

# **MOUNTING INSTRUCTION**

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## **CHAIN WHEEL OPERATORS**

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*CD*

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## 2. GENERAL INSTRUCTIONS

### 2.1 Original mounting instructions

This manual is the original manual.

- Copyright protection: any reproduction is permitted only with approval of the manufacturer.
- Subject to alterations in the interest of technical progress.
- All dimensions given in mm. The diagrams in this manual are not to scale.

### 2.2 Intended use

The operator series CD is intended for driving loads, such as sectional doors or rolling doors without weight counterbalance. The protection against falling has to be provided through external devices, such as safety catches or weight countebalances.

For other applications of the operators, the manufacturer must be consulted.

### 2.3 Warranty

The function and safety of the equipment is only guaranteed if the warning and safety instructions included in these operating instructions are adhered to.

The manufacturer is not liable for injury to persons or damage to property if these occur as a result of the warnings and safety advice being disregarded.

The CE declaration and the warranty will void if components are changed.

Only original spare parts and by the manufacturer approved accessories shall be used. These parts are used to maintain the quality and safety of the machine. Changes are only permitted after consultation with the manufacturer.




### 2.4 Target group

Only qualified and trained specialists are permitted to mount the operator and perform mechanical maintenance.

Only qualified and trained electricians may connect the operator and carry out the electrical maintenance.

Qualified and trained people have knowledge of general and specific safety and accident prevention regulations, the relevant regulations and standards, training in the use and maintenance of adequate safety equipment, as well as the ability to recognize hazards associated with their work.

### 2.5 Key to symbols

	<b>DANGER !</b> Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
	<b>WARNING !</b> Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	<b>CAUTION !</b> Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
	<b>NOTICE !</b> Indicates an imminent danger of damage or destruction.
	<b>INFORMATION !</b> Reference to separate documents which must be complied with.

### 3. SAFETY-RELATED REGULATIONS

For connecting, programming and servicing, the following regulations must be observed (the list is not exhaustive)!

Construction product standards:

- EN 13241-1
- EN 12445
- EN 12453
- EN 12635
- EN 12978

Electromagnetic compatibility (EMC):

- EN 55014-1
- EN 61000-3-2
- EN 61000-3-3
- EN 61000-6-2
- EN 61000-6-3

Machinery Directive:

- EN 60204-1
- EN 12100-1

Local protective regulations must be complied with.

### 4 SAFETY INSTRUCTIONS



#### **DANGER !**

Failure to observe the instructions in this document can result in mortal danger!



#### **DANGER !**

Risk of death by electric shock!

- When installing the operator, when opening housings and work on electrical equipment, the operator has to be disconnected from the power.
- Observe the local safety regulations.

#### **NOTICE !**

To avoid damage to the operator and at the door, the drive must be mounted only if :

- the drive is undamaged,
- the ambient temperature is  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ ,
- the installation site altitude does not exceed 1,000 m above sea level.
- The use of the operator, as well as the standard cable is only allowed indoors.
- For outdoor installation must be consulted with the manufacturer.



#### **WARNING !**

- Make sure that children can not access the door control or the hand-held transmitter.
- Ensure, before moving the door, that no persons or objects within range of the door.
- Test all existing emergency command devices.
- Pay attention to possible crushing and shearing points on the door system.
- Never reach into a running gate, into the guide rail or moving parts.

#### **INFORMATION !**

For drives with fixed connection a main switch with appropriate building main fuse must be provided.



#### **WARNING !**

Before installation, ensure that:

- the operator is installed with the intended covers or guards,
- all seals are correctly and

## 5. MOUNTING

### 5.1 Preparation

- Check that the delivery is complete.
- Check if all accessories for your installation situation are present (e.g. console).
- Check if the system has a suitable mains connection and a mains switch.
- Remove all unnecessary components from the door.
- Remove all devices, which are not required after installation of the drive system.
- Before installation, ensure that the operator is not blocked.
- Before installation, ensure that the operator has been newly prepared after a lengthy storage period.
- Before installation, ensure that no other sources of danger are present.
- Before installation, ensure that the installation site has been cordoned off over a wide area.

