



# **TROUBLESHOOTING MOTORGEARBOXES**

## Introduction

This guide describes the most common problems and/or breakdowns of motor gearboxes. The experience that is accumulated over time is put in this guide. This means this guide is never complete and can be complemented frequently.

The purpose of this guide is to help determine the cause of a problem and prevent them from happening in the future. Following chapters describe various observations regarding problems with motor-gearboxes, these problems can have a number of different causes. The paragraphs within the chapters explain the various causes and provide possible solutions to solve the problem or to prevent them from happening in the future. This document can be part of the training of installers and end users.

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## 1. General

### 1.1. Installation

- Read the installation manual supplied with the motor gearbox carefully and in full;
- Strictly observe the step-by-step procedures set out in the installation manual;
- Observe all of the information in the installation manual, in particular all information relating to safety, use, maintenance and servicing;
- Improper installation, commissioning, maintenance etc. of the motor gearbox can lead to personal injury and/ or material damage due to the high torque of the motor gearbox;
- Operate the motor within its electrical ratings to avoid damage to the motor, drive train or other parts of the system;

### 1.2. General safety instructions

- Switch the power off before starting to work on the motor gearbox or the system and lock it out (for example, with a padlock) to prevent it from being switched back on. This also applies to auxiliary circuits, such as limit switches or standby heating. It is not sufficient to switch off the controller by selecting 'stop' or '0'. The motor gearbox may also continue to operate in the «Stop» or «0» position in response to higher-level functions, such as signals from wind or rain sensors;
- With attached or driven components there is a risk of becoming trapped or injured. Amongst other things, the safety distances set out in EN 349 and EN 13857 must be observed and suitable precautions must be taken, such as safety devices or a dead-man vigilance system;
- The housing of the motor gearbox can reach temperatures above 60°C / 140°F. Be aware of all the safety symbols as mentioned in the installation manual;
- Do not allow people to stand under or close to suspended loads;
- Never loosen screws, couplings or other parts while the drive train is under load;
- Also observe national legislation and guidelines regarding working conditions and safety;
- Clean up the hazard area and leave it before switching the power back on;
- Despite careful planning and compliance with all regulations, some risks cannot be prevented.

### 1.3. Qualified staff

All activities regarding the motor gearboxes must be performed by qualified staff. Qualified staff means persons who, based upon their training, experience and/or education, have obtained sufficient knowledge of the applicable standards, provisions, accident prevention regulations and operating conditions and are thus able to identify and avoid potential hazards during relevant activities (for instance, installers recommended by De Gier). Approval by the safety officer for the overall plant or system is always required before work may be carried out.

#### 1.4. Warranty

To uphold the warranty conditions, it is required to have all activities involving the motor gearboxes to be performed by de Gier personnel. Modifications to the motor gearbox are not permitted. Any such modifications render the manufacturer's warranty null and void and relieve the manufacturer of liability for any consequences.

We only accept liability for original spare parts supplied by us. The warranty terms and conditions are the same as the standard "Metaalunie" conditions. These conditions are listed on the back of the quotation and invoice forms.

An additional copy of terms and conditions can be sent to you free of charge on request. For products from the Blue-line range a 3 year warranty period is applicable.

We reserve the right to make modifications.

## **2. Worn hexagon socket in electric motor shaft.**

### Problem:

Round or worn hexagon socket in motor shaft

### Cause:

All electric motors have a hexagonal socket (hole) in the back for manually operating the gearbox. This is solely for adjusting the limit switches before electrical connection of the motor during installation. The motor should be operated with correct size manual hexagon key or drill with a hexagonal key (maximum 250rpm). Be very careful not to open or close the windows beyond 100% of the stroke.

If the hexagon socket loses its hexagonal shape, rounded partially or totally, it is assumed that;

- the hexagon socket has been forced beyond the maximum
- a drill with a too high speed has been used
- there is some resistance in the ventilation system
- or an incorrect size of tool has been used.

