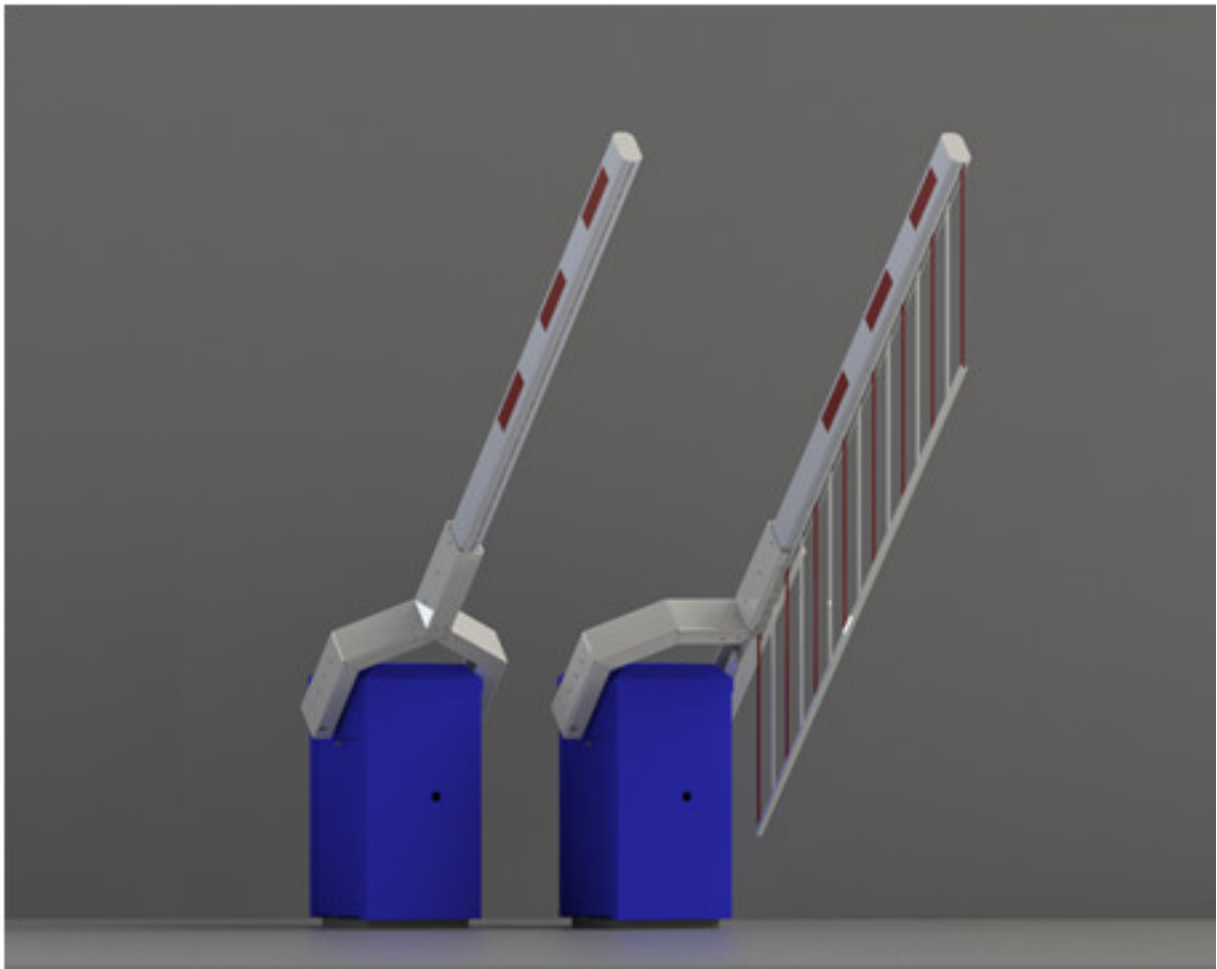


MCS61: Technical Manual



Thank you for choosing the MCS61 electrical boom barrier system, designed and manufactured by Bormet. We are confident that your purchase will fully meet your expectations. To ensure that you are fully satisfied with your purchase for as long as possible, we recommend that you read this manual carefully before installing the system.

Although the greatest care has been taken while compiling this manual, some of the information may be incorrect or unclear. If this is the case, please do not hesitate to contact us with any comments or questions you may have.

Important:

The MCS61 boom barrier system contains a mechanical operation system and various electrical components. Any negligence during an intervention on the boom barrier can put your safety at risk. Always first switch off the power supply before opening the cabinet.

Exercise extreme caution when working on live components or parts that can be set in motion.

To ensure your safety, the door contact will prevent the electrical drive mechanism from moving. For this reason, be very careful when you enable the “servicing position” for carrying out certain operations!

Only carry out work on the balance springs when the boom barrier is in the open position.

Important information for health and safety procedures

The use of the Bormet boom barrier system for vehicles means you have a great responsibility regarding the safety and health of each user or person in the vicinity of the installation.

Consequently, you need to draw up and apply all necessary and appropriate safety measures.

- Make sure pedestrians are not allowed within the boom barrier zone for vehicles unless it is made clear that the barrier is in operation, for example by using audio and/or visual alarms, road surface markings, signs etc.
- The keys for the boom barrier housing should only be given to authorised and competent persons who are familiar with the relevant electrical and mechanical safety procedures. The entire working system must be closed off.

You have a legal obligation and responsibility to ensure safety is adequate at all times.

Important: In the countries of the European Community, Article 1.3.7.2 of the European Machinery Directive specifies that the icon for “Danger zone — no access for pedestrians” must be displayed on both sides* of the system.



(* Within one metre of the boom arm in the closed position.)

Table of contents

Important:.....	3
Important information for health and safety procedures.....	3
Important:.....	3
CE Declaration of Conformity.....	6
Guidelines for the installer.....	7
General safety rules.....	7
1. Technical features	8
1.1. Dimensions.....	8
1.1.1. MCS61 Central.....	8
1.1.1. MCS61 Skirt.....	8
1.2. Technical data.....	9
1.2.1. Electrical properties of the motor	9
1.2.2. Column	9
1.2.3. Drive mechanism.....	9
1.2.4. Boom arm	9
1.2.5. Fast opening.....	9
1.2.6. Fulcrums	10
1.2.7. Balance springs.....	10
1.2.8. Thermal.....	10
1.2.9. Manual Operation.....	10
1.2.10. Door switches.....	10
1.2.11. Limit switches.....	10
1.1.1. Boom barrier closed safety switch.....	10
1.1.2. Controls	10
2. Configuration examples	12
3. Installation.....	13
3.1. Preliminary checks	13
3.2. Securing the fixing lugs in concrete.....	13
3.2.1. Prefab Concrete pedestal.....	14
3.3. Electrics.....	15
3.4. Mechanical installation.....	16
4. Commissioning.....	16
4.1. Connecting the power supply cable.....	16

4.2.	Connecting electrical equipment.....	17
4.3.	Use V-belt discs based on arm length	20
4.4.	Use balance springs based on arm length for MCS61 central.....	20
4.5.	Use balance springs based on arm length for MCS61 skirt.....	21
4.6.	Balance springs indicators.....	22
4.7.	Installing the boom arm.....	23
4.8.	Replacing the balance spring.....	24
4.9.	Adjusting the balance spring	24
4.10.	Replacing the motor	24
4.11.	Replacing the chain.....	25
4.12.	Replacing the V-belt.....	25
4.13.	Horizontal adjustment of the boom arm in closed position	25
4.14.	Adjusting the limit switches.....	26
4.15.	Checklist for start-up.....	26
5.	Maintenance.....	27

CE Declaration of Conformity

Manufacturer: Bormet BVBA

Address: Zwarteinde 11, B-3850 Kozen, Belgium

Declares that the MCS61 drive mechanism:

- was built for inclusion in a machine or for assembly together with other machines, with the aim of constructing a machine as defined in Directive 2006/42/EG
- in accordance with the basic safety requirements of the following EEC Directives:
 - 2006/95/EC Low voltage directive
 - 2004/108/EC Electromagnetic compatibility directive

and also declares that it is prohibited to commission the machine before the machine into which it is to be incorporated or of which it is to be a part has been identified, and its conformity has been stated in accordance with the conditions of Directive 2006/42/EG.