### 5.2 Special instructions for chain wheel drives

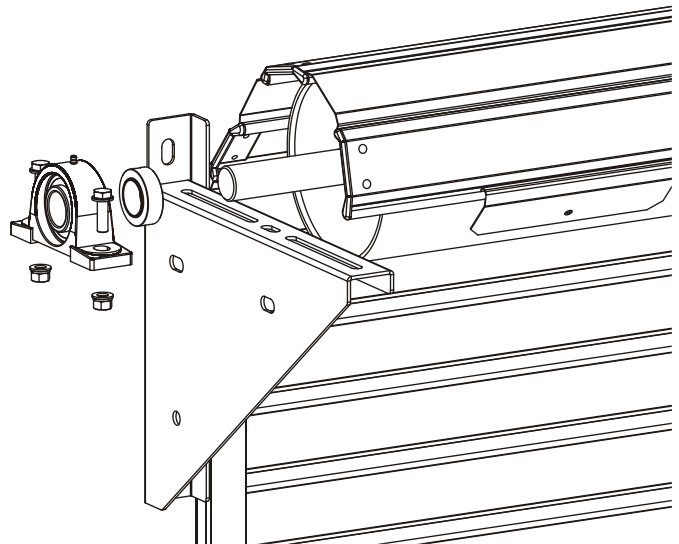
- The drive sprocket must not protrude beyond the end of the stub shaft and should be mounted as close as possible to the gearbox housing.
- The permissible chain tension must not be exceeded.
- Provision must be made for tensioning the chain. The sag of the chain must be approx. 1% of the centre distance or a chain link height.
- The maximum chain angle of 60° should not be exceeded without a tensioning wheel.
- In the case of shaft bolts and pillow block housings, the dependence of the breaking strength on the chain tensioning direction must be observed.

### 5.3 Mounting the chain wheel / changing the output side

- After removing the locking screw and support washer, the stub shaft can be pulled out and thus the output side can be replaced.
- The sprocket may only be mounted with the stub shaft removed.
- The shaft end must be greased before the sprocket is fitted.
- Push the sprocket onto the shaft.
- Secure the sprocket wheel against displacement.

### 5.4 Assembly of the pillow blocks

- Fit the bearings onto the shaft.
- Fasten the counter bearing to the bracket with suitable screws.
- The brackets must be mounted so that the winding shaft is horizontal.
- Fixing against axial displacement of the winding shaft is done on the opposite side on the self-aligning ball bearing (fixed bearing), by means of a set screw or with set collars on both sides.



#### **DANGER !**

All components must be designed by the construction and the ground for the loads of a catch case.



#### **DANGER !**

If the shaft groove is continuous, the feather key must be secured against displacement.



**CAUTION !**

For drives with weights of more than 20 kg, additional aids, such as hooks or ropes, must be used for securing and lifting. Appropriate eyelets are provided on the drives for fastening.



**DANGER !**

Skip of the chain, which can lead to displacement of the end positions, must be avoided

**INFORMATION !**

For the installation of the operator on the gate, the corresponding gate instructions must be observed.

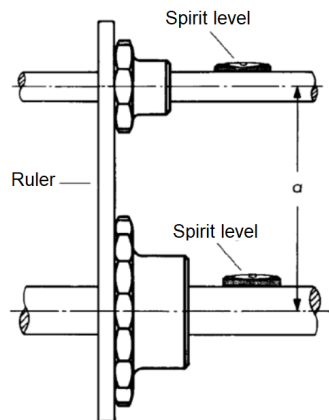


**WARNING !**

Crushing and shearing points in the area of the chain must be secured up to a height of 2.50 m above the floor or another permanent access level. Separating guards must have sufficient distance from the moving chain.

**6. MOUNTING THE CLAMPING CONSOLE**

- Mount the chip consoles with suitable fixing materials.
- The drilling pattern is shown in the dimensional drawings.
- Fasten the drive on the bracket.
- Fit and tension the chain (see 5.3).
- Check chain for correct arrangement, rework if necessary.



**NOTE !**

In order to avoid damage to the drive, the following points must apply:

- The correct arrangement of the chain drive ensures smooth door travel.
- If the sprockets are axially displaced (interlocked) or the axis has shifted (inclined position) or both, high wear and tear will occur and the chain will skip.

**7. COMMISSIONING**

Power-operated doors must be inspected by an expert before initial operation and as required, but at least once a year (with written proof).

The operators of the door system or their representatives must be instructed in the operation of the system after it has been put into operation.

Before installation, ensure that the direction of rotation of the gear motor is correct and that all motor protection devices are active.

**NOTE !**

In order to avoid damage to the drive, the following points must apply:

- The cable types and cross-sections must be selected in accordance with the applicable regulations.
- The rated currents and the type of connection must correspond to those on the motor rating plate.
- The on-site fuse must comply with the specifications.



**DANGER !**

The permissible tensile force of the chain must be observed (safety S=6 against breakage according to ASR A1.7).



**DANGER !**

Warning! Danger to life from electric shock.

Any work on the actuator is only permitted when it is de-energised. Before starting installation, check that the drive is de-energised and secure it against being switched on again.

**NOTE !**

When fixing the motor cables, make sure that the individual cables are inserted deep enough and that the screws are tightened so that a firm connection is made. This connection must be checked by pulling the cables.