### Solution:

Although the motor-gearbox is operational without the hexagon socket in the shaft, it cannot be driven manually anymore. If desired the complete motor-gearbox must be exchanged, since the hexagon socket cannot be repaired.

## **3. Overheated / burned electric motor.**

### Problem:

The electric motor is overheated / burned.

There are several main causes that can burn an electric motor: broken fan, overloaded system, incorrect connection, voltage changes, long wiring, etc.

### 3.1. Cause: broken fan

All electric motors are delivered standard with a fan for cooling the motor. This fan should rotate freely with the shaft of the motor. If the fan appears to be blocked, broken or melted, assumed is that the electric motor has suffered a blow blocking the fan. Without a functional cooling fan the electric motor will burn due to overheating.

### Solution:

Make sure the fan isn't blocked. If necessary replace the fan and/or fan cover or complete motor gearbox.

### 3.2. Cause: overloaded motor-gearbox

This occurs because the force needed to operate the system is more than the motor-gearbox can deliver. For example due to increased resistance, which can be caused by misaligned gear racks, shafts and motors or a lack of greasing. Also incorrect adjustment of the limit switches (e.g. windows closes further than possible) or an undersized motor-gearbox can be reasons of an overloaded motor-gearbox.

### Solution:

To prevent damage to the electric motor from overloading, a thermal overload protection is used. This protection must be properly sized and adjusted for each type of electric motor and specific application. Usually the protection must be set at a level of 5-10% above nominal motor-gearbox consumption (measured on site). If necessary replace complete motor gearbox.

3.3. Cause; wrong electrical connection

Every motor-gearbox is supplied with a standard wiring diagram for both motor and limit switch. It is necessary motor-gearboxes are connected and adjusted by a qualified personnel, according to the supplied diagrams and instructions. Not following up instructions might lead to problems. For example in case of phase change or wrong star/delta configuration.

Solution:

Problems will be avoided if motor-gearbox and switches are connected according to the standard wiring diagrams. If necessary replace complete motor gearbox.

3.4. Cause; voltage changes in power grid

If the region is vulnerable to voltage dips (e.g. due to instable power grid), brownouts can cause the electric motor to burn without activating the overload protection.

Solution:

If necessary replace complete motor gearbox. If the use of an unstable power grid is inevitable, special electric motors with an enlarged voltage range can be used. Please ask specifically for these situations.

3.5. Cause; long/ insufficient wiring

When very long cables and/or small wire gauge is used, the voltage might drop when the motor runs. This voltage drop can cause the electric motor to burn without activating the overload protection.

Solution:

If necessary replace complete motor gearbox. Use sufficient wire gauge (cross section area) to minimize the voltage drop.

3.6. Cause; too long/ continuous operation

The motor-gearbox is not suitable for continuous operation. The maximum continuous on time is 25 minutes (10 minutes for the GXP). The motor gearbox is S3-30% rated, which means that 70% of the time the unit needs to be in rest. If the motor runs too long, the motor will overheat.

Solution:

Make sure the S3-30% duty cycle is respected. If necessary replace complete motor gearbox.

3.7. Cause; ingress of water/dirt

The design of the motor gearbox has an IP55-protection degree. This literally means that water projected by a nozzle (6.3mm, short term) against enclosure from any direction shall have no harmful effects. Although this protection prevents moisture penetration, it is not completely tight. The motor gearboxes are not designed to be placed under constant water sources as gutters or others. Also (powerful) waterjets cause ingress of water. Any ingress of water can cause short-circuit and the motor to burn.

Solution:

The gearboxes must be installed inside the greenhouse. If placed outside or under a water source it must be provided with a rain-cover.

#### 4. Gearbox oil leakage

##### Problem:

Visible oil on the outside of the motor-gearbox.

There are several main causes that can lead to loss of oil: faulty oil seals, vent plug (breather) not installed etc. Please note that the oil does not need to be changed during maintenance. The motor-gearboxes are life-time greased. Only the oil level needs to be checked on a regular basis.