Kozen, 4 March 2015

Business Manager
R. Schreurs



Guidelines for the installer

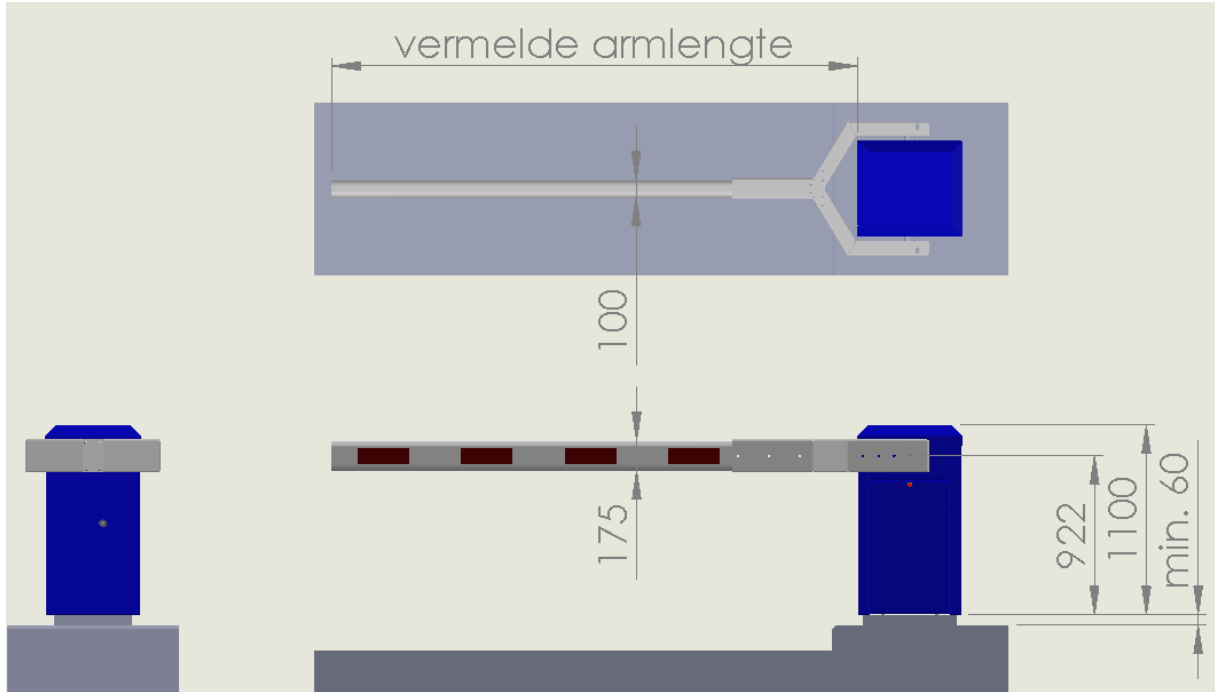
General safety rules

1. **ATTENTION!** It is important for safety reasons that all of the instructions in this manual are strictly observed. Incorrect installation and/or misuse of the product may cause serious personal injury.
2. Read the instructions carefully before you begin installing the product.
3. Packaging materials must not be left within the reach of children, as these can be a source of danger.
4. Keep this manual for future reference.
5. This product has been designed and manufactured only for use as stipulated in this manual. Any other use that is not expressly stipulated may damage the product and/or be a source of danger.
6. Bormet cannot be held responsible for any damage caused by improper use or by any other use than that for which the automatic system is intended.
7. Do not install this device in areas where there is an explosion hazard: the presence of flammable gas or fumes is a serious safety hazard.
8. The mechanical construction elements must be in accordance with the provisions of the EN 12604 and EN 12605 standards.
To obtain an adequate level of safety, non-EEC countries must adhere to the above standards, in addition to any national rules and regulations.
9. Installation must be carried out in accordance with the EN 12453 and the EN 12445 standards.
To obtain an adequate level of safety, non-EEC countries must adhere to the above standards, in addition to any national rules and regulations.
10. Before carrying out any work on the system, always switch off the system's power supply first.
11. Make sure the mains supply for the automatic system has a multipole switch with an opening between the contacts of three millimetres or more. A thermal magnetic 6A switch with a multipole circuit-breaker is recommended.
12. Check that there is a differential switch upstream of the electrical system, with a trip threshold that complies with local regulations.
13. Check that the earthing installation has been professionally installed and connect the metal parts of the boom barrier to it.
14. The boom barrier has intrinsic anti-crushing protection in the form of a torque limiter. Its activation threshold must be checked based on the requirements specified in this manual.
15. The safety devices, in accordance with the EN 12978 standard, provide protection in dangerous areas against mechanical movement hazards, such as crushing, dragging, or amputation.
16. Bormet cannot be held responsible for the safety and correct functioning of the system if parts other than original Bormet parts are used during installation.
17. Only use original Bam parts for maintenance.
18. Do not modify components that are part of the automatic system.
19. The installer must supply all information regarding the manual operation of the system in the event of an emergency and must provide the end user of the system with the instruction booklet.
20. Do not allow children or adults to remain in the vicinity of the product when it is in operation.
21. Keep all remote radio controls and other control devices out of the reach of children. This is to prevent the automatic system from being operated unintentionally.
22. Passing through the barrier is only permitted when the automatic system is stationary.
23. The end user must not attempt to repair or make any adjustments to the system. These operations must be carried out exclusively by qualified personnel.
24. Maintenance: the operation of the system must be checked at least once a year. Special attention should be paid to safety devices and the release devices.
25. Anything not explicitly stated in this manual is not permitted.

