BÖRGER®
Innovation

Operating Manual

Börger Reversing Control Unit

Types STE-RS MRU 23

Important!
Please read carefully before performing any activity involving the device! Keep for future reference!

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Product Specifications

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Product group:	Control unit, reversing control unit
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Document data:	
Document:	ZBA-STE-RS_Englisch.docx
Language:	English translation of the German original, available at service@boerger.de
Issue date:	9/26/2014

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1 General Information

1.1 Introduction

This operating manual is an important aid for the correct and safe operation of the control unit.
It contains important information for operating the control unit and the units connected to it in a safe, proper and economical manner. Adhering to these instructions will help avoid associated dangers, reduce repair costs and downtimes and increase the reliability and service life of the control unit and the units controlled by it.

The operating manual must be made available at all times. All personnel who work on or with the control unit must read and adhere to the manual. This work includes:

— Operation and troubleshooting
— Maintenance (machine care, maintenance and repairs)
— Transportation

1.2 Notes on copyrights and property rights

This operating manual must be treated as confidential. It may only be made accessible to authorized persons. The manual may only be passed on to third parties following written approval from Börger GmbH.

All documents are protected according to the copyright laws. The distribution and reproduction of documents, in whole or in part, plus the exploitation and distribution of all associated content is forbidden unless expressly authorized in writing.

Violations will be prosecuted and may lead to claims for compensation. All rights for exercising industrial property rights are reserved by Börger GmbH.

1.3 Information for the operator

The operating manual is an integral part of the control unit. The operator (i.e. the responsible party) is responsible for making the operating personnel aware of this manual.

Additionally, the operator is obligated to ensure the notice and observance of national regulations for accident prevention and environmental protection, plus the notice and observance of supervision and reporting duties taking special operational aspects into account, e.g. regarding work organization, work processes and personnel.

Aside from the operating manual and the currently valid accident prevention regulations in the country of operation and at the installation site, all recognized special regulations for safe and proper operation must be observed.

The operator is not permitted to make or arrange for any changes, modifications or alterations to the control unit without approval from Börger GmbH. This includes any changes to the programming beyond the settings described in the following chapters.

Any spare parts used must comply with the technical requirements specified by Börger GmbH. This is always guaranteed when original spare parts are used.
Only original spare parts may be used during the warranty period, failing which the warranty is void.

Only trained or instructed personnel may be assigned to operate, maintain, repair or transport the control unit. Clearly define the personnel responsible for operation, maintenance, repair and transportation.

1.4 Instruction

As the operator, you are obligated to inform and, if necessary, instruct your operating personnel in regard to the applicable legal and accident prevention regulations, as well as the safety equipment available on the control unit and the units controlled by it. The different technical qualifications of the operating personnel must be taken into account.

The operating personnel must have fully understood the instructions, and adherence to the instructions must be guaranteed. Only then can your personnel work safely and be fully aware of associated risks.

Adherence to instructions must be checked on a regular basis. As the operator, you should therefore have each instructed staff member confirm their training participation in writing.

Börger GmbH, their regional subsidiaries or your local sales partner will be happy to help you regarding staff instruction. On request, they can also carry out training on the functionality, commissioning, maintenance and repair of the control unit and the units controlled by it.

Contact us for a detailed quotation.

2 Safety

2.1 General information

Only high-quality components have been used in the control unit that have been specifically selected and programmed for the units controlled by it.

Nevertheless, the operation of the control unit and the units controlled by it may endanger the operating person and cause damage to the connected units, the control unit or other material assets in the following circumstances:

— When operated by untrained or uninstructed personnel
— When not used properly
— When not maintained or repaired properly

2.2 Notes on signs and symbols

The following terms, signs and symbols are used in this operating manual, and indicate particularly important information.

Danger!

Warns of an immediate hazardous situation with unavoidable serious injuries or death as a result if the instructions shown are not strictly adhered to.

Warning!

Warns of a hazardous situation with the possible risk of subsequent serious injuries or death if the instructions shown are not strictly adhered to.

Caution!

Warns of a possible hazardous situation with the risk of subsequent moderate or light injuries and material damage if the instructions shown are not strictly adhered to.

Notice

Indicates a possible hazardous situation or unsafe, dangerous work processes that may lead to damage to the machine or surrounding area.

Note

Offers useful information on safe and proper operation.

- Bullet points describe work and / or operational steps. These steps must be carried out from the top down.

— Indents indicate lists.

All instructions and symbols attached directly to the control unit and the units controlled by it (e.g. warning signs, operational signs, all component designations etc.) must be strictly adhered to.
They may not be removed and must be kept completely legible.

Some of the diagrams used in this operating manual, which are only used to illustrate a particular work step, show a different type of control unit. However the work step is the same.

2.3 Proper use

The STE-RS reversing control unit serves the purpose of preventing and removing slight blockages of a connected macerator caused by fiber materials.

An integrated motor protection protects the motor of the connected macerator from damage through overload. In the event of an overcurrent, the STE-RS switches off the connected macerator.

An emergency stop switch additionally allows the operator to bring the macerator to an immediate standstill.

It is possible to connect an external control unit (optional for some versions).

Proper use includes compliance with the instructions on

— safety,
— operation,
— repairs and maintenance,

which are described in this operating manual as well as in the operating manuals of the connected components.

Any other use or use over and above these specifications is deemed as improper use. The operator is solely liable for any resulting damage.

2.4 Residual risk

Even when all safety instructions are adhered to, there are residual risks involved in operating the control unit as detailed below.

All persons that work on and with the control unit must be aware of these residual risks and observe the associated instructions to avoid accidents or damage caused by these residual risks.

It may be necessary to open or remove on-site safety equipment during installation and modifications. This causes a residual risk and potential danger that each operating person must be aware of:

Danger!

Risk of fatal injury due to electric shock!

Electrical connections may only be installed by qualified electricians.
Pay particular attention to **all instructions and safety regulations contained in the operating manuals for electronic components in the appendix**.

Danger!

Danger of serious injury or death from electric shock!

For protection against contact, secure the power supply with an AC/DC sensitive residual current device (RCD Type B) according to the circuit diagram.

Switch off the STE-RS control unit using the main switch before performing any repair or maintenance work.