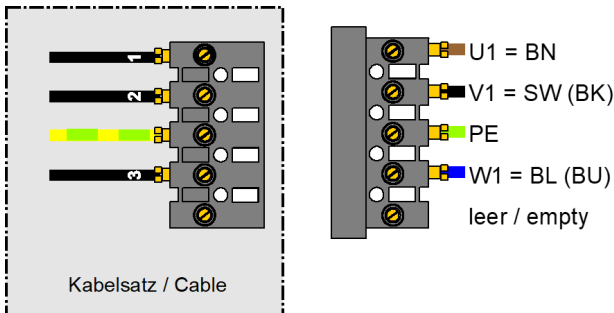
### 7.1 Connection to the control unit

The operator is factory wired to the control unit. If this is not the case, proceed as follows:

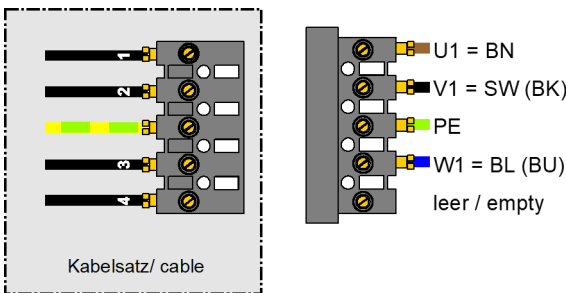
- Remove the cover from the operator.
- Run the cable gland of the cable into the corresponding fitting.
- Connect the motor cable to the plug, the plug is polarized.
- Connect the limit switch:  
AWG: connect plug  
Mechanical limit switch: connect according to diagram
- Attach the cover back on the operator.

#### Connection

Connection to cable set for mechanical limit switches:



Connection to cable set for electronic limit switches:



#### NOTE !

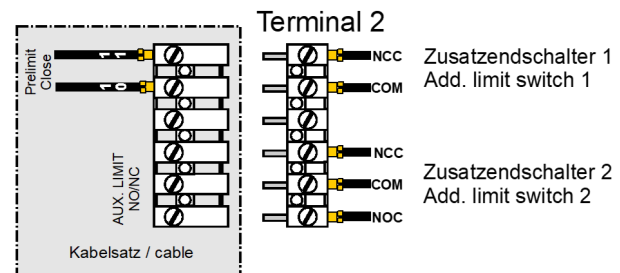
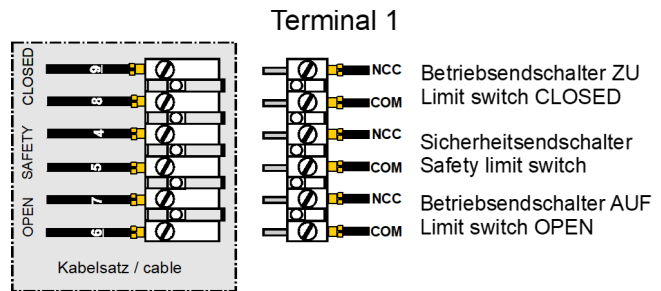
When used with frequency inverters, only shielded cables may be used.

### 7.2 Mechanical limit switch

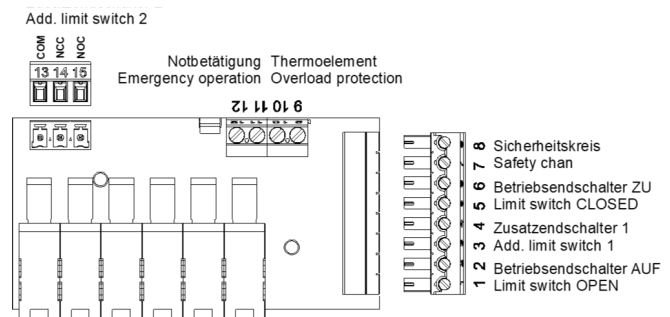
Cam (from outside in)	ME 6 (6 cams)
Red	Safety limit switch open
Green	Limit switch open
Green	Add. Limit switch 1
White	Limit switch close
Red	Safety limit switch close
White	Add. Limit switch 2

### 7.3 Connection

Operators series CD size 2 (PCB):

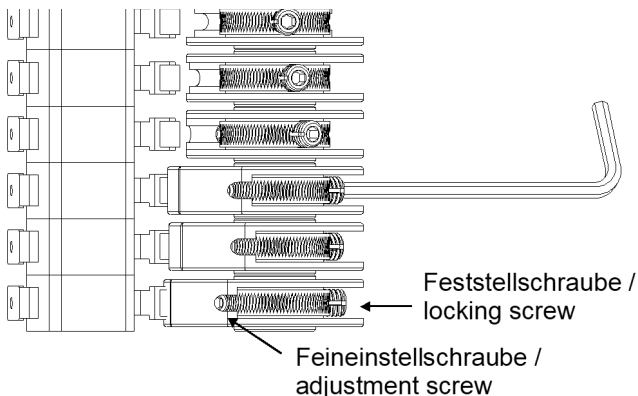


Operators series CD size 4/6 (PCB):



### 7.4 Setting the end positions: mechanical limit switch

For the adjustment of the cam an Allen key size 2.5 is required (included with the drive). The cam is fixed on the correct switch position using the locking screw after positioning (rough setting). Fine adjustment is possible via the precision set screw.