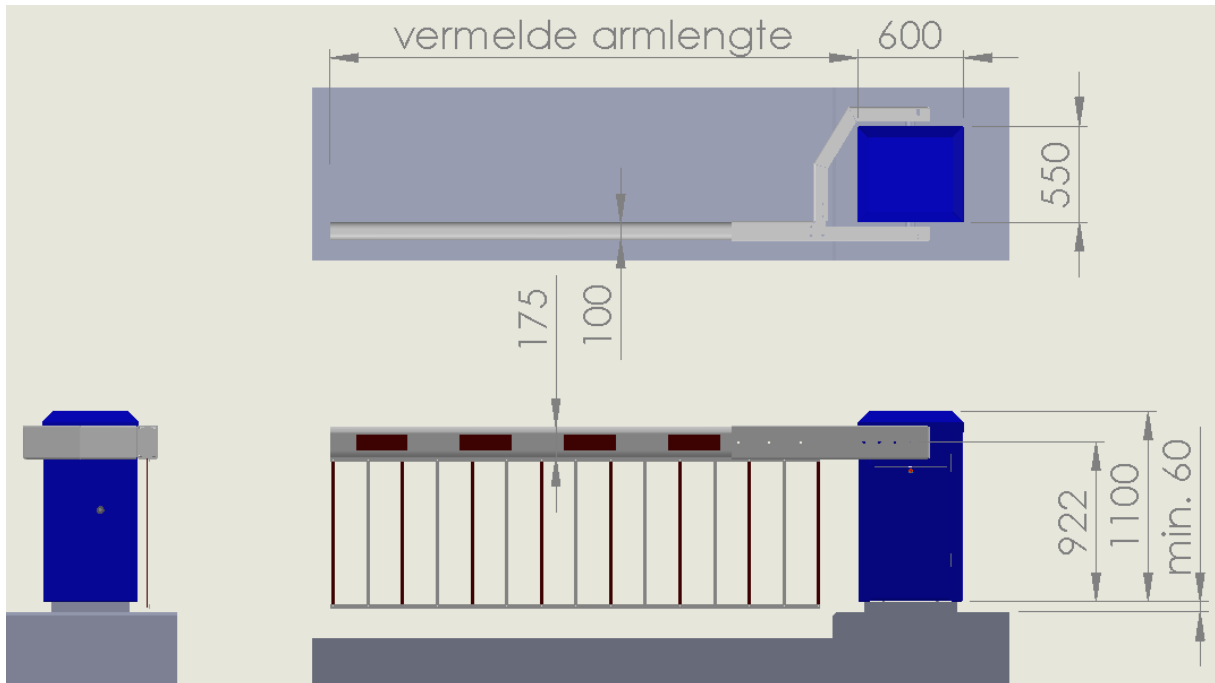
1. Technical features

1.1. Dimensions

1.1.1. MCS61 Central



1.1.1. MCS61 Skirt



1.2. Technical data

1.2.1. Electrical properties of the motor

Power supply:	400 V AC
Frequency:	50 Hz
Power consumption:	370 Watt
Cosine Phi:	0.71

1.2.2. Column

The column is made from folded and welded steel plate (3 mm) with 15 mm thickness of internal reinforcement.

The column surface has been shot-blasted and metallised. The finish is thermo-hardened polyester in a standard RAL colour.

The two access doors, locked with a single-cylinder lock, are located on the sides to ensure optimal accessibility to the mechanism and the controls.

The removable cover (that locks on the inside) inclines upward toward the middle to prevent dirt build up.

Column dimensions: 550 B x 600 D x 1,100 H

IP 44 (IP67 for the terminal box)

1.2.3. Drive mechanism

The drive mechanism consists of:

- an electric three-phase asynchronous motor
- a maintenance-free speed reducer
- a crankshaft drive-rod mechanism
- One (or more) adjustable built-in guided compression spring for balancing the boom arm.

The motor drives the speed reducer via a toothed V-belt.

The speed reducer is equipped with a slip clutch with Ferrodo discs. This reducer with worm and worm wheel is of the irreversible type.

The double-bearing intermediate shaft (Ø 45 mm) is driven by the speed reducer with a chain drive.

The intermediate shaft uses a crankshaft drive-rod mechanism to transfer the movement to the double-bearing shaft (Ø 60 mm).

This crankshaft drive-rod mechanism ensures progressive acceleration and deceleration of the movement, and mechanical locking in both end positions.

1.2.4. Boom arm

The boom arm consists of an eye-catching oval aluminium tube, internally reinforced, 175 mm x 100 mm.

Thermo-hardened, white polyester coating with red, reflective strips on both sides (330 x 90 mm). The white and red strips have the same width.

Cap on the ends.

The boom arm is balanced by means of wear-resistant compression spring (more than 3,000,000 movements).

Centrally mounted boom arm: Double fork attachment, which allows the forces on the boom arm to be evenly distributed over both shaft ends (i.e. more resistant to vandalism).

1.2.5. Fast opening

The opening and closing time of the boom barrier is the same in seconds as the boom arm length in meters with a tolerance of two seconds.

Each movement can be interrupted wherever the boom arm is positioned.

Once the boom arm has stopped, it remains completely motionless. This applies for all positions of the boom arm.

In this standstill position, it is possible to reverse the motion direction.

1.2.6. Fulcrums

The bearings consist of maintenance-free coupling heads and radial insert bearings. All bearings and springs are lubricated for the entire lifespan. Bearings and rod ends are fitted with grease nipples to allow additional lubrication to be added when needed.

1.2.7. Balance springs

The wear-resistant compression springs are adjusted and made suitable depending on the boom arm length.

The maximum compression of the springs is calculated based on an extremely long lifespan (more than 3,000,000 movements).

1.2.8. Thermal

Magnetic three-phase motor safety switch.

This motor safety switch is adjustable when in the off state.

1.2.9. Manual Operation

A crank is supplied with the boom barrier for manual operation.

When the crank is inserted for manual operation, the power supply to the motor will shut off.

This lock consists of a limit switch that is directly actuated by the crank at the location where it is coupled with the output shaft of the speed reducer.

The swivel cover to allow the crank to be inserted is not coupled with the above mentioned limit switch.

1.2.10. Door switches

Access to the boom barrier mechanism is protected by a circuit breaker.

When the door is open, the boom barrier cannot be operated electrically, unless the circuit breaker is put into the servicing position. When the door is closed again, the servicing position will be automatically reset.

1.2.11. Limit switches

The boom barrier is vertical in the open position and horizontal in the closed position.

These positions are determined by adjustable limit switches.

These switches can be set so that the utmost positions of the boom arm are adjustable to an angle of 5° in either direction.

The limit switches are fitted with a free contact to communicate the position of the boom barrier to a third party.

It is easy to adjust and replace the limit switches.

The limit switches are safety position switches of type XCS P 3902P20.

1.1.1. Boom barrier closed safety switch

In the closed position of the boom barrier, the magnetic contact on the upper shaft of the boom barrier actuates a safety position switch of type PILZ PSEN ma2.1p-30/PSEN2.1-10/6mm/.

