A35AE FU-A150AE FU
with TST FUS

en

Operating Instructions

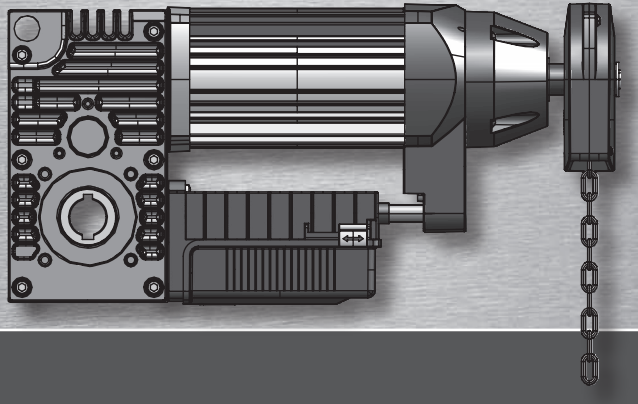
Direct Mount Drives with Control Unit

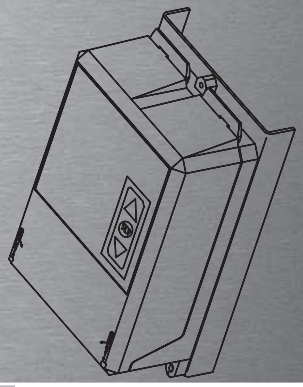
Important information for:

- *Fitters*
- *Electricians*
- *Users*

Please forward accordingly!

These instructions must be kept for future reference.





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Introduction

The A35AE FU-A150AE FU direct mount drives and TST FUS control unit are high-quality products with numerous features and advantages.

When installing the equipment and setting the functions, please observe these Operating and Installation Instructions.

Warranty

Structural modifications and incorrect installation which are not in accordance with these and our other instructions can result in serious injuries, e.g. crushing of limbs. Therefore, structural modifications should only be carried out with our prior approval and in accordance with our instructions, particularly the information contained in these Assembly and Operating Instructions. Any further processing of the products which does not comply with their intended use is not permitted.
The end product manufacturer and fitter have to ensure that all the current statutory, official regulations and, in particular, EMC regulations are adhered to during utilisation of our products, especially with regard to end product assembly, installation and customer advice.

Intended use

The A35AE FU-A150AE FU direct mount drives in connection with the TST FUS control unit are intended only for use indoors for the operation of roller doors, vertical lift gates, sectional doors, sheet gates or indirectly operated door systems.

For outdoor use, special connection cables are required, and if PVC connection lines are used, these must be channelled through a protective pipe. Use other than or beyond this is not regarded as intended use.

Other applications, utilisation and modifications are not permitted in order to protect the safety of the users and others, since these actions can impair the system's safety, resulting in personal injuries and property damage. Becker-Antriebe shall not accept liability for damages arising from such actions. Always observe the information in these instructions when operating or repairing the system. Becker-Antriebe shall not accept liability for damages resulting from incorrect usage.

Safety instructions

The following safety instructions and warnings serve to avert dangers and to prevent personal injuries and damage to property. Please retain these instructions for future reference.

Caution	Denotes a potentially hazardous situation. If this is not avoided, injuries can result.
Attention	Denotes a potentially hazardous situation. If this is not avoided, the product or property in its vicinity can be damaged.
Note	Denotes hints for use and other useful information.

Important safety instructions.
Caution Ignoring this information can result in serious injuries.
The safety instructions in EN 12453, EN 12445, EN 12978, VDE 0100, EN 50110, EN 60204, EN 50178, EN 60335 and BGR 232 and fire and accident prevention regulations must be observed.

- **Work on the electrical installation, electrical or electronic systems and equipment may only be carried out by a qualified electrician.**
- **When electrical or electronic systems or equipment are operated, certain components are live and therefore dangerous. If unqualified persons intervene or the warnings are ignored, physical injuries or damage to property could ensue.**
- **All the applicable standards and regulations for electrical installations must be observed.**
- **Only spare parts, tools and additional equipment approved by the manufacturer can be used.**
- **The manufacturer or provider is not liable for damage to persons or property or any consequential damage if non-approved third-party products are used or changes are made to the accessories.**
- **The thresholds specified in the technical data must not be exceeded.**
- **When installing the drive at a height of less than 2.50 m, the drive must be covered as touching the motor can cause burns.**
- **There must be a sufficient safety distance between the drive and flammable materials.**
- **The door system must be protected against crashing down.**
  - **In the case of direct mount drives for use on a roller door, vertical lifting gate, sectional door or indirectly operated door system, the customer must provide a suitable device (external safety catch, unwinding stopper) to reliably prevent the door from crashing down if the load carrier (e.g. cable or chain) fails.**
  - **In the case of direct mount drives with a disconnecting clutch (AK) for use on a sectional door with spring compensation or a counterweight, it is imperative to install a spring fracture or crash safety device to prevent the door crashing down.**
  - **In the case of direct mount drives with a light chain (LK) or hand crank (HK), it is necessary to ensure that if the spring fractures or the weight counterbalance fails, the torque on the drive is less than the static holding torque specified in the technical data.**

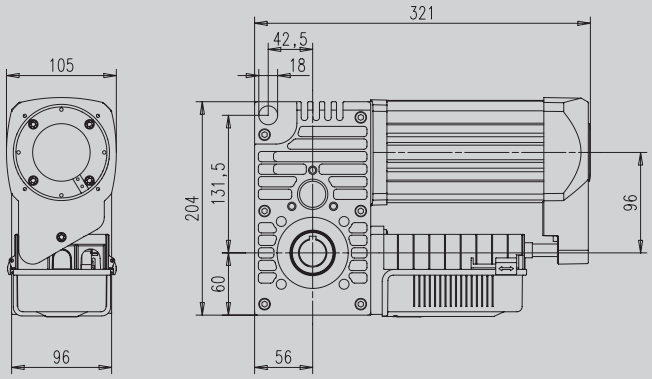
    If this is not the case, a safety device (anti-drop device) has to be installed when using this type of drive to prevent the door from falling down.
- **Opening the control device is only permitted if the power supply is turned off for all poles.**
- **If the potential-free contacts of the relay outputs or other contact points are supplied externally, i.e. operated with dangerous voltage which may still exist even after the control unit has been turned off or the plug has been pulled out, a clearly visible warning label must be attached to the control unit housing. ("CAUTION! All electric circuits must be turned off before you access the connection terminals.")**
- **Operating the control unit when open is not permitted.**
- **Operating the control unit with the CEE connector removed is only permitted if the electrical supply can be disconnected from the control unit for all poles by means of a switch. The plug or switch used in place of this must be easily accessible.**
- **If the connection line of this unit is damaged, it must be replaced by the manufacturer or its customer service team or a similarly qualified person in order to avoid dangers.**
- **Even after the power supply has been turned off, there is still dangerous voltage on the intermediate circuit condensers for up to five minutes. The time needed for the voltage to fall below 60VDC is a maximum of 5 minutes. It is dangerous to touch internal parts of the control unit during this discharge time.**

- **If the switched mode power unit is faulty, the time needed by the interim circuit condensers to run down to a voltage of less than 60VDC can be much longer. In this case, discharging can take up to 10 minutes.**
- **In the event of short-circuited or extremely overloaded 24V control voltage, the switched mode power unit does not start, even though the interim circuit condensers are charged. The display and LEDs are off. It is only possible to start the power unit once the short circuit or extreme overload has been eliminated.**
- **Once the power supply has been turned off, the power unit is still supplied for a few seconds from the interim circuit condensers and can supply power for a certain period, depending on the power unit load. In this case, glow lamp V306 is on until the voltage has dropped.**
- **The processor circuit with seven segment display, EPROM and multiplexers is galvanicly connected with the mains supply. This must be taken into consideration if any control measurements are taken (a measuring device with PE cover on the shunt circuit must not be used for measurements in the processor circuit).**
- **The control unit must not be operated without a connected protective conductor. If the protective conductor is not connected, dangerously high voltage occurs on the control housing, caused by leakage capacities. The protective conductor must be connected in accordance with EN50178 section 5.2.11.1 for leakage currents of >3.5mA.**
- **A dew-covered control unit must not be switched on/operated, as the control unit could be destroyed.**
- **If the control units are used outside the specified temperature range, a regulated and monitored heating system that maintains the specified temperature when the power supply is switched on and the control unit is operated must be ensured.**
- **Operation of the control unit with a damaged key pad or vision panel is forbidden. Damaged key pads and windows must be replaced. To avoid damage to the key pad, pointed objects must not be used to operate it. The key pad is designed to be operated by fingers only.**
- **The first time the power supply to the control unit is switched on, it is necessary to ensure that the evaluation cards (plug-in modules) are in the correct position. If the cards are plugged in in the wrong position or way, or unapproved cards from third-party manufacturers are used, the control unit may be damaged.**
- **If the door is operated in dead-man mode, it is necessary to ensure that the operator can view the door area, as safety devices such as the safety edge and photoelectric barrier do not take effect in this operating mode.**
- **The parameter settings and functioning of the safety devices must be checked. The parameter settings, bridging and other operating elements may only be carried out by trained staff.**

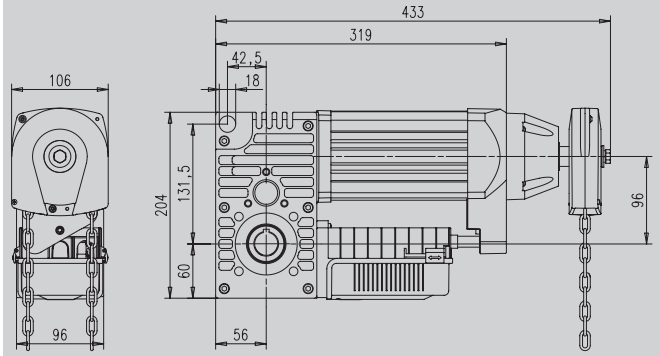
Product overview and dimensions

All dimensions in mm.

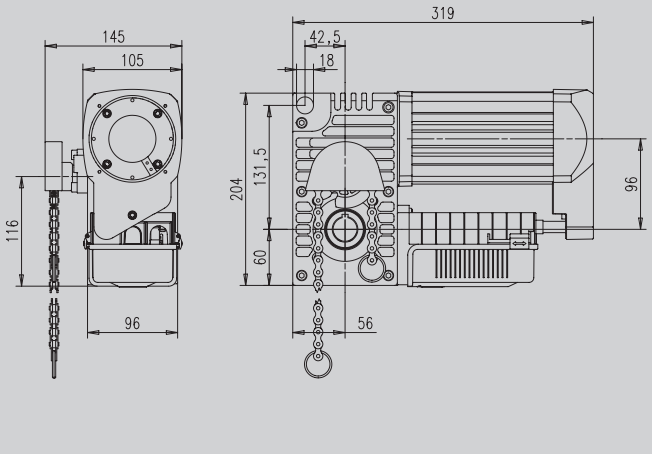
Direct mount drive with hand crank (HK)



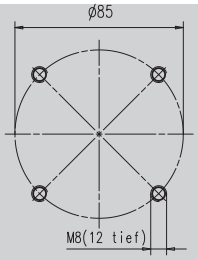
Direct mount drive with light chain (LK)



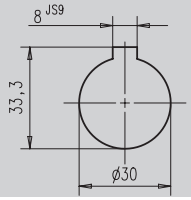
Direct mount drive with disconnection clutch (AK)



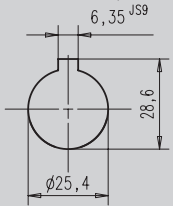
Hole pattern



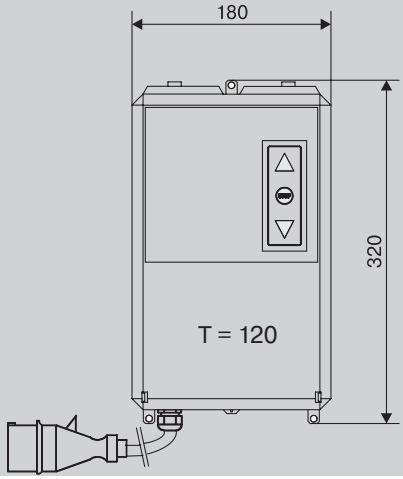
For door shaft Ø 30 mm



For door shaft Ø 25.4 mm



Control unit TST FUS



Installation

Drive installation

Attention

The direct mount drive has to be mounted on a vibration reducing mounting or torque supporting plate with adequate stability. Indirectly driven drives should not be mounted on a vibration reducing mounting. The maximum fastening torque for the M8 bolts used for fastening the drive must not exceed 25 Nm with a screw-in depth of 10 mm. If this is not observed, the product or something in its vicinity may be damaged.

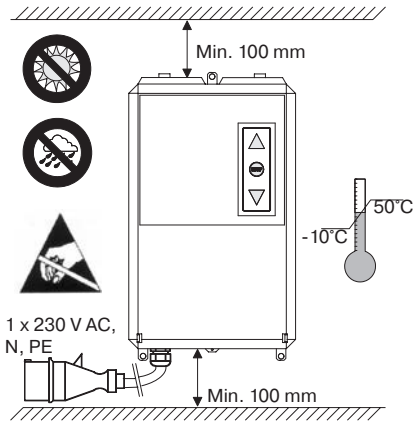
Before the direct mount drive is mounted on the door shaft, this must be lubricated in the drive area.

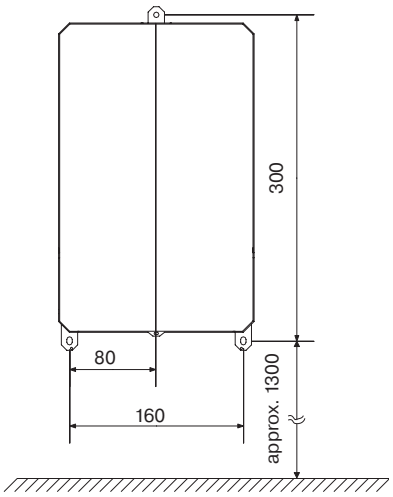
Control unit installation

Install the control unit so that the operator controls are readily accessible.

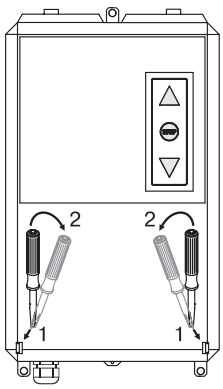
Caution

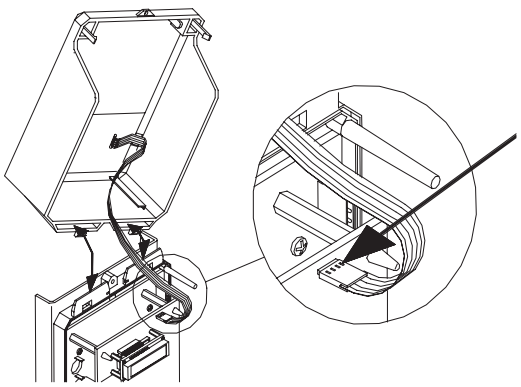
- **Before installation, the control unit must be checked for transport damage or other damage. In certain cases, damage to the internal area of the control unit can result in considerable subsequent damage to the control unit or even pose a health threat for the user.**
- **Touching electronic parts, particularly the parts of the processor circuit, is forbidden. Electronic components can be damaged or destroyed by electrostatic discharging.**
- **Before opening the housing cover, ensure that no drilling chips on the cover can fall into the housing.**
- **Ensure that the control unit is installed free from distortion.**
- **Cable entries that are not used must be closed using suitable measures to ensure IP54 housing protection.**
- **The cable entries must not be subject to any mech. load, in particular tensile load.**
- **The CEE connector must be well visible and accessible from the control unit.**





Opening, assembly of the cover and connection of the key pad





Electrical connection

Caution

Electrical connection may only be carried out by a qualified electrician. Please observe the information on the control unit to be used and the applicable VDE standards. Prior to any connection work, ensure that the door system is correctly disconnected from the power supply by removing the CEE connector/ switching off the main switch. Please observe the technical data of the direct mount drive. The thresholds specified in the technical data must not be exceeded. In particular the door system protection provided by the customer has to be carried out in accordance with the technical data.

