

# Pot handling robot TR 4103



## Instruction manual

Date of Issue: 01.02.2016 / V1.0

Read carefully before installation, commissioning and operation. For further reference please keep this manual within easy reach of the equipment at all times.



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# 1 Product description

## 1. Intended use

The MAYER POT HANDLING ROBOT model TR 4103 offers optimized solutions for various indoor plant transport and pot handling processes. The MAYER POT HANDLING ROBOT TR 4103 can be used for the following purposes:

### a) Placing plant pots on mobile benches

The plant pots are arranged on a conveyor belt by means of an accumulator at a preselected distance. From there the MAYER POT HANDLING ROBOT TR 4103 places them onto the mobile benches standing by the conveyor system.

It can further be selected by the user whether the pots should be placed in parallel rows or alternating rows.

### b) Removing plant pots from mobile benches

With the help of the MAYER POT HANDLING ROBOT model TR 4103 pots can be removed from mobile benches and placed onto a conveyor belt.

### c) Spacing pots

(With at least 2 interlinked POT HANDLING ROBOTS in operation)

The first POT HANDLING ROBOT lifts the pots from the mobile bench and places them onto the conveyor belt.

The second POT HANDLING ROBOT places AND spaces the pots as described under

a) 'Placing plant pots on mobile benches'.

### d) Sorting potted plants

(With at least 3 interlinked POT HANDLING ROBOTS in operation)

The first POT ROBOT lifts the pots from the mobile bench and places them onto the conveyor belt.

While on the conveyor belt, the pots are sorted and each sort is transported to a corresponding POT HANDLING ROBOT by means of conveyor belts.

Any utilization of the machine other than the intended uses specified in this Instruction manual is considered improper use.

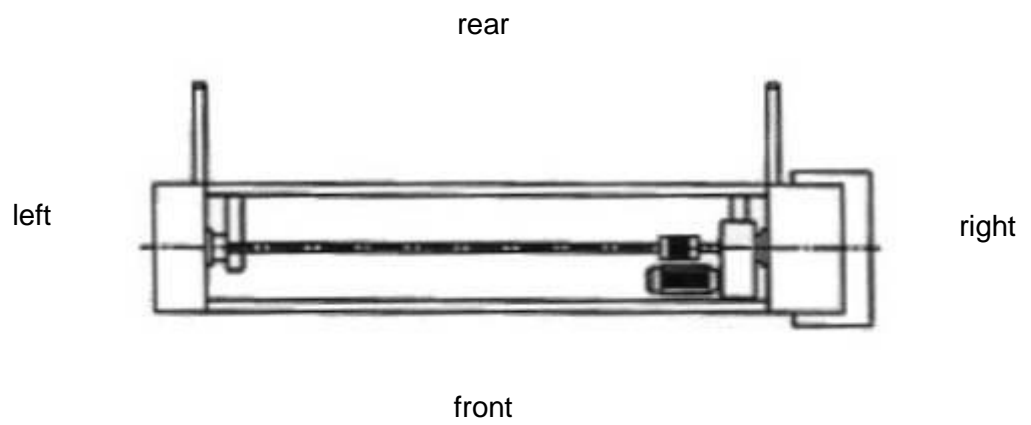
Should the MAYER POT HANDLING ROBOT model TR 4103 be used for anything other than its intended purpose, a safe operation of the machine cannot be guaranteed.

In order to fulfil the requirements for proper use and care, this instruction manual must be fully read and all included instructions must be strictly followed, with special regard to the ones on health and safety. Under this term it is further required that all inspection and maintenance duties are carried out on a regular basis at the specified time intervals.

All personal injury and property damage claims arising from an improper use of the machine shall become void. The producer excludes liability for any such injury or damage and all responsibility shall be borne exclusively by the user/ operator of the MAYER POT HANDLING ROBOT TR 4103.

## 2. Structure

### Top view of POT HANDLING ROBOT TR 4103



### 3. Functions of the Machine

#### a) Placing of pots

The pots are transported by means of conveyor belts to the accumulator of the MAYER POT HANDLING ROBOT TR 4103. The accumulator arranges the pots at a preselected distance from one another, which facilitates an easy and smooth lifting of the pots.

Once the number of plant pots within the accumulator reaches the required and pre-set level, the locking cylinder stops the feeding process. The pots transported towards the accumulator during the pot placing process are collected in the pre-accumulator.

The count switch on the accumulator actuates the placing process. The lifting unit controlled via two cylinders swivels in. During the pot placing operation the pot-filled lifting fork is held in a horizontal position by means of a chain between the cylinders and the pot lifting unit.

When the cylinders are retracted, an electric motor is started. With the help of a chain on the left and right hand side this motor enables the fork with the pots to move over the table positioned via electrical table feed. Once the fork is over the table, the pots will be placed on it and released, and the pot lifting unit swivels out.

Now the arm moves back into its starting position over the conveyor belt and waits until the accumulator is filled with pots again.

While the arm is swivelling back and inwards again, the table is rolled forwards by the table feed by a previously set path length in order to secure enough space for the next row of pots to be placed on the table.

Once the accumulator is filled with pots, the placing process starts again.

#### b) Lifting of pots

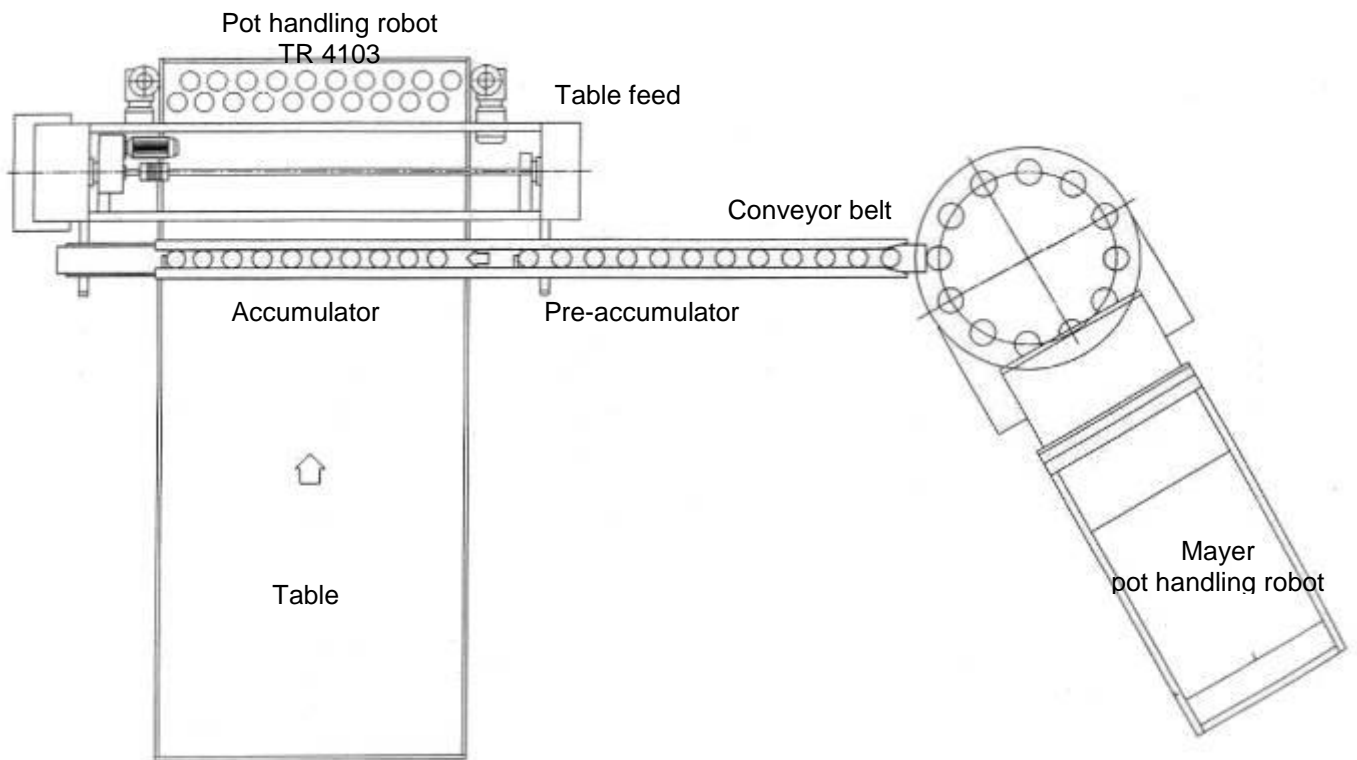
For the lifting of plant pots from the mobile benches no accumulator is required.

The pot lifting fork must be equipped with at least one switch.

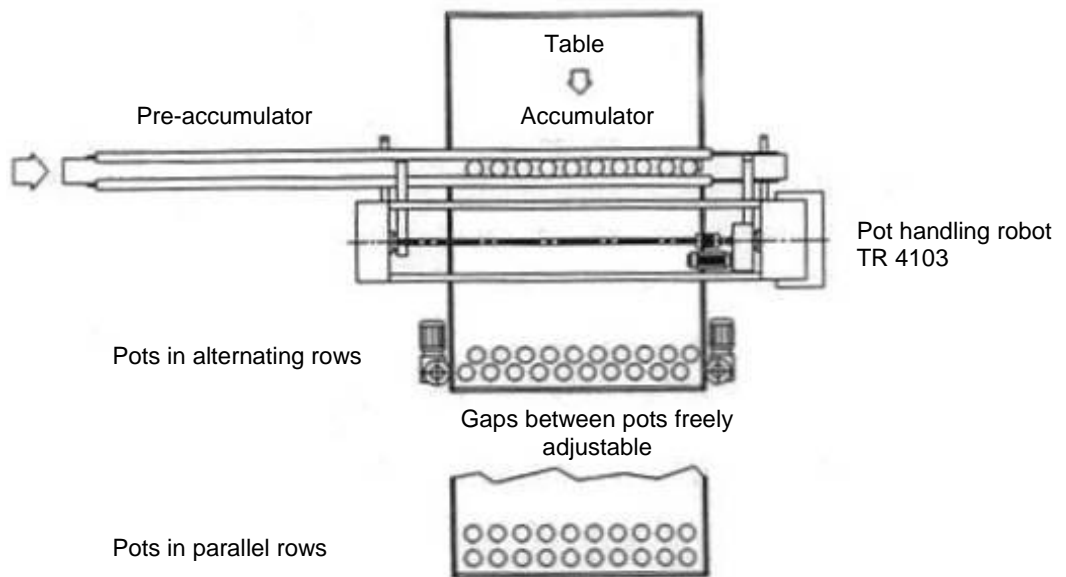
Once the mobile bench has taken up its position after the start, the fork swivels over the bench. The lifting unit swivels in and the table feed starts to move the pots towards the fork. The table feed keeps running until a switch on the fork is activated. The pot lifting unit then slightly lifts the pots from the table, following which the table feed rolls the table back by a previously set path length so that plants eventually grown into each other can be disentangled.

Once the process is ended and a light sensor signals that the conveyor belt is clear, the fork with the pots moves over the unmoving conveyor belt and places the pots on it.

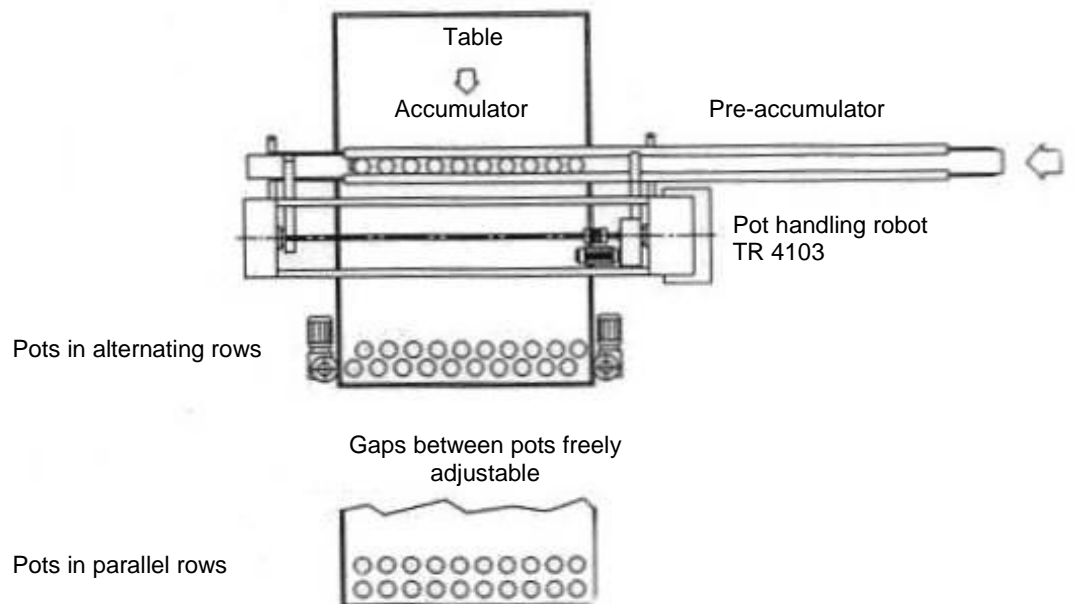
The pot lifting unit then swivels back and the conveyor belt starts to move.