Ensure that it cannot be switched back on unintentionally, e.g. by applying a U-lock to the main switch or by disconnecting the plug from the power supply.

Protect the STE-RS control unit from moisture, heat, and frost. In particular, ensure that water cannot enter when the control cabinet is open.

Ensure that all electric connections have been properly reconnected before switching the unit on and that the cables used are undamaged and have not been sharply bent.

Make sure that the control cabinet is always closed and locked before switching on and during operation, and that no unauthorized persons have access to the key.

Disconnect the unit during thunderstorms or a prolonged absence from the power supply.

Warning!

The following applies to versions with a frequency converter:

The frequency converters may carry a dangerous contact voltage for up to 10 minutes after disconnection from the power supply.

Only open the control cabinet 10 minutes after shutdown.

2.5 Description of the safety equipment

The control unit is equipped with the required safety equipment according to the applicable legal guidelines in the country of manufacture, current state-of-the-art technology and recognized safety regulations.

2.5.1 Fuses

The circuit breakers (automatic fuses) indicated on the electric circuit diagrams protect the electric circuits from being damaged by overcurrent.

2.5.2 Emergency stop

An emergency stop switch for the connected units is located at the front of the control cabinet door. This switch must always be accessible.

2.5.3 Filter ventilator protection

In the version with control cabinet climatization, a cover, a filter and a protective mesh protect the rotating axial ventilator fan from contamination and from anyone reaching into it.

The air inlet opening in the cover may not be blocked. The cover may not be removed.

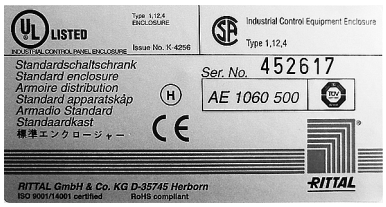
2.6 Marking and signs on the STE-RS control unit

(The data provided are for illustrative purposes only. Here, they refer to a Multichopper P150 control unit.)

Meaning:
The control unit manufacturer’s nameplate

Location:
In a clearly visible position on the control cabinet door inside the control cabinet

[1] Different address possible, e.g. when delivered through a subsidiary.



Meaning:
The control cabinet manufacturer's nameplate

Location:
In a clearly visible position on the inside of the control cabinet door

Meaning:
The filter fan hood manufacturer’s nameplate

Location:
In a clearly visible position on the filter fan hood

Meaning:
Marking of electronic components / circuits (the first number marks the page in the circuit diagram)

Location:
In a clearly visible position on the relevant components in the control cabinet

Meaning:
Emergency stop switch (red on yellow)

Location:
At the front of the control cabinet

Meaning:
Warns of dangerous electrical voltage

Location:
On the control cabinet and on individual components

Meaning:
Protective ground connection

Location:
On all connecting points to the protective ground wire

Attention!
Check that all terminal screws are properly tightened before commissioning the system

Meaning:
Warning:
The electrical connections must be checked before commissioning the STE-RS control unit and the components connected to it. In particular, it must be ensured that the terminal screws are tight.

Location:
In a clearly visible position on the inside and outside of the control cabinet

Meaning:
Warning: Components marked with this label carry voltage even after switching off the control unit via the main switch.

Location:
In a clearly visible position on the relevant components in the control cabinet

Additional markings on electronic components

Meaning:
See the manufacturer’s operating manual

Location:
On the individual components

2.7 Safety instructions for operating personnel

The control unit and the components controlled by it may only be operated while they are fully assembled, in perfect working condition and only for their intended purpose, in a safe and risk-conscious manner having regard to this operating manual.

All malfunctions must be rectified immediately and professionally, especially those affecting safety. This applies particularly to defects such as loose electrical connections, frayed, burnt, kinked or otherwise damaged cables etc.

Every person assigned with commissioning, operation or maintenance work must have fully read and understood this operating manual beforehand – specifically chapter 2, *Safety*. Consulting the manual during work is already too late. This applies especially to personnel that only work occasionally on the control unit.

The operating manual must always be kept accessible next to the control unit.

No liability will be assumed for any damage and accidents caused by non-compliance with the operating manual.

Adhere to the applicable accident prevention regulations and all other generally recognized safety regulations and guidelines for occupational health at work.

Clearly specify the responsible parties for the various maintenance and repair tasks and adhere thereto. Only then can handling errors be avoided, especially in dangerous situations.

If the control unit or the connected components malfunction:

- Use the emergency stop switch to shut down the control unit and the connected components immediately.
- Turn the main switch to **OFF**.
- Ensure that the control unit cannot be switched on again, e.g. by locking the main switch with a U-lock.
- Take all necessary measures in order to shut down the connected devices (e.g. close the valves).
- Report the malfunction to the responsible department/person.

This especially applies to safety-related alterations to the control unit or connected components.

Observe the maintenance instructions in the relevant operating manuals when carrying out maintenance on the connected components.

Work on the control unit may only be carried out by trained, reliable personnel. Personnel in training or requiring instruction, as well as persons currently in vocational training, may only operate the control unit under the constant supervision of an experienced staff member.

2.8 Safety instructions for maintenance and rectifying malfunctions on the STE-RS control unit

The control unit may only be opened, maintained and repaired by qualified electricians, while having proper regard to the attached electric circuit diagrams.

Adhere to the prescribed intervals for regular maintenance and inspections or those specified herein and in the operating manuals of the components.

Modifications, repairs and maintenance on the control unit may only be carried out when the control unit is switched off. Accidental restarting of the unit must be prevented completely.

To the extent necessary, amply secure the surrounding area when performing maintenance. Cordon off the working area with a red and white safety chain and a warning sign.

Large assemblies and components must be carefully attached and secured to hoists when they are removed or replaced so that associated dangers are minimized. Only appropriate hoists and lifting media in technically perfect working condition with sufficient load capacities may be used.