##### 4.1. Cause; misalignment of drive tube

A misalignment of the drive tube can create an excessive load on the bearings and oil seals. This can cause an oil leakage.

##### Solution:

Align all parts as much as possible and use standard chain couplings to compensate up to 4° misalignment. If necessary use double chain sprockets for short distances. In case the bearings and/or seals are damaged, the complete motor gearbox needs to be exchanged.

##### 4.2. Cause; missing vent plug (breather plug)

The GW-gearboxes are sealed by two plugs during transport. Before operation of the motor-gearbox, one of these plugs need to be exchanged with the vent plug. This vent plug prevents any pressure build-up inside the gearbox. If this vent plug is not properly installed, the expansion of oil and gas inside the gearbox will press out the oil. Note: GXP's have no breather plug. Removing one vent screw is sufficient.

##### Solution:

After installation (but before operation!) one of the plugs need to be exchanged with the supplied vent plug. Please check the "connection & maintenance"- information which plug needs to be changed.

##### 4.3. Cause; overfilling oil level

Every motor-gearbox is pre-filled during manufacture with the correct type and quantity of oil. Although the gearbox oil never has to be changed, it is strongly advised the oil level is checked on a regular basis. If the gearbox is over filled, oil may come out of the vent plug.

##### Solution:

Use the correct quantity of gearbox oil for every type of gearbox. Check the supplied info for the correct quantity. After installation the oil-level may not be higher than 1~2 cm below breather plug. Drain any excess oil from the gearbox.

##### 4.4. Cause; wrong mounting position

The motor-gearbox must be positioned according to the instructions that are included with every motor-gearbox. Not following these instructions may lead to oil leakage through the vent-plug.

##### Solution:

Follow instructions and mount the motor-gearbox in one of the allowed positions.

##### 4.5. Cause; too long/ continuous operation

The motor-gearbox is not suitable for continuous operation. The maximum continuous on time is 25 minutes (10 minutes for the GXP). The motor gearbox is S3-30% rated, which means that 70% of the time the unit needs to be in rest. If the motor runs too long, the motor will overheat which results in failure of the oil seal on the electric motor shaft.

##### Solution:

Make sure the S3-30% duty cycle is respected. If the seal of the electric motor is damaged, the complete motor gearbox needs to be exchanged.



4.6. Cause: operation in too cold temperature

The motor-gearbox is not suitable for operation in a very cold environment. If the motor gearbox is used under a certain temperature, (check supplied information about the temperature range) the oil can be pushed out of the vent plug by the rotating gears.

Solution:

Check if the operation temperature is within the range of the specifications.

4.7. Cause: damage to the seals of the output shaft

If the output shaft itself, or the seals of this shaft is damaged, imminent leakage will occur. These parts can be damaged due to tampering with sharp objects.

Solution:

If the output shaft and seals are damaged, the complete motor gearbox needs to be exchanged.

## **5. The motor gearbox does not stop**

### Problem: The motor gearbox overruns the end-switch

The threaded shaft of the limit switch system is driven via a timing belt transmission from the output shaft of the motor gearbox. During normal operation the switch nuts will move linearly. When the set starting or limit position is reached, the switch nut will hit the end stop of the shaft. The switch nut will start to turn with the threaded shaft and push the spring of the operating switch.

5.1. Cause: broken switchboard relay

Make sure the motor relays are suited for switching motors (inductive electrical load), and in particular that they are suited for the correct motor size. It's very common that contacts of unsuitable relays melt together and cause these effects.

Solution:

Use the correct motor relays (motor contactors) of a correct size. Before adjusting the limit switches and activating the system again, please check the complete end-switch system for damage. In particular the timing belt pulley key-connections on the shafts.

5.2. Cause: wrong electrical connection

Every motor-gearbox is supplied with a standard wiring diagram for both motor and limit switch. It is necessary motor-gearboxes are connected and adjusted by a qualified personnel, according to the supplied diagrams and instructions. Not following up instructions might lead to these problems.