**Pots fed from the left**



**Pots fed from the right**



#### 4. Technical specifications

<b>Manufacturer:</b>	<b>Mayer</b>
<b>Type of machine:</b>	<b>Pot handling robot</b>
<b>Model no.:</b>	<b>TR 4103</b>
<b>Length:</b>	2740 mm (incl. table drive)
<b>Width:</b>	700 mm (excl. table drive)
<b>Height:</b>	2050 mm (minimum ceiling height = 2500 mm)
<b>Weight:</b>	370 kg (incl. control cabinet)
<b>Current consumption:</b>	10 A
<b>Voltage:</b>	400V/50Hz, 5-phase
<b>Compressed air supply:</b>	max. 9 bar / min. 5 bar dry, filtered compressed air
<b>Air consumption:</b>	ca. 80 l/min. per pot handling robot at 7 bar
<b>Pot sizes:</b>	diameters of 8 to 14 cm (depending on pot type and manufacturer)
<b>Alternation:</b>	max. 140 mm
<b>Fork width:</b>	when working with alternation max. 1600 mm when working without alternation max. 1740 mm
<b>Table width (inner) with alternation:</b>	max. 1640 mm + alternation
<b>Table width (inner) without alternation:</b>	max. 1780 mm
<b>Additional parts:</b>	Forks and accumulators to be selected according to pot size and gap between pots
<b>Hourly output rate:</b>	see output chart
<b>Workplace-related emission value:</b>	70dB (A)

#### Output chart

The output rates of MAYER POT HANDLING ROBOT TR 4103 are influenced by the diameter of the applied pots as well as the table width.

The output rates presented in the following chart are based on theoretical calculations.

Pot diameter (mm)	Output/hour	Output per 8 hours	Output/day at 80% cap. util.
80	6,000	48,000	38,400
90	6,000	48,000	38,400
100	5,000	40,000	32,000
120	4,000	36,000	28,800
140	3,000	24,000	19,200
160	2,000	16,000	12,800



**Optional extras** (available for extra charge)

- Pot forks
- Pot accumulator
- Blow-off unit for cleaning the conveyor belt
- Table drive with query

**Attention!**

**When ordering spare parts and optional extras, kindly remember to state the type and model number of your machine.**

## 5. EC Declaration of Conformity

in accordance with Annex II A of the EC Machinery Directive (2006/42/EG)

The manufacturer:

**Mayer Ipari es Kereskedelmi BT.**  
**Kossuth ut. 106**  
**9341 Kisfalug | Hungary**

hereby declares that the machine described hereinafter:

**Manufacturer: Mayer**  
**Type: Pot handling robot**  
**Year of construction: from 2015 onwards**

fully meets the health and safety regulations specified in the following EC Machinery Directive(s):

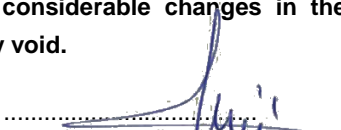
**2006/42/EG**

*Applicable harmonized standards:*

EN ISO 12100:2011	Safety of machinery, basic terminology, general guiding principles for organization
EN ISO 13857	Safety distances to keep the upper limbs from reaching danger points
ISO 13854	Safety of machines, minimum distances to avoid any crushing of body parts
EN ISO 13849-1	Safety-related parts of control systems pl.: "C"
EN ISO 14121	Part 1: General principles for design
ISO 14119	Principles for risk assessment
ISO 13850	Interlocking devices associated with guards
IEC 60204-1	EMERGENCY SHUT-OFF systems
EN 349:1993+A1:2008	Electrical equipping of industrial machines
EN 953:1997+A1:2009	Part 1: General requirements (category „0” STO (Safe torque off).)
EN ISO 4254-1:2010	Safety of machinery - Minimum gaps to avoid crushing of parts of the human body
	Safety of machinery Guards General requirements for the design and construction of fixed and movable guards
	Agricultural machinery – Safety - Part 1: General requirements

**Commissioning of the machine is prohibited until it is proved that that the whole of the mobile bench configuration is in line with the regulations of all relevant harmonized EC directives and guidelines. Any constructional changes that affect the technical parameters and intended purpose set forth in this instruction manual are bound to result in considerable changes in the machine and will, therefore, render this EC Declaration of Conformity void.**

Kisfalud, 01.02.2016

  
 .....  
 Arpad G. Meszaros, (MSC)  
 Head of Development and Construction

## 2 General safety instructions

### 1. Operator's duty of care

The design and construction of the MAYER POT HANDLING ROBOT model TR 4103 was based on careful risk assessment and performed in line with the relevant prevailing harmonized standards and other technical specifications. As a result, this state-of-the-art equipment guarantees the highest level of safety.

In practice, however, maximum safety can only be achieved if all relevant requirements are fully met. The careful planning and consequent enforcement of measures safeguarding the fulfilment of these requirements fall within the liability of the operator (Operator's duty of care).



**The operator is, therefore, solely liable to ensure that**

- the machine is only used for its Intended Purpose (for further details please refer to chapter 1 on *product description*)
- the machine is only operated in an unimpaired and fully functional condition, with special regard to the protective guards and safety devices, which must be checked on a regular basis and kept in a fully functional condition at all times
- the instruction manual is kept in a full and readable condition and within easy reach of the machine at its place of operation
- the equipment is used, serviced and repaired by fully qualified and authorized operating personnel only
- all signs, symbols and warnings on the equipment related to health and safety are kept unimpaired and in a readable condition at all times.
- All users of the machine are liable to ensure that they do not attempt to operate the machine unless it is in an unimpaired condition.
- Arbitrary modifications on the machine or any changes that affect its safe operation are not permitted.
- All maintenance and repair work on the machine must be conducted with the machine turned off.
- This operating personnel is trained and regularly updated on all relevant matters of health, safety and environmental protection, and that they are fully aware of the contents of this Instruction

- Manual with special regard to the included instructions on health and safety.
- Before maintenance and repair work on the machine is commenced, all its drive units and additional equipment must be secured against being inadvertently turned on.
  - Protective guards and safety devices are only to be removed if the machine is fully and safely turned off.
  - The operating of this machine is subject to prevailing local and regional laws and regulations on health and safety.
  - Under no circumstances is the machine to be started with its safety devices removed.
  - The machine operator is responsible for any third person staying in the working area.
  - **Should any of the instructions set forth above not be observed, the manufacturer will automatically be released from all his liabilities.**

## 2. Explanation to the safety signs and symbols used

The safety signs and symbols, together with the related warning texts, are meant to call attention to the unavoidable residual risks associated with the use of the machine. These residual risks may affect

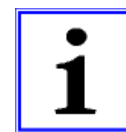
- people
- the machine
- other objects and properties
- the environment.

In this instruction manual the following safety symbols are used:

This symbol suggests that the related hazards primarily endanger the machine, objects and the environment. However, this sign does not refer to any danger to people. Not following these instructions can cause machine malfunction or damage to the machine and other properties, and the environment might be harmfully affected as well.



This symbol calls attention to information that contributes to a better understanding of the machine. This information helps you optimize the use of the equipment. This symbol, however, does not refer to any health and safety instructions.



This symbol warns of electric shock hazards.



Please note that on no account is a safety sign or symbol meant to replace the actual text of a safety instruction. The relevant safety instructions are, therefore, always to be read fully and thoroughly.

### **3. Basic safety measures**

**Please make sure that the following safety measures are strictly followed at all times:**

- The personnel is to wear tight fitting work clothes at all workstations.
- Wearing rings, chains or bracelets is strictly prohibited.
- For technological reasons, the MAYER POT HANDLING ROBOT TR 4103 cannot be covered completely. Nevertheless, the protective shield fitted on the sides provide extra protection against the moving pot lifting unit.
- It is strictly prohibited to reach behind the protective shields in order to eliminate eventual disturbances while the machine is in operation.

#### 4. Machine-specific safety measures

Responsibilities related to the individual operations performed with the machine must be clearly specified and strictly observed.

Unclear or undefined competences represent a safety hazard.

The Emergency-OFF button must always be freely and easily accessible.

The machine must be installed stably on a firm and level surface. If falling over, the machine can cause death.

In order to eliminate the danger of slipping, the floor (at the workstations around the machinery, in passageways and transport routes) must be kept clean and dry at all times.

Tripping hazards represented by connected power cables must be eliminated.

All supply lines connected to the machine must be unimpaired.

Maintenance and repair work on the electrical equipment must be conducted by qualified and authorized electricians only.

Protective guards and safety devices

- are installed to protect the health and safety of the operating personnel, and
- are under no circumstances to be changed, removed or bypassed through altering the machine.

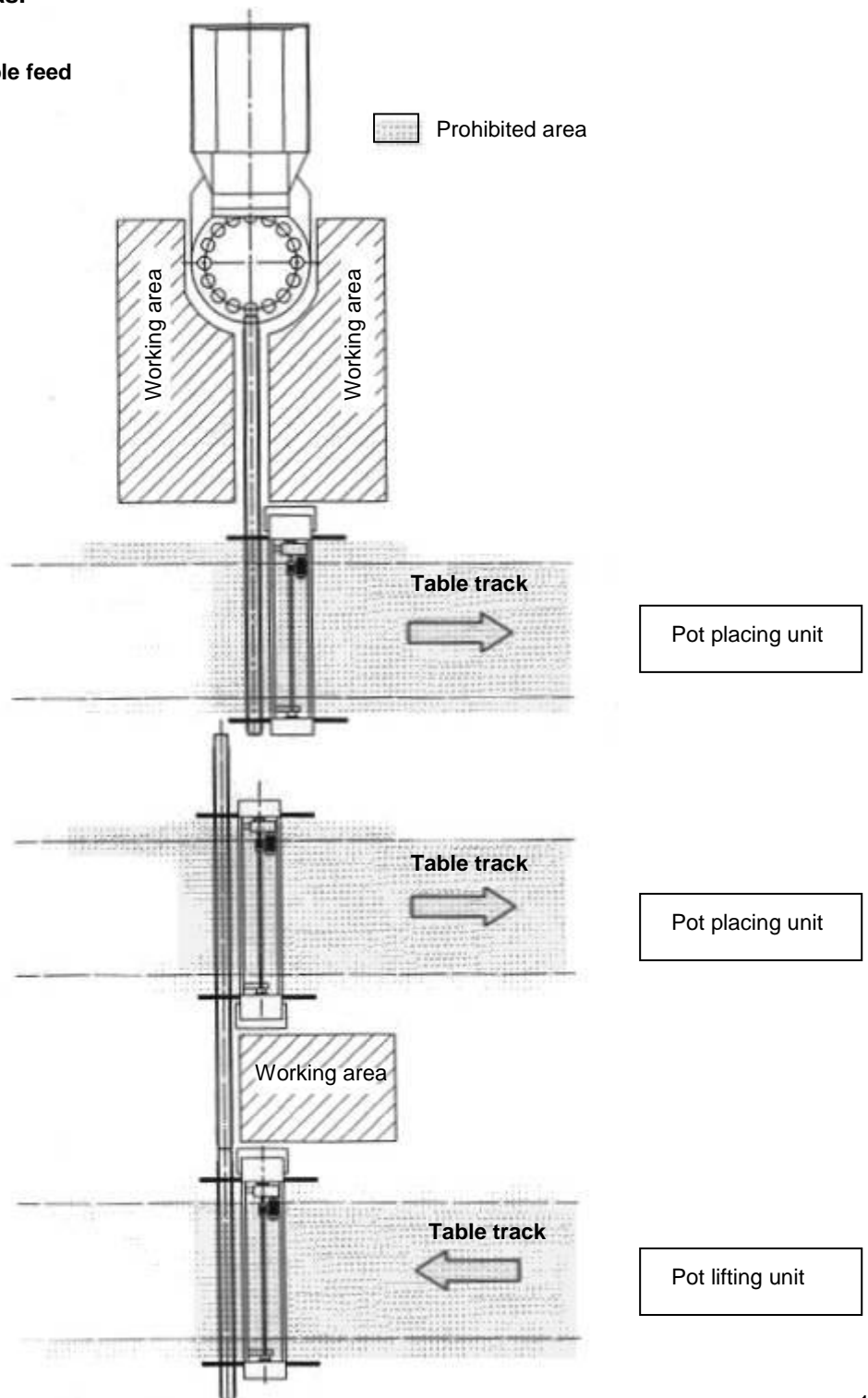
Residual currents that cannot be detected by means of an ordinary residual current circuit breaker can arise in frequency converters. The machine can, therefore, only be operated if it is equipped with an all-current sensitive FI circuit breaker.

Frequency converters are fitted with capacitors that discharge after the machine has been switched off. The machine can, therefore, only be unplugged from the socket 1 to 2 minutes after the main switch has been turned off.