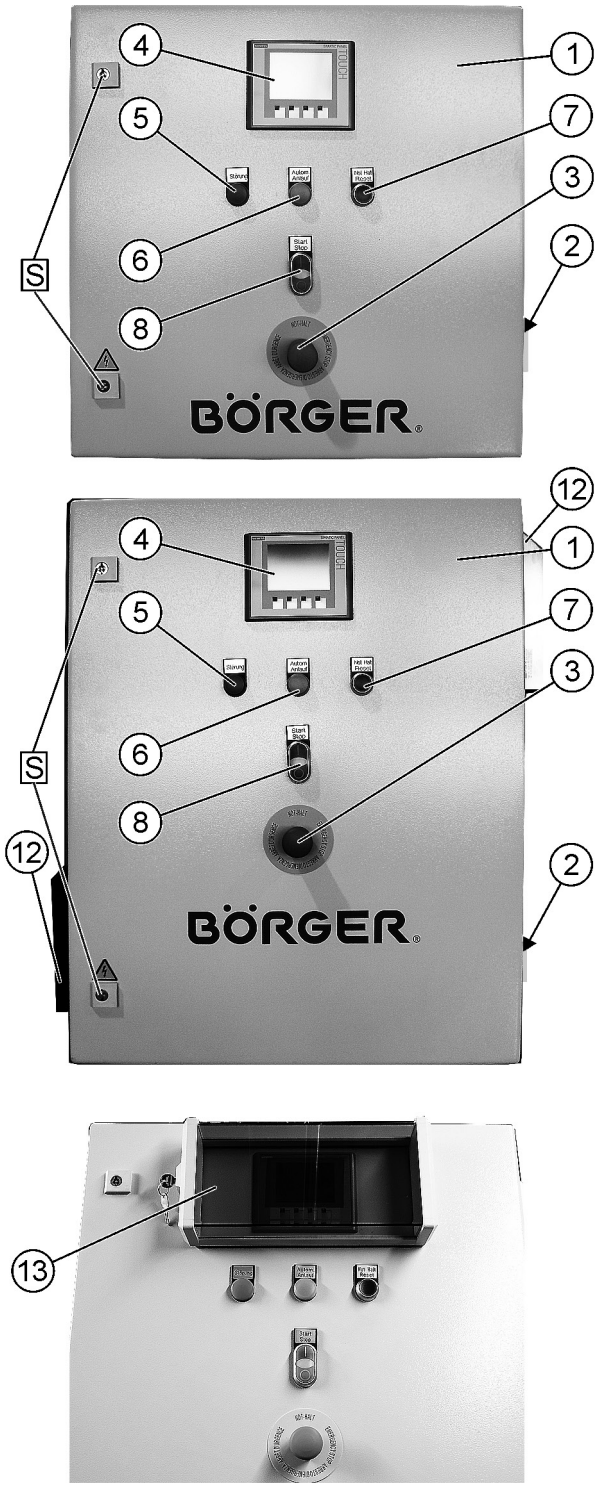
Never stand under suspended loads.

Protect the electronic components from moisture and impurities. Do not use aggressive cleaning agents to clean the outside. Use lint-free cleaning cloths. Only clean the electronic components with suitable agents according to the manufacturers' operating manuals.

Dispose of any replacement parts in a safe and environmentally-friendly manner.

3 Product Description

3.1 Construction of the STE-RS reversing control unit

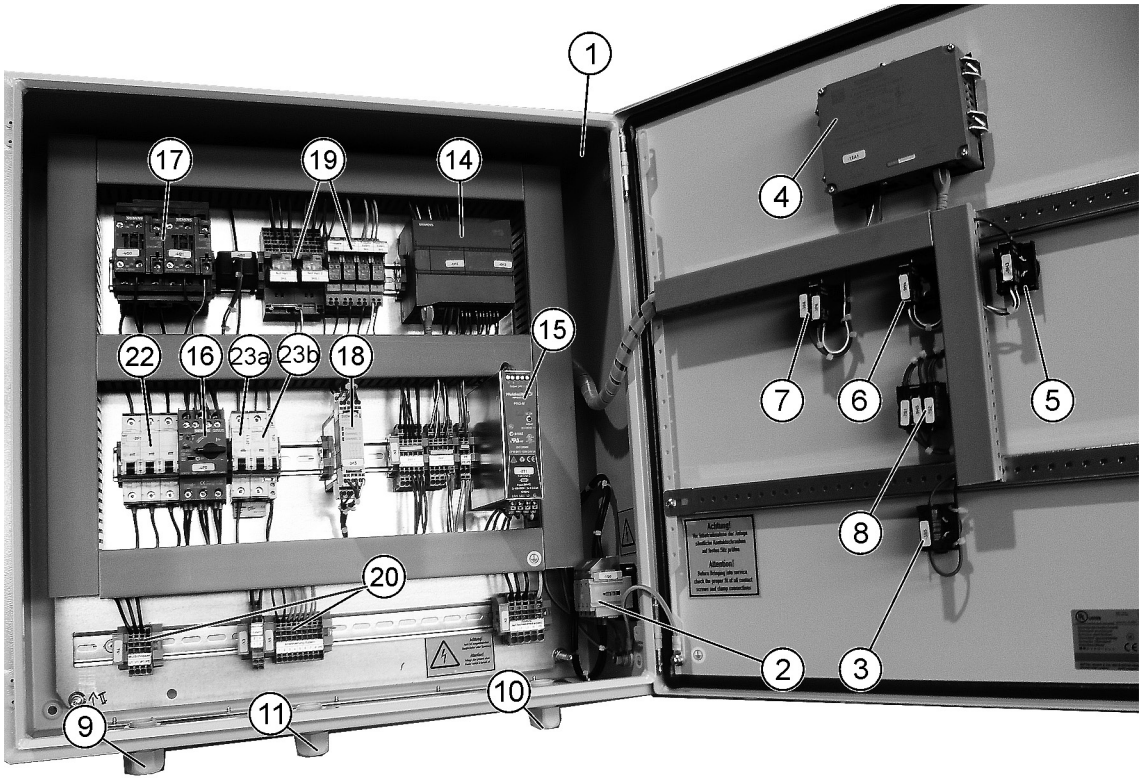


Outside of the control cabinet, front view

1 Control cabinet with lock (S)
2 Main switch
3 Emergency stop
4 Operating terminal
5 Red LED indicator lamp, is lit in the event of malfunctions
6 Yellow LED indicator lamp, is lit during automatic operation
7 Blue LED illuminated pushbutton for restoring readiness for operation after an emergency stop
8 Start button / stop button for connected components, with indicator light for trouble-free operation