To set the limit switch, the operator must be ready for operation, completely mechanically fitted and electrically connected.

Before the first activation of the operator the door should be in a center position to ensure there is sufficient travel in both directions when starting.

On actuating the button OPEN, the door must open. Otherwise the two phases L1 and L2 have to be exchanged.

To do this, control and drive must be disconnected from the main supply.

#### Setting the CLOSED end position

- Bring the door in the CLOSED end position.
- Set the cam so that the CLOSED limit switch is actuated.
- Tighten the locking screw.
- The Safety limit switch CLOSED must be set so that it switches immediately when the limit switch CLOSED is passed over.
- Adjust the safety limit switch CLOSED.

#### Setting the OPEN end position

- Bring the door in the OPEN end position.
- Set the cam so that the OPEN limit switch is actuated.
- Tighten the locking screw.

- The Safety limit OPEN switch must be set so that it switches immediately when the limit switch OPEN is passed over.
- Adjust the safety limit switch OPEN.

#### Additional limit switches:

- Bring the door to the desired position from the desired direction (e.g. partial open position from the position CLOSED).
- Set the switch cam so that the additional limit switch is actuated.
- Tighten the locking screw.

#### Correct the end positions

With the fine adjustment screw a readjustment of the respective end position is possible.

#### Check of end positions

Check if the end positions are set correctly and if the operator stops in the corresponding end position.

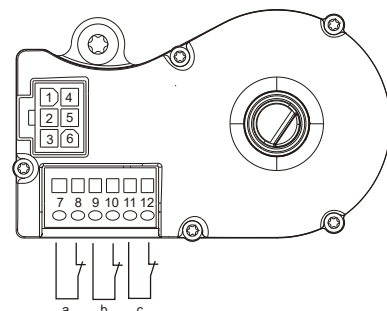
### 7.5 Connection of the electronic limit switch

The electronic (digital) limit switch is an absolute value encoder.

It is connected via an RS485 interface to the control unit.

The encoder has a 6-pin connector on the serial interface, which is connected to the control unit.

The safety switches of the operator are connected to the terminals 7 - 12. Unused terminals must be equipped with a wire bridge.





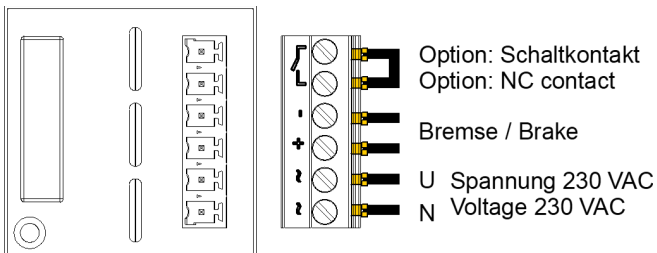
Pin	Assignment	Color
1	Safety chain in	Yellow
2	RS 485 B	Green
3	0 VDC	White
4	RS 485 A	Pink
5	Safety chain out	Grey
6	7 ... 18 VDC	Brown

### 7.6 Setting the end positions: electronic limit switch

Please refer to the control unit operating manual for instructions on setting the end positions.

### 7.7 Connection of the brake / brake rectifier

Operators CD are equipped with a DC-Brake. The brake rectifier is integrated in the drive and pre-wired at the factory. For the connection a neutral conductor is required.



### 7.8 Emergency operation

During maintenance works or in the case of an electrical fault, the door can be moved towards the OPEN or CLOSED positions with the help of the emergency operation equipment.



#### WARNING !

Improper use may result in serious injury!

- Emergency operation must only be carried out when the motor is stationary.
- The system must be disconnected from the power supply during emergency operation.
- Emergency operation must only be carried out from a safe standing position.
- Operators with a spring brake must be actuated against the closed brake when opening or closing



#### WARNING !

- In the case of drives with spring-operated brakes, which are mounted on doors without weight compensation, manual operation must be carried out against the closed brake.
- An unintentional release of the brake must be prevented by the customer.