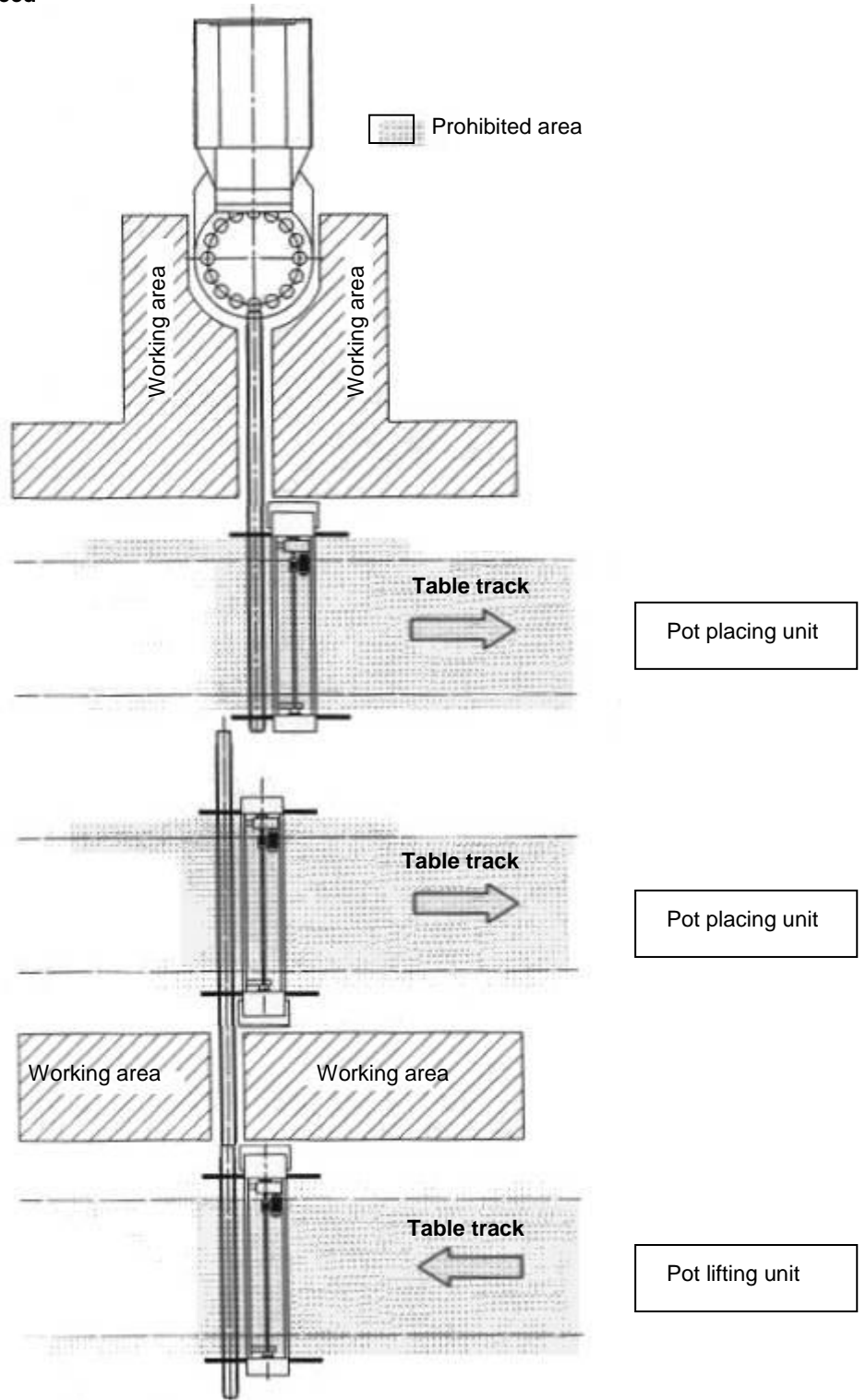


Schematic representation of a pot handling robot, marking the working areas and the prohibited areas.

a) Automatic table feed



**b) Manual table feed**





## 5. Requirements regarding the operating personnel

The machine is to be operated by properly trained, qualified and authorised personnel only. This operating personnel must be aware of the contents of this manual and strictly follow the instructions and regulations set forth in it. The individual responsibilities and liabilities of operating staff members must be clearly specified.

In addition to the above, the following duties require special qualifications and authorization:

Operating personnel still in training is only allowed to operate the machine under the strictest supervision of an authorized person with sufficient experience. The successful completion of an initiation training must be certified in a written format.

Control units are only to be operated by personnel properly and specifically trained for this purpose.

All employees conducting work on and around the machine must carefully read this instruction manual and sign a declaration stating that they have fully understood the instructions and provisions set forth in it.

Further requirements:

- While the machine is running it is strictly prohibited to reach into the work space of the machine! At the guards the following warning decals are attached:



- While the machine is running it is strictly prohibited to approach the movable arm! At the guards the following warning decals are attached:



- While the machine is running it is strictly prohibited to loose screws of the safety guards and to remove the guards! The guards may only be removed when servicing the machine! At the guards the following warning decals are attached:

## ACHTUNG!

Der Schutz darf nur bei der Wartung der Maschine entfernt werden.



## 3 Transportation

**In order to prevent property damage or personal injury during transportation of the machine, the following instructions must be strictly followed:**

- Transport-related activities can only be conducted by qualified personnel, under the strictest observance of all relevant safety regulations and instructions.
- The equipment is only to be lifted at the designated lifting points.
- For the transportation of this machine no other than the hereinafter listed lifting tools, equipment and slings must be used.
- Please consult the chapter on *general safety instructions* as well.

**The transportation of this equipment represents the following types of hazards:**

- Suspended loads may be subject to falling and thus represent a death hazard. Standing underneath such loads must be avoided at all times.
- Should other than the hereinafter listed lifting tools and equipment be applied, this can cause severe damage to the machine.

### 1. Transportation

While transporting the machine, all due care must be paid to avoid it being damaged through any external force or due to careless loading and/or unloading.

The consignment must be firmly fixed and secured during transportation as appropriate based on the method of transport and the length of the transport route.

During transportation condensation due to considerable changes in temperature or transport-related impact must be prevented.

The equipment must be handled with due care at all times.

### 2. Storage

Should the machine or its structural components not be installed directly after their arrival at the place of operation, they will require careful storing in a protected place. During storage the machine and its structural components must be covered properly to prevent dust and moisture from gaining access to them.

For instructions on machine standstill please refer to chapter 6.3.

## 4 Installation

### 1. General information

a)

In order to protect the machine against weather conditions, it must be installed in an enclosed space.

b)

Voltage: 400 V / 50 Hz, 5-phase, 10 A

Compressed air supply: coupling SV-1087/KY6451 Hoerbiger

The pot handling robot shall be installed and connected to the available supply systems by personnel authorized by our company.

The machine can only be connected to sockets that are secured by means of an all-current sensitive FI circuit breaker.

c)

Enough space must be secured for the assembly and installation work to be performed on the machine. This requirement should be taken into account when arranging upstream and downstream machines.

d)

In order to make optimum use of the available machine capacity, a continuous flow of pots and plants on the conveyor belts must be ensured. Maximum operational efficiency is further secured by a smooth and well-organized moving and handling of the mobile benches.

e)

The machine must be installed and commissioned by our technicians, who are also to test-run the machine during the initial commissioning.

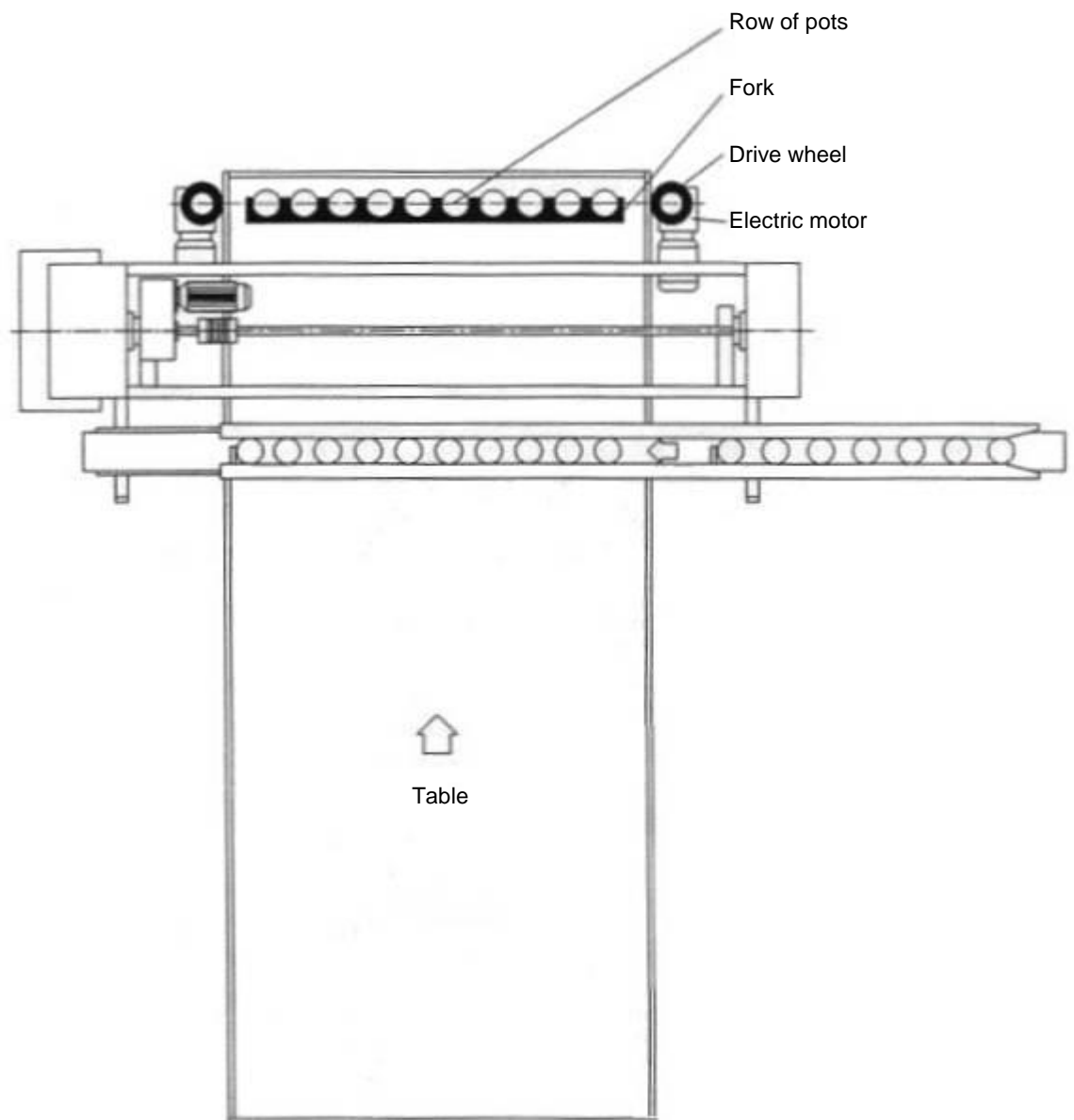
## 2. Installation of the machine

When installing the machine, please ensure that the following steps and guidelines are strictly followed:

- a) When transporting and moving the machine always use the fixture over the table tracks.
- b) Position the machine.
- c) Remove transport fixture.
- d) Arrange the machine:
  - aligning with the table track and
  - at a height appropriate for the table base.
- e) Affix the table feed and the light sensor for table positioning (10B1 – 10B3 placing unit, 10B4 – 10B5 lifting unit) on the table track.

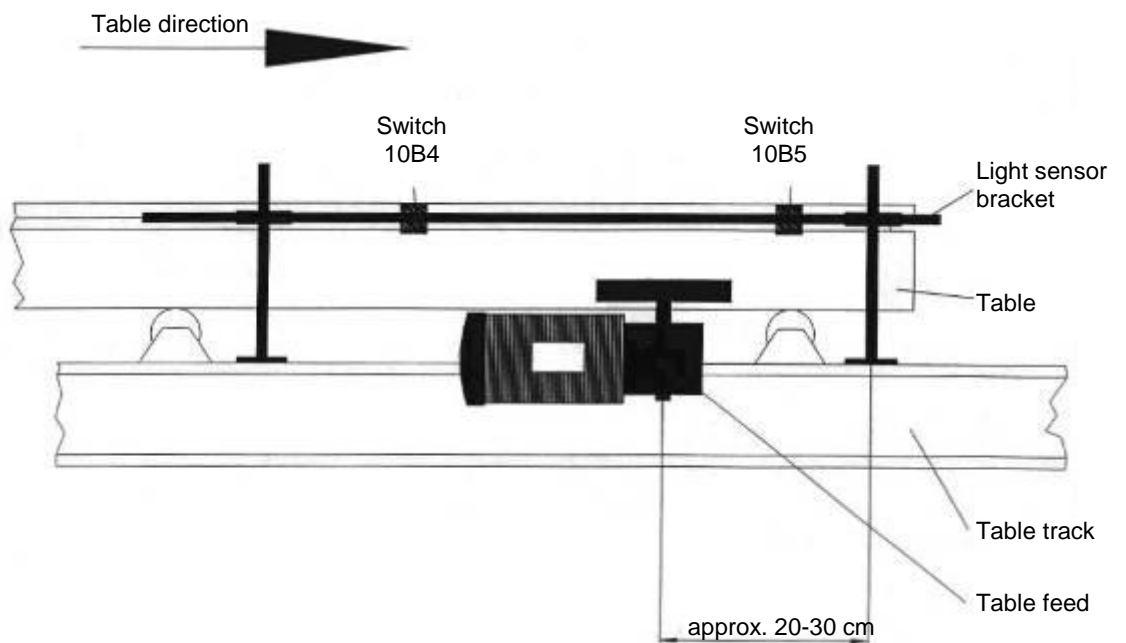
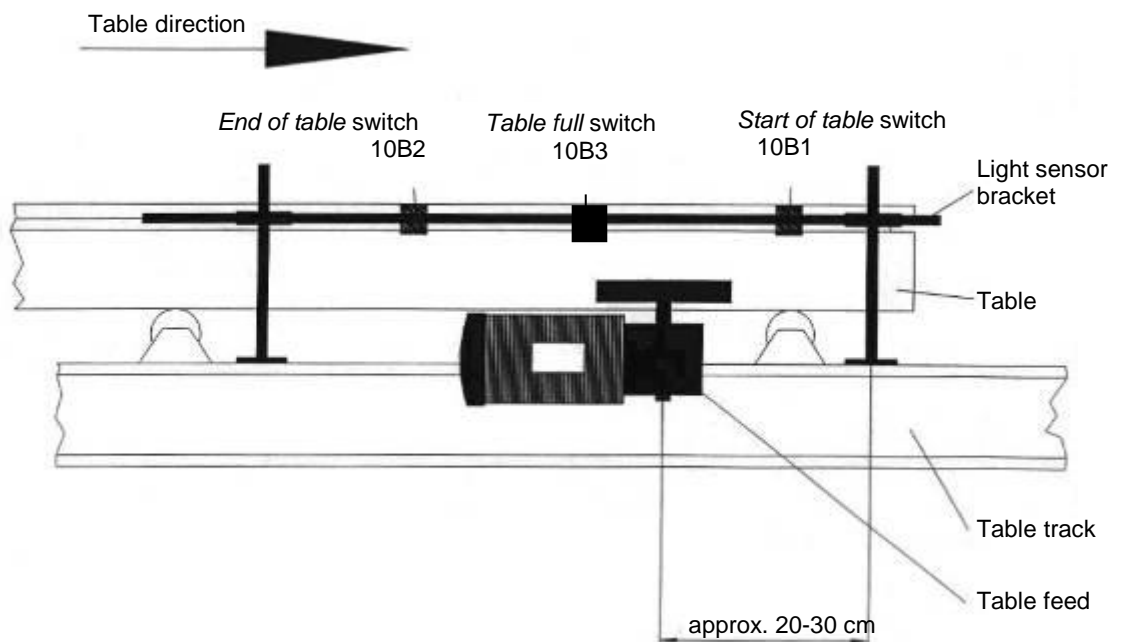
<p><b>NOTE:</b> Please consider the total height of the machine when installing it!</p>
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### Arrangement of the table feed



When assembling the MAYER POT HANDLING ROBOT TR 4103 at its place of operation for the first time, the table feed must be attached to the table track of the table transport in a way that allows for the middle of the drive wheel on the electric motor to be in alignment with the row of pots previously placed there manually (see schematic representation above).