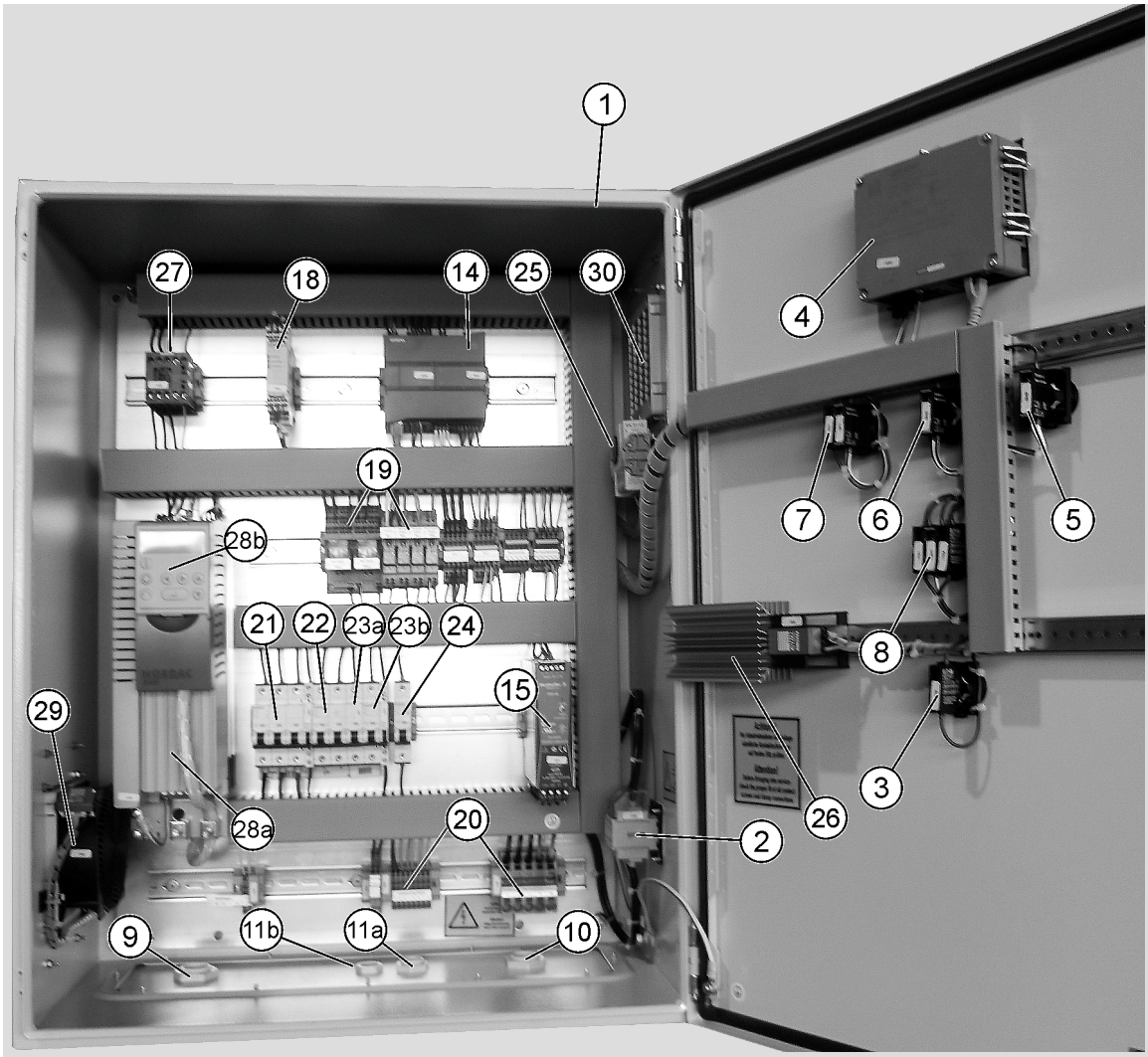
Options:

12 Control cabinet climatization with filter fan hood (supplied as standard in version with frequency converter)
13 UV cover, lockable



Inside of the control cabinet, version with reversing contactor combination and motor protection switch

1 Control cabinet with lock
2 Main switch
3 Emergency stop
4 Operating terminal
5 Red LED indicator lamp
6 Yellow LED indicator lamp
7 Blue LED illuminated pushbutton
8 Start button / stop button
9 Cable gland, M25x1.5, IP 68, for macerator
10 Cable gland, M32x1.5, IP 68, for voltage supply
11 Cable gland, M20x1.5, IP 68, for connection to an external control unit
14 PLC / CPU
15 Power supply unit, power supply 24 V DC
16 Motor protection switch
17 Reversing contactor combination with current measuring module
18 Emergency stop relay (safety relay)
19 Coupling relay
20 Serial feed-through terminals for connecting the components of the system according to the circuit diagram
22 Circuit breaker, three-pole, for power supply unit, 400 V
23a Circuit breaker, single-pole, for control voltage, 24 V
23b Circuit breaker, single-pole, for PLC outputs, 24 V



Inside of the control cabinet, version with frequency converter

1 Control cabinet with lock
2 Main switch
3 Emergency stop
4 Operating terminal
5 Red LED indicator lamp
6 Yellow LED indicator lamp
7 Blue LED illuminated pushbutton
8 Start button / stop button
9 Cable gland, M25x1.5, IP 68, for macerator
10 Cable gland, M32x1.5, IP 68, for voltage supply
11a Cable gland, M20x1.5, IP 68, for connection to an external control unit
11b Cable gland, M16x1.5, IP 68, for connection of an external emergency stop
14 PLC / CPU
15 Power supply unit, power supply 24 V DC
18 Emergency stop relay (safety relay)
19 Coupling relay
20 Serial feed-through terminals for connecting the components of the system according to the circuit diagram
21 Circuit breaker, three-pole, for frequency converter
22 Circuit breaker, three-pole, for power supply unit, 400 V
23a Circuit breaker, single-pole, for control voltage, 24 V
23b Circuit breaker, single-pole, for PLC outputs, 24 V
24 Circuit breaker, single-pole, for control cabinet heating/climatization
25 Temperature controller
26 Control cabinet heater
27 Release contactor for frequency converter
28a Frequency converter
28b Operating device of the frequency converter
29 Air inlet with filter ventilator
30 Air outlet with outlet filter

3.1.1 Control cabinet

The standard version of the control cabinet (1) is made of painted sheet steel.