When laying the protective conductor, please ensure that the contract of the protective conductor is interrupted last when the cable is pulled out unintentionally. Subsequently lay the connection cable so that this is not touching the drive.

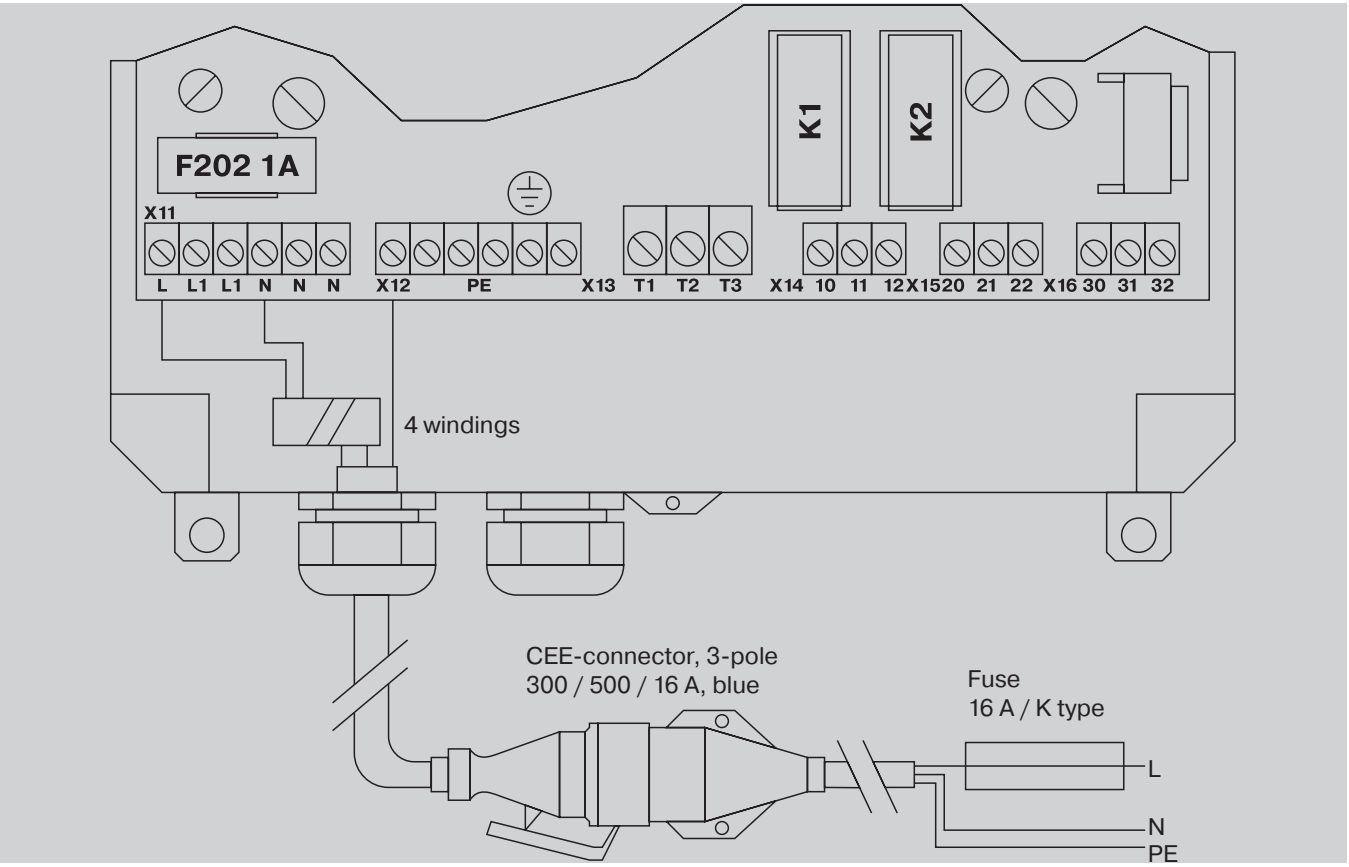
There is still dangerous voltage up to 5 minutes after the control unit has been switched off. It is dangerous to touch electronic parts because of residual voltage. The control unit must never be operated with an open housing cover. After the wiring has been carried out and before the control unit is switched on for the first time, check whether all motor connections are tight/properly corrected on the control unit and motor side. Loose motor connections usually damage the converter. All control voltage inlets are galvanically separated from the power supply by basic insulation. All components to be connected to the control units must have additional insulation with a rated voltage of > 230 V (in accordance with EN 60335-1).

The plug must be visible and accessible from the control unit.

Attention

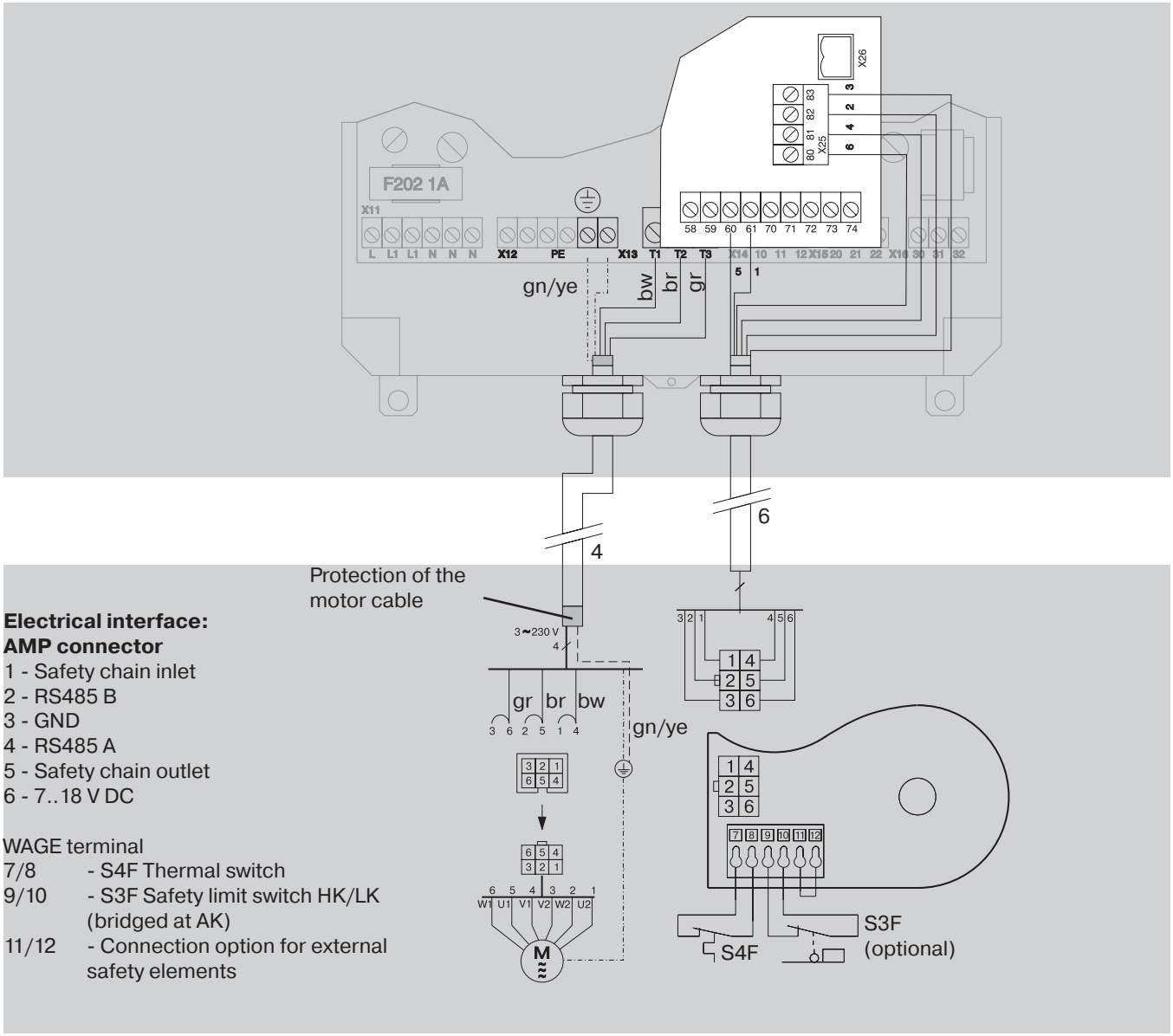
Very high electrostatic charges occur particularly on fast sheet gates. Discharging this can cause damage to the control unit. Suitable measures to prevent electrostatic charging must therefore be carried out.

Connection of the supply voltage



Connecting the drive to the control unit

To connect the direct mount drive to the control unit, only use original control and motor cables approved by the manufacturer.



Electrical interface:
AMP connector
1 - Safety chain inlet
2 - RS485 B
3 - GND
4 - RS485 A
5 - Safety chain outlet
6 - 7..18 V DC

WAGE terminal
7/8 - S4F Thermal switch
9/10 - S3F Safety limit switch HK/LK (bridged at AK)
11/12 - Connection option for external safety elements

Connection of the control unit

Connection of the control cable

- Unscrew the oval, black screw holding devices from the screw.
- Now separate the two parts of the screw holding device from each other
- Put the cable with the terminals and the thicker part of the screw holding device through the right oval opening.
- Fit together the halves of the screw holding device on the housing wall.
- Loosen the screw coupling ring so that the screw can be turned on the cable.
- Now screw the screw tightly into the screw holding device.
- Push the cable into the control unit until the casing is around 0.5 cm into the control unit.
- Tighten the coupling ring to ensure protection.
- Connect to terminals 60/61 and 80/81/82/83 in line with the diagram above.

Connection of the motor cable

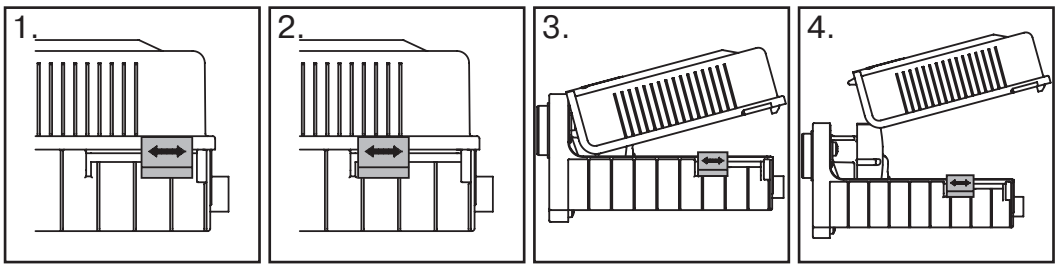
The motor cable is connected in the same way as the control cable with the following differences:

- Insert the motor cable through the left oval opening.
- Connect to terminal T1/T2/T3 in accordance with the diagram above and tighten the two green/yellow wires on the PE terminal.

Connection of the drive

Opening of the limit switch box

If necessary, remove the bolts at the yellow lock bars and carry out steps 1 – 4.

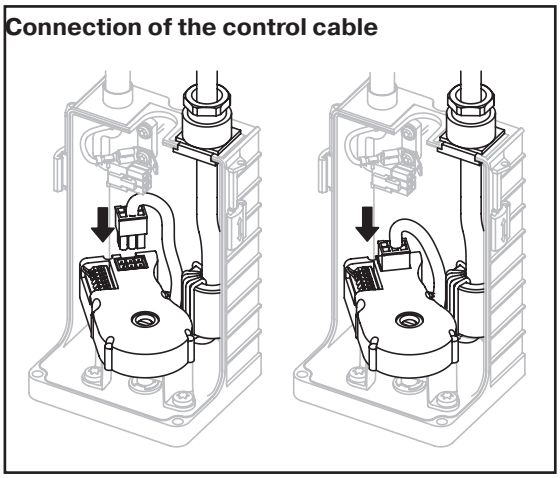


The control and motor cables can be inserted on the drive side. To ensure that the tension relief and protection class of the drive are guaranteed, the screws must not be loosened. The connectors are protected against reverse polarity and there is an audible click when they engage.

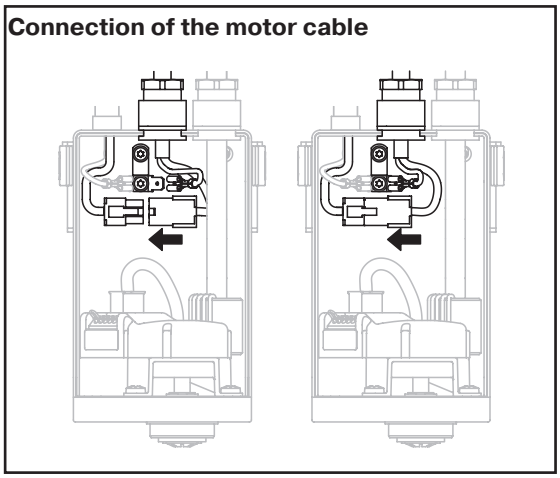
Note

The green/yellow protective conductor wires must be connected to the designated push-on connector ⏚. Please ensure that it clicks into place properly.

Connection of the control cable



Connection of the motor cable

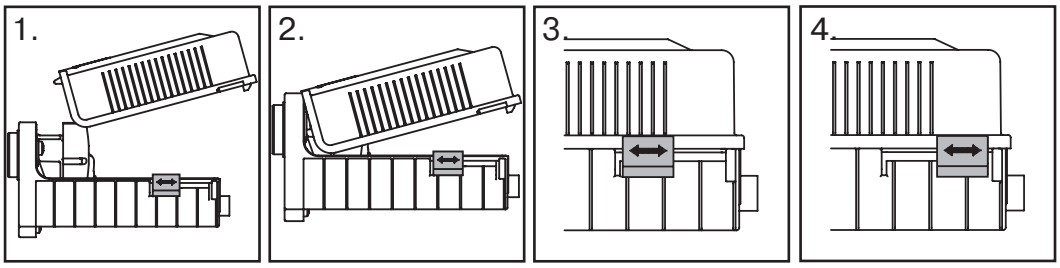


Closing of the limit switch box

Use the previously removed bolts or the bolts supplied in the casing cover and carry out steps 1 – 6 shown below.

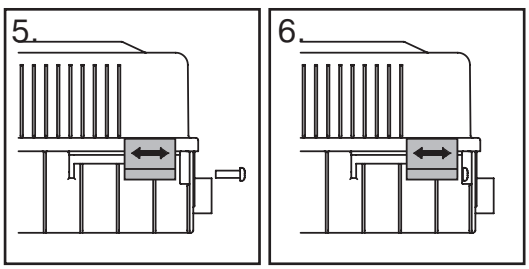
Note

Please ensure that the seal and the lining groove are clean and that the cover has been placed correctly.



Caution

If the drive is installed at a height of less than 2.50 m, the yellow latches must be secured using the enclosed screws.



Carefully tighten the screws.

Emergency manual operation

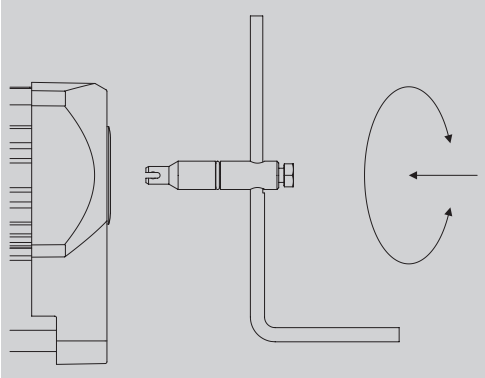
With the aid of emergency manual operation, the door can be opened or closed in the event of a power failure.

Attention

Before emergency manual operation is used, the door system must be disconnected from the power supply. Manual emergency operation is only allowed with the motor turned off, via hand crank, and can only be carried out by the service technician or instructed personnel. The door must not be moved beyond the final position.

For emergency manual operation, 3 different systems are available:

- Hand crank – HK
- Light chain – LK
- Disconnecting clutch – AK



Hand crank – HK

First remove the cover. For emergency manual operation, the hand crank is inserted in the motor shaft.

This activates the S3F safety switch to ensure that electrical operation of the door system is prevented during emergency manual operation.

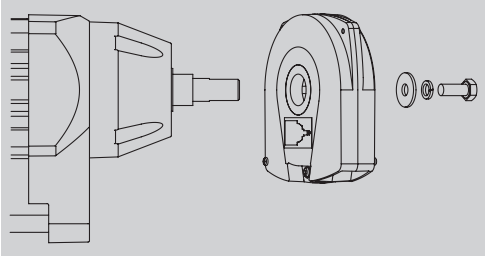
The door can be opened or closed by turning the hand crank.