### Arranging the bracket for light sensors 10B1 to 10B5



### 3. Requirements for structural stability

Note:

In order to safeguard the structural stability of the MAYER POT HANDLING ROBOT TR 4103, it is essential that the legs of the machine are dowelled on a concrete foundation with the following dimensions:

Length: min. 1.00 m  
Width: min. 1.00 m  
Depth: min. 0.20 m



For the dowelling of the machine 4 screws with a minimum diameter of 10 mm and a minimum length of 120 mm should be used with each of the 2 legs.

### 4. Dismantling and disposal of the machine

Upon completing the full length of its operational life the machine must be disconnected from the power supply network and disposed of as specified by the prevailing laws and regulations.



## 5 Commissioning

While commissioning the machine, the following safety instructions must be observed in order to eliminate the risk of personal injuries, property damage and damages to the machine.

- Commissioning of the machine is to be performed by qualified personnel only, under the strictest observance of the relevant regulations on health and safety.
- Prior to initial start-up please make sure that all tools and foreign objects have been removed from the machine.
- Check all electrical connections before starting the machine for the first time.
- Activate all safety devices and Emergency OFF switches before starting up the machine.
- Please consult the chapter on *health and safety instructions* as well.



### 1. Inspection prior to the initial commissioning

Prior to the initial commissioning of the machine kindly go through the following checklist:

- Are all protective guards and safety devices fitted?
- Has transportation caused any damage to the machine?
- Are all accessible bolted joints tight enough?
- Are all connection cables of the equipment and the connection of the Emergency – OFF switch intact?

## 2. Initial start-up of the machine

Control panel Omron NQ5 TQ010-B – display and keyboard



In order to test run the machine after installation please go through the following procedure:

a)

For a smooth operation of the machine it is essential that the operating pressure be set properly.

The adjustment of pressure can be performed on the service unit.

The pressure must reach a minimum value of 5 bar and must not exceed a maximum value of 9 bar. Should the operating pressure fall below the minimum of 5 bar, the pressure control will be activated and the machine will stop.

b)

For test-running the machine please complete the following procedure (test-running of the machine only to be performed in manual mode):

After switching on the machine the starting screen will be displayed on the control panel for 6 seconds.

**4103 Put down**

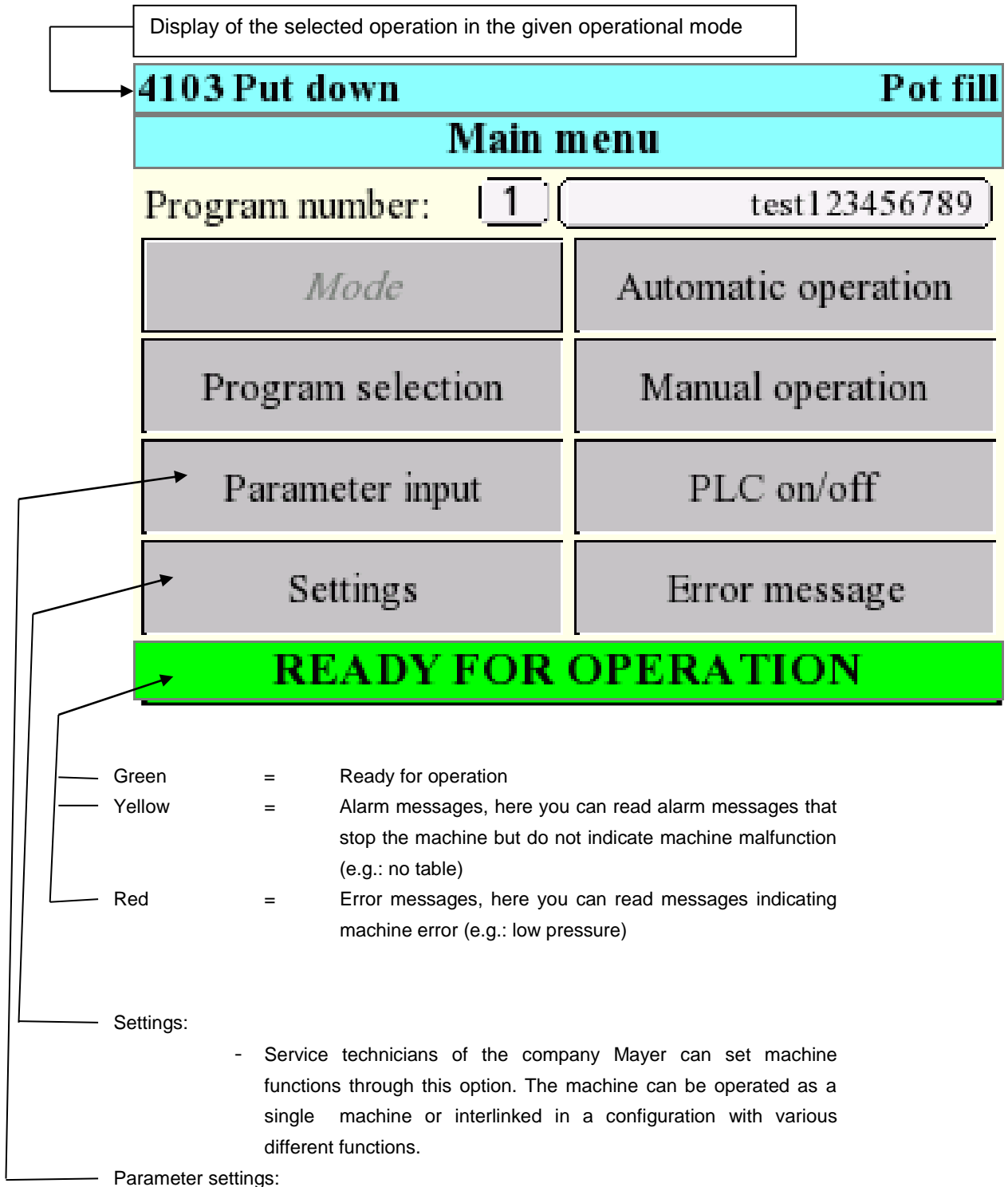
**Pot fill**

Mayer Gmbh & Co. KG  
Maschinenbau und Verwaltung  
Poststraße 30  
89522 Heidenheim | Germany  
Phone +49 7321.9594 290  
Fax +49 7321.9594 297



Mayer HW & SW Kft.  
Karácsondi ut. 40  
3200 Gyöngyös | Hungary  
Phone +36 37.508 110  
Fax +36 37.508 119

Then the following screen will appear:



- Through this option the required parameters can be set for the different programmes.

Programme selection:

- You can select the required programme from 25 options.

Machine function:

- If the machine is operated as part of a configuration, the machine functions can be selected through this option.

Error message:

- Messages of machine malfunction will be displayed here.

PLC IN/OUT:

- Inputs and outputs of the PLC control system are displayed here, active inputs and outputs are marked yellow.

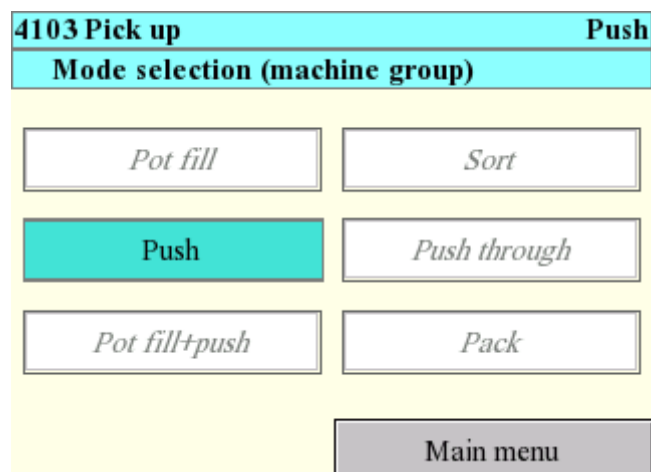
Manual operation mode:

- The individual operations and functions of the machine can be activated by pressing the relevant buttons.

Automatic operation mode:

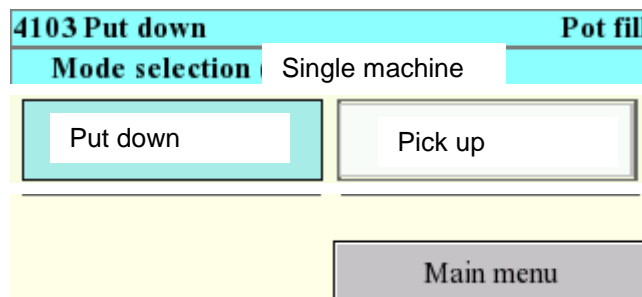
- The individual operations and functions of the machine will be performed automatically.

First the required function must be set after the machine has been turned on. Once the field *function* is activated on the touch panel, the following screen will be displayed (only if the machine is used as part of a configuration):



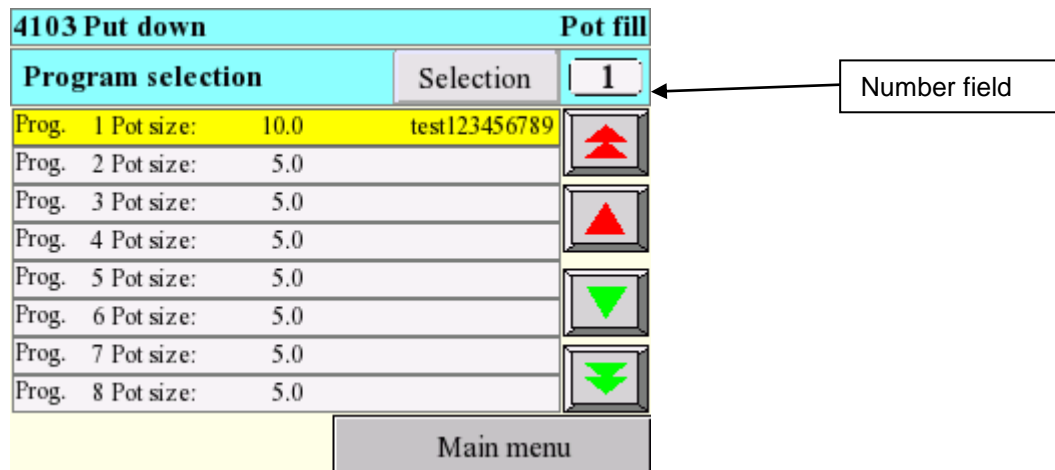
Now you can select the type of function you wish to perform with the help of the machine. For this simply press the relevant field and wait for the title of the selected function to appear in the top line of the display.

If you are using the robot as a single machine, there will be only two options to choose from:



By pressing key F1 you can return to the starting screen.

Next you need to select the required programme. Upon pressing the option *programme selection* on the starting screen, the following screen will be displayed:



Through activating the fields -- , - , + or ++ you can select the required programme, which will appear in the Number Field. Then, if you press the number field, a numeric keypad will open up.



Here you can key in the number of the required programme and confirm your choice by pressing the ENT button.

**After entering the programme number, the field *selection* must be pressed in order to activate the selected programme.**

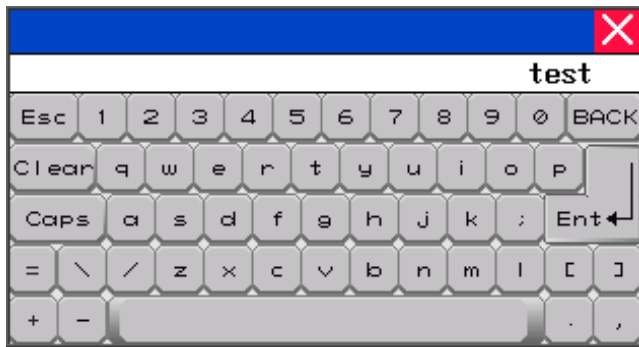
By the pressing of key F1 you can return to the starting screen.