The casing protection degree according to DIN EN 60529 is IP 55.

Two locks with a removable key make it possible to prevent unauthorized access.

Fixing bores are available on the backside for securely attaching the control cabinet to the wall.

Options:

— Temperature controller with connected heating and filter ventilator for climatizing the interior for protection of electronic components (supplied as standard in version with frequency converter)
— Lockable UV cover, IP 54, which keeps the operating terminal protected from exposure to the weather
— Control cabinet made of high-quality stainless steel

3.1.1.1 Main switch and emergency stop

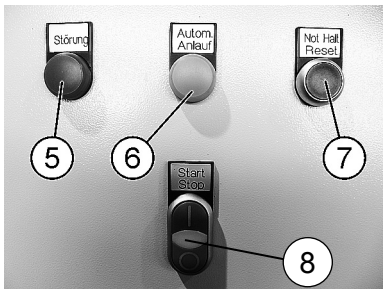
On the right of the control cabinet, there is the main switch (2) for the reversing control unit and the connected components.

A central emergency stop switch (3) switches off the macerator immediately when pressed.

3.1.1.2 Start button / stop button

By pressing the start-stop button with indicator lamp (8), the connected components for **manual operation** are started and stopped if the main switch is activated.

3.1.1.3 LED elements



Red LED indicator lamp (5)	**Fault** is lit in the event of malfunctions
Yellow LED indicator lamp (6)	**Autom. Start-up** warns of a possible automatic start-up of the macerator (when in automatic operation)
Blue LED illuminated pushbutton (7)	**Emergency Stop Reset** is lit after an emergency stop until readiness for operation is restored by pressing this button
Indicator lamp (8)	Is lit during trouble-free operation

3.1.2 Control unit

The programmable SIMATIC S7-1200 PLC/CPU control unit (14) is a modular, compact and powerful control unit for small control environments:

— Saving of target values and limits

— Controlling of the reversing contactor combination or controlling of the frequency converter in the version with FC

— Evaluation of the digital and analog output signal of any optional measuring devices

Extended control units are available as an option, see chapter 3.1.9.

Further details on the PLC control module are contained in the manufacturer's operating manual.

The SIMATIC S7-1200 PLC/CPU control unit (14) allows remote maintenance via GSM/UMTS if the optional remote maintenance module is installed. This option enables the provision of fast and targeted support in the event of faults, see chapter 3.1.9 *Options and accessories*.

3.1.3 Reversing contactor combination

The current consumption of the macerator motor is continuously measured via the current measuring module of the reversing contactor combination (17). The values are transmitted to the PLC (14). The reversing contactor combination (17) changes the direction of rotation of the motor according to the PLC signal (14), e.g. for reversing operation when the defined current consumption limit is exceeded.

The reversing contactor combination (17) is not available in the version with frequency converter, see chapter 3.1.5.

3.1.4 Motor protection switch

In order to prevent damage from overload, a thermomechanical motor protection switch (16, bimetal) triggers the shut down of the macerator motor based on a preset heating curve when the stored current consumption limit is exceeded.

The motor protection switch is not available in the version with frequency converter, see chapter 3.1.5.

3.1.5 Frequency converter

For motor outputs greater than 7.5 kW, a frequency converter (28) with release contactor (27) is supplied instead of the reversing contactor combination and the motor protection switch. Current measurements and changes of the direction of rotation are then handled by the frequency converter (28) according to the evaluation performed by the PLC (14).

A frequency converter (28) can also be supplied for lower motor outputs as an option.

For motor outputs greater than 7.5 kW, the frequency converter (28) can be replaced by the reversing contactor combination (17) with motor protection switch (16) upon special request, depending on the specific circumstances at the installation site. However, Börger GmbH expressly recommends the use of a frequency converter (28), at least for motor outputs greater than 7.5 kW.

3.1.6 Electrical connections

The standard version of the STE-RS control unit is supplied with cable glands according to DIN EN 50262 (9, 10, 11), IP 68, and serial feed-through terminals (20).

The enclosed circuit diagram provides a detailed description of the cabling to be laid.

Extensions for measuring devices to be evaluated are possible, see chapter 3.1.9.

3.1.7 Operating terminal

The operating terminal (4) offers optimized visualization and enables comfortable operation.

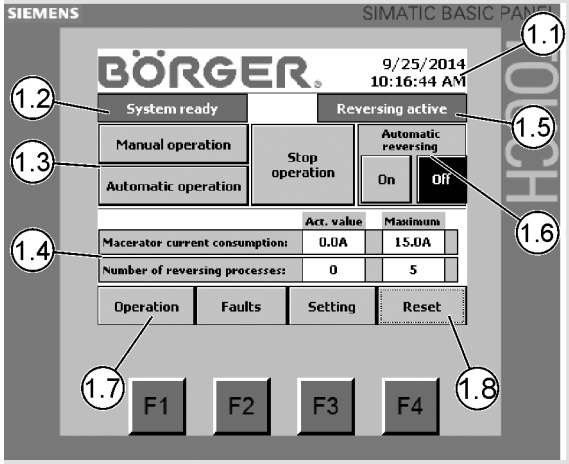
Display	4" STN display, 4 gray scales, resolution of 320x240 dpi
Touchscreen	analog resistive, IP 65 external / IP 20 internal, single touch
Memory	512 KB

The software of the terminal is programmed entirely according to the order specifications for the macerator to be connected. The menu is delivered in German language as standard. Optionally, the display can also be delivered in another language.

The standard version of the control unit and the programming of the operating terminal is designed for operating a single macerator. Optional extensions according to chapter 3.1.9 are possible.

In addition, a 6" TFT display may be delivered with control units with optional extensions.