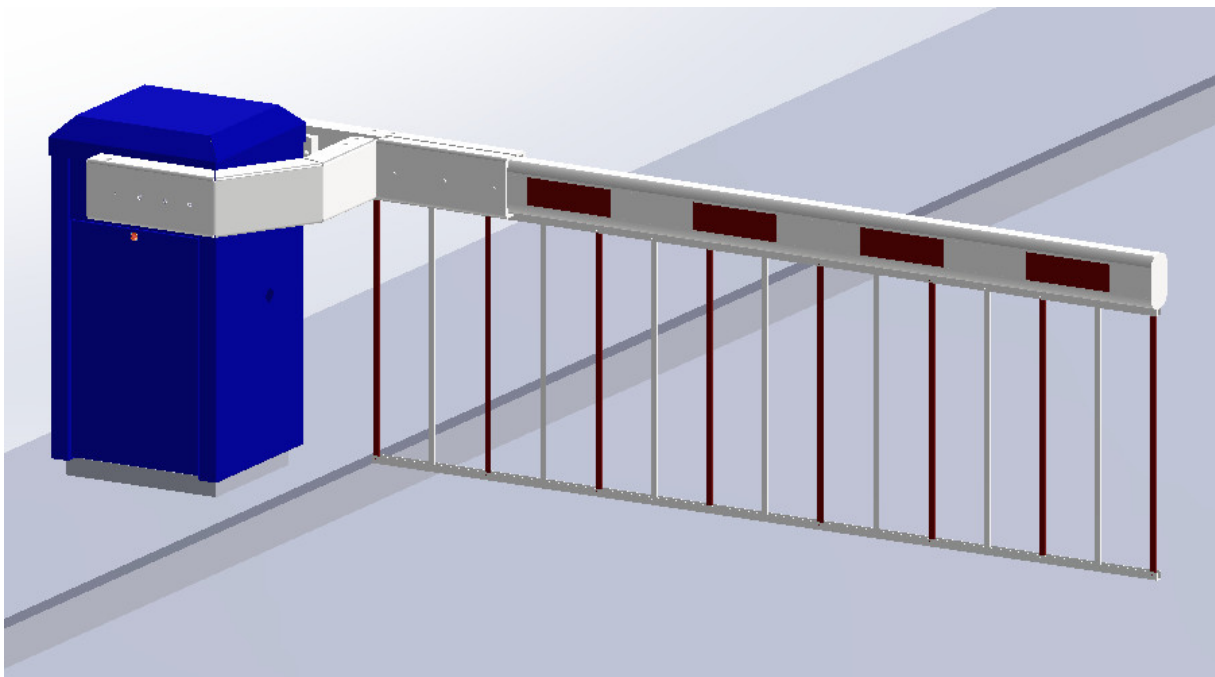
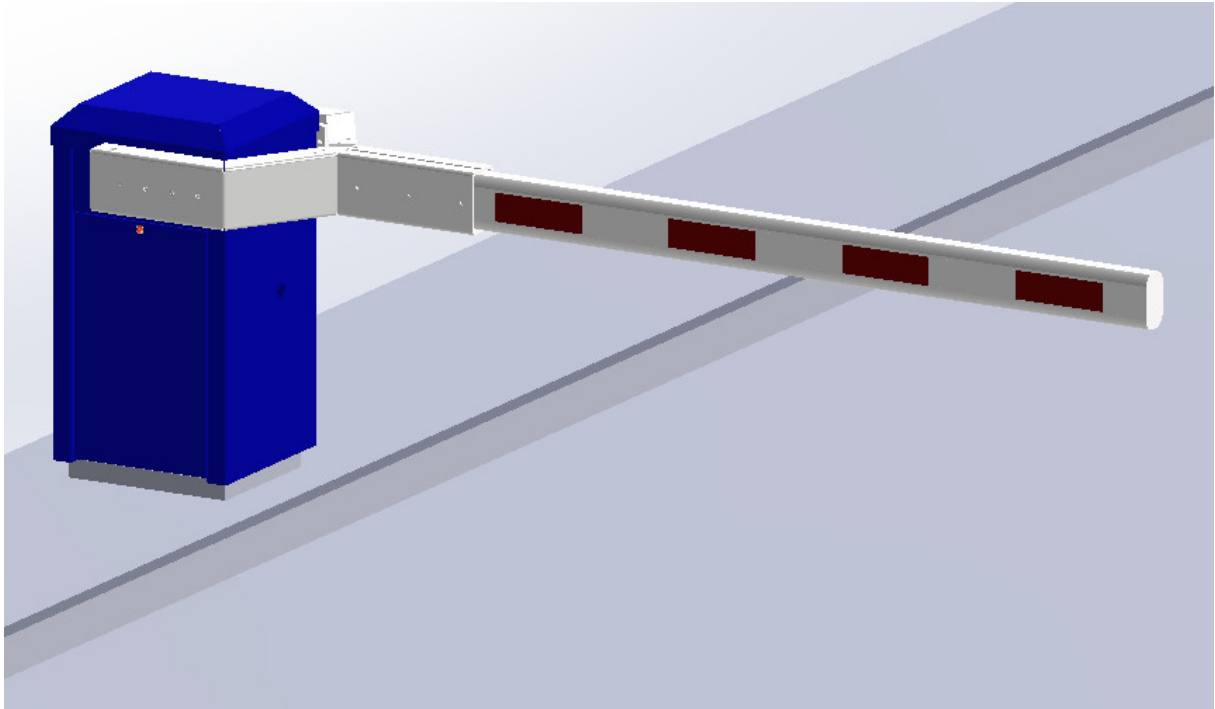
1.1.2. Controls

The boom barrier column contains a control panel with:

mcs61_man_2015_en_v02_2016-11-25MCS61_man_2015_EN_MDM_Specifications_14C03_Replacing boom barriers in the Zandvliet and Berendrecht lock complex_v01.docx

- two command push buttons: “Open” and “Close”. Releasing the push button stops the movement.
- a selector switch “local control” / “OFF” / “remote control”
- an isolation switch for interrupting the power supply
- a red mushroom emergency stop button.

2. Configuration examples



3. Installation

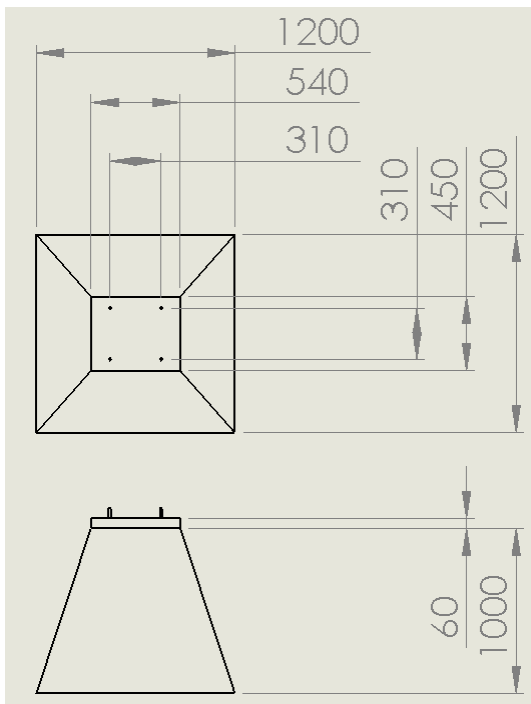
3.1.Preliminary checks

With a view to the safety and correct operation of the automatic system, always check that the following requirements are met:

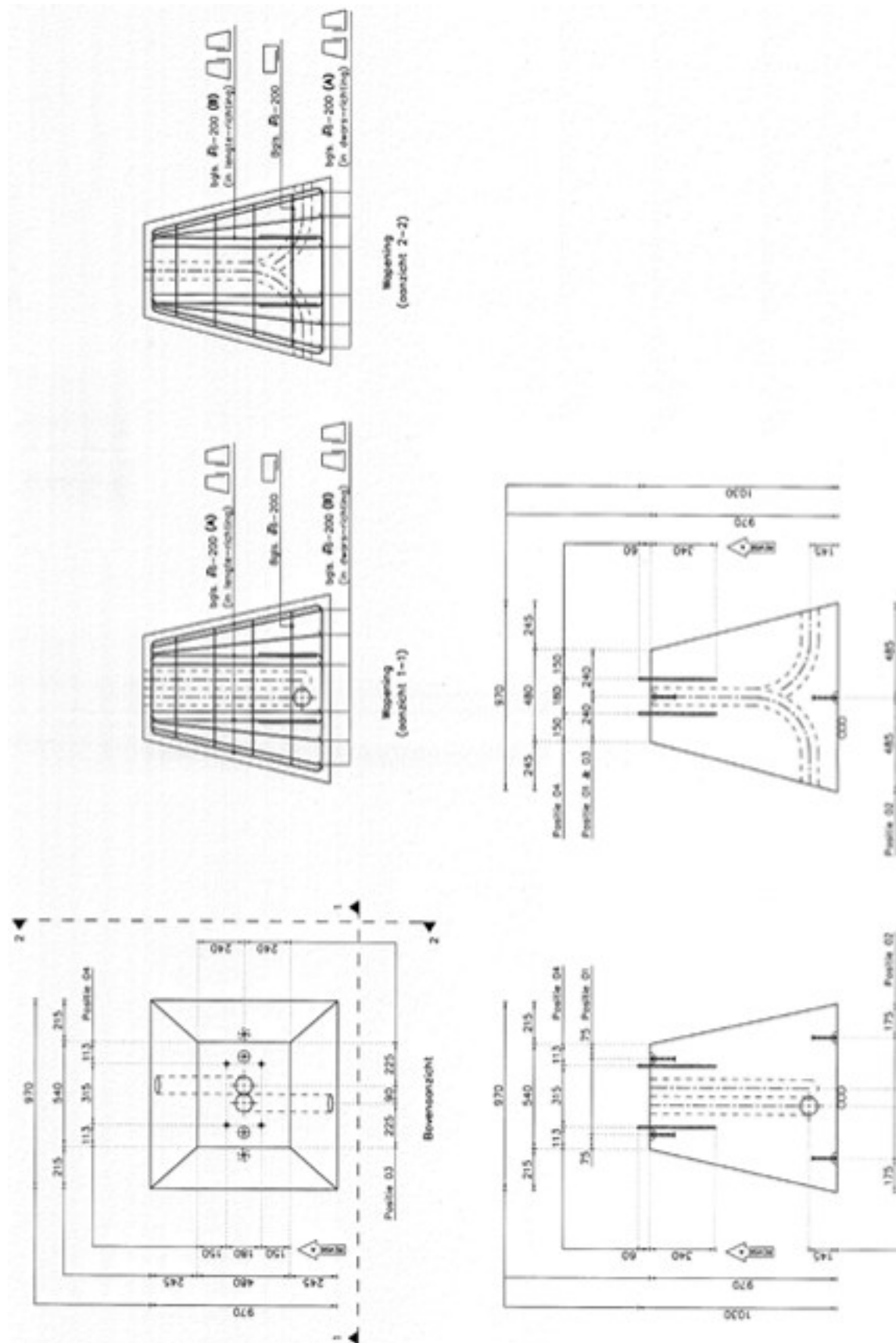
- The boom arm must never come into contact with any object when moving.
- The ground conditions must be such that the base is sufficiently stable.
- Make sure there are no pipes or electricity cables in the area around the base.
- If the boom barrier housing is exposed to passing vehicles, then a suitable scuff block should be fitted if possible.
- Check that the earthing system for the connection to the housing is satisfactory.
- Check which safety devices are necessary and whether these can be installed correctly.

3.2.Securing the fixing lugs in concrete

- Assemble the fixing lugs as shown in the illustration.
- Make a base as shown in the illustration.
- To prevent the threaded ends of the fixing lugs from being damaged when casting the concrete, we recommend that you protect them with adhesive tape.
- The top of the concrete foundation must be level and perfectly horizontal.
- Use PVC conduits for the power supply cables and control wires from the concrete base block.
- Let the concrete dry until it is fully cured.
- NOTE: it is also possible to assembly the boom barrier on a prefab concrete pedestal in accordance with Section 3.2.1.



3.2.1. Prefab Concrete pedestal



3.3.Electrics

To be provided by the client in accordance with the applicable statutory provisions of the country of installation:

- Power supply: From the general low-voltage fuse board up to the base block.
- Control wires: From where the control box is installed up to the base block.
- Safety cables: From where the protective devices are installed to the base block.

Note:

- Make sure each cable has a length of at least 1.5 metres protruding from the base block.
- Always keep the power supply cables isolated from the control and safety cables.

Specifically for MDM 14C03 specifications:

- Connect the socket box and connector block (IP 65 / 16A / 380V / 24-pole + earthing / Harting or equivalent and compatible) in accordance with technical specifications in the wiring diagram.

Bezetting van de kabel:

	13	14	15	16	17	18	19	20	21	22	23	24
	PE											
-	13	1										
L stopc	14	2										
N stopc	15	3										
L 230 VAC	16	4										
+ 24 VDC LED	17	5										
Bevel OP	18	6										
Bevel NEER	19	7										
Terugmelding OP	20	8										
Terugmelding NEER	21	9										
-	22	10										
Fail safe switch NO	23	11										
Fail safe switch NC	24	12										
	PE											

UPS
3f 400 VAC
Fail-safe circuit
230 VAC

3.4. Mechanical installation

- Remove the protection from the fixing lugs.
- Check the cables, and make sure they are the correct length.
- Remove the packaging from the boom barrier. Take the packaging to a waste processing company for it to be disposed of in the most appropriate manner.
- Unlock and open the door of the boom barrier cabinet.
- Check the condition of the boom barrier system. Although it has been very carefully packaged, there is always the possibility of damage during transport. If damaged, please contact Bormet or your insurance company. If necessary, carry out any repairs.
- Place a rubber mat on the base block over the fixing lugs.
- Place the boom barrier cabinet on the base block over the fixing lugs. The two doors are always at right angles to the roadway.
- Use the adjusting bolts to ensure the boom barrier cabinet is level.
- Anchor down the boom barrier with the fixing lug nuts and the supplied supporting discs.

4. Commissioning

4.1. Connecting the power supply cable

- The electrical connection must be carried out according to the accompanying diagram.
- Make sure the power supply cables are not live.
- Connect the socket box in accordance with the following cable assignment:

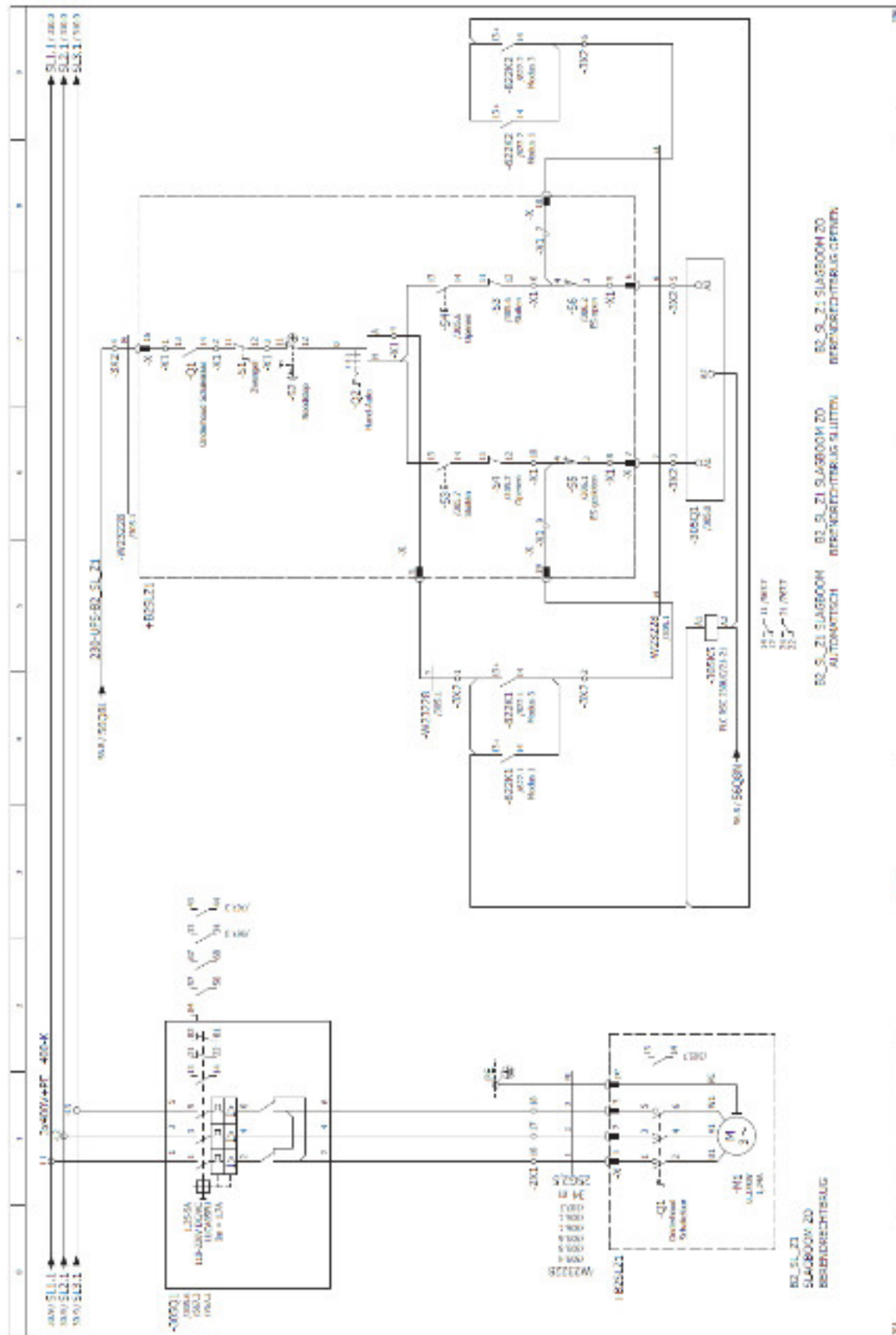
Bezetting van de kabel:

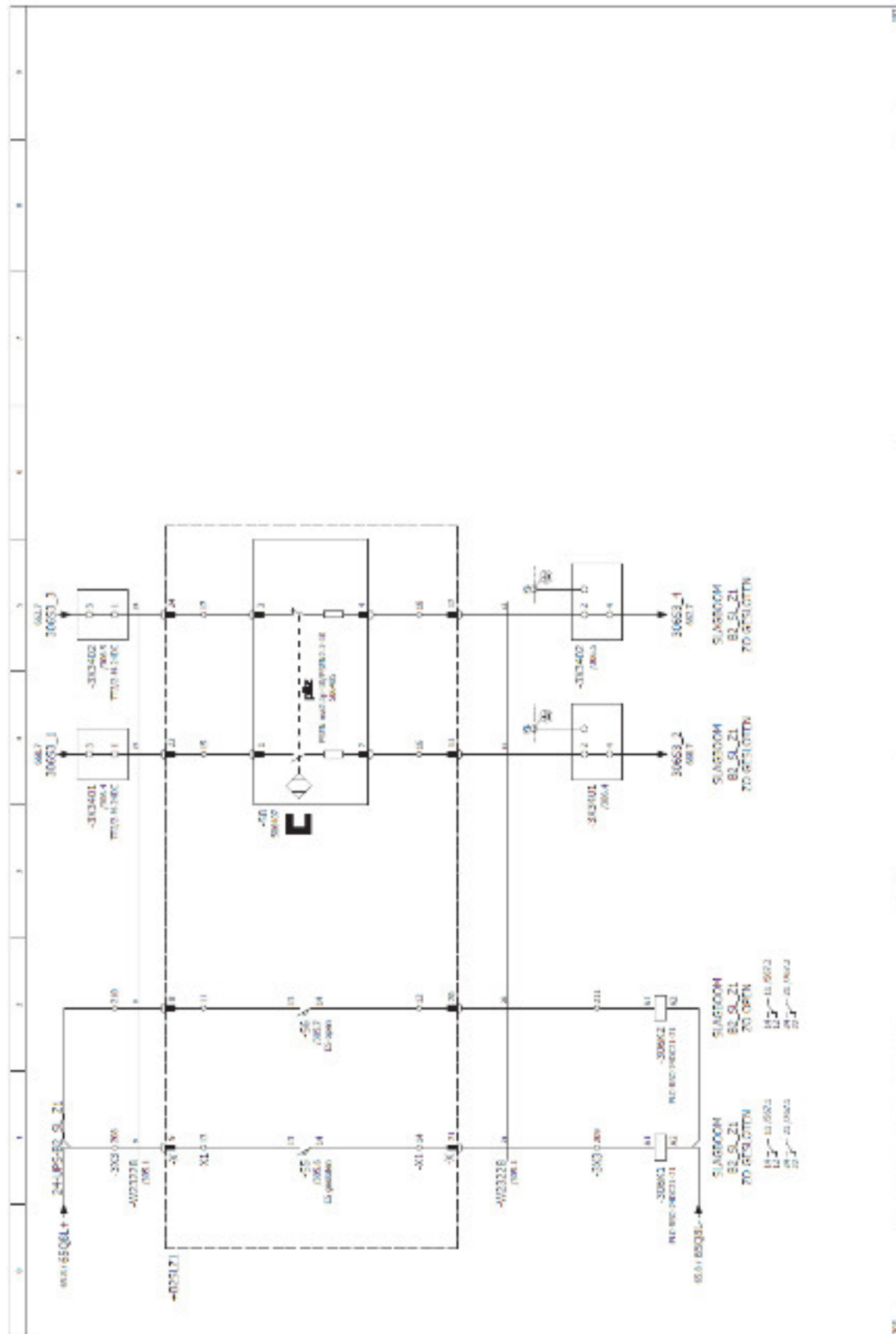
	PE		
-	13	1	L1 motor
L stopc	14	2	L2 motor
N stopc	15	3	L3 motor
L 230 VAC	16	4	-
+ 24 VDC LED	17	5	Bediening AUTO
Bevel OP	18	6	Bevel OP
Bevel NEER	19	7	Bevel NEER
Terugmelding OP	20	8	+ 24 VDC
Terugmelding NEER	21	9	+ 24 VDC
-	22	10	- 24 VDC
Fail safe switch NO	23	11	Fail safe switch NO
Fail safe switch NC	24	12	Fail safe switch NC
	PE		