Solution:

Problems will be avoided if motor-gearbox and switches are connected according to the standard wiring diagrams. Before adjusting the limit switches and activating the system again, please check the complete end-switch system for damage. In particular the timing belt pulley key-connections on the shafts.

5.3. Cause: manual activating switchboard contactors

When no manual control from the switchboard is available, people will tend to manually activate the motor contactors in the switchboards. If so, the end-switch can be overrun without noticing.

Solution:

Never activate relays or contactors manually. Before adjusting the limit switches and activating the system again, please check the complete end-switch system for damage. In particular the timing belt pulley key-connections on the shafts.

5.4. Cause: phase change

Every motor-gearbox is supplied with a standard wiring diagram for both motor and limit switch. It is necessary motor-gearboxes are connected and adjusted by a qualified personnel, according to the supplied diagrams and instructions. Not following up instructions might lead to problems in case of phase change.

Solution:

Problems will be avoided if motor-gearbox and switches are connected according to the standard wiring diagrams. Before adjusting the limit switches and activating the system again, please check the complete end-switch system for damage. In particular the timing belt pulley key-connections on the shafts.

5.5. Cause: manual operation of hexagon key in the motor shaft

When the electric motor is manually driven, the end-switch can be overrun without noticing.

Solution:

Only use the hexagon key in the motor shaft for setting the end-switch. Before adjusting the limit switches and activating the system again, please check the complete end-switch system for damage. In particular the timing belt pulley key-connections on the shafts.

5.6. Cause: fixed switching nuts during (initial) adjustment of the end-switch.

During initial setting the end-switch system, both nuts on the threaded shaft need to be loosened. When the electric motor is manually driven (for example with a drill), the end-switch can be overrun without noticing.

Solution:

Always check if the setscrews on both nuts are loose before setting the end-switch. Please check the complete end-switch system for damage. In particular the timing belt pulley key-connections on the shafts.

5.7. Cause: blocked end-switch due to foreign objects

The gearbox is delivered with a manual in a plastic bag attached to the cover. When the manual is stored under the black cover, there's a chance the end-switch system will be blocked. Also electrical wiring which isn't properly connected to the end-switch often result in blocking the end switches.

Solution:

Never store any parts underneath the black cover. Make sure the electrical wiring doesn't block any moving parts. Before adjusting the limit switches and activating the system again, please check the complete end-switch system for damage. In particular the timing belt pulley key-connections on the shafts.

5.8. Cause: reduced self-braking effect of the motor gearbox

The worm-gear transmission inside the gearbox is designed in such way that the motor gearbox is self-braking. This self-braking effect can negatively be influenced by a wrong type of oil or overloading of the gearbox. When the self-braking effect is reduced, the end-switch can overrun it's switches.

Solution:

Use original gearbox oil supplied by de Gier. This oil makes the perfect combination between friction and correct lubrication of the gears. Make sure the gearbox is clean and has no residue of any other type of oil.

Make sure the GW is properly sized to the load of the system. To prevent damage to the gears, a thermal overload protection is used. This protection must be properly sized and adjusted for each type of electric motor and specific application. Usually the protection must be set at a level of 5-10% above nominal motor-gearbox consumption (measured on site). If necessary replace complete motor gearbox

5.9. Cause; ingress of water/dirt

The design of the motor gearbox has an IP55-protection degree. This literally means that water projected by a nozzle (6.3mm, short term) against enclosure from any direction shall have no harmful effects. Although this protection prevents moisture penetration, it is not completely tight. The motor gearboxes are not designed to be placed under constant water sources as gutters or others. Also (powerful) waterjets cause ingress of water. Any ingress of water can cause short-circuit with the possibility that the motor doesn't stop.

Solution:

The gearboxes must be installed inside the greenhouse. If placed outside or under a water source it must be provided with a rain-cover.

5.10. Cause; loosened setscrews of limit switch

If both setscrews on both switch-nuts of the limit switch aren't set to the proper torque, these screws might loosen in time. Loose setscrews cause the limit settings to change.