3.1.8 Menu navigation



Main menu

1.1 Current **date and time** display

1.2 **Operating status** display
System ready / System not ready

1.3 **Operating mode** activation fields:
Manual operation (without regulation) or automatic operation (regulation according to the pump control unit), highlighted in dark gray when selected

1.4 **Current value** display:

— Current consumption of the macerator, actual value and limit

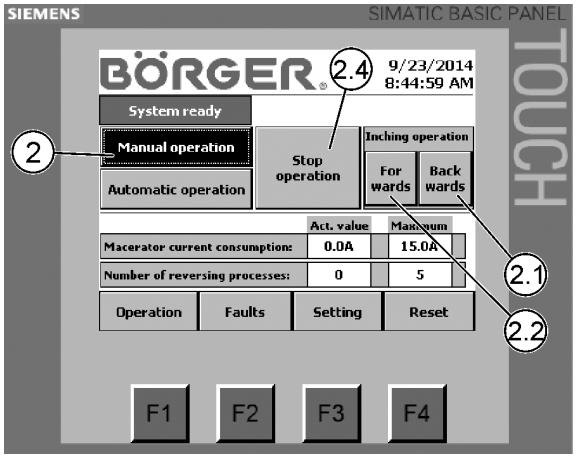
— Number of reversing processes related to overcurrent within 10 minutes before a fault message is generated;
Act. value = actual reversing processes already performed and
Maximum = maximum number of reversing processes within 10 minutes stored

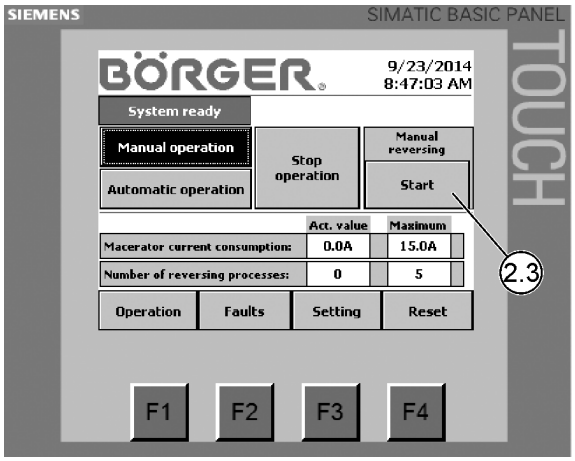
1.5 **Reversing active:**
This display appears while reversing processes are being performed.

1.6 **Automatic reversing On/Off:** Activation fields for switching automatic, **time-dependent** reversing processes on and off (independent of the current consumption of the drive), highlighted in dark gray when selected

1.7 **Operation:**
Touching the field leads back to the main menu from a submenu

1.8 **Reset**:
Touching the field resets the control unit back to the operation status after a fault has been reported





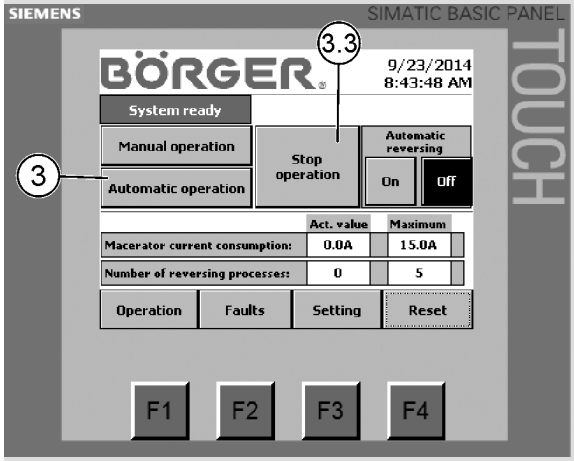
2 **Manual operation:** Operating mode, to be activated for unregulated operation as well as for inching operation (e.g. for manual reversing), highlighted in dark gray when activated

2.1 **Backwards:** activates the backward operation of the macerator for the duration of the touch, highlighted in dark gray when activated

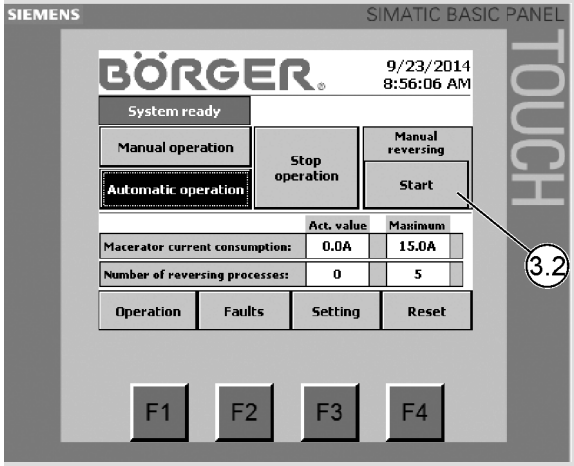
2.2 **Forwards:** activates the forward operation of the macerator for the duration of the touch, highlighted in dark gray when activated

2.3 **Manual reversing / Start:**
After starting the drives via the start-stop button, the start field for manual reversing appears during ongoing operation. When touching the start field, a reversing process is started manually according to the values defined in submenu 4.2.

2.4 **Stop operation:**
Touching this option ends the operating mode and stops the connected drive

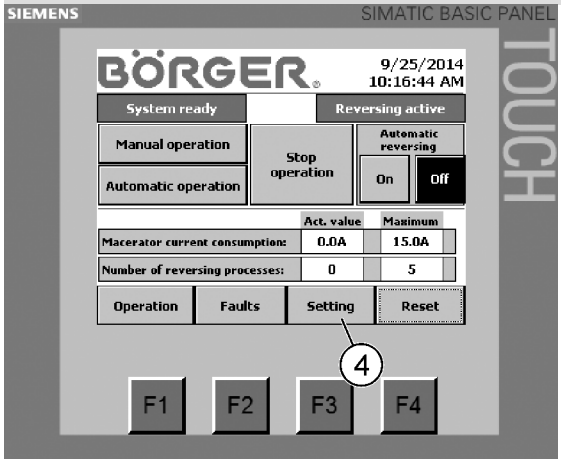


3 **Automatic operation:** Operating mode, to be activated for controlled operation according to the pump control unit, flashes alternatingly in light and dark gray when activated