Caution

After operation, the hand crank must be removed, otherwise injuries or damage to property may occur.

Attention

After the hand crank has been removed, the cover must be replaced to ensure the protection class of the drive is retained.



Light chain – LK

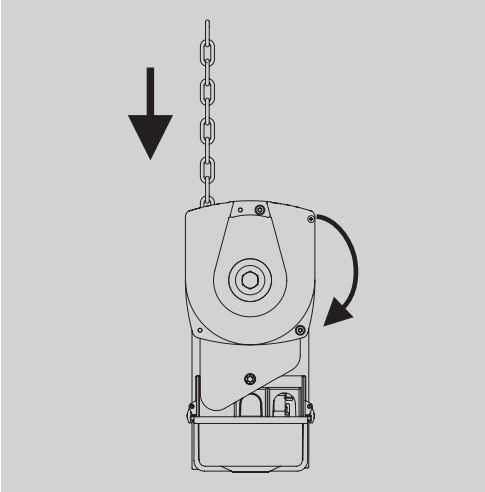
Note

Direct mount drives with a light chain (LK) must be mounted horizontally.

Mounting of the chain wheel with integrated chain guard.

Mount the chain wheel with the integrated chain guard so that the side that has the sticker is facing the drive.

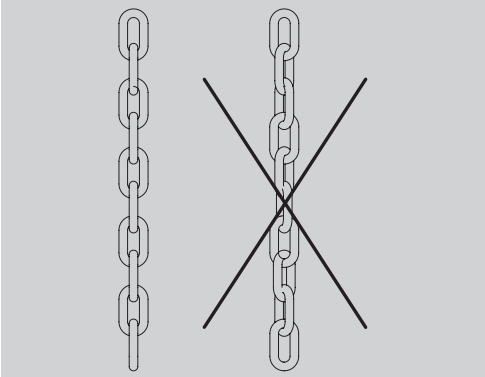
Fix the chain guard using a flat washer, spring washer and screw.



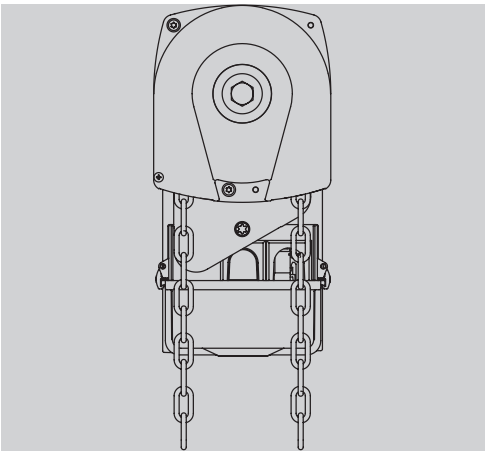
Introduction of the chain

Turn the chain guard so the openings face upwards.

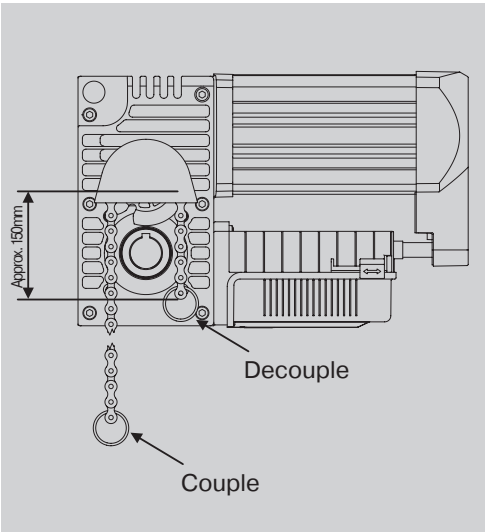
Take one end of the chain and insert this into the left opening of the chain guard. Ensure the chain is properly positioned in the guide. Then turn the chain guard to the right until you are able to pull the end of the chain out of the other opening.



Connection of the ends of the chain
Before connecting the ends of the chain using the chain lock, make sure that the chain is not twisted.
The chain lock must be fastened carefully.



Operation
You can manually open or close the door by pulling the relevant chain. This activates the S3F safety switch to ensure that electrical operation of the door system is prevented during emergency manual operation. After operation, ensure that the chain hangs freely again, so that the S3F safety switch is released and electrical operation is possible again.



Disconnecting clutch – AK

Attention

When using direct mount drives with a disconnecting clutch (AK) on a sectional door with spring compensation or a counterweight, it is imperative to install a safety device (anti-drop device in case of a spring fracture) to prevent the door from falling down.

A disconnecting clutch should only be used on sectional doors if the door system is fully counterweighted and the drive is not in operation.

Note

Ensure that the chain wheel is on the left buffer.

Mounting of the chain and chain guard

- Mount the chain so that approx. 150 mm is suspended freely on the right-hand side.
- Push the chain on to the chain wheel hub until it audibly clicks into place.

Operation
When you pull the chain, the drive is decoupled from the door shaft. The counterbalanced door can now be opened and closed manually. After operation, the drive must be coupled again by pulling the other end of the chain.

Note

Make sure that the lower final position of the door is set so that the cables for suspending the door remain taut, i.e. that the entire weight of the door hangs on the cables.

This guarantees the smooth running of the disconnecting clutch. Incorrect settings (slack cable) in the lower final position prevent smooth running of the disconnecting clutch.

Operator controls

Button ▲
Pressing the UP button opens the door. When the upper final position has been reached or if a safety function responds, the door stops automatically. If the UP button is pressed whilst the door is closing, the door stops and after a short delay it moves to the upper final position.

Button STOP
Pressing the STOP button stops the door instantly when it is opening or closing. An error can also be acknowledged and reset by pressing the button for a longer period.

Button ▼
Pressing the DOWN button closes the door. When the door reaches the lower final position, it stops automatically. If the safety edge or photoelectric barrier responds, the door stops and then continues to the upper final position. Pressing the DOWN button while the door is opening has no effect.

EMERGENCY STOP switch (optional)
If the EMERGENCY OFF button is pressed, the drive is switched off. Door movement is only possible again after releasing the EMERGENCY STOP button.

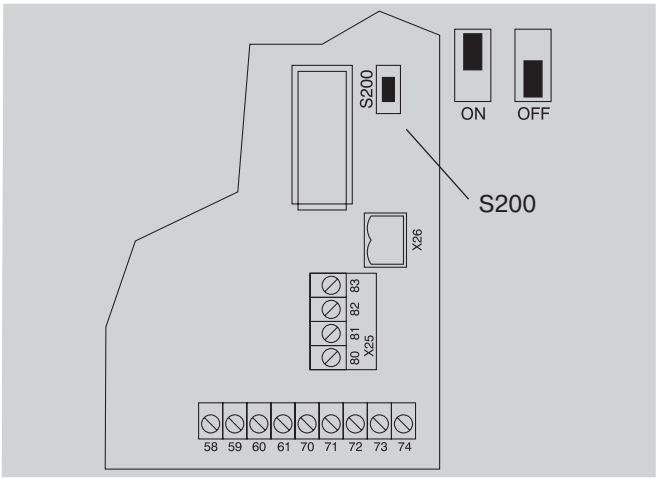
General operating instructions on parameterisation

Three operating levels are available for changing the parameters (**P.999: 0-2**) see Parameter Overview section.
Once optimum door running has been set, you go from operating level 2 to 1. This means you cannot change the door running by mistake.

Change parameters

Proceed as follows to change parameters:

- Pull out the power plug
- Turn DIP switch S200 to ON.
- Put the power plug back in.
- Press the STOP and UP buttons simultaneously for about 3 seconds to go to parameterise mode for door control.
- Change the parameters as required.
- Once you have made the settings, exit parameterise mode by pressing the STOP button for about 3 seconds.



Caution
Once you have changed the parameters, set DIP switch S200 to OFF.

Start parameterise modes				
1.	Switch of door control	Switch off supply for all poles (note safety instructions).	7-segment display disappears after a delay of a few seconds.	
2.	Switch the S200 switch to ON	Service mode is deactivated, close housing.		
3.	Switch on door control	Switch on control unit.	When service mode is active, the initial decimal point flashes. Display depends on control state.	.✶ . . .
4.	STOP + UP Stop + UP (long)	Press Stop button and Up button for a long time.	After about 3 seconds control will switch to parameterise mode.	P . 0 0 0

Parameter selection			
UP or DOWN	Select the required parameter. **CAUTION:** Not all parameters can be viewed/ changed directly. This depends on the selected operating level (**P.999: 0-2**).	The parameter value can be viewed or changed (see below). The display differs depending on your selection.	P . . . .

Parameter editing				
1.		Control in parameterise mode.	Display of the required parameter name.	P. 0 1 0
2.	STOP (short)	Opening of the parameter.	The current parameter value is displayed.	5
3.	Up	Up button to increase parameter value.	If the currently valid parameter value is changed, the decimal points flash.	6✶
or	Down	Down button to decrease parameter value.		4✶
4.	STOP (long)	Save defined parameter value.	The parameter has been saved when all the points stop flashing.	6
or	STOP (short)	Discard defined parameter value.	Termination, the original parameter value is displayed.	4
5.	STOP (short)	Go to display of parameter name.	Display of parameter name.	P. 0 1 0

Exit parameterise mode				
1.	STOP (long)	Parameterise mode is cancelled immediately, door operation is active again.	The last value saved is automatically retained.	. . . .
2.	Switch of door control	Switch off supply for all poles (note safety instructions).	7-segment display disappears after a delay of a few seconds.	
3.	Switch the S200 switch to OFF	Service mode is deactivated, close housing.		
4.	Switch on door control	Switch on control unit.		

Note
Service mode is automatically reset after about 1 hour. To return to service mode, the control unit must be switched off briefly and then switched back on or a reset must be carried out.

Reset of control unit

STOP + ▲ + ▼ simultaneously for about 3 seconds.

Checking the direction of movement

Move the door into semi-opened position using emergency manual operation.
Insert the control unit's CEE connector into the socket, or turn on the control unit's main switch.
The drive specifications are already stored in the control unit. The control unit is currently in „Calibration" mode (dead-man mode), which is indicated on the display by the message „EICH".
The drive's rotation direction depends on the control unit and must first be checked. Proceed as follows:

- Check whether the door is in semi-open position.
- Check whether the control unit is in EICH mode. If it is not, proceed as follows:
  1. Start parameterise mode by simultaneously pressing the STOP and UP button (long).
  2. Access parameter P.210 Reprogram all Final Positions by pressing the arrow buttons.
  3. Access the parameter by briefly pressing the STOP button and use the arrow buttons to select value 5 and then save with the STOP button (long).
  4. When you have changed the parameter, exit parameters P.210 parameterise mode by pressing the STOP button for a long time.

  The message "EICH" is shown on the display.

Note
In future, this procedure will be shown as follows:
P.210: 5

- Press the STOP button (short) to confirm EICH mode.
  The message "E.i.E.u." is shown on the display.
- Use the UP and DOWN buttons on the control unit to determine whether the door's direction of movement matches that of the button you pressed.

Note
If the door does not move, the motor does not have enough power. You can use the boost (increase in performance at low speeds) to give the motor more power.

Boost/performance increase at low speeds
The boost is used to improve the drive performance at low speeds. An error in door running can occur if the boost setting is too high or too low. The setting range for the boost is 0-30%. If the boost is too high, this results in an overcurrent error (F.510/ F.410). In this case, the boost must be reduced. If the boost is low or 0 and the motor does not have enough power to move the door, the boost must be increased.
Because of the numerous types of door, the correct boost setting must be determined by trial and error.
Boost for moving up: P. 140: 0-30 %
Boost for moving down: P. 145: 0-30 %

Note
You can use diagnosis parameter P.910: 2 to display the current motor current. The boost should be set so that the motor current is as low as possible.

- If the door's direction of movement does not match the button commands, change the direction as follows:
  - **P. 130: 0 = right rotation field**

Check the direction of movement again.

Setting of the door final positions

Caution

Each time you change the door final positions, you must then fine tune the final positions and check the pre-limit switch.

Note

If the final positions were programmed in advance, programming of the final positions must be requested again.

To do this, set the following parameters:

P.210: 5 = Reprogramming of all final positions

The drive has an absolute value encoder, which detects the door final positions via the control unit.

Attention

It is not possible to define the settings for this absolute value encoder in the drive.

Before the door final positions are programmed, the door safety edge must be connected to the TST FUS door control unit (see the "Electrical connection/operation of external control devices and safety devices" section).

The door final positions are set directly in the control unit.
Ensure that the message "E.i.E.u." is shown on the display.
The control unit is in dead-man mode.

- Move the door to the required lower final position.
- Save the final position by pressing the STOP button (long).
  The message "E.i.E.o." is shown on the display.
- Move the door to the required upper final position.
- Save the final position by pressing the STOP button (long).
  The message "E.i.E.o." is shown on the display.
- If you do not want to set a partial opening position, press the STOP button (long).
  The message "¯Eo¯"
- If you want to set a partial opening position, move the door to the required position.
- Save the partial opening position by pressing the STOP button (long).
  The message "STOP" is shown on the display.

The control unit requires several adjustment runs before the final positions can be reached at full operational speed. During the adjustment runs, the final positions that are set are intentionally not reached and message "I.5XX" is displayed.
Move the door towards the final positions until the message "I.510, _Eu_ or -Eo-" is displayed.
Setting of the final positions is then complete.

Setting of the ramps and door leaf speed

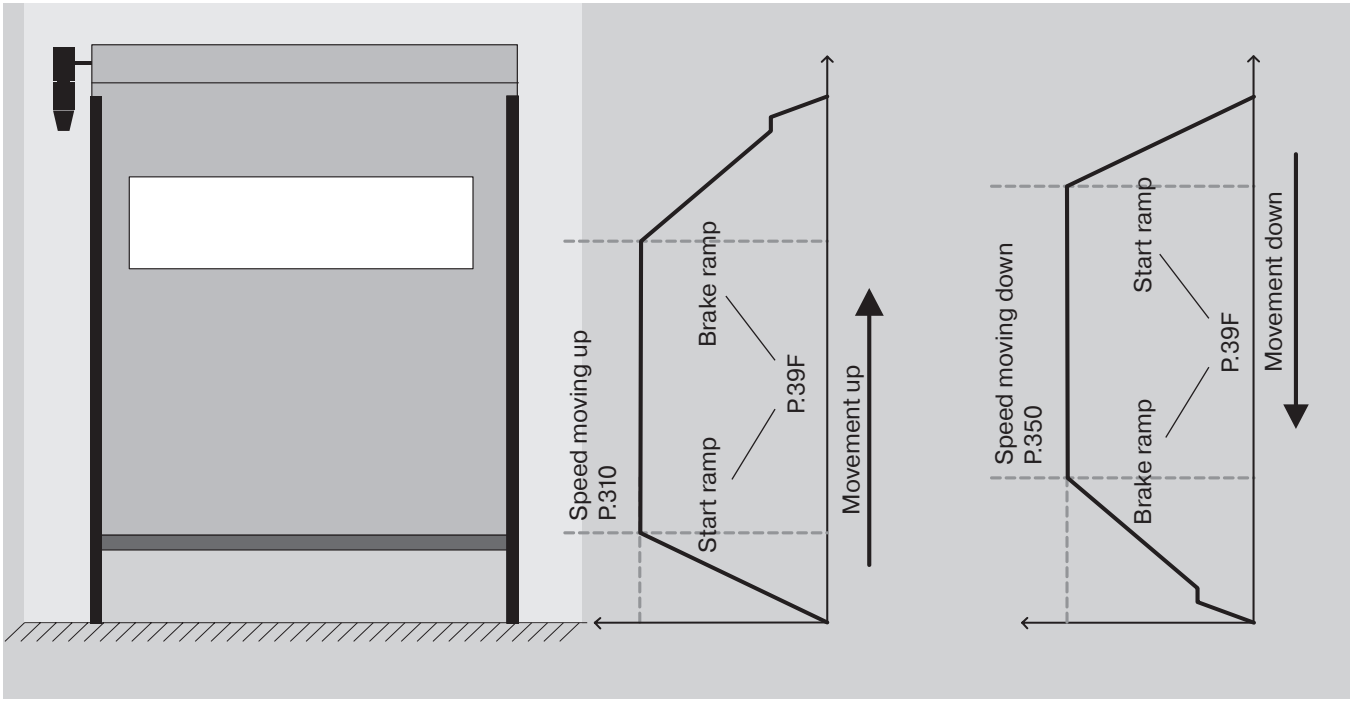
Caution
Each time you change the door leaf speed or ramps, you must then fine tune the final positions and check the pre-limit switch.