Solution:

Make sure the setscrews are tightened according to the instructions; 2 Nm.

## **6. Unusual (humming) sounds from the electric motor.**

Problem:

The electric motor is designed to run smoothly without rattling noise. When a unusual sound from the motor is heard, there might be something wrong. Please check the following causes.

6.1. Cause; external mechanical shock to the electric motor or gearbox

Mechanical shocks to the gearbox or electrical motor can cause problems like a unbalance in the rotor, premature wear of the bearings, displacement of the coils etc.

Solution:

If the electric motor is beyond repair, replace complete motor gearbox.

6.2. Cause; broken fan / dent in fan cover

Electric motors are delivered standard with a fan for cooling the motor. This fan should rotate freely with the shaft of the motor. A (partially) blocked fan can result in a rattling noise. Please note that reduced cooling on the electric can result in overheating and thus damage the motor.

Solution:

Make sure the fan isn't blocked. If necessary replace the fan and/or fan cover or complete motor gearbox.

6.3. Cause; one phase missing

Although three phase electrical motors are designed to run on three phases, there is a chance that light loaded gearboxes can (continue to) run on only two phases. This causes unusual noises.

Solution:

Make sure the electrical motor is properly electrical connected and switched.

6.4. Cause; operation in too cold temperature

The motor-gearbox is not suitable for operation in a very cold environment. If the motor is used under a certain temperature, (check supplied information about the temperature range) the bearings make more noise than normal.

Solution:

Check if the operation temperature is within the range of the specifications.

6.5. Cause; wrong voltage

The voltage on the motor windings must correspond to the value mentioned on the motor type plate. Wrong voltages (too high and/or too low) imminently lead to damage.

Solution:

Make sure the voltage is correct according to the motor type plate. If necessary replace complete motor gearbox.

6.6. Cause; wrong mains frequency

The mains frequency on the motor windings must correspond to the value mentioned on the motor type plate. Although most 3-phase motors can handle 50 and 60 Hz, most 1-phase motors do not. Wrong frequencies (60 Hz instead of 50 Hz, or 50Hz instead of 60Hz) imminently lead to damage.

Solution;

Make sure the frequency is correct according to the motor type plate. If necessary replace complete motor gearbox.

## **7. Unusual (humming) sounds from the gearbox.**

Problem;

The specific design of the GW motor gearboxes makes a quiet operation possible. The fast running gears (1<sup>st</sup> stage) are made of smooth quietly meshing worm gears. Only the low speed gears (2<sup>nd</sup> and 3<sup>rd</sup> stages) are spur gears. When a unusual sound from the gearbox is heard, there might be something wrong. Please check the following causes.

7.1. Cause; a mechanical shock to the electric motor or gearbox

Mechanical shocks to the gearbox or electrical motor can cause problems like a unbalance in the rotor, premature wear of the bearings, displacement of the coils etc.

Solution;

If necessary replace complete motor gearbox.

7.2. Cause; wrong mounting position

The motor-gearbox must be positioned according to the instructions that are included with every motor-gearbox. Not following these instructions may lead to improper lubrication of the gears.

Solution;

Follow instructions an mount the motor-gearbox in one of the allowed positions.

7.3. Cause; operation in too cold temperature

The motor-gearbox is not suitable for operation in a very cold environment. If the motor is used under a certain temperature, (check supplied information about the temperature range) the bearings make more noise than normal.

Solution;

Check if the operation temperature is within the range of the specifications.

7.4. Cause; overloaded motor-gearbox

This occurs because the force needed to operate the system is more than the motor-gearbox can deliver. For example due to increased resistance, which can be caused by misaligned gear racks, shafts and motors or a lack of greasing. Also incorrect adjustment of the limit switches (e.g. windows closes more that possible) or an undersized motor-gearbox can be reasons of an overloaded gearbox.

Solution;

To prevent damage to the motor gearbox from overloading, a thermal overload protection is used. This protection must be properly sized and adjusted for each type of electric motor and specific application. Usually the protection must be set at a level of 5-10% above nominal motor-gearbox consumption (measured on site). If necessary replace complete motor gearbox.