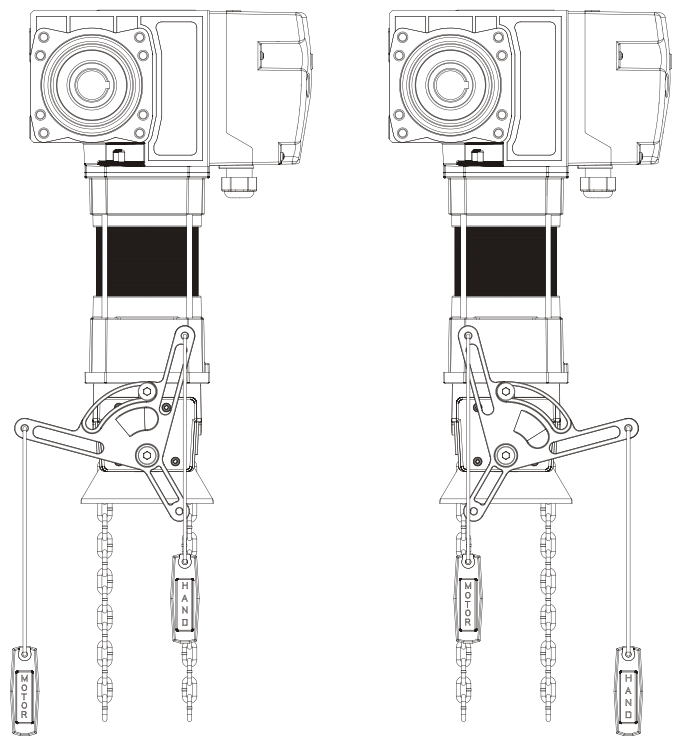
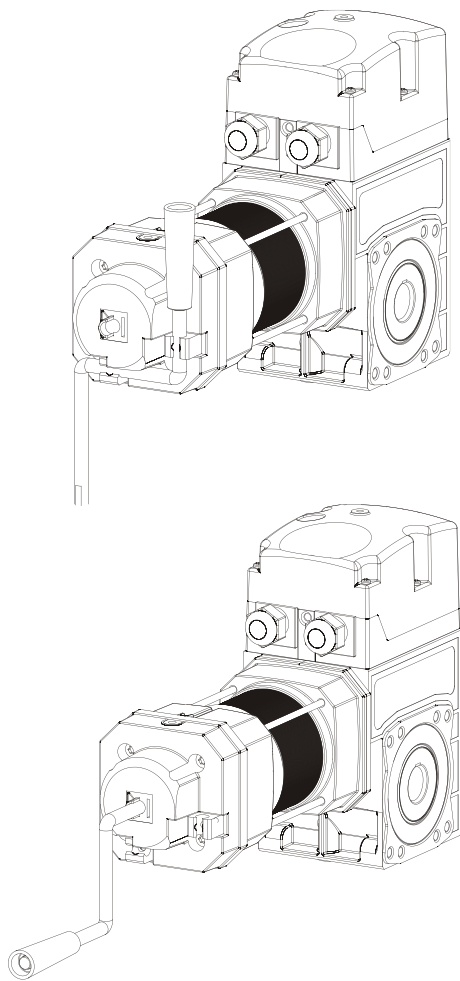
#### INFORMATION !

- For testing purposes, the brake of the drive may be released in the lower position for doors without weight compensation.
- If the door is moved beyond the end positions with the emergency manual operation, the safety limit switches will be approached, causing the power supply to be switched off via the safety circuit of the control unit. Motor operation is no longer possible.

### 7.9 Emergency hand crank

- Hand cranks with different diameters ( $\varnothing 10$  /  $\varnothing 12$  /  $\varnothing 15$ mm) and lever arms are assigned to the different gearbox sizes.
- The holders for the emergency hand crank in the housing are adapted to the crank diameters.
- On the crankcase there is a tab which facilitates the insertion of longer crank rods.
- Remove the crank handle from its mounting and insert it into the receptacle on the actuator with light pressure and a little rotation until it stops.
- A microswitch built into the housing of the emergency crank device interrupts the power supply via the safety circuit in the control unit to the motor.
- The door can be opened or closed by turning the crank.
- If the crank is pulled out again, the microswitch automatically releases the control unit. The door can be operated electrically again.





system decoupled  
(motor operation)

system coupled  
(manual operation)

Depending on the torque of the drive, the chain system is designed with different sized wheels and with different ratios:

### 7.10 Emergency hand chain

By pulling the release lever, the coiler shaft of the hand chain system is shifted and thus switches between motor - and manual operation.

When switching to manual mode a micro switch is actuated and interrupts the safety circuit. No motor operation is possible.

1. Red handle - HAND (system coupled):  
Switching to manual mode  
(the operating force is max. 390 N)
2. Open or close the door using the hand chain.
3. Green handle - MOTOR (system decoupled)  
Switching to motor operation  
(the operating force is max. 390 N)
4. The door can be operated again electrically.

Torque	Ratio	Ø Wheel
140 Nm up to 180 Nm	1:1	80 mm
220 Nm up to 450 Nm	2:1	80 mm
550 Nm up to 650 Nm	2:1	160 mm
750 Nm up to 2000 Nm	2:1	200 mm

### 7.11 Extending or shortening the chain

The coil is joined via one or two coupling links (marked by color yellow).