If there is no programme saved under *programme selection*, please press the option *parameter entry* on the starting screen. This will open up an entry field where you can enter and save various parameters for the required machine programmes.

4103 Put down		Pot fill
Parameter input 1		
Prog nr.:	<input type="button" value="v"/> <input type="text" value="1"/> <input type="button" value="^"/> <input type="button" value="Save"/>	<p>New entries and modifications must always be saved, otherwise they will not be imported into the given programme.</p>
Prog name:	<input type="text" value="test123456789"/>	
Pot size:	<input type="text" value="10.0"/> cm	<p>Only for information, shall not affect the programme.</p>
Pot count:	<input type="text" value="1"/> pcs.	
Pot difference:	<input type="button" value="In"/>	<p>When <i>pot difference</i> is activated, one pot less will be placed in every second row.</p>
<input type="button" value="Main menu"/> <input type="button" value="&gt;"/>		

Number of programme to be created or modified

After the individual entry fields are selected, the relevant keypads will appear with the help of which the required data can be entered.



By activating key F4, you can move on to the next entry field.

4103 Put down		Pot fill
Parameter input 2		
Prog nr.:	▼ 1 ▲	Save
Line distance:	30	mm
Number of lines:	1	
Staggered order - Offset:	Out	
Table position +:	0	mm
<		Main menu >

Gap between rows: Distance between the pot rows on the table  
Should the length of the table track be set here, 1 must be entered for the number of rows.

Number of rows: Here you can enter the number of pot rows to be placed on the table depending on the table length.

**Attention! There is no correlation between the pot size and the length of the table, as a result of which the track length must always be checked for the selected number of rows.**

Should a number be entered for the number of rows, the track length will be calculated automatically and the result will appear in the field *row distance*. This result must always be checked.



Alternating rows: Through this option you can select the way how the pots should be placed on the table: in parallel rows or in alternating rows. For a schematic representation please refer to page 7. Should you opt for the placement of pots in alternating rows, please remember that the distance for the cylinder must be set mechanically.

**Attention! The path length (distance) must be set mechanically for each fork/ pot size.**




Table position +: This represents the distance between the table position activating reflective light sensor 10B1 and the position of the first row of pots on the table.

4103 Put down		Pot fill
Parameter input 3		
Prog nr.:	<input type="button" value="v"/> <input type="text" value="1"/> <input type="button" value="^"/> <input type="button" value="Save"/>	
Push:	<input type="button" value="Out"/>	
Push way:	<input type="text" value="0"/>	mm
<input type="button" value="←"/>	<input type="button" value="Main menu"/>	

Parameter entry field 3 will only appear on the display if the function *feed* is pre-set among the basic entries of the machine.

Feed: The pots will be placed on the table, then the table feed moves back to a predetermined distance before the gripper swivels out. The pot rows will be pushed together on the table.

Feeding distance: The path length (distance) by which the table moves back after placing the pot row.

4103 Pick up		Push
<b>Parameter input 3</b>		
Language:		
Conveyor free:	<input type="text" value="1.00"/>	s
TOTAL COUNTER:	<input type="text" value="2808"/>	pcs.
	<input type="button" value="Main menu"/>	

Parameter entry field 4 will only appear on the display if the required password has been entered under the settings.

Language: Here you can select and change the language.


Conveyor belt off: Here you can set the time at which, with the pot barrier closed, the conveyor belt and the pot handling robot will be stopped.

By activating key F3 you can always return to the previous screen.

By activating key F4 you can always move on to the next screen.

By activating key F1 you can always return to the starting screen.

Parameter entries for the pot lifting unit:

4103 Pick up		Push
<b>Parameter input 1</b>		
Prog nr.:	<input type="button" value="v"/> <input type="text" value="1"/> <input type="button" value="^"/>	<input type="button" value="Save"/>
Prog name:	<input type="text" value="test"/>	
Pot size:	<input type="text" value="10.0"/>	cm
Disentangle (backwards):	<input type="text" value="20"/>	mm
Lift up:	<input type="text" value="0.50"/>	s
<input type="button" value="Main menu"/>		




Disentangling (backwards): In this function the table rolls backwards up to a predetermined distance once the pots are lifted and in the fork and the lifting time has run up. This allows for the pot rows to be disentangled.

Lifting: This refers to the time interval during which the arm moves back to the conveyor belt (pots are lifted from the table) before the table rolls back.

4103 Pick up		Push
Parameter input 2		
Prog nr.:	<input type="button" value="v"/> <input type="text" value="1"/> <input type="button" value="^"/>	<input type="button" value="Save"/>
Staggered order - Offset:	<input type="button" value="In"/>	
Table feed turn off:	<input type="button" value="Out"/>	
Table feed turn off time:	<input type="text" value="0.50"/> s	
<input type="button" value="←"/> <input type="button" value="Main menu"/>		

Alternating rows: see: Pot placing

Table feed OFF: With this option you can set whether the table feed should be stopped immediately after the pots are in the fork or only after the time interval set through the field *stopping time for table feed* has run up.

<b>4103 Pick up</b>	<b>Push</b>
<b>Parameter input 3</b>	
Language:	
Conveyor free:	<input type="text" value="1.00"/> s
TOTAL COUNTER:	<input type="text" value="2808"/> pcs.
	<input type="button" value="Main menu"/>
	

Parameter entry field 3 will only appear on the display if the required password has been entered under the settings.

Language: Here you can select and change the language.

Conveyor belt clear: Through this option you can set a safety time interval that runs out when light sensor 12B5 cannot detect any more pots on the conveyor belt. When the pre-set time runs up, the transport arm moves back to the conveyor belt and places the pots down there.

Once all pre-settings have been finalized, the machine can be started in the manual mode by activating the field *manual operation mode*. Then the following screen will be displayed:

The selected function will be displayed here.

<b>4103 Put down</b>	<b>Pot fill</b>	
<b>Line manual operation</b>		
Grip	<i>Selection</i>	
<i>Reset table position</i>	<i>In/forward</i>	<i>Out/back</i>
Automatic operation	PLC on/off	Error message
Start	Stop	Long runtable forward
<b>READY FOR OPERATION</b>		Long runtable backwards
VPN router passive		Main menu

Selection	Through this function you can select the type of operation you wish the machine to perform.
IN/forwards	
OUT/backwards	By activating these keys the selected function will be completed. Operations that involve a cylinder need only to be tipped. Operations that require motoric control will only be active as long as the relevant field is being pressed.
Reset	
table position	This allows for the table to be returned to its zero position after moving the table manually.
Automatic operation mode	After stopping the manual operation mode, this option allows you to switch to automatic mode directly.
PLC in/out	Through this option you can retrieve all inputs and outputs of the PLC control system.
Error messages	Error messages will be displayed here.
Continuous operation / table>	In stop operation the table drive can be switched to continuous forward running mode.
Continuous operation / table<	In stop operation the table drive can be switched to continuous backward running mode.
Start	Through this option you can start the manual operation mode. Operations can only be performed after the manual operation mode is started and the given operation is enabled via the relevant safety prompts. <b>The manual operation mode can only be started through the control panel!</b>
Stop	Through this option the manual operation mode can be stopped. At the same time, all stop buttons on the machine remain active.

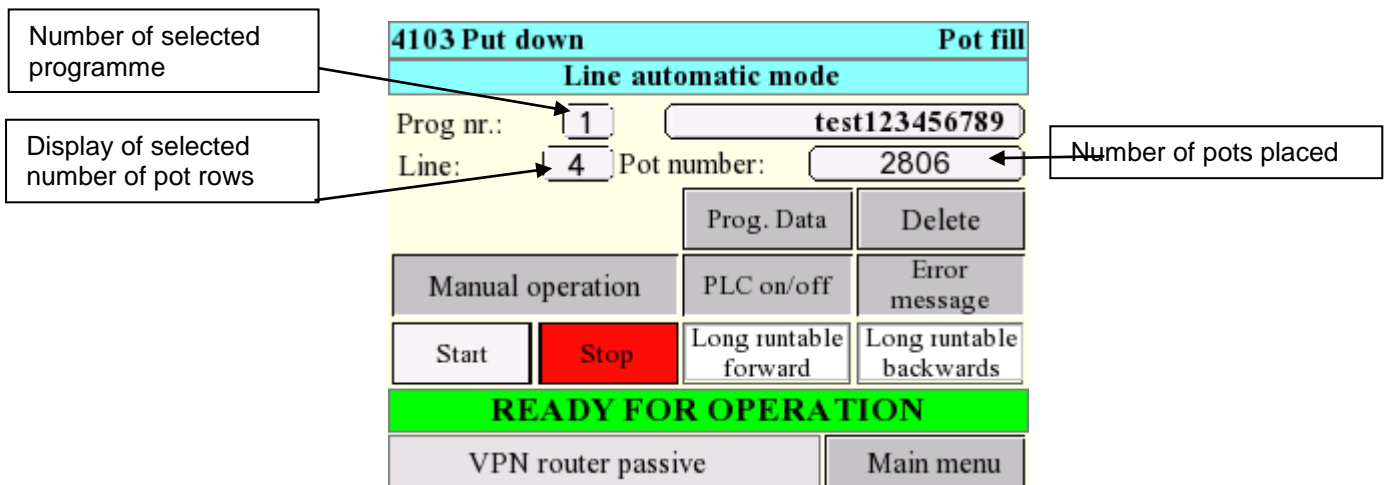
After activating the start field and selecting the required operation, the operation can be performed by activating the fields IN/forwards or OUT/backwards. When starting the machine for the first time, all operations should be completed after one another by pressing IN/forwards and then immediately OUT/backwards.

Should all operations run perfectly, a complete work process can be initiated.  
Gripper IN > arm forwards > gripper OUT > arm back > table forwards.

If the option *alternating rows* has been selected, every second row will automatically be placed in alternation in manual mode as well. The conveyor belt is started automatically in manual mode as well, after the arm with the swivelled out gripper has moved back.

Should there be no irregularities (e.g. unusual noises or error messages) found during the trial run, the machine can be switched into automatic operation mode. The automatic mode can be started by activating the field **automatic operation mode** in the starting screen. Consequently, the following screen will appear:

Screen for the placing unit:



<b>4103 Put down</b>		<b>Pot fill</b>	
<b>Line automatic mode</b>			
Prog nr.:	1	test123456789	
Line:	4	Pot number:	2806
	Prog. Data	Delete	
Manual operation	PLC on/off	Error message	
Start	Stop	Long runtable forward	Long runtable backwards
<b>READY FOR OPERATION</b>			
VPN router passive		Main menu	

Screen for the lifting unit:

<b>4103 Pick up</b>		<b>Push</b>	
<b>Line automatic mode</b>			
Prog nr.:	<input type="text" value="0"/>	<input type="text"/>	
Line:	<input type="text" value="4"/>	Total counter:	<input type="text" value="0"/>
<input type="button" value="staggered order went in"/>	<input type="button" value="staggered order went out"/>	<input type="button" value="Prog. Data"/>	<input type="button" value="Delete"/>
<input type="button" value="Manual operation"/>		<input type="button" value="PLC on/off"/>	<input type="button" value="Error message"/>
<input type="button" value="Start"/>	<input type="button" value="Stop"/>	<input type="button" value="Long runtable forward"/>	<input type="button" value="Long runtable backwards"/>
<b>READY FOR OPERATION</b>			
			<input type="button" value="Main menu"/>

**Programme data** The parameters of the selected programme can be read from this screen. With this setting the parameters cannot be changed.

**The programme data can only be modified through the starting screen via the option *parameter settings*. Whenever a parameter is modified through the starting screen the modification shall not be imported into the relevant programme until the modified programme is activated again.**

**Delete** Through this option you can delete the number of placed pots.

**Manual operation mode**

When the automatic mode is stopped, you can switch to manual operation mode directly through this option.

**PLC in/out** Through this option you can retrieve all inputs and outputs of the PLC control system.

**Error messages** Error messages will be displayed here.

**continuous operation / table>**

In stop operation the table drive can be switched to continuous forward running mode.

**Continuous operation / table<**

In stop operation the table drive can be switched to continuous backward running mode.

**Start** Through this option you can start the automatic operation mode. At the same time all start buttons on the machine remain active. All operations of the machine will be performed automatically according to the parameters pre-set for the required programme.

**Stop** Through this option the automatic mode can be stopped. At the same time, all stop buttons on the machine remain active.

Additional fields for the lifting unit:

**Alternating rows retracted** If you select the option *alternating rows retracted*, the first row of pots on the table will be removed with the cylinder retracted.

**Alternating rows extended** If you select the option *alternating rows extended*, the first row of pots on the table will be removed with the cylinder extended.

In **AUTOMATIC OPERATION MODE** the robot performs its operations according to the pre-set parameters. The machine can be stopped by activating the internal or external **STOP buttons**.

Whenever an error message is generated, the machine quits the **AUTOMATIC OPERATION MODE**. The error message is displayed with a red background in the bottom line of the screen.

In **MANUAL OPERATION MODE** the control image GRIPPER appears once the **START button** has been pressed. The gripper can be navigated with the help of the **IN/FORWARDS** and **OUT/BACKWARDS** buttons. This action can be performed with any arm positions.