Setting of start and brake ramps

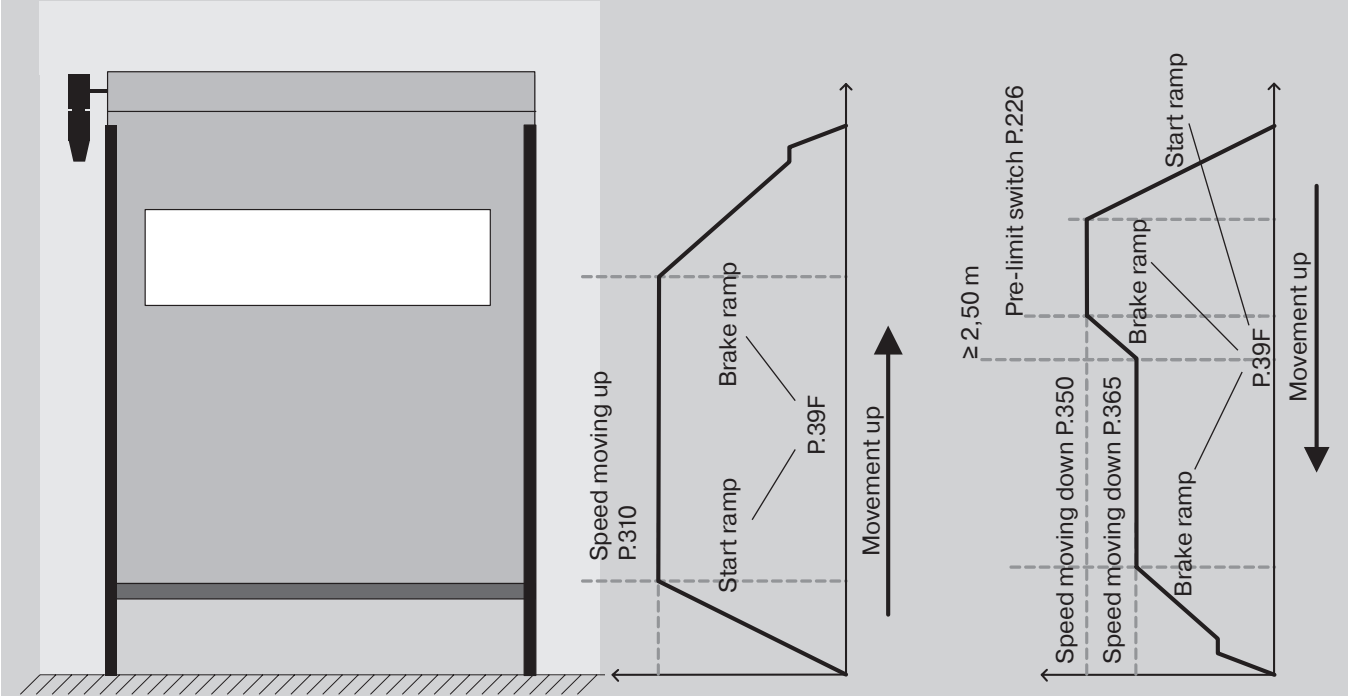
Note
Changing the ramps (P.39F) resets the frequencies for movement up and down (P.310/P.350) to the factory setting (60Hz/ 40Hz).

P.39F: 0 = average/slow acceleration of the door
P.39F: 1 = slow acceleration of the door (large, heavy door)
P.39F: 2 = average acceleration of the door
P.39F: 3 = fast acceleration of the door (small, light door)

Doors with a height of less than 4m



Doors with a height of more than 4m (recommendation)



Setting the door leaf speed

P.310: 20 - 100 Hz = frequency for speed moving up
P.350: 20 - 100 Hz = frequency for speed moving down
P.365: 20 - 100 Hz = frequency for second speed moving down for door with a height of more than 4 m

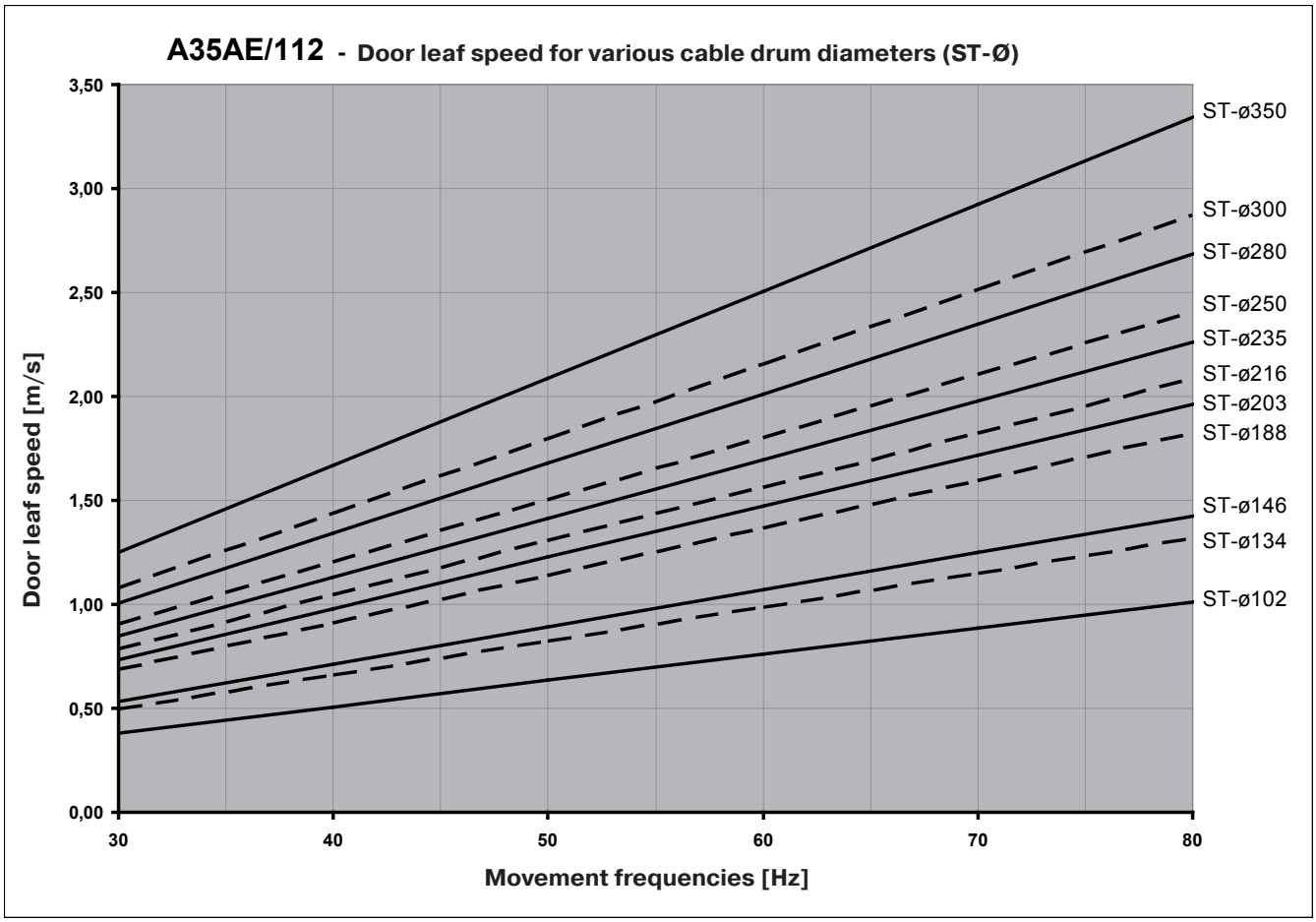
Note
Increase the frequency in small intervals (max. 5 Hz)
If the door does not move or is very slow, the motor does not have enough power. You can use the boost (increase in performance at low speeds) to give the motor more power. If the door moves very slowly despite maximum boost (30 %), the frequency must be reduced.

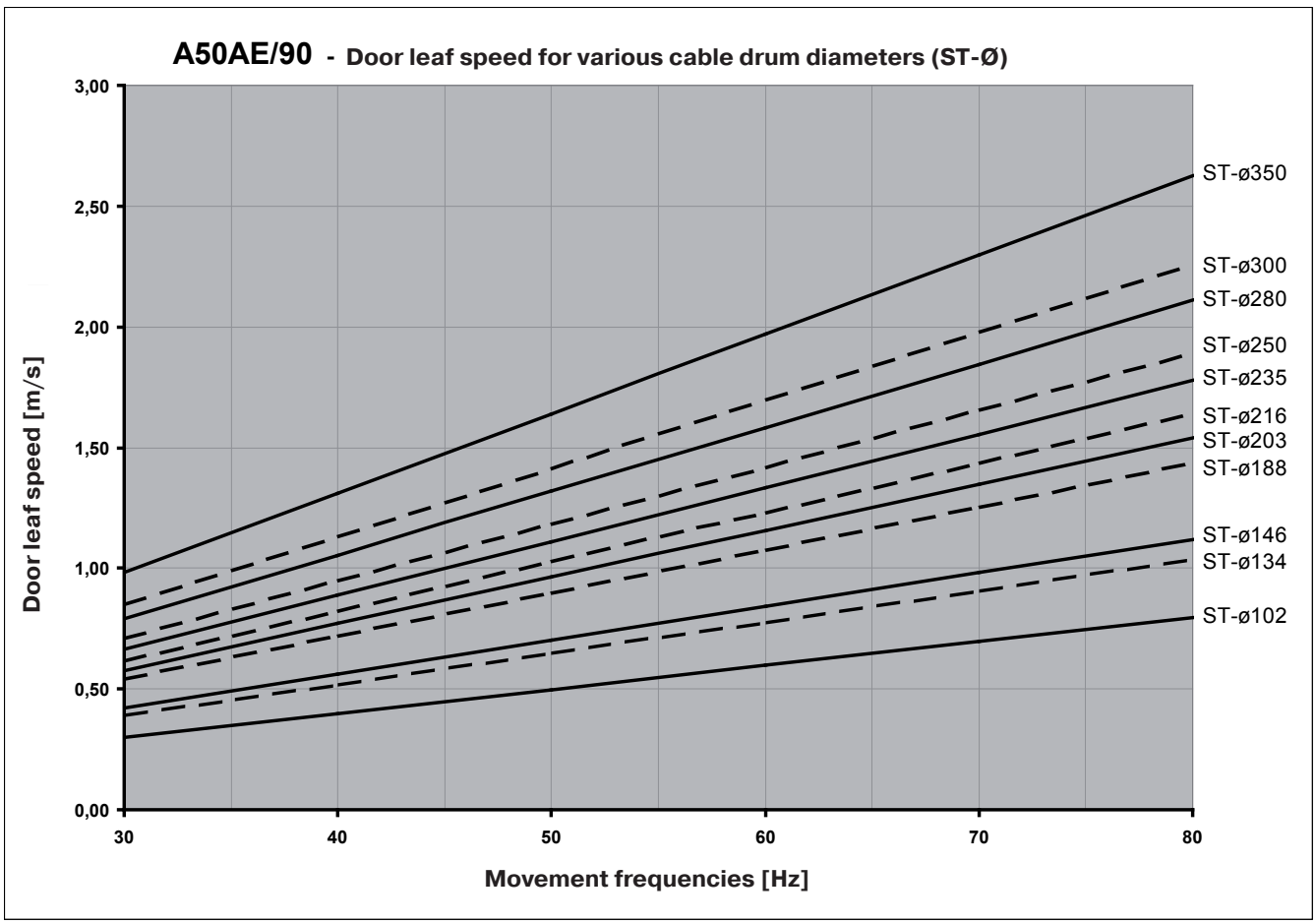
Because of the numerous types of door, the correct boost setting must be determined by trial and error.
Boost for moving up: P.140: 0-30 %
Boost for moving down: P.145: 0-30 %

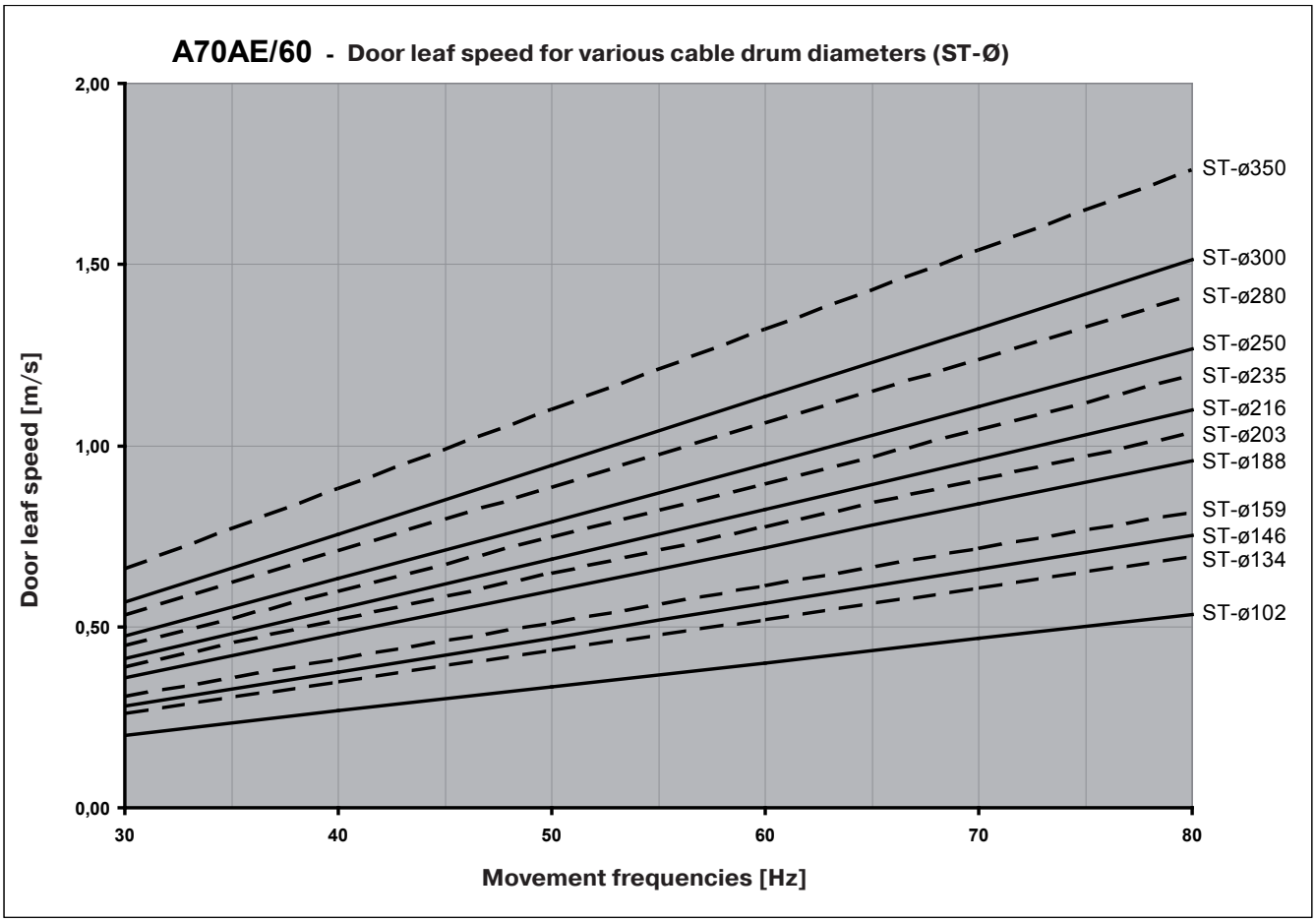
Note
You can use diagnosis parameter P.910: 2 to display the current motor current. The boost should be set so that the motor current is as low as possible.