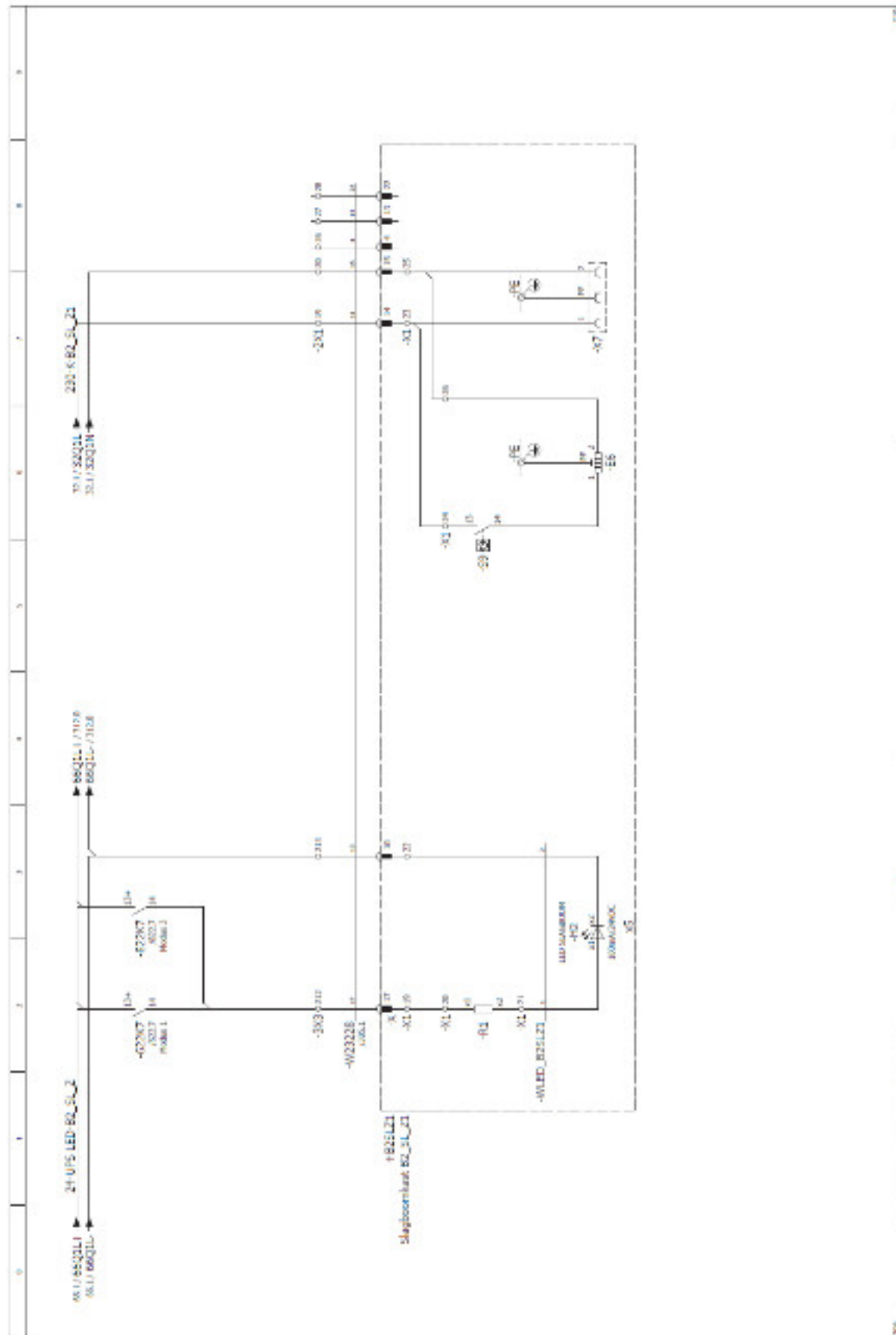
UPS
3f 400 VAC
Fail-safe circuit
230 VAC

- Check that the main switch is in the 0 position.
- Check that the emergency stop is pushed in.
- Check that the selector switch is in the 0 position.
- Only now can you insert the Harting connector block.

4.2.Connecting electrical equipment







4.3. Use V-belt discs based on arm length

V-belt disc on motor	V-belt disc on reducer	opening speed	maximum boom arm length
Ø 118	Ø 118	5.8 seconds	3,800 mm
Ø 63	Ø 80	7.3 seconds	5,300 mm
Ø 80	Ø 118	8.5 seconds	6,500 mm
Ø 63	Ø 118	10.7 seconds	8,300 mm

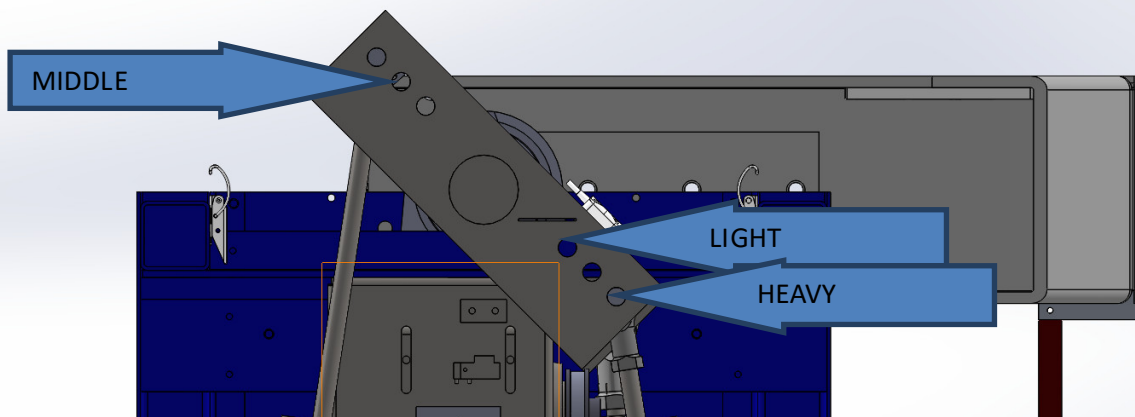
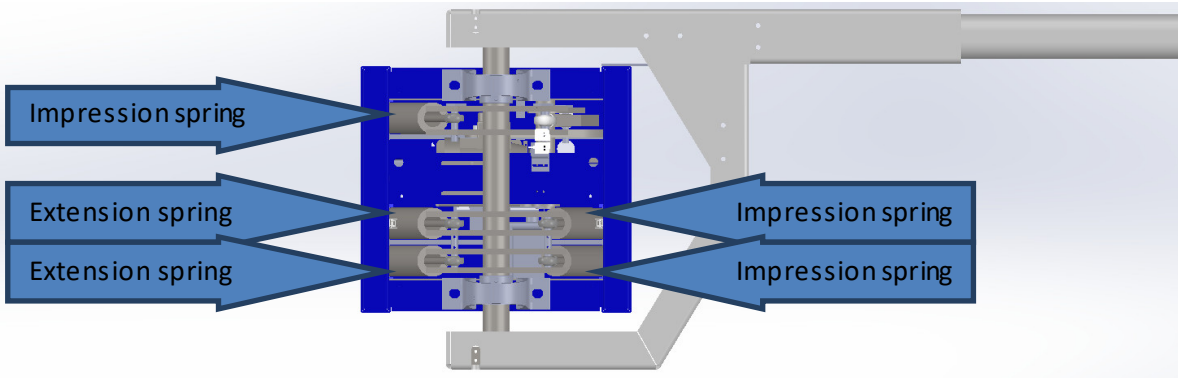
4.4. Use balance springs based on arm length for MCS61 central

Maximum boom arm length	Extension spring 1	Extension spring 2	Extension spring 3	Impression spring 1	Impression spring 2
2,000 mm	.	.	O L790 LIGHT	.	.
2,500 mm	.	.	O L770 MIDDLE	.	.
3,000 mm	.	.	O L770 MIDDLE	.	.
3,500 mm	O L770 MIDDLE	O L770 MIDDLE	.	.	.
4,000 mm	O L770 MIDDLE	O L770 MIDDLE	.	.	.
4,500 mm	O L770 MIDDLE	O L770 MIDDLE	.	.	.
5,000 mm	O L770 MIDDLE	O L770 MIDDLE	O L790 LIGHT	.	.
5,500 mm	O L770 MIDDLE	O L770 MIDDLE	O L770 MIDDLE	.	.
6,000 mm	O L770 MIDDLE	O L770 MIDDLE	.	I L770 MIDDLE	I L770 MIDDLE
6,500 mm	O L770 MIDDLE	O L770 MIDDLE	.	I L770 MIDDLE	I L770 MIDDLE
7,000 mm	O L770 MIDDLE	O L770 MIDDLE	O L790 LIGHT	I L770 MIDDLE	I L770 MIDDLE
7,500 mm	O L770 MIDDLE	O L770 MIDDLE	O L770 MIDDLE	I L770 MIDDLE	I L770 MIDDLE
8,000 mm	O L770 MIDDLE	O L770 MIDDLE	O L745 HEAVY	I L770 MIDDLE	I L770 MIDDLE
8,300 mm	O L770 MIDDLE	O L770 MIDDLE	O L770 MIDDLE	O L745 HEAVY	O L745 HEAVY