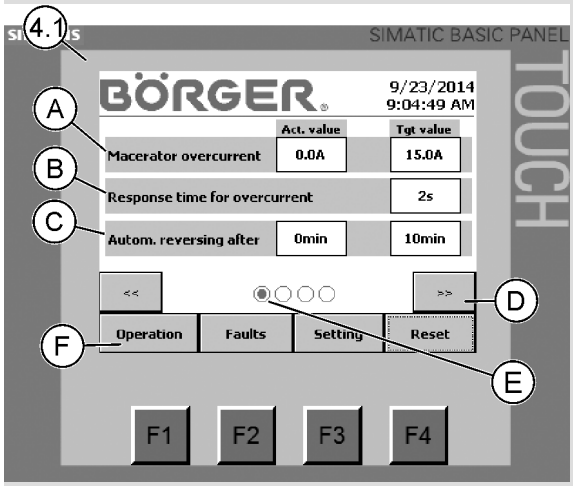
3.2 **Manual reversing / Start:**
After starting the drives via the pump control unit, the start field for manual reversing appears during ongoing operation. When touching the start field, a reversing process is started manually according to the values defined in submenu 4.2.

3.3 **Stop operation:**
Touching this option ends the operating mode and stops the connected drive



4 **Setting:**
Touching leads to the submenus

- To the entry screen for the operating parameters, etc.
- To the operating hours counter
- To the service programs



4.1 Submenu
Settings for reversing

A **Macerator overcurrent:**
The limit for the maximum admissible current consumption of the macerator is defined in the **Tgt value** field.
The reversing process is triggered when the limit is exceeded.
Settings can also be made during operation.
The actual current consumption of the motor is displayed below the **Act. value**.
The limits for the drive must be observed.

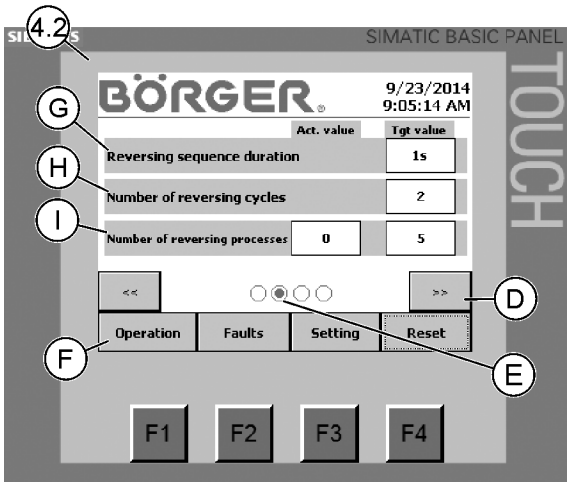
B **Response time for overcurrent:**
Defining a response time between the time when the overcurrent is measured and the switching off of the macerator prevents unnecessary shut-downs in the event of short-term current fluctuations.

C **Autom. reversing after..... min**:
A time interval in minutes for a preventive reversing process independent of the current consumption can be entered under **Tgt value**.
Time-dependent reversing is activated in the main menu.

D The arrow buttons **>>** and **<<** can be used for navigating within the settings menus.

E The currently active page is highlighted here.

F **Operation:**
Touching the field leads back to the main menu from a submenu



4.2 Second submenu
Settings for reversing

G **Reversing sequence duration:**
During a reversing process, the macerator repeatedly runs forwards and backwards in short sequences.
The duration of a reversing sequence in seconds (i.e. the duration for which the macerator runs in one direction) is defined here in the second settings menu under **Tgt value**.

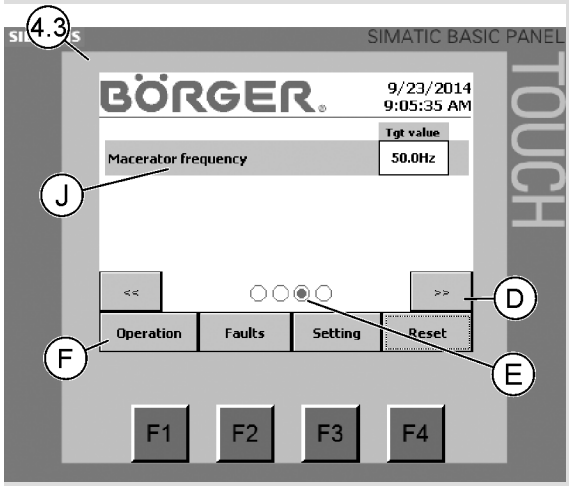
H **Number of reversing cycles:**
For the STE-RS reversing control unit, a reversing cycle is defined as one backward sequence and one forward sequence.
The number of these reversing cycles within a reversing process is defined here in the second settings menu under **Tgt value**.

I **Number of reversing processes:**
This is where the permitted number of complete reversing processes (consisting of the previously defined number of reversing cycles) within ten minutes is defined before the system switches to "Fault" if the error is not remedied.

D The arrow buttons **>>** and **<<** can be used for navigating within the four settings menus.

E The currently active page is highlighted here.

F **Operation:**
Touching the field leads back to the main menu from a submenu



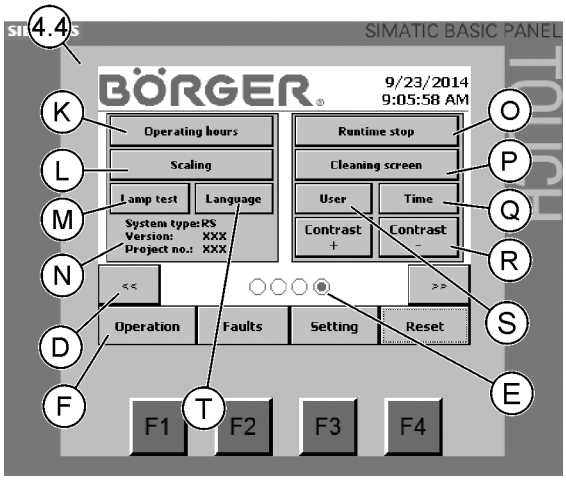
4.3 Additional submenu
for version with frequency converter
(not applicable for version without frequency converter)

J **Macerator frequency**
The frequency of the drive of the connected macerator is defined in the third settings menu under **Tgt value**. By changing the frequency, the rotational speed of the macerator can be adjusted to the properties of the medium.