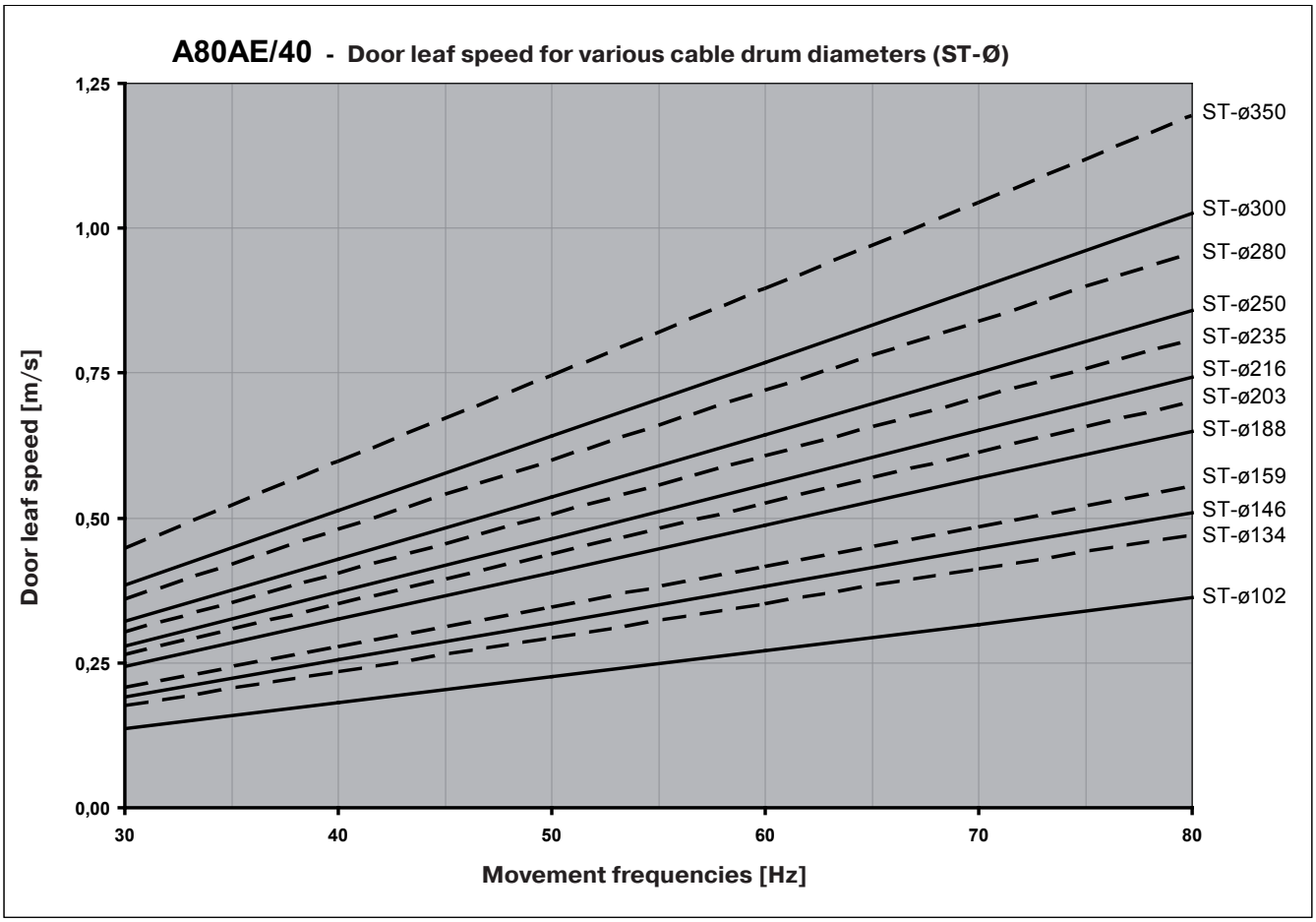
The control unit requires several adjustment runs before the final positions can be reached at full operational speed. During the adjustment runs, the final positions that are set are intentionally not reached and message "I.5XX" is displayed.
Move the door towards the final positions until the message "I.510, _Eu_ or -Eo-" is displayed.
Setting of the door leaf speed and start and brake ramps is now completed.

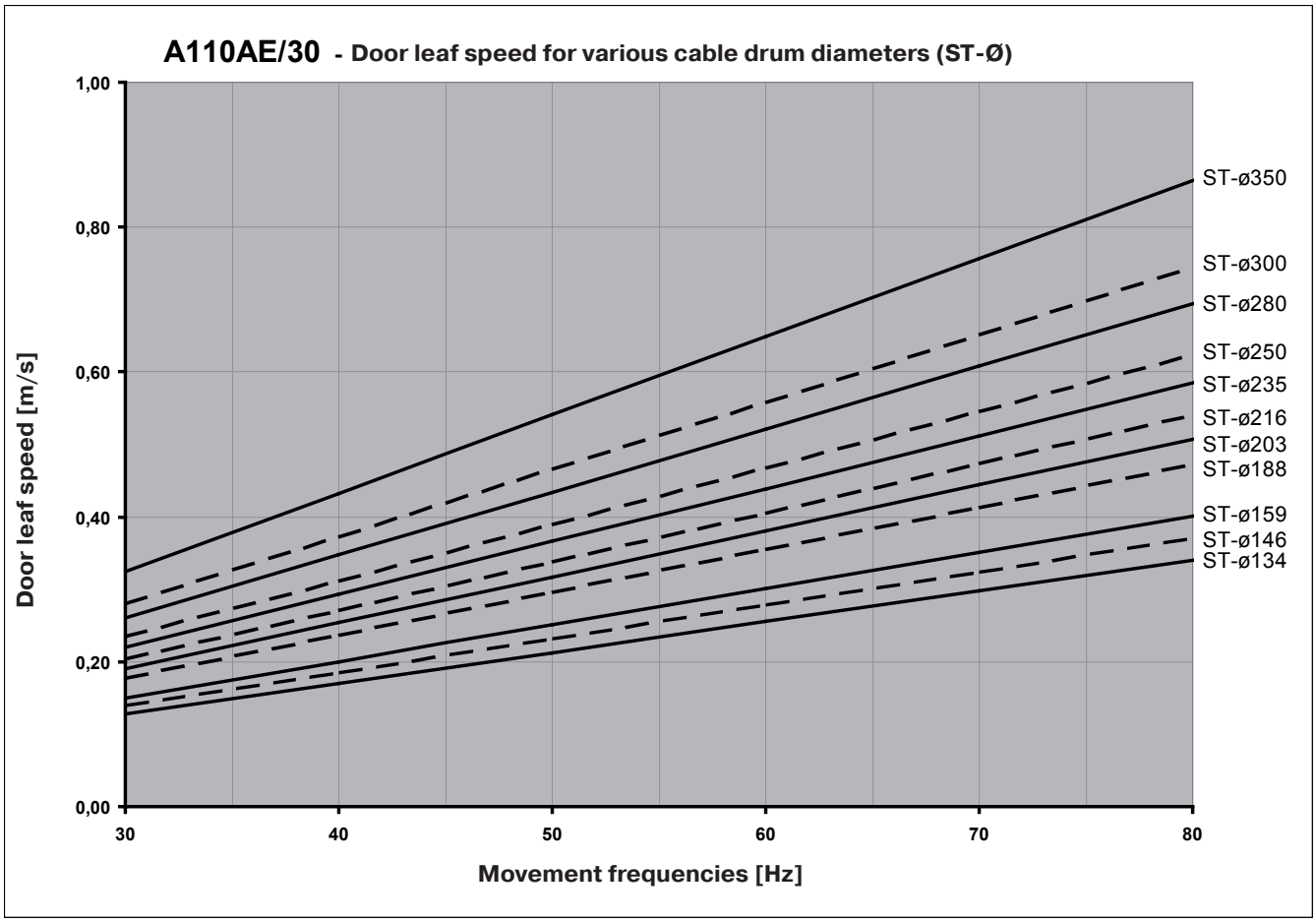
Caution
Make sure you observe standard EN 12445: Safe use of power-operated doors - test procedure. The closing force can be no more than 400 N.

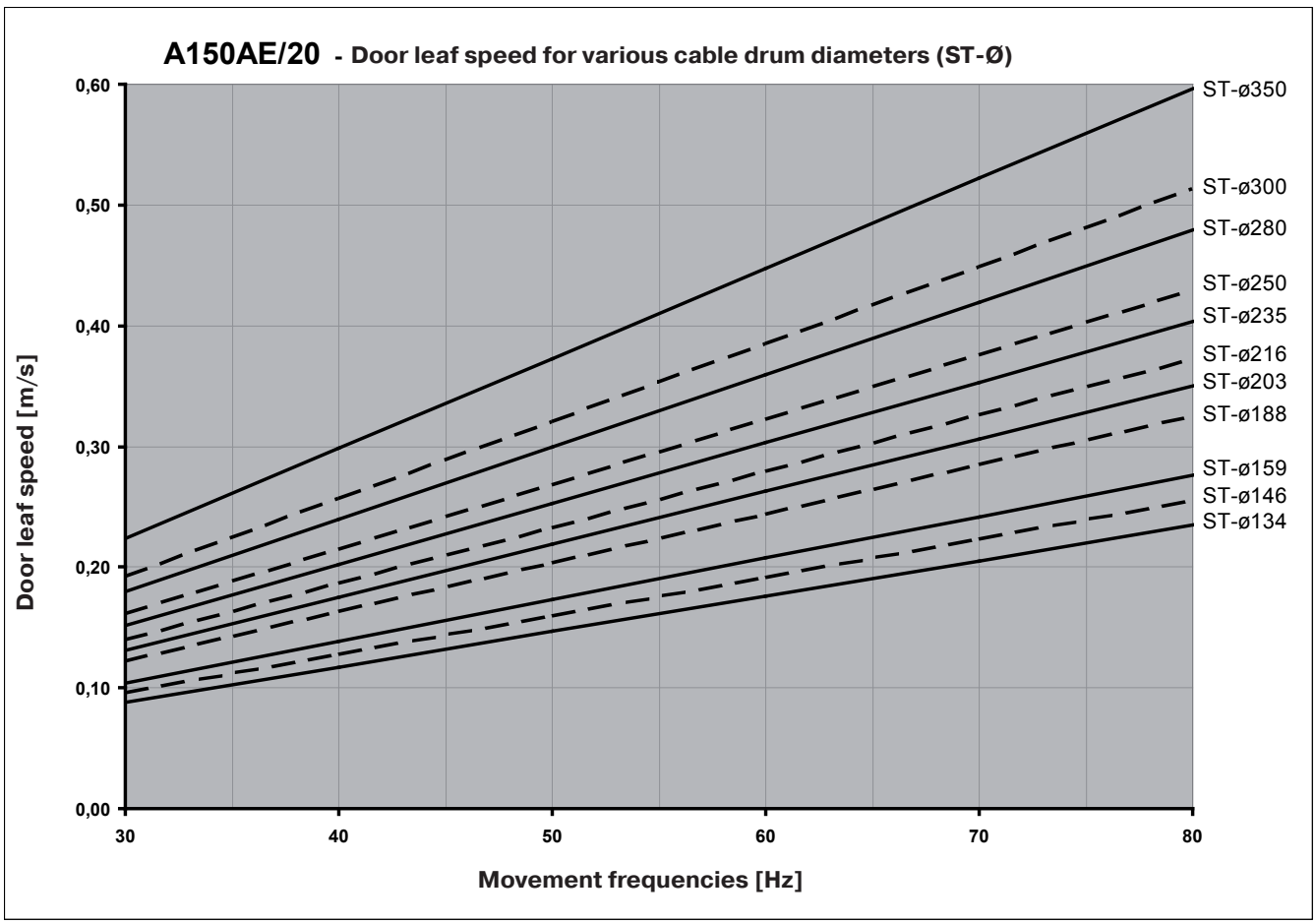

A35AE/112 - Door leaf speed for various cable drum diameters (ST-Ø)
Door leaf speed [m/s]
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
30
40
50
60
70
80
Movement frequencies [Hz]
ST-ø350
ST-ø300
ST-ø280
ST-ø250
ST-ø235
ST-ø216
ST-ø203
ST-ø188
ST-ø146
ST-ø134
ST-ø102


A50AE/90 - Door leaf speed for various cable drum diameters (ST-Ø)
Door leaf speed [m/s]
3,00
2,50
2,00
1,50
1,00
0,50
0,00
30
40
50
60
70
80
Movement frequencies [Hz]
ST-ø350
ST-ø300
ST-ø280
ST-ø250
ST-ø235
ST-ø216
ST-ø203
ST-ø188
ST-ø146
ST-ø134
ST-ø102


A70AE/60 - Door leaf speed for various cable drum diameters (ST-Ø)
Door leaf speed [m/s]
2,00
1,50
1,00
0,50
0,00
30
40
50
60
70
80
Movement frequencies [Hz]
ST-ø350
ST-ø300
ST-ø280
ST-ø250
ST-ø235
ST-ø216
ST-ø203
ST-ø188
ST-ø159
ST-ø146
ST-ø134
ST-ø102


A80AE/40 - Door leaf speed for various cable drum diameters (ST-Ø)
Door leaf speed [m/s]
1,25
1,00
0,75
0,50
0,25
0,00
30
40
50
60
70
80
Movement frequencies [Hz]
ST-ø350
ST-ø300
ST-ø280
ST-ø250
ST-ø235
ST-ø216
ST-ø203
ST-ø188
ST-ø159
ST-ø146
ST-ø134
ST-ø102


A110AE/30 - Door leaf speed for various cable drum diameters (ST-Ø)
Door leaf speed [m/s]
1,00
0,80
0,60
0,40
0,20
0,00
30
40
50
60
70
80
Movement frequencies [Hz]
ST-ø350
ST-ø300
ST-ø280
ST-ø250
ST-ø235
ST-ø216
ST-ø203
ST-ø188
ST-ø159
ST-ø146
ST-ø134


A150AE/20 - Door leaf speed for various cable drum diameters (ST-Ø)
Door leaf speed [m/s]
0,60
0,50
0,40
0,30
0,20
0,10
0,00
30
40
50
60
70
80
Movement frequencies [Hz]
ST-ø350
ST-ø300
ST-ø280
ST-ø250
ST-ø235
ST-ø216
ST-ø203
ST-ø188
ST-ø159
ST-ø146
ST-ø134

Fine tuning of the finish positions and control of pre-limit switch

Note
If you increase the value, the switching point gets higher.
If you decrease the value, the switching point gets lower.

Fine tuning of the finish positions

P.231: -125 to +125 increments = adjustment value for the upper finish position
P.221: -125 to +125 increments = adjustment value for the lower finish position

Control of pre-limit switch for deactivation of the safety edge function

Caution
To check the deactivation of the safety edge function by the internal pre-limit switch VES, consult standard EN 12445: Safe use of power-operated doors - test procedure.
The max. permitted set height of the pre-limit switch to the ground can be no more than 50 mm at the least favourable place.
To check the set height of the pre-limit end switch VES, put the VES gauge or a similar spacer (height: 50 mm) on the ground under the door at the most unfavourable place in the door opening. When the door reaches the 50 mm high VES gauge or similar spacer, the door must stop immediately and then release this simulated obstacle (move up). If this is not the case, you must adjust the pre-limit switch.

P.440: -60 to +999 = adjustment value for the pre-limit switch of the safety edge

Electrical connection/operation of external control devices and safety devices

Safety edge

The following safety edge systems can be connected to door control unit TST FUS directly:

- Pneumatic safety edge (DW) or
- Electric safety edge (EL)
- Optoelectronic safety edge: FRABA OSE.

The sensor required is integrated into the control unit (self-monitoring sensor as per pr EN 12453).
The pneumatic safety edge or the electric safety edge is connected up to terminals **72** and **73** and monitored with a terminating resistor. It must be connected inside the pressure switch contact or at the end of the electric safety edge in accordance with the wiring diagram.
In the case of factory-assembled electric safety edges, check their terminating resistance. Safety edges with a 1.2 kΩ or 8.2 kΩ terminating resistor may be used.
Connect the OSE optoelectronic safety edge made by FRABA to terminals **72**, **73** and **74** directly without the need for a terminating resistor (**72** - green wire, **73** - white wire, **74** - brown wire).
To modify the control unit in line with the safety edge, jumper **J600** (see the section on the position of terminals and components, above right) and parameter **P.460** must be set in accordance with the table below.