It can be opened at the coupling link and can be extended with a piece of chain and another coupling link.

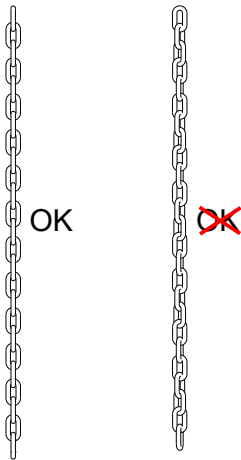
When shortening, the respective part is to be separated from the coil chain using a bolt cutter. The coupling links must be carefully bent together.

When making changes to the coil chain, make sure that the chain is not twisted when mounted

### 7.12 Rotate the hand chain system

The emergency chain system can be rotated by 180° so that the coil wheel is on the other side.

To do this, the 4 fastening screws have to be unscrewed and the housing has to be rotated by 180 ° and then re-tightened (M=7Nm).



chain not twisted

chain twisted

## 8. TECHNICAL DATA

Operator Type	Gearbox Size	Starting Torque	Nominal Torque	Output Speed	Limit capacity <sup>2)</sup>	Hollowshaft Diameter <sup>3)</sup>	Operating Voltage (50 Hz)	Engine Output	Duty Cycle Engine <sup>4)</sup>	Nominal Current at 230 / 400 V	See Drawing / Length L <sub>1</sub>	Type of manual operation	Protection Category	Weight
		M <sub>A</sub> [Nm]	M <sub>N</sub> [Nm]	n <sub>2</sub> [min <sup>-1</sup> ]	i <sub>stW</sub>	D [mm]	U [V]	P [kW]		I <sub>N</sub> [A]	L <sub>1</sub> [mm]		IP	m [kg]
CD-130.24 <sup>1)</sup>	2	130	110	24	40	30	3~230 3~400	0,55	MD	3,54 2,0	264	KU KE	54	14
CD-220.22 <sup>1)</sup>	3	220	200	22	40	40	3~230 3~400	0,75	MD	2,3 4,0	328	KU KE	54	31
CD-300.23 <sup>1)</sup>	3	300	230	23	40	40	3~230 3~400	1,0	MD	5,0 2,9	328	KU KE	54	31
CD-350.23 <sup>1)</sup>	4	350	310	23	40	40	3~230 3~400	1,5	MD	6,4 3,7	341	KU KE	54	37
CD-550.23 <sup>1)</sup>	4	550	500	23	40	40	3~230 3~400	2,2	MD	9,0 5,2	355	KU KE	54	37
CD-750.22 <sup>1)</sup>	6	750	620	22	40	55	3~230 3~400	2,2	MD	13 7,5	437	KU KM	54	63
CD-1000.25 <sup>1)</sup>	6	1000	850	25	40	55	3~230 3~400	3,0	MD	11,9 7,2	437	KU KM	54	85
CD-1250.25 <sup>1)</sup>	6	1250	1100	25	40	55	3~230 3~400	4,0	MD	15,4 8,9	477	KU KM	54	90
CD-1650.25 <sup>1)</sup>	6	1650	1400	25	40	55	3~230 3~400	5,5	MD	19,5 11,3	460	KU	54	98

<sup>1)</sup> Operator is equipped with DC-brake, neutral connection is required.

<sup>2)</sup> Limit ratio 20:1 available on request

<sup>3)</sup> All hollow shaft fitting H8, Keyway acc. to DIN 6885;

Ø 30 = 8x7, Ø 40 = 12x8, Ø 55 = 16x10

<sup>4)</sup> Duty Ratio HD available on request.

## 9. DIMENSIONS

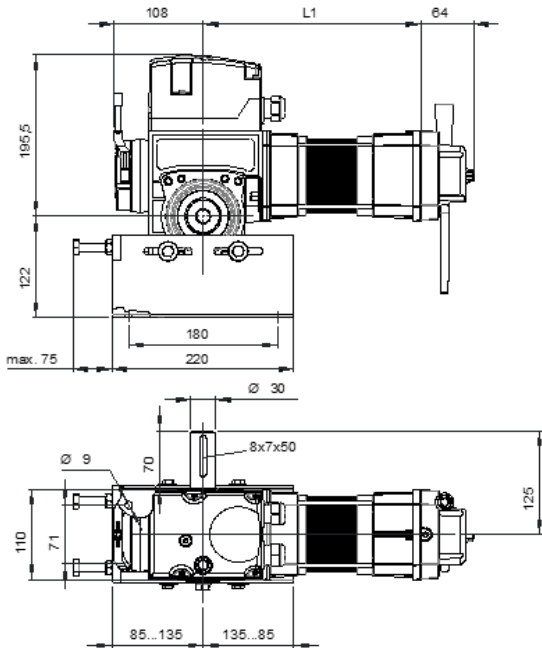
The following illustrations show all relevant dimensions of our operator series. Refer to the table of technical data for the assignment of the sketches and for dimension L1.