Placing unit:

<b>4103 Put down</b>		<b>Pot fill</b>	
<b>Line manual operation</b>			
Grip		Selection	
Reset table position	In/forward	Out/back	
Automatic operation	PLC on/off	Error message	
Start	Stop	Long runtable forward	Long runtable backwards
<b>READY FOR OPERATION</b>			
VPN router passive		Main menu	

Lifting unit:

<b>4103 Pick up</b>		<b>Push</b>	
<b>Line manual operation</b>			
Grip		Selection	
	In/forward	Out/back	
Automatic operation	PLC on/off	Error message	
Start	Stop	Long runtable forward	Long runtable backwards
<b>READY FOR OPERATION</b>			
			Main menu

After pressing the option **selection**, the control image **ARM** will appear. The arm can be navigated with the help of the buttons **IN/FORWARDS** and **OUT/BACKWARDS**.

- I) With the gripper swivelled out the arm can always be moved.
- II) With the placing unit:
  - *Arm forwards* can be used in all cases.
  - *Arm back* can only be used if the gripper is swivelled out
- III) With the lifting unit:
  - *Arm forwards* can be used in all cases.
  - *Arm back* can only be used if the belt is clear and the machine is running in AUTOMATIC OPERATION MODE.

After pressing the option **selection**, the control image **FEED** will appear. Table feed can be controlled by means of the buttons **IN/FORWARDS** and **OUT/BACKWARDS**.

After pressing the option **selection**, the control image **FORK** will appear on the screen for the lifting unit. The fork can be navigated with the help of the buttons **IN/FORWARDS** and **OUT/BACKWARDS**.

After pressing the option **selection**, the control image CONVEYOR **BELT** will appear on the screen for the placing unit and the lifting unit. The belt can be started by activating the **IN/FORWARDS** button.

After pressing the option **selection**, the control image **ALTERNATION** will appear. Alternation can be controlled by means of the buttons **IN/FORWARDS** and **OUT/BACKWARDS**.

After pressing the option **selection**, the first control image **GRIPPER** will reappear.

### 3. Stopping the machine

This machine can be stopped in the following two ways:

a)

In an ordinary case the machine will be stopped by activating the STOP button on the control panel or by activating the flexible START / STOP switch.

b)

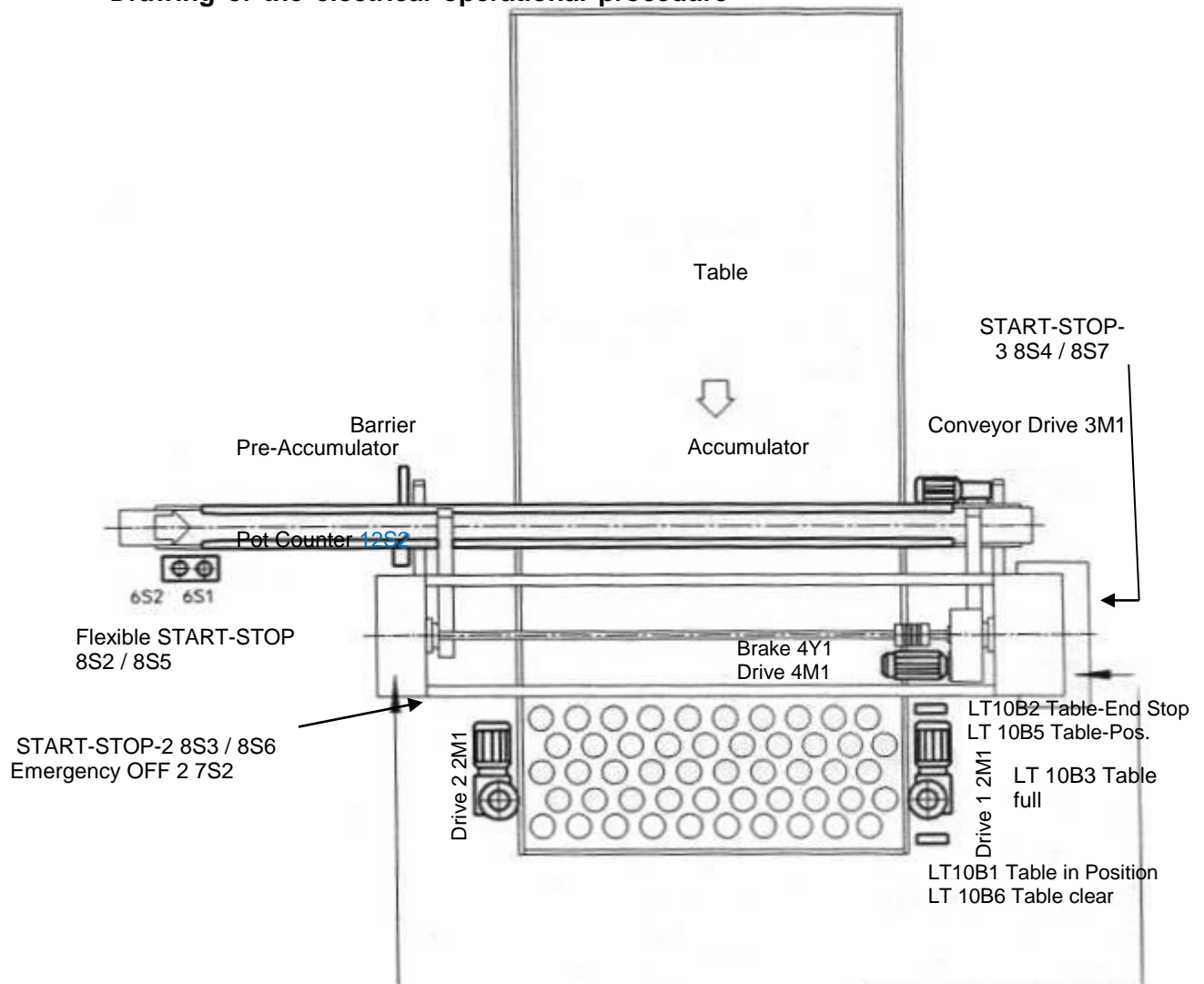
In the event of emergency, the machine can be stopped by activating the "Emergency OFF" button.

**Note:**

**Please consult section 6.2 on the *shutdown procedure* as well.**

## 6 Operation

Drawing of the electrical operational procedure



Valves: 14Y1 Pot barrier  
14Y5 Alternator  
14Y6 Fork (on demand)

10S1 Pressure  
11B8 Gripper 1 swivelled in  
11B6 Gripper 1 swivelled out  
12B1 Gripper 2 swivelled in  
11B7 Gripper 2 swivelled out  
10B8 Arm Pos. Conveyor  
11B1 Creep feed Conveyor  
11B3 Creep feed Table  
11B2 Arm Pos. Table  
14Y2 Gripper 1  
14Y3 Gripper 2  
14Y3 Gripper slow-mo  
(only without additional fork pivoting)

## 1. Standard operating procedures

### a) Before commencing operations with the machine the following points must be taken into account:

- Are there enough pots, plants and substrates available within easy reach of the machine?
- The largest quantity of objects to be transported should cover the shortest possible distance.
- *From which direction are the pots coming into the pot robot?* Pots can be fed from the right and from the left as well.
- *Are the accumulators and forks properly matched and coordinated?* When selecting the accumulators and forks the gaps between the pots as well as the pot sizes must be considered.
- *How should the pots be placed?* Pots can be placed in parallel or in alternating rows.
- *Are the table end stops properly positioned at both ends?* You must determine the distance between the first pot row and the table edge at the starting end of the table and the distance between the last pot row and the table edge at the end of the table.
- *What would be the optimum setting for the table feed?* The table feed should be adjusted to the required gap between the pot rows.

### b) Changing the forks and accumulators

The MAYER POT HANDLING ROBOT will be installed at your facility by our own technicians. While assembling the machine, the mounting of the accumulator will be fixed in its initial position. This will facilitate an easy and quick changing of the accumulator.

In order to exchange an accumulator for another, first the clamping levers must be loosened on both sides. Then the accumulator can be removed and another one fitted in its stead. After placing in the new accumulator, the clamping levers must be tightened closely. Then the fork must be exchanged as well.

**ATTENTION:**

The pot size as well as the gap between the pots must always be synchronized with the fork and accumulator.

Should the above requirement not be met, the plants and the machine are likely to be damaged. The size of the fork and accumulator must be adapted to the pot size and the table width (number of pots in a row).

The position of forks on the gripper cannot be changed. In order to exchange the forks themselves, first the electric plug of the switch control must be unplugged (only on the lifting unit). After the clamping levers on the gripper have been loosened, the fork can be removed. Then the new fork must be pushed into the clamping levers while the washers must remain above the fork. This way the forks can be prevented from being damaged. Finally, the clamping levers must be tightened closely, in order to firmly fix the fork in its position.

The electric plug of the switch control must then be connected to the network again (only on the lifting unit).

**c) Basic settings of the MAYER POT HANDLING ROBOT TR 4103**

*Automatic and manual operation mode*

In order to secure a smooth operation of the machine, you must make sure that the operational pressure is set properly.

The pressure can be regulated on the service unit of the machine.

The air pressure must reach a minimum value of 5 bar and must not exceed a maximum value of 8 bar.

Whenever the operational pressure falls below 5 bar, pressure control will be activated and the machine stops immediately.

The number of pots in the fork as well as the required accumulator must be determined according to the pot size and table width.

Whenever the fork and accumulator are exchanged, a new programme must be selected and activated through the starting screen.

#### **d) Table-feed**

The tables are rolled by means of two friction wheels on two electric drives.

When the gripper has swivelled out and the arm is moving towards the conveyor belt, the table feed is started.

#### **e) Table-change**

Should the *table end* switch (10B2) be passed during the table feeding process, the table will be rolled back while the gripper swivels out. Whenever switch 10B3 is passed, the table is full and no new work operation will be initiated. In this case the gripper stands still over the conveyor belt.

The empty table will now be rolled on until the switch *table in position* (10B1) is passed.

The POT HANDLING ROBOT automatically starts to place the pots again onto the empty table. If the position switches for the table are clear (10B1, 10B2, 10B3), the table feed will remain inactive. Should the table pass light sensor 10B2, the table feed will start to run until light sensor 10B1 is activated.



#### **f) Automatic operation mode**

##### ***Placing process***

Please consult chapter 5.2 on *STARTING THE MACHINE*

*Please make sure that the parameters for table feed and the number of pots are set correctly in the selected programme.*

**ATTENTION !**

**When calculating the length of feeding path the pot diameter must be taken into account. If the feeding path is too short, the pots will be stacked upon one another on the table.**

*Starting the automatic operation mode*

The automatic operation mode can be started by selecting the *start* option on the control panel or by pressing the flexible *START/STOP* button. (The title *automatic operation mode*) will then appear on the display.)

*Placing pots in parallel rows*

After starting the machine, the conveyor belt of the pot handling robot will roll towards the placing unit and the filled pots will be transported to the accumulation rail. Counter 12S2 counts the number of pots transported into the accumulator. When the number of pots pre-set for the given programme is reached, barrier 14Y1 will close automatically.

Then the gripper swivels in. Proximity switches 11B8 and 12B1 signal *gripper swivelled in* and they put the arm into operation. The arm controlled through frequency converter 4A1 goes over the acceleration ramp to its maximum speed moving towards the table. After it has passed proximity switch 11B3, the speed will be reduced and the arm moves slowly into its end position (11B2). Once proximity switch 11B2 signals *position table*, the gripper will swivel out. As soon as switches 11B6 and 11B7 are passed (*gripper swivelled out*), the arm moves back again. 11B1 signals *slow motion* and 10B8 signals *position conveyor belt reached*.

Once the gripper has swivelled out and the arm is moving towards the conveyor belt, the two feed motors (2 M1, 2 M2) will be started and they keep running until the pre-set (in the programme) track length is covered.

The work operation can then be repeated.

After the MAYER POT HANDLING ROBOT has placed the last two pot rows on the table, the gripper will not swivel out at its usual speed, it will slow down. At the same time the table feed



will be running backwards. Once the gripper is swivelled out to its end position, the arm moves back into its initial position.

In the case of MAYER POT HANDLING ROBOT with an additional fork swivel (available on demand) the gripper speed will not be reduced. With this model the fork is pivoted (rotatable in its housing) and fixed on 2 pneumatic cylinders. With the last pot rows (after passing switch 10B2 *table end position*) the fork swivels back first, then the arm moves back into its initial position. While the arm is moving back, the fork swivels downwards again.

Both solutions, i.e. speed reduction as well as additional fork swivel serve the purpose of placing the last pot row close enough to the table edge to secure an optimum utilization of the available surface.

#### *Placing pots in alternating rows*

The process is performed in the same way as described in the case of pot placement in parallel rows with the difference that the alternator is activated with every second row. After the second pot row has rolled into the accumulator, the gripper swings in and the arm moves forwards. Should only switch 11B1 be passed during this forward movement, the alternating cylinder will move out to the distance pre-set at the cylinder. While the arm is moving backwards, the alternating cylinder will be moved back after switch 11B3 has been passed.



Setting of the distance on the alternating cylinder (performed manually).

### **g) Automatic operation mode**

#### ***Lifting Process***

Please consult section 5.2 on *STARTING THE MACHINE*  
Please check the settings for the required programme.

**ATTENTION !**

**The automatic mode can only be started if the affected placing unit is in operation.**

*Lifting of pots placed in parallel rows*

Once the table is in position after it has been started, the arm will move forward through the frequency converter the same way as with the pot placing process. After proximity switch 11B1 has been passed, the fork will swivel out. When passing proximity switch 11B3, the gripper moves in. When the arm reaches its position over the table (11B2), the fork will swivel back in and the table feed starts to transport the pots towards the fork. The table feed keeps running until a switch (12S4 or 12S4.1) will be activated. Should this switch (12S4 or 12S4.1) signal that the pot row is positioned in the fork, the arm moves back for the period of lifting time pre-set in the programme. Then the table feed starts to move backwards in order to disentangle the plants (feed backwards distance to be set in advance in the programme via the option *disentangle*).