Type of safety edge	P.460	J600
Safety edge inactive Note: This setting is only possible if a safety edge is not connected.	0	1K2
Electric safety edge 1,2 kOhm, normally open contact	1	1K2
Electric safety edge 8,2 kOhm, normally open contact	1	8K2
Electric safety edge 1,2 kOhm, normally closed contact	2	1K2
Electric safety edge 8,2 kOhm, normally closed contact	2	8K2
Safety edge with testing (DW) 1,2 kOhm, normally open contact	3	1K2
Safety edge with testing (DW) 8,2 kOhm, normally open contact	3	8K2
Safety edge with testing (DW) 1,2 kOhm, normally closed contact	4	1K2
Safety edge with testing (DW) 8,2 kOhm, normally closed contact	4	8K2
Optoelectronic safety edge FRABA OSE	5	1K2

Caution

If a pneumatic safety edge is used, parameter P.460 must have the value 3 or 4, as otherwise the functioning of the pneumatic safety edge cannot be monitored correctly. When delivered, safety devices may be bridged. Before initial use, always check that no non-permissible bridging exists. Parameter P.460 cannot have the value 0 as this deactivates the safety edge.

If the safety edge responds during UP movement (E.360), the door is immediately stopped by the TST FUS control unit. After an internal period of 0.2 s (**P.420: 3 - 200 [10 ms]** = **30 - 2000 ms**), TST FUS moves the door back to the upper final position.

Caution

Make sure you observe standard EN 12445: Safe use of power-operated doors - test procedure. After at least 750 ms the closing force must be reduced to less than 150 N.

Note

Before connecting other external control devices you should first check the direction of door movement and set the final positions of the door, the door leaf speed and the ramps.

EMERGENCY STOP switch/spring fracture safety device

At terminal **60**, the aforementioned switches can be connect in series to **wire 5 of the drive**. If a switch is actuated the door is stopped. Every additional door movement is blocked for as long as it is pressed.

Slack rope switch/wicket door switch

The aforementioned switches can be connected, if necessary in series, to terminals **70** and **71**. For installation the wire jumper across terminals **70** and **71** must be removed. This input is debounced via an internal timing element. If one of the switches responds beyond this period, the door is stopped. Every additional door movement is blocked for as long as it is pressed.

Photoelectric barrier

A photoelectric barrier (24 V DC) can be connected to terminals **47**, **48** and **49**. For installation the wire jumper across terminals **47** and **48** must be removed.
This control input has two functions:

- If the photoelectric barrier responds during downward movement (E.105), the door stops instantly. TST FUS then moves the door back to the upper final position.
- If the light beam is broken when the door is open or in the process of opening and is then released again, the Keep Open Time 2 of 3 s (**P.015: 0 - 200 s**) starts running once the door reaches the upper final position.

If the photoelectric barrier is installed in the guide tracks, note that a pre-limit switch must be set to deactivate the photoelectric barrier function.
Set the following parameters to be able to read the current position value:
P.910: 9 = current position in increments
From the lower final position, move the door to the required installation height for the photoelectric barrier.
Check the position value at this point.
The installation height cannot be higher than position value 900.
Now install the photoelectric barrier.
Then move the door closing edge 20 mm to max. 50 mm above the photoelectric barrier and read off the current position value.
Now set parameter **P.441 (0-999)** to the current position value.
Check the functioning of the photoelectric barrier and set parameter **P.910** back to 0.
P.910: 0 = display control process

External 1-way pushbutton switch

A 1-way pushbutton switch can be connected to terminals **44** and **45**. The pushbutton commands are executed one after the other in the sequence UP (up to upper final position) / DOWN / STOP - Up.
The pushbutton commands are ignored if there is a fault.

External triple pushbutton

An external triple pushbutton can be connected to terminals **40, 41, 42** and **43** .

Caution

If you use several triple pushbuttons, the stop buttons must be switched in series. (see overall wiring diagram).

These have the same functions as those on the keypad on the front of the control unit apart from in the following cases:

- Confirm and reset errors
- Go to parameterise mode

The jumper between terminals **40** and **42** must be removed in order to connect an external triple pushbutton.

Automatic closing
A switch for deactivating the **"automatic closing"** function can be connected to terminals **54** and **55**.
If automatic closing is activated (switch open), the control unit automatically moves the door to the upper final position after the keep open time 1 of 10 s (**P.010: 0 - 200 s**) and to the partial opening position after the keep open time 3 of 10 s (**P.011: 0 - 200 s**). If the photoelectric barrier was broken, the door automatically closes after the keep open time 2 of 3 s (**P.015: 0 - 200 s**).
For **P.010: 0, P.011: 0** and **P.015: 0** automatic closing is deactivated.
If the early warning time before moving down (**P.025 : 0 - 20 s**) is set to greater than 0 s with warning light (**P.700: 1**) a warning is given before the start of automatic closing through actuation of relay K1.

Partial opening
A switch to activate the **"partial opening"** function (also referred to as 1/2 door height) can be connected to terminals **56** and **57**. If partial opening is activated, the programmed partial opening position is used as the upper finish position.

Setting the partial opening position
Set the following parameters to be able to read the current position value:
P.910: 9 = **current position in increments**
Move the door to the required partial opening position.
Now set parameter **P.240** to the current position value.
Check the set partial opening position and set parameter **P.910** back to 0.
P.910: 0 = **display control process**

Stop in UP direction
A switch for stopping in UP direction can be connected to terminals **58** and **59**. For installation the wire jumper across terminals **58** and **59** must be removed.
If the switch responds during UP movement, the door is stopped. UP movement remains locked. The switch must be released by manually pressing the **DOWN** button (jogging mode). As soon as the switch is released, the door stops and switches back to automatic mode.

Connection and function of the switching outputs

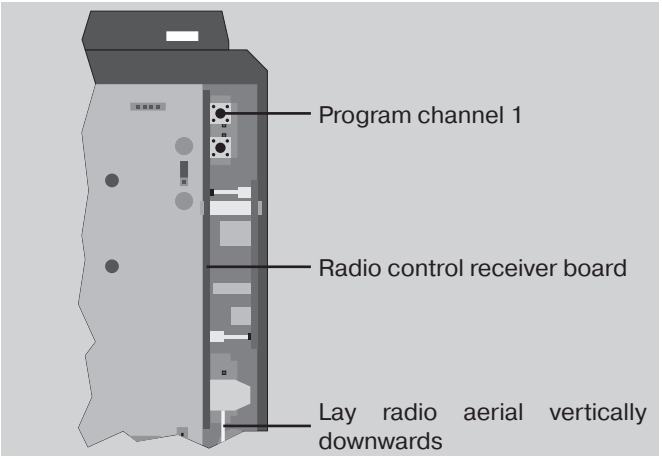
Switch outputs
The TST FUS door control unit has 3 potential-free relay switch outputs (changeover contacts, see wiring diagram) each with a switching capacity of 230 V AC / 3 A.

Switching functions of the indicator outputs	**P.700**
Door status + warning light flashing Relay K1 switches on when the door leaves either of the finish positions and flashes at a rate of 1 Hz. If the early warning time before moving down (**P.025 : 0 - 20 s**) or before moving up (**P.020: 0 - 1000 [10ms]**) is greater than 0 s, relay K1 switches on flashing as soon as the early warning time starts. Relay K2 switches on at the upper finish position. Relay K3 switches on at the lower finish position. When the door is moving, relays K2 and K3 are off.	1
Door status + yard light with time delay At the beginning of each door movement relay K1 switches on and remains on for 120 s (**P.713: 0 - 999 =10 - 1009 s**) after the end of each door movement. Relay K2 switches on at the upper finish position. Relay K3 switches on at the lower finish position. When the door is moving, relays K2 and K3 are off.	2

Installation and functioning of the radio control receiver

The TST FUS control unit can be fitted with a 1-channel radio remote control system. If such a system has been ordered with the control unit, the radio receiver will already have been installed in the control unit. If this is the case, please proceed to the "Function" section.

If a radio remote control system is being retrofitted, you must first install the receiver board on the motherboard. For this disconnect the entire door control system from the mains.
Insert the radio control receiver board in slot **FUNK** at the top right of the TST FUS control unit, as shown on the drawing. Make sure the board is aligned correctly.
Lay the receiver aerial in the control unit vertically downwards.



Function

Channel 1

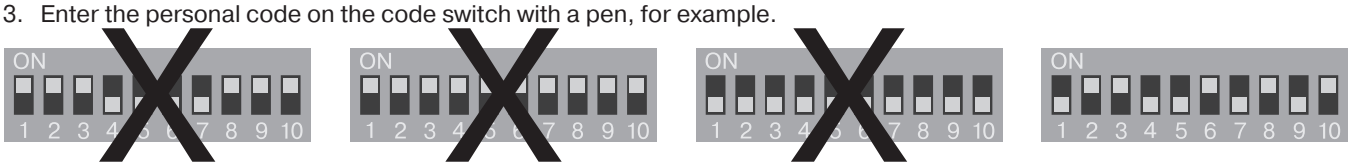
Channel 1 of the radio remote control operates in the same way as the 1-way pushbutton switch. The pushbutton commands are executed one after the other in the sequence UP (up to upper final position) / DOWN / STOP - Up.
The pushbutton commands are ignored if there is a fault.

Caution

When using a radio control system the person controlling the door must have a clear view of the door and its surrounding area during door movement and must not be in a dangerous position.

Programming the Hand-held Transmitter Code

1. Press the Transmit button on the transmitter and check whether the transmission control light is on.
2. At the bottom of the hand-held transmitter, press the long grey button with your thumb and open the hand-held transmitter.
3. Enter the personal code on the code switch with a pen, for example.



4. Close the hand-held transmitter.
5. To program the hand-held transmitter code in the radio control receiver proceed as follows:

- Press **Program Channel 1** on the radio control receiver.
- Within 5 s press the Transmit button on the hand-held transmitter that is to be programmed for channel 1 until the red LED on the radio control receiver is on (the drive starts to run).

You can program up to 32 transmitters with different codes in this way.

Deleting all the transmitter codes programmed

Note

It is not possible to delete an individual transmitter.

To delete the hand-held transmitter codes in the radio control receiver proceed as follows:
Press **Program Channel 1** on the radio control receiver for about 10 seconds until the red LED comes on.
All the programmed transmitter codes are now deleted.

Installation and functioning of the induction loop evaluator

The TST SUVEK1 induction loop evaluator (1 channel) is a system for inductive vehicle identification.
The TST FUS control unit can be fitted with a 1-channel induction loop evaluator. If such a system has been ordered with the control unit, the induction loop evaluator will already have been installed in the control unit. If this is the case, please proceed to the "Function" section.

If an induction loop evaluator is being retrofitted, you must first install the induction loop evaluator board on the motherboard. For this disconnect the entire door control system from the mains.
Insert the radio control receiver board in slot **SUVEK** at the bottom right of the TST FUS control unit, as shown on the drawing. Make sure the board is aligned correctly.

Function

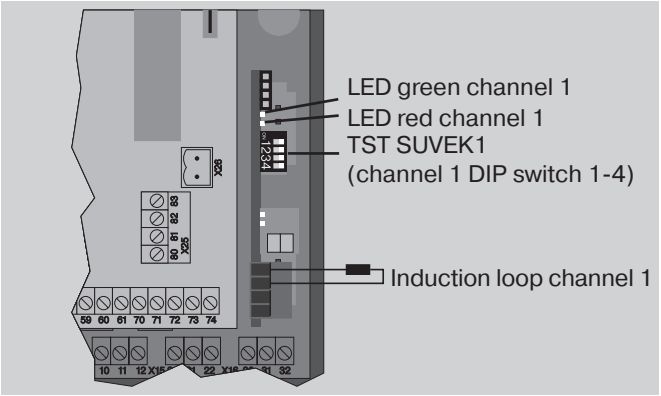
Channel 1

Channel 1 of the induction loop evaluator has the same function as the UP button.

Setting the sensitivity

You set the sensitivity for each channel to define which inductivity change a vehicle must cause so that the sensor output is set.

Sensitivity level	Channel 1 DIP switch 1, 2
1 low	OFF/OFF
2	ON/OFF
3	OFF/ON
4 high	ON/ON



Setting the stopping time

The stopping time can be set using DIP switch 3. Once the stopping time has passed, "loop free" is signalled and readjustment of the loops is automatically carried out. The stopping time starts when the loop is occupied.

Stopping time	Channel 1 DIP switch 3
5 minutes	OFF
infinite	ON

Setting the frequency and automatic readjustment

The working frequency of the sensor can be set using DIP switch 4.

Frequency	Channel 1 DIP switch 4
low	OFF
high	ON

The permitted frequency range is 30kHz to 130kHz.
Readjustment can be triggered manually by changing the frequency setting of a channel. When the power supply is turned on, the sensor automatically carries out readjustment for the loop frequency. Automatic readjustment is not carried out in the event of a short-term loss of power of <0.1s.

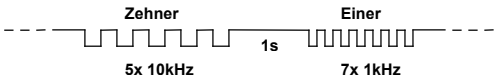
LED display

The green LED signals that the sensor is ready for operation. The red LED indicates activation of the relay output, depending on the occupancy status of the loop.

LED green Loop control	LED red Loop status	Sensor status
off	off	No power supply
flashing	off	aut. readjustment or frequency output
on	off	Detector ready, loop free
on	on	Detector ready, signal output
off	on	Loop malfunction

Output of loop frequency

Approx. 1s after sensor automatic readjustment, the loop frequency is output via the flashing signal of the green LED. The 10kHz point is output first. For each 10kHz loop frequency, the green LED of the sensor channel flashes once. After a 1s pause, the 1kHz point is output in the same way. If the one kHz point has the value '0', 10 flash signals are output. The 1kHz flash signals are somewhat shorter than those for the 10kHz point.
Example of 57 kHz loop frequency:



Parameter

Operating level 0 (**P.999: 0; DIP switch S200 to OFF**). The level 0 parameters are visible.
Operating level 1 (**P.999: 1; DIP switch S200 to ON**). The level 0 and 1 parameters are visible.
Operating level 2 (**P.999: 2; DIP switch S200 to ON**). The level 0.1 and 2 parameters are visible.

