			Wrong operating voltage.	Check operating voltage and correct if necessary.
E5	Current sensor monitoring triggered	The monitoring of the current sensor has triggered.	Cable to the motor damaged.	Replace the cable to the motor or the motor.
			Current sensor is defective.	TSG V4-Replace electronic components.
			Wrong operating voltage.	Check operating voltage and correct if necessary.
			CPU, RAM or ROM is defective.	TSG V4-Replace electronic components.
E6	TSG internal monitoring	Check CPU, RAM and ROM.	RAM triggered.	TSG V4-Replace electronic components.
			Display of *E6* flashes on for 1.5 seconds, off for 0.5 seconds: run time monitoring has triggered.	
			Display of *E6* flashes on for 1.0 seconds, off for 1.0 seconds: timing monitoring has triggered.	
			Display of *E6* flashes on for 0.5 seconds, off for 1.5 seconds: ROM has triggered.	

Par.	Function	Meaning	Possible cause	Remedy
E7	Blocked after switching back on	Door was blocked after mains restored.	After the TSG V4 is switched on again or an error has occurred, the door must rereference itself. If the door is blocked during this travel the error is triggered. The door mechanics have been changed, but the TSG V4 has not been teached-in again.	Check the mechanics. Start measuring journey. [1]
E8	Number of restarts	Counter for the number of mains starts.	Mains power has failed, the TSG V4 electronic components carry out a restart.	Check supply cable.
				Check backup fuse.
				Check fuse on the TSG V4 electronic components electronic components.
				If necessary, replace TSG V4 electronic components.
E9	Monitoring of stop input, end stage, self diagnosis		End stage is defective.	TSG V4-Replace electronic components.
			Set parameter is incorrect.	Check parameter and change if necessary.
EA	Overcurrent in standstill	The connected motor draws too much current.	End stage is defective.	TSG V4-Replace electronic components.
			Current sensor is defective.	TSG V4-Replace electronic components.
Eb	Voltage error	The various operating voltages on the TSG V4 electronic components are monitored and evaluated. An error has occurred.	5 V not ok.	TSG V4-Replace electronic components.
			Eb display flashes on for 0.5 seconds, off for 1.5 seconds: 12 V not ok.	
			Eb display flashes on for 1.0 seconds, off for 1.0 seconds: 24 V not ok.	
			Eb display flashes on for 1.5 seconds, off for 0.5 seconds: 38 V not ok.	
EC	Motor is faulty	The connected motor is damaged.	An incorrect motor is connected.	Replace the motor.
			Cable to the motor damaged.	Replace the cable to the motor or the motor.
			Operating voltage too low.	Check the operating voltage and correct if necessary.
Ed	Motor detection is faulty		The motor is not detected by the cable to the encoder.	Test the cable to the encoder and start the measuring journey. [1]
			Short circuit in encoder connector.	Test the encoder connector and start measuring journey. [1]

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Par.	Function	Meaning	Possible cause	Remedy
EH	Temporary warning message: Motor is faulty. The **EH** display is only shown as long as the error is queued. No error counter is stored, a readout is not possible.	The internal resistance of the motor is higher than expected.	The connected motor is damaged.	Replace the motor.
			The cable to the motor is too long.	Check the wiring. If it has been lengthened, change it back.
			Operating voltage too low.	Check operating voltage and correct if necessary.
EL	Temporary warning message: Motor is faulty. The **EL** display is only shown as long as the error is queued. No error counter is stored, a readout is not possible.		Cable to the motor damaged.	Replace the cable to the motor or the motor.
			Cable to the encoder is damaged.	Replace the cable to the encoder.
			Operating voltage too low.	Check operating voltage and correct if necessary.
En	CAN bus communication is interrupted or disturbed. The **En** display is only shown as long as the error is queued. No error counter is stored, a readout is not possible.	The CAN bus connected to the additional circuit board is interrupted or faulty.		Check CAN bus cable and connections.
				Check CAN bus master.
Eu	Additional communication circuit board is interrupted or faulty. The **Eu** display is only shown as long as the error is queued. No error counter is stored, a readout is not possible.	Communication with the connected additional circuit board is interrupted or disrupted.	Flat ribbon cable not plugged in correctly or is defective.	Plug in flat ribbon cable or replace TSG V4 electronic components.
			Wrong additional circuit board selected via the parameter **hA**.	Correct value in parameter **hA**.
			Additional circuit board is defective.	TSG V4-Replace electronic components.
EE	Load default settings			
EF	Delete error counter			

1. See also ▶ *Manual measuring [p. 49]*.

Table 41:   Meaning of the error codes for troubleshooting

9.3 Error without displayed error code

The following table contains information on errors for which an error code cannot be displayed when they occur.