Once the required disentangling distance has been covered and light sensor 12B5 signals *belt clear*, the arm will return to the conveyor belt. After proximity switch 11B1 is passed, the conveyor belt stops. As soon as the arm reaches its position over the conveyor belt (switch 10B8), the gripper moves out and the conveyor belt starts again.

The work operation can be started again.

After the MAYER POT HANDLING ROBOT has taken the first three rows of pots off the table, the fork will stop swivelling and the gripper moves in directly.

*Lifting of pots placed in alternating rows*

The process is performed the same ways as in the case of pots placed in parallel rows with the difference that here the alternation will set in with every second pot row. The alternation is performed in the same way as in the case of pot placing.

It can be set via the control panel whether the alternation should start with the first or with the second row.

**NOTE:**

Should the handled tables be provided with a rim that is not low enough, the POT HANDLING ROBOT functioning as lifting unit must be equipped with an additional fork pivoting. If, in order to avoid further expenses, the additional fork pivoting shall not be invested in, the first three pot rows must be lifted manually from all tables whose rim proves too high.

In addition to the above, the machine-specific health and safety regulations set forth in chapter 7.2 of this manual must be strictly observed.

**h) Manual operation mode**

*Placing of pots - lifting of pots*

Preliminary settings must be completed as described in the sections on the *automatic operation mode*:

- Programme selection

On the starting screen the option MANUAL OPERATION MODE must be selected (MANUAL ALTERNATING ROWS or MANUAL PARALLEL ROWS on the display).

*Starting the Manual operation mode*

Please consult chapter 5.2 on *STARTING THE MACHINE*.

**NOTE:**

In stop operation the table feed can be set into continuous running mode by selecting the options *continuous table feed forward* and *continuous table feed backward* on the control panel.

## 2. Shutdown Procedure

This machine can be stopped in the following two ways:

a)

In an ordinary case the machine will be stopped by pressing the STOP button on the control panel.

Upon pressing the STOP button, the machine completes the movement it has started. If the START button is pressed again, the programme will automatically continue the operation from the point where it has been interrupted.

b)

In the event of emergency, the machine can be stopped by activating the **Emergency OFF** button.

Once the "Emergency OFF" button is activated, the machine will shut down immediately.

After unlocking the **Emergency OFF** button, the machine must be switched into manual operation mode and the interrupted operation must be completed manually.

Then the machine can be switched into automatic operation mode and be started again.

### **3. Measures before and after a prolonged standstill period**

#### **a) Before a prolonged standstill period**

- The machine must be cleaned thoroughly.
- All machine parts must be greased and lubricated according to maintenance schedule.
- The machine must be protected (covered) against eventual contamination and moisture.
- The machine must be disconnected from its supply networks (electrical network and compressed air supply).

#### **b) After a prolonged standstill period**

- The machine must be checked by means of visual inspection.
- The machine must be connected to the power network.
- The machine can be started as described in the chapter on *commissioning*.

## 7 Machine malfunction

In order to eliminate the risk of property damage and personal injuries in the event of machine malfunction and during corrective action, the following regulations must be strictly followed:

- Please do not attempt correcting a malfunction unless you are fully qualified to undertake the required action.
- Consult the chapter on *health and safety instructions*.
- While machine malfunction is being corrected, the following specific hazards must be considered:
  - An inadvertent turning on of the power supply can cause severe personal injuries or property damage.
  - In unsecured manual operation mode the risk of injury due to the crushing or squeezing of body parts is considerably increased.

### 1. Malfunction procedures

Should any malfunction occur during the operation of the machine, please follow the procedure set forth below:

1. Stop the machine immediately by pressing the STOP button or by activating the “Emergency OFF” button, as required by the situation.
2. If rendered necessary to secure the safety of people or the machine / equipment, disconnect the machine without delay from the power network.
3. Failure search > if required, this task must be performed by qualified personnel only.
4. Troubleshooting > if required, this task must be performed by qualified personnel only.
5. The machine can be started again.

## 2. Malfunctions, probable causes and corrective action

### a) Mechanical malfunction

Failure / Malfunction	Cause	Corrective action
An Arm has some play on the drive shaft	The feather keys are worn or damaged.	Replace worn parts
The two arms are not moving parallel to each other	The chains situated on the right and left under the cover are not tight enough or are not adjusted properly.	- Tighten chains - Adjust the arms with the help of chain tensioners so that they are parallel to each other
The gripper swings when the arms are rotated	The slide bearings in the arm situated on the control panel side of the machine are worn or damaged.	Replace slide bearings
	The chain in the arm is not tight enough.	Tighten chain in the arm
Pots are placed incorrectly when being placed in alternating rows	The cylinder stops are not set properly.	Correct cylinder stop settings
The alternating cylinder strikes to intensively in the end position	The throttle check valve is not set properly.	Correct throttle check valve settings
Alternating rows are not managed well during pot lifting	- No compressed air available - Defective valve - Defective cylinder	- Check air pressure - Replace valve or cylinder
Table will not roll through	Incorrectly set table dimensions (table wider or more narrow than set).	Adapt table feed to table width
Table feed not long enough	The friction rollers of the table feeding unit are not tight enough.	Adapt table feed to table width
While lifting the pots, the pot rows are deferred.	The switch on the fork is defective.	Replace switch
The pots are not grabbed properly when taken out from the accumulator by the gripper.	Accumulator position is not set properly.	Adjust accumulator to pot lifting
The locking cylinder will not close when the accumulator is full.	No compressed air available - defective valve or counter - defective locking cylinder	-Check pressure -Replace defective parts

The pots are not transported into the accumulator	Distance between the two accumulator angles too narrow	Adjust accumulator settings
The pots are transported into the accumulator in an irregular manner	The levers in the accumulator are stuck (e.g. due to substrate between lever and track)	Clean accumulator

#### b) Error messages on the control panel

Error messages are displayed in the control panel in red. Once the cause of the error has been eliminated, the required manual or automatic operation can be selected and started again.

Error / Failure	Cause	Corrective action
"Emergency Off" pressed	The "Emergency OFF" button is pushed on the POT HANDLING ROBOT used as a single machine or as part of a configuration together with other pot handling machines in order to avoid personal injury or damage to the machine.	Unlock "Emergency OFF" and start machine again
Motor protection is activated: A motor protection switch on the drives is activated (e.g. table drive, conveyor belt)	Motor consumes too much power or gets overheated.	Check motor to establish if the voltages are OK or if there is a mechanical problem
Problem with the frequency converter: The frequency converter has switched off.	The rated motor current of the motor running through the frequency converter has been exceeded. Too high voltage in the intermediate circuit, the engine does not slow down properly.	Check motor connection Check brake commutator Check brake and motor mechanism
Low pressure: The compressed air pressure is too low.	The pressure falls below 5 bar and pressure control 7S8 switches off.	Check pressure pipes and compressor

#### c) Gripper failure:

Failure / Malfunction	Cause	Corrective action
The gripper moves too slowly or not at all into its end position.	The gripper bumps into a mechanical obstacle. There are problems with the compressed air pressure.	Check motion to establish whether the gripper runs against the conveyor belt or the table edge. Solenoid valve does not switch over properly.



## 8 Maintenance

In order to avoid personal injuries, damage to the machine or to other properties as well as environmental damage while maintenance work is being performed on the machine, the following instructions must be strictly observed.

- **All cleaning, lubrication and servicing work must be performed on the machine by qualified and authorized personnel only, under the strictest observation of all relevant instructions.**
- Work on the electrical units of the machine is only to be performed by technicians specifically trained and qualified for this purpose.
- All power supplies must be turned off and secured against inadvertently being turned on again during maintenance work.
- All pressure units must be depressurized.
- All intervention affecting the control software of the machine must exclusively be performed by MAYER GmbH & Co. KG.
- All fuels, lubricants and auxiliary materials that are not re-used must be disposed off in line with the relevant environmental safety regulations.
- Please consult the chapter on *health and safety instructions* as well.

Maintenance and servicing of the machine is associated with the following specific types of hazards.

- Building in faulty components or counterfeit spare or wear parts can cause severe damage to the machine.
- An inadvertent turning on of the power supplies while servicing the machine can cause severe personal injuries or damage to the machine.
- Accessible sharp-edged machine parts or tools can cause severe personal injuries.
- Spilt lubricants or fertilizers, when coming into direct contact with the skin, can cause irritation.
- In unsecured manual operation mode the risk of injuries to persons due to the squeezing or crushing of body parts is considerably increased.

## 1. General information

An annual inspection of the whole machine performed by our aftersales services staff is strongly recommended.

For help with the servicing or installation of the machine please contact the customer service department of one of our service centres.

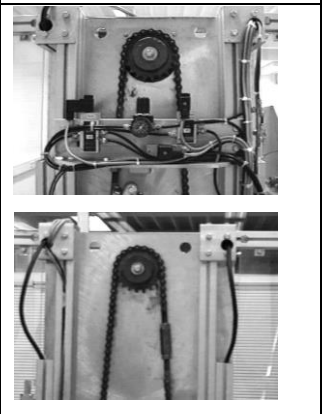
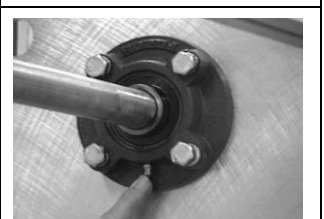






All spare parts must comply with the technical specifications issued by the manufacturer of the machine. Through the use of original MAYER components this requirement is automatically fulfilled.

## 2. Maintenance schedule

The maintenance demand of the machine has been reduced to a minimum through the application of maintenance-free machine elements.

The following parts must be lubricated with standard lubricating grease at the time intervals set forth in the following chart:

Description	Interval	
<b>Chains and chain wheels of the swivel drives of the arms</b>	once a year	
<b>Grease nipples on the upper shaft (on the left and right of the bearing of the drive shaft)</b>	twice a year	

<b>Grease nipples on the arm</b>	every quarter of a year	
<b>Grease chain in the arm on the left (cover to be opened)</b>	twice a year	
<b>Tighten chain</b>	as required	
<b>Grease guides</b>	every week	

The oil filling in the drives of the conveyor belt, the placing unit and the table feed shall be exchanged after ca. 10,000 service hours.

**Recommended Oil Types:**

BP	Energol	SG-XP 460
KLÜBER	Syntheso	D 460 EP
MOBIL		Glygole 80
SHELL		Tivela SD

Or other synthetic oils VG 460 with a viscosity of 440-500 cST at 40 degrees Celsius.

## **9 List of spare parts**

## 1. Mechanical spare parts

### Hauptantrieb oben Main drive above

Pos.	Benennung Description	Artikelnummer Part number	Stück Amount
1	Kupplung <b>Coupling</b>	111137	1
2	Flanschlager <b>Flange bearing</b>	111126	1

### Kettenantrieb rechts (Motorseite) Chain drive to the right (on the motor side)

Pos.	Benennung Description	Artikelnummer Part number	Stück Amount
1	Kettenrad oben <b>Chain wheel above</b>	4100-02-02-01-00	1
2	Kettenrad unten <b>Chain wheel below</b>	4100-02-02-02-00	1
3	Rollenkette <b>Chain belt</b>	111136	1
4	Verschlussglied <b>Chain lock</b>	111143	2
5	Flanschlager <b>Flange bearing</b>	4100-02-02-04-00	2

### Kettenantrieb links Chain drive to left

Pos.	Benennung Description	Artikelnummer Part number	Stück Amount
1	Kettenrad oben <b>Chain wheel above</b>	4100-02-02-01-00	1
2	Kettenrad unten <b>Chain wheel below</b>	4100-02-03-02-00	1
3	Rollenkette <b>Chain belt</b>	111281	1

4	Rollenkette <b>Chain belt</b>	111282	1
5	Verschlussglied <b>Chain lock</b>	111143	4
6	Flanschlager <b>Flange bearing</b>	4100-02-02-04-00	2

Aufnahme Verband:  
**Recording joint:**

Pos.	Benennung <b>Description</b>	Artikelnummer <b>Part number</b>	Stück <b>Amount</b>
1	Flanschlager <b>Flange bearing</b>	4100-04-01-02-00	2
2	Laufschiene <b>Rail</b>	4100-04-01-04-00	4
3	Führungsrolle <b>Guide roller</b>	4100-04-01-05-03	8
4	Buchse <b>Bush</b>	4100-04-01-05-04	4
5	Exzenterbuchse <b>Eccentric bush</b>	4100-04-01-05-05	4
6	Schräggugellager <b>Angular ball-bearing</b>	111320	8

Schwenkantrieb:  
**Swing drive:**

Pos.	Benennung <b>Description</b>	Artikelnummer <b>Part number</b>	Stück <b>Amount</b>
1	Kettenrad <b>Chain wheel</b>	4100-04-02-01-02	1
2	Kettenrad <b>Chain wheel</b>	4100-04-02-02-00	1
3	Rollenkette <b>Chain belt</b>	111144	1

Pneumatisch  
**Pneumatics**

Aufnahme Verband:  
**Taking-off staggered order:**

Pos.	Benennung <b>Description</b>	Artikelnummer <b>Part number</b>	Stück <b>Amount</b>
1	Druckluftzylinder <b>Compressed-air cylinder</b>	111204	1
2	Drosselrückschlagventil <b>Throttle check valve</b>	111205	2
3	Flexo-Kupplung <b>Flexo-coupling</b>	111207	1