## 8. Motor gearbox does not run at all.

### Problem:

Although the motor-gearbox seems to be connected correctly, it doesn't run (anymore).

#### 8.1. Cause; wrong mounting position

The motor-gearbox must be positioned according to the instructions that are included with every motor-gearbox. Not following these instructions may lead to improper greasing of the internal gears. Worm-gears wear quickly without proper greasing.

#### Solution:

Follow instructions and mount the motor-gearbox in one of the allowed positions. If necessary, replace complete motor gearbox.

#### 8.2. Cause; no electrical power

Loss of electrical power is a common cause. Wiring can be damaged, an electrical fuse might be tripped, etc.

#### Solution:

Check the power supply. Restore power and check the motor-gearbox for any damage before activating it again. Check if the capacity of the fuse is correctly sized for the number of motors.

#### 8.3. Cause; wrong electrical connection

Every motor-gearbox is supplied with a standard wiring diagram for both motor and limit switch. It is necessary motor-gearboxes are connected and adjusted by a qualified personnel, according to the supplied diagrams and instructions. Pay special attention to the possibilities of star/ delta connection of the motor windings.

#### Solution:

Problems will be avoided if motor-gearbox and switches are connected according to the standard wiring diagrams.

#### 8.4. Cause; damaged internal gears

Mechanical shocks to the gearbox or electrical motor can cause problems like premature wear of the bearings, breaking of hardened spur gear teeth, displacement of the coils etc.

#### Solution:

If necessary replace complete motor gearbox.

#### 8.5. Cause; overloaded motor-gearbox (1-phase in particular)

This occurs because the force needed to operate the system is more than the motor-gearbox can deliver. For example due to increased resistance, which can be caused by misaligned gear racks, shafts and motors or a lack of greasing. Also incorrect adjustment of the limit switches (e.g. windows closes more than possible) or an undersized motor-gearbox can be reasons of an overloaded gearbox. Especially 1-phase motors are more sensitive to overloading due to the minimized starting torque.

#### Solution:

To prevent damage to the motor gearbox from overloading, a thermal overload protection is used. This protection must be properly sized and adjusted for each type of electric motor and specific application. Usually the protection must be set at a level of 5-10% above nominal motor-gearbox consumption (measured on site). If necessary replace complete motor gearbox.

## 9. Tripping thermal overload protection.

### Problem:

To prevent damage to the motor gearbox from overloading, a thermal overload protection is used. If the current is higher than the set value of the protection, the power to the motor will be cut off. This protects the driven system from further damage.

#### 9.1. Cause: overloaded motor-gearbox

This occurs because the force needed to operate the system is more than the motor-gearbox can deliver. For example due to increased resistance, which can be caused by misaligned gear racks, shafts and motors or a lack of greasing. Also incorrect adjustment of the limit switches (e.g. windows closes more that possible) or an undersized motor-gearbox can be reasons of an overloaded gearbox.

#### Solution:

The thermal protection must be properly sized and adjusted for each type of electric motor and specific application. Usually the protection must be set at a level of 5-10% above nominal motor-gearbox consumption (measured on site). Make sure the motor-gearbox is correctly sized. If necessary replace complete motor gearbox.

#### 9.2. Cause: wrong electrical connection

Every motor-gearbox is supplied with a standard wiring diagram for both motor and limit switch. It is necessary motor-gearboxes are connected and adjusted by a qualified personnel, according to the supplied diagrams and instructions. Pay special attention to the possibilities of star/ delta connection of the motor windings.

#### Solution:

Problems will be avoided if motor-gearbox and switches are connected according to the standard wiring diagrams.

#### 9.3. Cause: ingress of water/dirt

The design of the motor gearbox has an IP55-protection degree. This literally means that water projected by a nozzle (6.3mm, short term) against enclosure from any direction shall have no harmful effects. Although this protection prevents moisture penetration, it is not completely tight. The motor gearboxes are not designed to be placed under constant water sources as gutters or others. Also (powerful) waterjets cause ingress of water. Any ingress of water can cause short-circuit and cause the thermal protection to trip. Especially when the terminal box isn't closed correctly or if the cable glands aren't fully tightened.