4.5. Use balance springs based on arm length for MCS61 skirt

Maximum boom arm length	Extension spring 1	Extension spring 2	Extension spring 3	Impression spring 1	Impression spring 2
2,000 mm	O L770 MIDDLE
2,500 mm	O L770 MIDDLE
3,000 mm	O L770 MIDDLE	.	O L790 LIGHT	.	.
3,500 mm	O L770 MIDDLE	O L770 MIDDLE	.	.	.
4,000 mm	O L770 MIDDLE	O L770 MIDDLE	O L790 LIGHT	.	.
4,500 mm	O L770 MIDDLE	O L770 MIDDLE	O L790 LIGHT	.	.
5,000 mm	O L770 MIDDLE	.	.	I L770 MIDDLE	I L770 MIDDLE
5,500 mm	O L770 MIDDLE	O L770 MIDDLE	.	I L770 MIDDLE	I L770 MIDDLE
6,000 mm	O L770 MIDDLE	O L770 MIDDLE	O L790 LIGHT	I L770 MIDDLE	I L770 MIDDLE
6,500 mm	O L770 MIDDLE	O L770 MIDDLE	O L770 MIDDLE	I L770 MIDDLE	I L770 MIDDLE
7,000 mm	O L770 MIDDLE	O L745 HEAVY	O L745 HEAVY	I L770 MIDDLE	I L770 MIDDLE
7,500 mm	O L745 HEAVY	O L745 HEAVY	O L745 HEAVY	I L770 MIDDLE	I L770 MIDDLE
8,000 mm	O L745 HEAVY	O L745 HEAVY	O L745 HEAVY	O L745 HEAVY	O L745 HEAVY
8,300 mm	O L745 HEAVY	O L745 HEAVY	O L745 HEAVY	O L745 HEAVY	O L745 HEAVY

4.6. Balance springs indicators



4.7. Installing the boom arm

1. Put the boom barrier in the open position.
2. Make sure the isolation switch is in the 0 position.
3. Check that the selector switch is in the 0 position.
4. Press the emergency stop button.
5. Uncouple the extension springs.
6. Let the boom barrier move to the closed position.
7. Make sure the three points of the drive rod are absolutely in line. (Pull the drive rod until it is against the lower shaft.)
8. Loosen the bolts of the reinforcing plates.
9. Make sure that all three bolts are removed from the arm fixture.
10. Place the boom arm into the arm fixture.
11. Assemble the three bolts to lock the arm.
12. Fasten tight the bolts of the reinforcing plates.
13. Check that all the bolts and nuts are securely tightened.
14. Put the boom barrier in the open position.
15. Couple the extension springs back in place.
16. Adjust the balance of the boom barrier with the springs.
17. First manually test the boom barrier.

4.8.Replacing the balance spring

1. Put the boom barrier in the open position.
2. Make sure the isolation switch is in the 0 position.
3. Check that the selector switch is in the 0 position.
4. Press the emergency stop button.
5. Loosen the locking nut between the rod end and the spring rod.
6. Adjust the spring rod tension by turning the adjusting nut until the spring is no longer fully tensioned.
7. Loosen the cotter pins.
8. Slide the rod end off the pin.
9. Turn the spring sleeve towards you and then slide the spring sleeve off the spring pin.
10. Install the new balance spring and adjust it.

4.9.Adjusting the balance spring

1. Put the boom barrier in the open position.
2. Make sure the isolation switch is in the 0 position.
3. Check that the selector switch is in the 0 position.
4. Press the emergency stop button.
5. Disconnect the drive rod.
6. Manually move the boom arm until it is at a 45-degree angle.
The boom arm must remain in this position when you release the arm.
7. Loosen the locking nut between the rod end and the spring rod.
8. Adjust the force of the spring using the adjusting nut of the spring rod.
9. When you have achieved the desired result, tighten the locking nut again.
10. Put the boom barrier back in the open position.
11. Reconnect the drive rod.

4.10. Replacing the motor

1. Put the boom barrier in the open position.
2. Make sure the isolation switch is in the 0 position.
3. Check that the selector switch is in the 0 position.
4. Press the emergency stop button.
5. Isolate all electrical connections from the motor.
6. Loosen the two clamping bolts.
7. Loosen the four nuts on the bottom of the motor plate.
8. Remove the motor from the boom barrier housing.
9. Install the motor and tighten the nuts manually.
10. Stretch the chain using the clamping bolts.
11. Securely tighten the four nuts on the bottom of the motor plate.

4.11. Replacing the chain

1. Put the boom barrier in the open position.
2. Make sure the isolation switch is in the 0 position.
3. Check that the selector switch is in the 0 position.
4. Press the emergency stop button.
5. Loosen the two clamping bolts.
6. Loosen the four nuts on the underside of the reducer plate.
7. Open the lock of the chain and remove it.
8. Position the new chain.
9. Manually tighten the four nuts on the bottom of the motor plate.
10. Stretch the chain using the clamping bolts.
11. Securely tighten the four nuts on the bottom of the motor plate.

4.12. Replacing the V-belt

1. Put the boom barrier in the open position.
2. Make sure the isolation switch is in the 0 position.
3. Check that the selector switch is in the 0 position.
4. Press the emergency stop button.
5. Loosen the two clamping bolts.
6. Loosen the four nuts on the bottom of the motor plate.
7. Move the motor until the V-belt comes loose and then remove it.
8. Position the new V-belt.
9. Manually tighten the four nuts on the bottom of the motor plate.
10. Tension the V-belt using the clamping bolts.
11. Securely tighten the four nuts on the bottom of the motor plate.

4.13. Horizontal adjustment of the boom arm in closed position

1. Place the boom barrier in the closed position.
2. Make sure that the distance between the drive rod and the lower shaft is approximately five millimetres.
3. Adjust the boom arm so it is level using the nuts on the threaded rod of the drive rod.
4. Make sure that all the nuts are securely tightened again.

4.14. Adjusting the limit switches

Attention: Make sure that the power supply is off before you adjust the limit switches.

1. Allow the boom barrier to close electrically.
2. Check that the contact operates correctly and that the switch is not jammed.
3. Check that the distance between the drive rod and the lower shaft is five millimetres.
4. If necessary, adjust the stop pin for the closed position.
5. Allow the boom barrier to open electrically.
6. Check that the contact operates correctly and that the switch is not jammed.
7. If necessary, adjust the stop pin of the open position.

4.15. Checklist for start-up

1. Run through the following electrical tests:
 - a. Open
 - b. Close
 - c. Safety
 - d. Electrical options:
 - i. Traffic lights
 - ii. Magnet post
 - iii. Pin lock
2. Have all of the nuts and bolts been securely tightened?
3. Have all of the cotter pins been installed correctly?
4. Have all of the wires been correctly connected to the corresponding terminals?
5. Has the boom arm been installed correctly?
6. Is the boom arm perfectly horizontal when in the closed position?
Is there any play between the drive rod and the lower shaft?
7. Does the service switch work correctly?
8. Have all foreign materials been removed from the boom barrier cabinet?
9. Has the top cover been closed correctly using the two spring locks?
10. Has the boom barrier housing been cleaned?

5. Maintenance

The following maintenance steps should be repeated on a regular basis, depending on the intensity of use.

1. Remove all dust and clean the inside of the cabinet.
Remove all materials that do not belong in the cabinet.
2. Check that all the nuts and bolts have been securely tightened.
3. Check that all the wires are securely connected to the terminals.
Check the condition of the contacts and relays.
4. Check that the boom arm has been attached correctly.
Check that the boom arm is perfectly horizontal in the closed position.
5. Check the condition and tension of the chain.
6. Check the condition and tension of the V-belt.
7. Check the condition of the limit switches.
8. Check the operation of the slip clutch.
9. Check the general condition of the balance spring.
10. Lubricate all bearings and moving parts.