### Dimensions of Manual Override

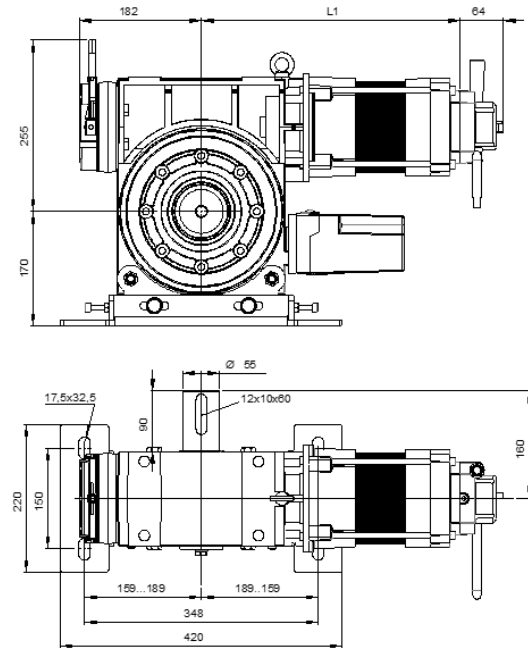
Gearbox Size	Crank Length	Crank-Radius	Length Chain drive	Width Chain-Side	Width Clutch-Side
	L <sub>k</sub> [mm]	R <sub>k</sub> [mm]	L <sub>c</sub> [mm]	B <sub>1</sub> [mm]	B <sub>2</sub> [mm]
2	230	80	122	106	95
4	230	185	137	112	95
6	340	220	152	130	108

## 10. Drawings

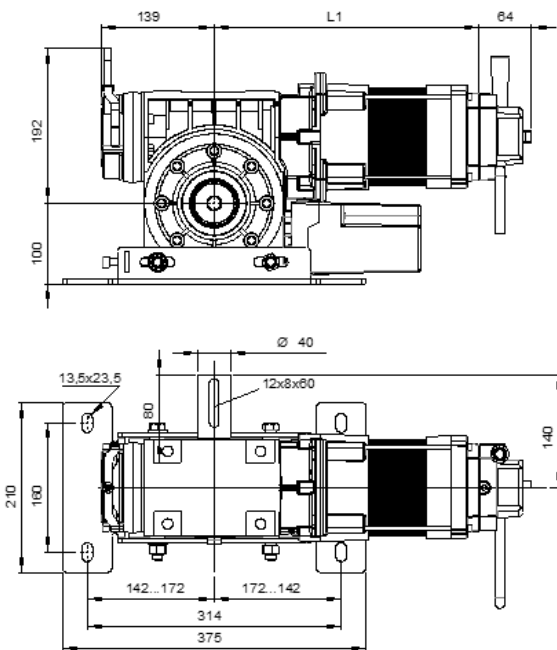
### Gearbox Size 2



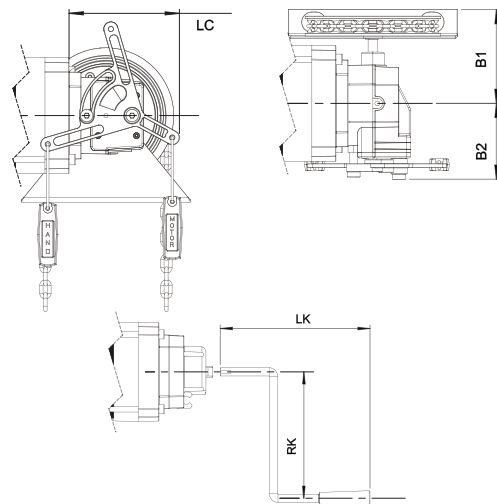
### Gearbox Size 6



### Gearbox Size 4



### Manual Override



## 11. MAINTENANCE / ANNUAL INSPECTION



### **DANGER !**

Danger of fatal electric shock!

- For the maintenance of the operator, when opening the housings and the work on electrical equipment, the operator must be disconnected from the main power.

### **NOTICE !**

- Only original spare parts and approved accessories shall be used
- Changes are only permitted after consultation with the manufacturer.

### **INFORMATION !**

- The maintenance of power-operated windows, doors and gates must be performed only by authorized persons who are familiar with the relevant maintenance and the national and local regulations.

### 11.1 Gear unit

The gear unit has lifetime lubrication and is maintenance-free. The hollow shaft must be kept rust-free. Check for noise and oil leakage.

### 11.2 Motor

The motor is maintenance free.

### 11.3 Fixtures

All fastening screws must be checked for tightness and proper condition.

### 11.4 Brake

Check the brake for functionality.