P.	[Unit] Setting range	Description	ex works
000	[Cycles]	Display of door cycle counter Representation: 1234567 ⇒ 1234. ⩛.567 Representation: 67 ⇒ 67	
010	[s] 0..200	Keep open time 1 Keep open time 1 starts when the door is in the upper final position. 0 = automatic closing deactivated	10
011	[s] 0..200	Keep open time 3 Keep open time 3 starts when the door is in the partial opening position. 0 = automatic closing deactivated	10
015	[s] 0..200	Keep open time 2 Keep open time 2 starts if the photoelectric barrier is broken. 0 = automatic closing deactivated	3
016	[s] 0..60	No function	5
020	[10 ms] 0..1000	Early warning time before moving up	0
025	[s] 0..20	Early warning time before moving down	0
130	0..1	Motor rotary field 0: Right rotary field 1: Left rotary field	1
140	[%] 0..30	Boost for moving up Voltage increase in U/f characteristic curve in % of nominal voltage when moving up. → Torque increase in lower speed range	5
145	[%] 0..30	Boost for moving down Voltage increase in U/f characteristic curve in % of nominal voltage when moving down. → Torque increase in lower speed range	0
210	0..5	Reprogramming of final positions 0: no → None/termination 1: Eu → No function 2: Eo → Upper limit switch 3: uo → Upper and lower limit switch 4: E1 → Limit switch – partial opening 5: al → (All) Upper, lower and partial opening	0
221	[Inc] ± 125	Adjustment value lower final position If you increase the value, the switching point gets higher. If you decrease the value, the switching point gets lower. (Set to 0 is the door final positions are reset)	0
226	0..2100	Switching point between fast and normal movement down in connection with **P.365**	0
231	[Inc] ± 125	Adjustment value upper final position If you increase the value, the switching point gets higher. If you decrease the value, the switching point gets lower. (Set to 0 is the door final positions are reset)	0
240	25..9999	Partial opening position	25
310	[Hz] 20..100	Frequency for moving up	60
350	[Hz] 20..100	Frequency for moving down CAUTION: Observe closing forces on safety edge.	40

P.	[Unit] Setting range	Description	ex works
365	[Hz] 20..100	Frequency for 2nd speed moving down in connection with **P.226**	30
39F	0..3	Ramp profiles 0: Average/slow acceleration of the door 1: Slow acceleration of the door (large, heavy door) 2: Average acceleration of the door 3: Fast acceleration of the door (small, light door)	0
420	[10 ms] 3..200	Reversing time when safety edge actuated If the safety edge is actuated when the door is moving down, the door stops and is opened again after a short period. The time between stopping and reopening is set with this parameter. (20 = 200ms)	20
440	-60..999	Position of pre-limit switch safety edge	10
441	0..999	Position of pre-limit switch photoelectric barrier	20
460	-1..5	Type of safety edge 0: Safety edge inactive Note: This setting is only possible if a safety edge is not connected. 1: Electric safety edge, normally open contact 2: Electric safety edge, normally closed contact 3: Safety edge with testing (DW), normally open contact 4: Safety edge with testing (DW), normally closed contact 5: Optoelectronic safety edge FRABA OSE	-1
700	1..2	Switch output function 1: Door status + warning light flashing 2: Door status + yard light with time delay	2
713	0..999 (=10..1009s)	Yard light duration of illumination	110 (=120s)
910	0..15	Display mode (on request using STOP button or while door is moving) 0: Control process (automatic) 1: [Hz] Current rotary field frequency 2: [A] Current motor current (> 1A) 3: [V] Current motor voltage 4: [A] Current intermediate circuit current (active current) 5: [V] Intermediate circuit voltage 6: [°C] Temperature in housing in [°C] 7: [°F] Temperature in housing in [°F] 8: Lasted measured runtime (1/10 to 99.9s, 1/1 from 100s) 9: [Inc] Current position progression 10: No function 11: [dig] Current channel 1 value from absolute value encoder 12: [dig] Current channel 2 value from absolute value encoder 13: [V] Current reference voltage (2.5V) 14: High-level stage temperature in °C 15: High-level stage temperature in °F 16: No function 17: No function	0
920	Eb 1 Eb 2 Eb 3 Eb 4 Ebcl Eb -	Fault recorder/malfunctions ⇒ Open by pressing the Stop button again ⇒ Switch using Up/Down button ⇒ Close by pressing Stop button again ⇒ Exit by terminating "EB-". • Eb 1 → Error messages 1 (most recent) or Er-- • Eb 2 → Error messages 2 or Er-- • Eb 3 → Error messages 3 or Er-- • Eb 4 → Error messages 4 or Er-- • Ebcl → Delete complete fault recorder • Eb - → Termination (Display of noEr: there are no faults)	Eb 1
925		Software version	-

930	[s] 0..120,0	Runtime of drive last time door moved.	-
940	[V]	Input supply voltage	-
980	0..3	Operating mode 0: Automatic (automatic movement up and down) 1: Dead-man down (manual operation for down/automatic for up) 2: Dead-man (manual operation for up and down) 3: Emergency (dead-man up and down, all faults and safety devices are ignored)	0
990	0..1	Reset to factory settings	0
999	0..2	Password to select operating level	2

Overview of messages

Error messages

Errors can be confirmed if they are not reset automatically. To do this, press the STOP STOP button for about 3 seconds.

Attention

The cause of the error or fault must be eliminated before the message can be confirmed.

Error code	Description	Cause/remedy
F.000	Upper final position overrun	• Mechanical brake faulty • Final position overrun during emergency manual operation of the drive Reset door final positions, if necessary
F.005	Lower final position overrun	• Mechanical brake faulty • Final position overrun during emergency manual operation of the drive Reset door final positions, if necessary
F.030	Dragging error (door position change is less than expected)	• Door or drive is blocked • Power too low for starting torque Increase boost if necessary (**P.140** / **P.145**) Reduce frequency if necessary (**P.310** / **P.350** / **P.365**)
F.031	Drive's direction of rotation is not the expected direction of rotation	• Motor rotary field was changed after door final positions were set (**P.130 or terminal T1, T2, T3**)
F.043	Malfunction of pre-limit switch for photoelectric barrier	• The pre-limit switch for the photoelectric barrier stays in use in the partial opening position or upper final position
F.090	Control unit not parameterised	• If an error occurs, please contact Customer Services immediately.
F.201	Internal emergency off switch actuated or watchdog (computer monitoring)	• Internal emergency off switch actuated (**terminal X26**) • Internal parameter or EEPROM checks contain errors
F.211	Emergency stop actuated on terminal **60**/**61**	• S3F safety switch HK/LK of drive actuated • S4F thermal switch of drive actuated • Spring fracture safety device actuated • External emergency off switch actuated
F.212	Emergency stop actuated on terminal **70**/**71**	• Slack rope switch actuated • Wicket door switch actuated
F.360	Short circuit identified on safety edge input (**terminal 72**/**73**)	• Line fault identified for safety edge with normally closed contact
F.361	Safety edge activated for 5 door movements one after the other	• Safety edge activated for 5 door movements one after the other Clear door area
F.362	Redundancy error in the event of short circuit on safety edge input (**terminal 72**/**73**)	• Internal safety edge sensor faulty • Fraba OSE connected but not set in parameter **P.460**
F.363	Interruption at safety edge input (**terminal 72**/**73**)	• Connection cable (spiral cable) of safety edge faulty • Safety edge terminating resistor faulty or jumper (**J600**) set incorrectly

F.364	No safety edge switching pulse at lower final position - testing failed.	• No safety edge switching pulse at lower final position – testing failed Readjust DW contact if necessary Correct pre-limit switch for safety edge if necessary (**P.440**) Correct shut-off point in lower final position if necessary (**P.221**)
F.365	Redundancy error in the event of interruption on safety edge input (**terminal 72/73**)	• Internal safety edge sensor faulty • Fraba OSE connected but not set in parameter **P.460**
F.366	Pulse frequency of optical safety edge too high	• Faulty optical safety edge • Internal safety edge sensor faulty
F.369	Safety edge incorrectly parameterised	• A safety edge is connected but deactivated (**P.460**)
F.385	Malfunction of pre-limit switch for safety edge	• Pre-limit switch for shutting off safety edge or reversing after safety edge actuation still used in upper final position after safety edge actuation (**P.440**)
F.400	Hardware reset of control unit identified	• Serious faults with power supply • Internal watchdog actuated • RAM error
F.410	Overcurrent Drive/interim circuit	• Boost set too high (**P.140/P.145**) • Incorrectly dimensioned drive for door in question • Door slow • The plug-in drive connected is not A35AE FU ¬ A150AE FU
F.420	Interim circuit overcurrent limit 1	• Brake chopper faulty (TST FUS-C)/non-existent (TST FUS-B) • Input mains voltage far too high • Drive returns too much energy in generator operation, the door's movement energy cannot be sufficiently reduced Check counterweight or spring tension of the door if necessary Reduce boost if necessary (**P.140** / **P.145**) Reduce frequency if necessary (**P.310** / **P.350** / **P.365**) Replace TST FUS-B control unit with TST FUS-C if necessary
F.430	Heat sink temperature outside working range limit 1	• Load on output or brake chopper too high • Ambient temperature too low for operating the control unit
F.435	Temperature in housing increases to above 75 °C	• Load on frequency converter/switching too high • Control unit not sufficiently cooled
F.440	Interim circuit overcurrent Limit 1	• Boost set too high (**P.140/P.145**) • Incorrectly dimensioned drive for door in question • Door slow • The plug-in drive connected is not A35AE FU ¬ A150AE FU
F.510	Overcurrent Drive Limit 2	• Boost set too high (**P.140/P.145**) • Incorrectly dimensioned drive for door in question • Door slow • The plug-in drive connected is not A35AE FU ¬ A150AE FU
F.515	Drive protection function identified overcurrent	• Boost set too high (**P.140/P.145**) • Incorrectly dimensioned drive for door in question • Door slow • The plug-in drive connected is not A35AE FU ¬ A150AE FU
F.519	Output function identified overcurrent	• Short circuit or earth fault on drive terminals (**T1, T2, T3**) • Boost set too high (**P.140/P.145**) • Incorrectly dimensioned drive for door in question • Door slow • Motor winding faulty • Temporary interruption of emergency off circuit (**terminals X26, 60/61, 70/71**) • The plug-in drive connected is not A35AE FU ¬ A150AE FU
F.520	Interim circuit overcurrent Limit 2	• Brake chopper faulty (TST FUS-C)/non-existent (TST FUS-B) • Input mains voltage far too high • Drive returns too much energy in generator operation, the door's movement energy cannot be sufficiently reduced. Check counterweight or spring tension of the door if necessary Reduce boost if necessary (**P.140** / **P.145**) Reduce frequency if necessary (**P.310** / **P.350** / **P.365**) Replace TST FUS-B control unit with TST FUS-C if necessary

F.521	Interim circuit undercurrent	• Input supply voltage too low • Load on drive too high • Fault on output or brake chopper (**TST FUS-C**)
F.524	24 V supply non-existent or too low	• Overload but no short circuit • In the event of short circuit of 24 V, the control unit power supply does not start and the V306 glow lamp is on
F.530	Heat sink temperature Working range limit 2	• Load on output or brake chopper too high (**TST FUS-C**) • Ambient temperature of control unit too low
F.535	Temperature in housing increases to above critical 80 °C	• Load on frequency converter/switching too high • Control unit not sufficiently cooled
F.540	Overcurrent Interim circuit. Limit 2.	• Boost set too high (**P. 140**/**P. 145**) • Incorrectly dimensioned drive for door in question • Door slow • The plug-in drive connected is not A35AE FU ¬ A150AE FU
F.700	Position recording contains errors	• Setting of door final positions not completed or contains errors and must be repeated • Incorrect partial opening position set
F.750 **F.751** **F.752**	Transfer error to drive‘s absolute value encoder	• Interface line faulty (**terminal 80, 81, 82, 83**) Check that the control cable connector is firmly in the limit stop housing of the drive • Sensor electronics of absolute value encoder faulty • Sensor electronics of control unit faulty
F.760 **F.761** **F.762**	Position recording of absolute value encoder faulty	• Upper final position or partial opening position overrun • Control unit not yet initialized • Sensor electronics of absolute value encoder faulty • Sensor electronics of control unit faulty

Internal system errors F.9xx

These errors are internal errors that the user cannot rectify.
If an error of this kind occurs, contact your customer service team immediately.

Information messages

Status messages during door operation	
STOP	**Stop** / reset status, wait for next incoming command
_Eu_	**Lower final position Eu**
≡Eu≡	**Lower final position blocked** → upward movement not possible (e.g. lock)
ZUF ⊓	**Active downward movement**
¯Eo¯	**Upper final position Eo**
≡Eo≡	**Upper final position blocked** → downward movement not possible (e.g. safety loop)
⊓UP	**Active upward movement**
-E1-	**Partial opening position reached E1**
≡E1≡	**Partial opening position blocked** → downward movement not possible (e.g. safety loop)
FAIL	**Fault** → only dead-man movement possible, possibly automatic upward movement
EICH	**EICH mode** → setting of final positions in dead-man mode
≡NA≡	**Emergency off** → movement not possible
NOTF	**Emergency movement** → Dead-man movement ignoring safety devices
‚Hd‘	**Manual** → dead-man mode
ParA	**Parameterisation**
‚Au‘	**Automatic** → identifies switch from ‘Manual’ to ‘Automatic’ status
‚Hc‘	**Semi-automatic** → identifies switch from ‘Manual’ to ‘Semi-automatic’ status
FUS	First display after switching on **(power up and self-test)**
Status messages during setting of door final positions	
E.i.E.u.	Movement to lower final position (in dead-man mode)
E.i.E.o.	Movement to upper final position (in dead-man mode)
E.i.E.1.	Movement to partial opening position E1 (in dead-man mode)
Status messages during dead-man mode	
Hd.cL	Dead-man downward movement (button ⩛)
Hd.oP	Dead-man upward movement (button ⩓)
Hd.Eu	Lower final position reached
Hd.Eo	Upper final position reached
Hd.Ao	Upper final position overrun (dead-man upward movement not possible)
Information messages during automatic operation	
I.100	Speed too high when reaching upper final position
I.150	Speed too high when reaching lower final position
I.160	Permanent UP still active
I.210	Upper pre-limit switch implausible
I.211	Lower pre-limit switch implausible
I.500	Adjustment of upper limit switch under way
I.501	Upper pre-limit switch adjusted
I.502	Upper limit switch range adjusted
I.505	Adjustment of lower limit switch under way
I.506	Lower pre-limit switch adjusted
I.507	Lower limit switch range adjusted
I.510	Adjustment of limit switches completed
I.515	Control unit preparing for automatic programming of limit switches
I.520	The set maximum speed cannot be achieved
I.555	Adjustment of limit switches being carried out

Information messages during parameterisation	
noEr	Fault recorder: no faults recorded
Er--	Fault recorder: if there are faults, a related message was not found
Prog	Programming message during execution of original parameters or default set

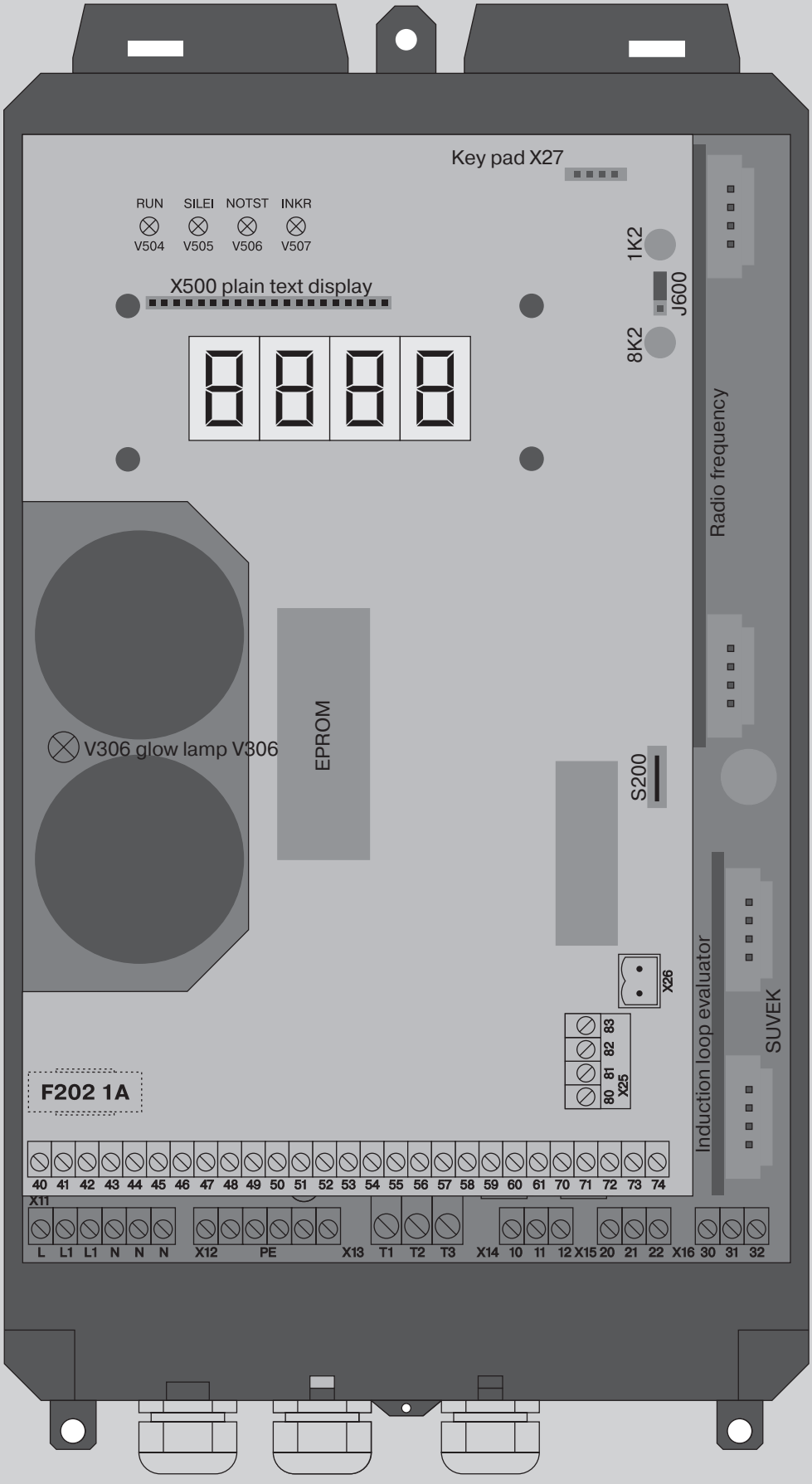
Incoming messages

General inputs	
E.000	Up button key pad
E.050	Stop button key pad
E.090	Down button key pad
E.101	Input terminal **41** Up button internal
E.102	Input terminal **42** Stop button external
E.103	Input terminal **43** Down button external
E.104	Input terminal **45** 1-way pushbutton switch internal
E.105	Input terminal **48** photoelectric barrier
E.106	Input terminal **58** Stop in UP direction
E.107	Input terminal **56** partial opening
E.108	Input terminal **54** automatic closing
E.109	Input terminal **52** Up button external
E.110	Input terminal **51** 1-way pushbutton switch external
Safety/emergency stop chain	
E.201	Internal emergency off switch actuated (**terminal X26**)
E.211	Emergency stop actuated on terminal **60/61**
E.212	Emergency stop actuated on terminal **70/71**
Safety edge	
E.360	Actuation of safety edge
E.363	Safety edge fault
Radio plug-in module	
E.401	Radio channel 1
E.402	Radio channel 2
Induction loop evaluator - plug-in module	
E.501	Detector channel 1
E.502	Detector channel 2