Schwenkantrieb:  
**Swivel drive:**

Pos.	Benennung <b>Description</b>	Artikelnummer <b>Part number</b>	Stück <b>Amount</b>
1	Druckluftzylinder <b>Compressed-air cylinder</b>	111208	1
2	Drosselrückschlagventil <b>Throttle check valve</b>	111212	2
3	Näherungsschalter <b>Proximity switch</b>	111213	2

Sammler:  
**Collector:**

Pos.	Benennung <b>Description</b>	Artikelnummer <b>Part number</b>	Stück <b>Amount</b>
1	Druckluftzylinder <b>Compressed-air cylinder</b>	107618	1



Pneumatik allgemein:  
**Pneumatics – general:**

Pos.	Benennung <b>Description</b>	Artikelnummer <b>Part number</b>	Stück <b>Amount</b>
1	Wartungseinheit <b>Maintenance unit</b>	111181	1
2	5/2 Wegeventil <b>Valve 5/2</b>	111182	3
3	3/2 Wegeventil <b>Valve 3/2</b>	111183	1
4	Druckwächter <b>Pressure checker</b>	111184	1
5	Druckregler <b>Pressure controller</b>	111185	1
6	Manometer <b>Manometer</b>	111186	1
7	Drosselrückschlagventil <b>Throttle check valve</b>	111193	1

**2. Electrical spare parts**

Hauptantrieb:  
**Main drive:**

Pos.	Benennung <b>Description</b>	Artikelnummer <b>Part number</b>	Stück <b>Amount</b>
1	Elektromotor <b>Electric motor</b>	4100-02-01-01-00	1

Tischvorschub:  
**Table feed:**

Pos.	Benennung <b>Description</b>	Artikelnummer <b>Part number</b>	Stück <b>Amount</b>
1	Schneckengetriebemotor <b>Worm-driven motor</b>	109167	2



Sammler:  
**Collector:**

Pos.	Benennung Description	Artikelnummer Part number	Stück Amount
1	Mikroschalter <b>Microswitch</b>	109963	1
2	Schutzhaube <b>Protecting cover</b>	102085	1
3	Tüllengehäuse <b>Cable clip box</b>	102115	1
4	Steckereinsatz <b>Connecting part</b>	102111	1

Aufnehmgabel:  
**Pick-up fork:**

Pos.	Benennung Description	Artikelnummer Part number	Stück Amount
1	Mikroschalter <b>Snap switch</b>	109963	2
2	Schutzhaube <b>Protecting cap</b>	102085	2

Nur am Aufnehmer:  
**Only at pick-up:**

Pos.	Benennung Description	Artikelnummer Part number	Stück Amount
1	Reflexlichtschranke <b>Reflected light equipment</b>	114640	1
2	Kabel <b>Cable</b>	114938	1
3	Reflektor <b>Reflector</b>	103863	1

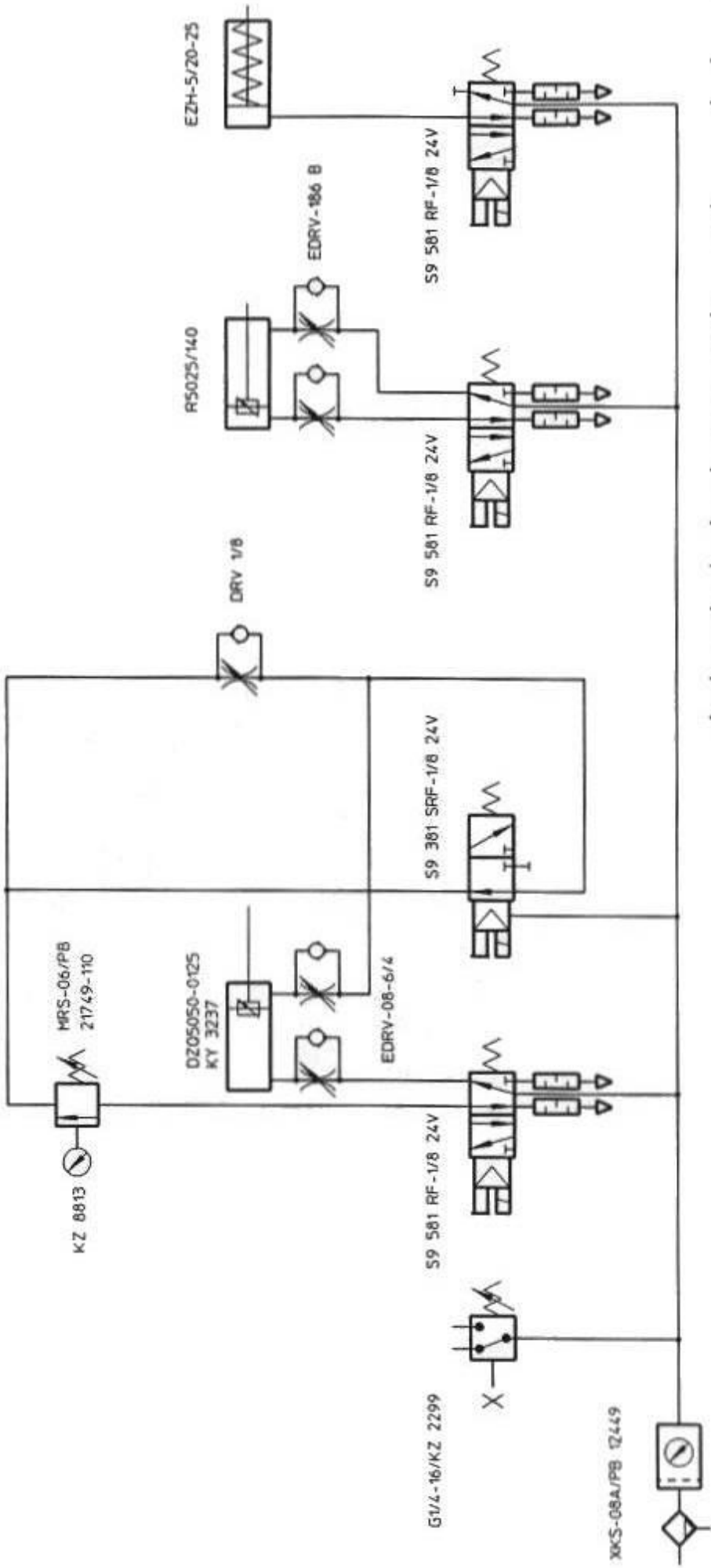


## **10 Pneumatic and electrical diagrams**

Swivel drive

Staggered order

Pot collector



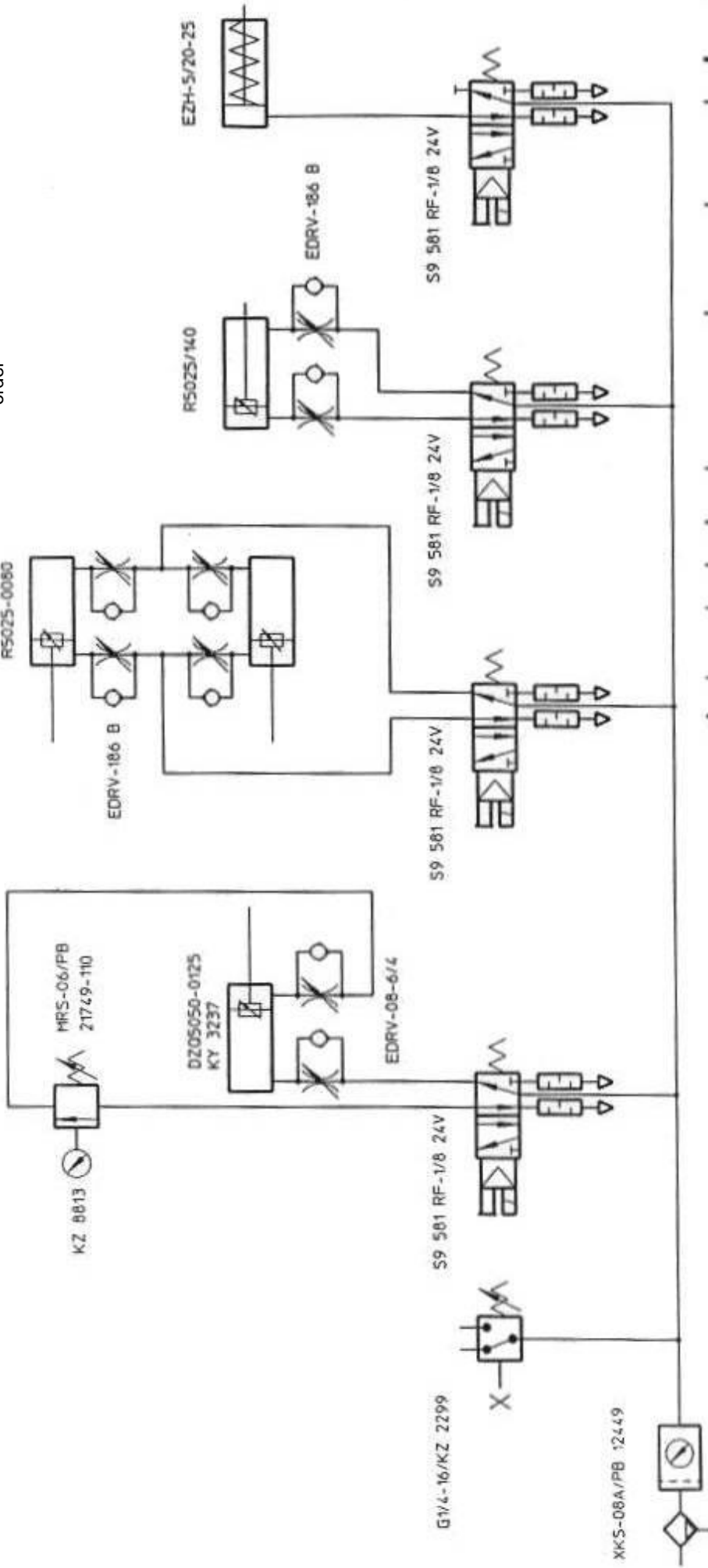
Teilnr.		Benennung		Werkstoff		Rohrleit		Sick		Paßmaß		Abmaße	
Zeil.-Nr.	Anforderung	Datum	Name	ab Maschine-Nr.		Benennung		Pneumatikschaltplan		mit Verband		ohne zus. Schwenkung	
	Vorrichtl.-Nr.	1994	Mayer										
Freisolltoleranzen nach DIN 7168 Gütegrad mittel		Bearb. Gepr. Normg.	25.01										
SW 4 0,1 SWR 4 04 20 ± 0,2 SWR 20 04 03 ± 0,3 SWR 02 04 305 ± 0,5		Mayer, GmbH & Co. Postfach 11710 D-69022 Heidelberg		Zeichn.-Nr.		4100-05-01-00-00		Ersatz wird					

Swivel drive

additional swivelling

staggered order

Pot collector



Teilnr.	Benennung	Werkstoff	Rohrl. Stk	Paßmaß	Abmaß
Maßstab	ab Maschine-Nr.				
1994	Name	Benennung			
25.01.	Mayer	Pneumatikschaltplan			
Gepr.		mit Verband			
Normg.		mit zus. Schwenkung			
Vorrichtl.-Nr.		Freimittleranzug nach DN 7156 Gütegrad mittel		Zeichn.-Nr. 4100-05-02-00-00	
Änderungsbibl.		Mayer, Omdorf & Co. Heilbronn, D-69522 Heilbronn		Ersatz wird	
Über 4 bis 20 x 0,2					
Über 20 bis 021 x 0,3					
Über 021 bis 16 x 0,5					

## 10 Warranty

### **Horticultural equipment and machines for special purposes**

We undertake warranty against defective delivery as well as on the quality and performance of the product as set forth above. With the exclusion of all other warranty claims and rights, our company warrants that any part or parts of the machine that show evidence of material, manufacturing or constructional defects and/or are thus rendered unusable or impaired in their serviceability will be repaired or replaced as elected by our company uncharged for the parts and labour if the defect appears within twelve months (or, if the machine is operated in several shifts, within six months) from the date on which the machine is delivered to the purchaser. Any items considered for warranty but not manufactured by our company (e.g. engines) are only warranted by us for the time period and to the extent covered by the warranty offered to us by our supplier.

Eventual replaced parts remain our property. This warranty shall not apply if the defect in question is due to the purchaser's improper care or use of the product and/or excessive use or handling, or in the event if the machine has been altered or changed improperly and without our prior written consent or if the installation of the machine was performed by the purchaser or any third party.

All rights of the purchaser to register warranty claims due to defective delivery is limited to six months from establishing the defect, but at the earliest to the expiry of the guarantee period. All obligations of our company under this warranty shall be terminated if the purchaser should fail to fulfil his liabilities towards our company prior to establishing the defect.

**Improvements or changes in the construction or design of our horticultural machines and equipment**

Our company reserves the right to make improvements or changes in the construction or design of its products, with special regard to technical plans, specifications, etc. during the guarantee period under the restriction that no considerable changes shall be made to the product sold, the product quality or its value shall not be reduced in any way and the changes and modifications shall be acceptable to the purchaser.

**Thank you for your decision to purchase this state-of-the-art product.**

**We wish your company every success in the future.**

**If our products and services have been to your satisfaction, please recommend us to others.**

**Yours truly,**

**Your MAYER TEAM**