### 11.5 Cabling

Check power cord and cables regularly for damage and insulation failure.

## 12. Transport, Storage, Disposal

The drive has been fully assembled at the factory, ready wired, tested and packaged.

To avoid damage, transport and store the operator in the original packaging or an equivalent substitute.

For the disposal the national regulations must be observed.

### **INFORMATION !**

Attention! The gearbox contains oil. A proper disposal must be ensured.

## 13. Service, Spare Parts, Accessories

Only original spare parts and approved accessories must be used. The use of non-original spare parts and accessories may affect the functionality and the safety of the system. For damages incurred thereby, any liability and warranty is excluded.

In the case of malfunctions which can not be fixed easily in person, please consult a specialist from the manufacturer of the door system or another specialist company.

#### 14. DECLARATION OF INCORPORATION

We hereby declare that the products described below:

### **Chain wheel drives of the model ranges CD**

are in conformity with the essential requirements of the Machinery Directive 2006/42/EC.

In addition, the partly completed machinery is in conformity with

- the Construction Products Regulation (EU) No 305/2011
- the Electromagnetic Compatibility Directive 2014/30/EU
- the Low Voltage Directive 2014/35/EU

The following standards were applied:

- EN 60204-1
- EN 12100-1
- DIN EN 12453
- DIN EN 12604
- EN 61000-6-2
- EN 61000-6-3
- EN 60335-1
- EN 60335-2-103

#### **Manufacturer and technical documentation management**

Tornado Antriebstechnik GmbH  
Flohrstr. 33  
D-13507 Berlin

The relevant technical documentation is compiled in accordance with Annex VII(B) of the Machinery Directive 2006/42/EC. We undertake to transmit, in response to a reasoned request by the market surveillance authorities, this documentation in electronic form within a reasonable period of time.

The machinery is incomplete and must not be put into service until the machinery into which the partly completed machinery is to be incorporated has been declared in conformity with the provisions of the Machinery Directive 2006/42/EC.

#### **Place, Date**

Berlin, 01.09.2019

#### **Manufacturer's signature**

**Franck Poirier**



#### **Sales Director/ authorized signatory**

## 15. ANNEX – STAR / DELTA CONNECTION

The operator in the standard version is suitable as three-phase motor for 230V/400V operation.

By rewiring it is possible to switch the operator from the factory star connection for 3 ~ 400V to the delta connection for 3 ~ 230V.

The winding ends have to be rewired as shown below:

The nominal cross section of the wires in the terminal is max. 2.5 mm<sup>2</sup>.

After reconnecting, the rotation direction of the drive has to be confirmed.



### DANGER !

Danger of fatal electric shock!

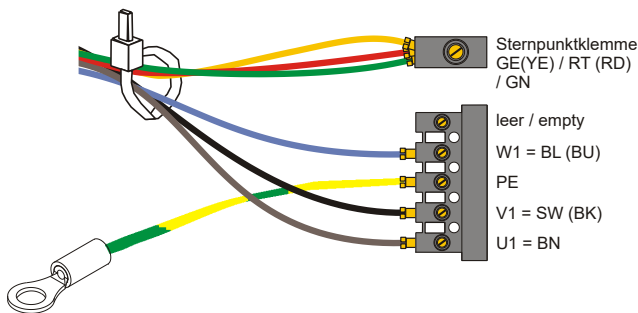
- Before commencing cabling works, you **MUST** disconnect the drive system from the mains supply.
- Ensure that the electricity supply remains disconnected throughout the cabling works.

### NOTICE !

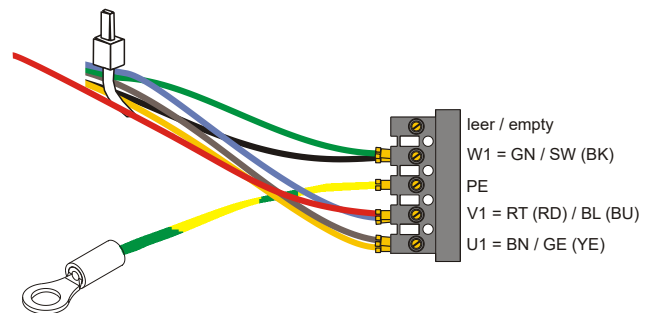
If the motor is wired to delta (3 ~ 230) ensure, that the control unit and the mains power supply are adapted to this voltage!

When reconnecting the motor cable, make sure that the individual lines are inserted deep enough into the connector and the screws are tightened properly (torque max. 0.5 Nm). The connection can be checked by gently pulling at the cable.

### Star 3~400V



### Delta 3~230V





# **PRODUCTS**

**Rolling Shutter Operators**  
**Sectional Door Operators**  
**High-Speed Door Operators**  
**Chain Wheel Operators**  
**Control Panels**  
**Safety Systems**  
**Accessories**