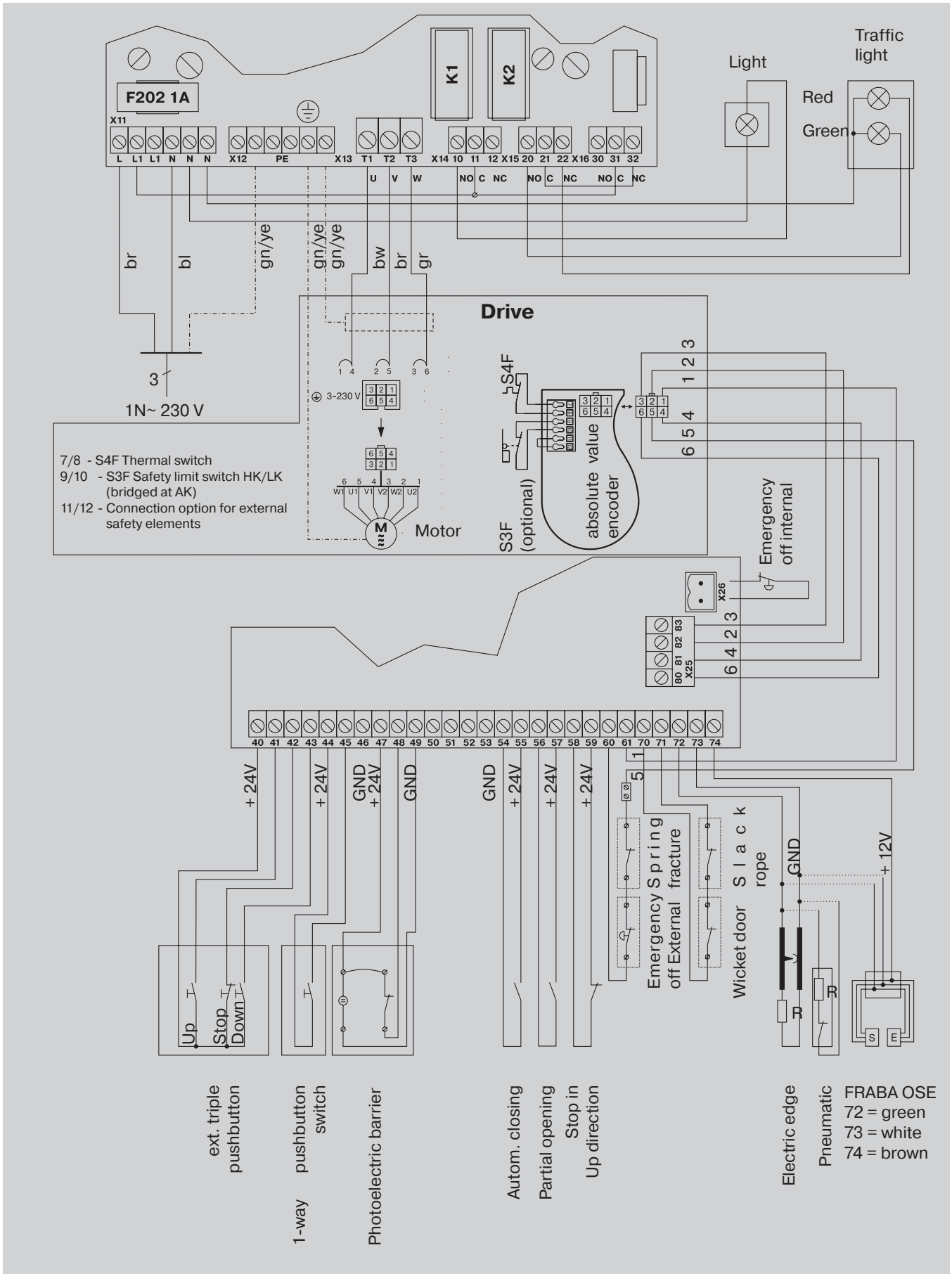
LED display codes

LED	Display	Description
green RUN	ON	Internal error identified (e.g. computer circuit) → Switch control unit on and off or perform the reset function
	3s ON / 3s OFF (0,15 Hz)	Automatic downward movement from upper final position not possible • Object protection photoelectric barrier, Up/Stop command active in upper final position • Dead-man mode active
	1s ON / 1s OFF (0,5 Hz)	Control unit is ready for operation
	OFF	Control unit without power supply
yellow SILEI	ON	Safety edge activated for 5 door movements one after the other
	3s ON / 3s OFF (0,15 Hz)	Safety edge fault • Interruption in closer system • Short circuit in opener system • Safety edge signal when safety edge deactivated (**P.460**) • Interruption or failure of Fraba OSE system
	1s ON / 1s OFF (0,5 Hz)	Actuation of safety edge • Short circuit in closer system • Interruption in opener system • Actuation of Fraba OSE system (frequency < 200 Hz)
	0,1s ON / 0,1s OFF (5 Hz)	Systm fault • No safety edge switching pulse at lower final position - testing failed • Pulse frequency too high for Fraba OSE system • Internal safety edge sensor faulty
red NOTST	ON	24 V control voltage missing (overload or short circuit → check all 24 V consumers, disconnect if necessary) → Fuse resets itself
	3s ON / 3s OFF (0,15 Hz)	Internal emergency off switch actuated (**terminal X26**)
	1s ON / 1s OFF (0,5 Hz)	Emergency stop actuated on terminals **60**/**61** or **70**/**71** • S3F safety switch HK/LK of drive actuated • S4F thermal switch of drive actuated • Spring fracture safety device actuated • External emergency off switch actuated • Slack rope switch actuated • Wicket door switch actuated
	0,1s ON / 0,1s OFF (5 Hz)	• Upper final position active (display only with UP button) • Lower final position active (display only with DOWN button)
green INKR	ON	Active movement but no ramp active
	0,1s ON / 0,1s OFF (5 Hz)	Active movement in a ramp
	3s ON / 3s OFF (0,15 Hz)	Frequency converter fault
white V306	ON	Processor not running, nothing displayed but dangerous voltage on control unit
Display OFF and also flashing NOTST LED		Short circuit of 24 V control voltage Power unit does not start

Position of terminals and components



Wiring diagram



Maintenance

The following checks must be carried out for the drive at regular intervals:

1. Fixings:
All fixing screws are to be checked to ensure they are tight and in good condition.

2. Safety switch:
The functional reliability of the S3F safety switch must be checked.
To do this proceed as follows:
Turn off the power supply to the door system.
Open the control unit cover.
Pull out plug-in terminal 60/61.
On the removed plug-in terminal, check the continuity of wires 1/5 using a continuity tester.
There must be continuity.

For hand crank (HK)
Remove the cover on the front of the drive.
Insert the hand crank in the motor shaft.
For light chain LK
Pull the chain and keep it taut.

Check the continuity of wires 1/5 again on the disconnected terminal 60/61.
There must be no continuity.

For hand crank (HK)
Remove the hand crank from the motor shaft.
Close the cover on the front of the drive.
For light chain LK
Let go of the chain
Make sure that the chain is freely hanging so that the S3F safety switch is released again.

Insert plug-in terminal 60/61 into its socket again.
Close the control unit cover.
Turn the power supply to the door system back on.

3. Counterweight (does not apply for sheet doors and sectional doors with spring compensation or a counterweight):
Check the counterweight or spring tension. The sectional door should be fully counterbalanced in every position. Observe the door operating instructions.

Drive technical data

Typ		Unit	A35/112		A50/90	
Drive torque	T	Nm	35	25	50	40
Drive speed	n	min^{-1}	112		88	
Hollow shaft diameter		mm	30			
Nominal current	I	A	3.0	2.7	3.0	2.7
Power factor	cos φ		0.72	0.67	0.72	0.67
Mode of operation	S3	%	40	60	40	60
Static holding torque		Nm	70		70	
Operating voltage	U	V	3~230			
Frequency	f	Hz	50			
Insulating material class			H			
Thermal switch		°C	170			
Protection *1)	IP		54			
Limit switch box			Single-turn absolute value encoder KI-type no. 05 4420 00 manufactured by Kostal			
Limit switch range		Rotations	12			
Zul. Permitted ambient operating temperature		°C	-10 bis +35			
Weight *2) (approx.)		kg	10			

Typ		Unit	A70/60		A80/40		A110/30		A150/20	
Drive torque	T	Nm	70	60	80	65	110	90	150	130
Drive speed	n	min^{-1}	59		40		29		20	
Hollow shaft diameter		mm	25,4							
Nominal current	I	A	3.0	2.7	3.0	2.7	3.0	2.7	3.0	2.7
Power factor	cos φ		0.72	0.67	0.72	0.67	0.72	0.67	0.72	0.67
Mode of operation	S3	%	40	60	40	60	40	60	40	60
Static holding torque		Nm	300		600		600		600	
Operating voltage	U	V	3~230							
Frequency	f	Hz	50							
Insulating material class			H							
Thermal switch		°C	170							
Protection *1)	IP		54							
Limit switch box			Single-turn absolute value encoder KI-type no. 05 4420 00 manufactured by Kostal							
Limit switch range		Rotations	12							
Zul. Permitted ambient operating temperature		°C	-10 bis +35							
Weight *2) (approx.)		kg	10							

*1) Optional: IP65
*2) For version LK the weight increases by around 0.5 kg.
Deviations are possible in structurally identical drives or special drives.
The information on the identification plate always applies.

CE

Subject to technical changes without notice.

Control unit technical data

Type	TST FUS
Housing dimensions (W x H x D):	180 x 320 x 120mm
Supply voltage via L, N, PE:	230 V AC ±10%, 50…60 Hz Permitted range: 180…240V ± 10% / 50…60Hz Protection: 16A K characteristic
Control unit's own consumption:	max. 30W when fully equipped
External supply 1 (230 V):	230 V AC ±10%, 50…60 Hz (protected on printed board: F202 / 1 AT)
Control voltage/supply 2:	24 V DC regulated (± 5% with nominal voltage 230 V) max. 500 mA to 40°C, max. 250 mA to 50°C Incl. optional plug-in modules protected by self-resetting semi-conductor protection, short circuit-proof by means of central switching regulator
Control voltage/supply 3:	for electronic limit switches and safety edge Nominal value 11.5V / max. 130 mA
Control inlets	24 V DC / typ.15 mA, max. 26 V DC / 20 mA The connection for all inputs must be potential-free or: < 5 V: inactive → logical 0 > 7 V: active → logical 1 Min. signal duration for input control commands: > 100 ms Galvanic separation through opto-coupler on printed board
RS485 A and B:	for electronic limit switch only RS485 level, closed with 100 Ω
Safety chain/emergency off	It is imperative that all inputs have potential-free connection Contact load: ≤ 26 V DC / ≤ 120 mA If the safety chain is interrupted, drive movement is no longer possible, not even in dead-man mode
Safety edge input:	For safety edge with 1.2 kΩ or 8.2 kΩ load resistance and for Fraba OSE system
Relay outputs	If inductive loads are switched (e.g. other relays or brakes), these must be fitted with appropriate anti-interference measures (recovery diode, varistors, RC modules). Potential-free change-over contact min. 10 mA max. 230 V AC / 3 A Contacts used once for power switching can no longer switch any low currents.
Drive output	For drives up to 0.75 kW at 230 V Motor constant current at 100 % duty and 40°C ambient temperature: 5 A Motor constant current at 60 % duty and 50°C ambient temperature: 5 A Can be temporarily overloaded up to 15 A for 0.5 s Max. length of motor cable: 30 m
Brake resistance load (optional):	max. 1.5 kW for max. 0.5 seconds. Repeat rate min. every 20 seconds.
Temperature range Operation: Storage:	 -10…+50°C -25…+70°C
Air humidity	up to 80 % non-condensing
Vibration	Low-vibration installation e.g. on a masonry wall
Protection type	IP54
Weight	Approx. 5 kg

Guidelines	Standards
EMC guideline: 89/336/EEC Amended by: 91/263/EEC 92/031/EEC 93/068/EEC	EN 50081-1 / 03.93: Emission standard, residential EN 50081-2 / 03.94: Emission standard, industrial environment EN 61000-6-2 / 2001: Immunity for industrial environments
Low voltage guideline: 73/023/EEC Amended by: 93/068/EEC	EN 60335-1 / 2003: Safety of household and similar electrical appliances / part 1
Design tested to:	EN12453 / 2001: Safe use of power-operated doors – requirements. EN12453 / 2001: Safe use of power-operated doors – test procedure.
Applied national technical specifications relating to the aforementioned guidelines	EN12978 / 2003: Industrial, commercial and garage doors and gates – Safety devices for power operated doors and gates – Requirements and test methods

Manufacturer's declaration

BECKER

EG-Herstellererklärung

Dokument Nr./Monat . Jahr **A110/03.09**

Hersteller: **BECKER-ANTRIEBE GMBH**

Anschrift: **Friedrich-Ebert-Str. 2 - 4**
D - 35764 Sinn

Produktbezeichnung: **Antrieb A70AE/60 LK FU Art.Nr.: 2361 500 001 0**
mit Steuerung TST FUS-B-Becker Art.Nr.: 4040 000 001 0
sowie alle Antriebe, Steuerungen und Leitungen, die im Anhang 1 aufgeführt sind.

Für das bezeichnete Produkt wird hiermit bestätigt, daß die Forderungen folgender Richtlinien erfüllt werden:

Nummer: 2004/108/EG
Text: Richtlinien des Rates zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten über die **elektromagnetische Verträglichkeit**.
Weitere Angaben über die Einhaltung dieser Richtlinie enthält Anhang EMV!

Nummer: 98/37/EG
Text: Richtlinien des Rates zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten für **Maschinen**.
ehemals RL 89/392/EWG des Rates.
Weitere Angaben über die Einhaltung dieser Richtlinie enthält Anhang MSR!

Nummer: 2006/95/EG
Text: Richtlinien des Rates zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten betreffend **elektrische Betriebsmittel** zur Verwendung innerhalb bestimmter Spannungsgrenzen.
Weitere Angaben über die Einhaltung dieser Richtlinie enthält Anhang NSR!

Hinweis:
Die Inbetriebnahme der Toranlage, in der dieser Antrieb eingebaut werden soll, ist so lange untersagt, bis festgestellt wurde, daß die Toranlage den Bestimmungen der Richtlinie 98/37/EG entspricht.

Aussteller: **BECKER-ANTRIEBE-GMBH**

Sinn, den 27.3.2009 .....
(Ort, Datum)

.....
(Rechtsverbindliche Unterschrift)

Die Anhänge sind Bestandteil dieser Erklärung.
Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften.
Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten!

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