Error	Possible cause	Remedy
Drive is not running.	TSG V4 Is de-energised.	Switch on mains power. Check LED 1, LED 2, LED 3 and LED 4.

Table 42:   Further possible causes of error

10 Dismantling and disposal

10.1 Dismantling and disposal safety instructions

⚠ DANGER

Risk of fatal injury from electrical current
Dangerously high electrical voltages may be present on cables and terminals.
— Only qualified electricians may work on electrical components.
— Before starting work on electrical components, the five electrical safety rules must be observed:
  — Disconnect
  — Secure against reconnection
  — Verify absence of voltage
  — Earth and short-circuit
  — Provide protection against adjacent live parts

⚠ CAUTION

Risk of burning on the motor
The motor of the TSG V4 can get very hot in continuous operation, thus causing a risk of burns.
— Allow the motor to cool before starting the work.
— Wear the specified personal protective equipment (suitable protective gloves).

ATTENTION

Risk of environmental damage
Handling and disposal of hazard substances such as lubricants and cleaning agents are subject to legal provisions. If operating supplies and lubricants are not disposed of properly, the environment can be damaged.
— Make sure that the operating supplies are disposed of properly.
— Do not mix waste oil that is produced with other substances or liquids.
— If you have any questions, contact the customer service of Langer & Laumann.

10.2 Disposal

If a return or disposal agreement has not been concluded, recycle or reuse the dismantled parts:

1. Scrap metals.

2. Recycle plastic element.

3. Dispose of the other components according to their material properties.

If you have any questions, contact the customer service of Langer & Laumann.

Electronic components The following electronic components must be disposed of separately:

— Displays, display devices

— Electrical supply

— Controls

— Circuit boards with electronic components

Used operating materials Detailed information on disposal of the lubricants used can be found in the safety data sheets of the lubricants and cleaning agents.

11 Declaration of incorporation

The original EC declaration of Incorporation for the TSG V4 is available on the internet: www.lul-ing.de

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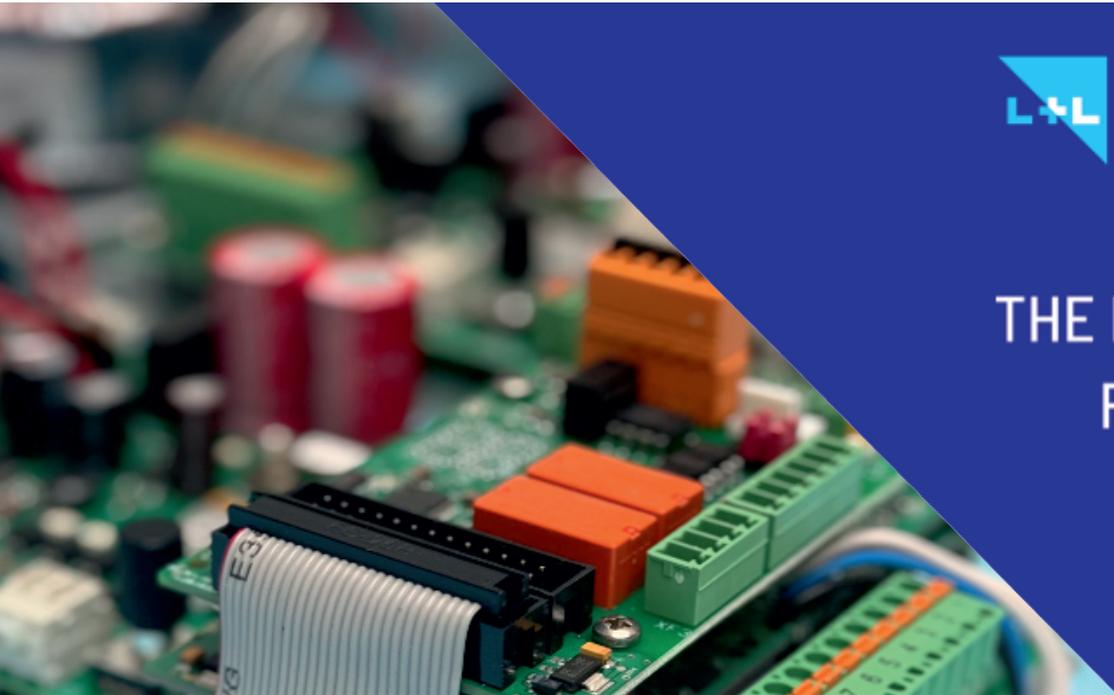
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