#### Solution:

The gearboxes must be installed inside the greenhouse. If placed outside or under a water source it must be provided with a rain-cover.

#### 9.4. Cause: damaged wiring

When the isolation of the wires is damaged, the overload protection might trip. Damage to the isolation of the wires is often caused by UV-radiation on the plastics, bad/improper wiring, wiring between cover of the electrical connection box etc. ...

#### Solution:

Repair the wiring to the (locally) applicable standards.

## 10. Damaged (chain) couplings, telescopic arms or drive shaft.

### Problem:

Normally the motor gearboxes are connected to the driveshaft with chain wheel couplings. Telescopic arms are often used for roll-up side ventilation. If there is damage to these parts, or the driveshaft itself, please check the causes mentioned below.

#### 10.1. Cause: large misalignment

The chain couplings are designed to correct a small amount of misalignment up to 4°. Larger angles lead to big forces on the chains and couplings which result in damage and/or excessive wear.

#### Solution:

Make sure all parts are aligned correctly.

#### 10.2. Cause: overloaded driveshaft

The calculation tables for each motor gearbox indicate the maximum number of meters a certain motor can drive. Tables must be customized for the applicable greenhouse and window type. Also the drive shaft (tube) and (chain)couplings can transfer a maximum torque. Please contact the De Gier sales department for further information. If these parts are overloaded, damage will occur.

#### Solution:

Make sure the motor-gearbox, drive tube and couplings are correctly sized. If necessary replace complete motor gearbox, drive tube and/or parts.

#### 10.3. Cause: drive tube has been weakened

The drive shaft (tube) can transfer a maximum torque. The given values are only valid when the tube isn't weakened, e.g. by drilled holes.

#### Solution:

Make sure the driveshaft is correctly sized. If necessary drive tube and/or parts.

## 11. GXP-carriage doesn't run smooth

### Problem:

The GXP-carriage provides the GXP the support to roll or unroll a vertical screening or window. This carriage consists of a main plate and four "diabolo" rollers. The vertical tube will be guided between the four rollers. Please check the following causes when the carriage doesn't run smooth.

#### 11.1. Cause: overloaded motor-gearbox

This occurs because the force needed to operate the system is more than the GXP can deliver. For example due to increased resistance or incorrect adjustment of the limit switches. Also the length of the window might exceed the capacity of the GXP.

#### Solution:

To prevent damage to the motor gearbox from overloading, a thermal overload protection is used. This protection must be properly sized and adjusted for each type of electric motor and specific application. Usually the protection must be set at a level of 5-10% above nominal motor-gearbox consumption (measured on site). If necessary replace complete GXP.

#### 11.2. Cause: wrong size of vertical tube

The outer diameter of the vertical guide tube must be Ø32 mm. The rollers of the carriage will not roll smoothly if this diameter of the tube is bigger or smaller.

#### Solution:

Make sure the vertical tube is Ø32 mm.

11.3. Cause: miss-alignment of the roller tube

When the roller tube or vertical guide tube aren't aligned correctly, the forces on the drive-parts will increase considerably. Symptoms as a slightly bended plate or tubes can be visible.

Solution:

Make sure all parts are aligned correctly.

**12. Rust, excessive oxidation.**

Problem:

Usually some rust on the drive parts do not lead to malfunction of the system. Sometimes corrosion excessive in such way, that it isn't visually acceptable.

The design of the motor gearbox has an IP55-protection degree. This literally means that water projected by a nozzle (6.3mm, short term) against enclosure from any direction shall have no harmful effects. Although this protection prevents moisture penetration, it is not completely airtight. The motor gearboxes are not designed to be placed under constant water sources as gutters or others. The gearboxes must be installed inside the greenhouse or, if placed outside, provided with a rain-cover.