D The arrow buttons **>>** and **<<** can be used for navigating within the four settings menus.

E The currently active page is highlighted here.

F **Operation:**
Touching the field leads back to the main menu from a submenu



4.4 Submenu **Date, Time, Contrast and Service Program settings**

K **Operating hours:** Touching leads to the operating hours counter and intermediate meter

L **Scaling:** This submenu for general functions of the control unit can only be accessed by Börger GmbH.

M **Lamp test:** Touching the field makes the LED indicator lamps and the indicator lamp light up for testing purposes provided an appropriate electrical connection is in place and the LED element in question is not defective.

N **Identification data** for the reversing control unit

O **Runtime stop:** Ends the program, can only be accessed by Börger GmbH.

P **Cleaning screen:**
When touching this field, the touch screen is locked for 20 seconds to permit cleaning the screen during operation without changing any settings.

Q **Time:** Touching the field leads to a submenu for setting the date and local time.

R **Contrast + / Contrast –**
This is to adjust the contrast of the display.

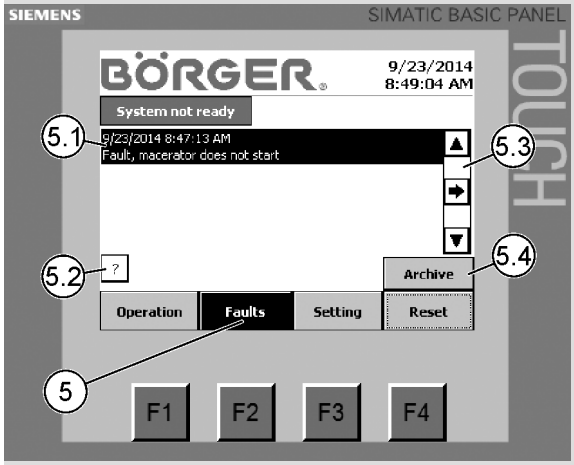
S **User:** Touching the field leads to the submenu for setting up and changing user accounts and passwords

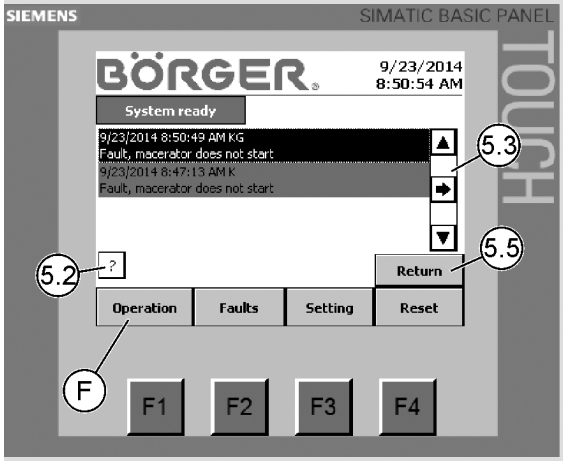
T **Language:** Touching this field changes the menu language (if the bilingual option is available)

D The arrow buttons **>>** and **<<** can be used for navigating within the four settings menus.

E The currently active page is highlighted here.

F **Operation:** Touching the field leads back to the main menu from a submenu





5 **Faults:**
Touching the field leads to the submenu for current fault messages

5.1 Example of a fault message

5.2 Short descriptions of the fault messages can be retrieved by touching the help field marked by a "**?**".

5.3 Navigation bar for navigating within the messages

5.4 **Archive**:
Touching the field displays the alert log

5.5 **Return:**
Touching the field leads back to the submenu for current fault messages

F **Operation:**
Touching the field leads back to the main menu from a submenu

The function keys F1-F4 have no separate additional function in the standard version of the STE-RS reversing control unit.

F1: same function as the **Operation** field
F2: same function as the **Faults** field
F3: same function as the **Setting** field
F4: same function as the **Reset** field

Note

The largely self-explanatory software can be adapted to the individual requirements of your application as a matter of course. This may lead to deviations from the menu navigation displayed here. However, the general functionality is the same.

3.1.9 Options and accessories

3.1.9.1 Remote maintenance module

Optionally, the control unit can be supplied with a remote maintenance module. The remote maintenance module enables remote maintenance via GSM/UMTS by Börger GmbH. This option makes it possible to obtain quick, targeted support should a fault arise.
If this option was agreed to in advance, the remote maintenance module is assembled ready for operation and generally already appropriately configured for the SIM card that you provided. Alternatively, remote maintenance via LAN is possible. For further information, please contact Börger customer service.

Upon consultation with Börger customer service, the control unit can also be retrofitted for remote maintenance.

Note

For individual cases, a unit for performing remote maintenance can also be leased from Börger customer service.

3.1.9.2 Radio control unit

As an option, the control unit can also be equipped with a radio control unit for operation. For details, please see the enclosed manufacturer's documentation for the radio control unit.

3.1.9.3 Further options

The following units or components may be integrated in the control unit:

— A pump
— Additional macerators
— A fill level sensor, pressure sensor or other measuring devices
— Valves

etc. Further optional special equipment for the STE-RS control unit is available for special applications. Details can be found in the enclosed circuit diagram. The menus of the control unit will be extended as required in this case. The operating manuals of the relevant manufacturer of the component are then included.

Note

If a pump with an integrated pump control unit is connected, there will usually be no connection for the external control unit. An extension for connection to an external control unit is optional.

3.2 Function of the STE-RS reversing control unit

The STE-RS reversing control unit serves the purpose of preventing and removing slight blockages of a connected macerator caused by fiber materials in order to avoid downtimes.

To this end, the STE-RS reversing control unit causes reversing processes with alternating forward and backward sequences whose duration and number is adjustable by means of a PLC and depending on the current consumption of the drive.

If the blockage cannot be removed by means of repeated reversing within a defined time interval, the macerator is switched off and the control unit switches to **"Fault"**.

Blockages can also be prevented by regular automatic reversing (not dependent on current).

The underlying parameters are entered and saved via the operating terminal.

The control unit also supports manual reversing.

The integrated motor protection protects the motor of the connected macerator from damage through overload.

The Multichopper control module is programmed in such a way that the direction of rotation changes automatically every eight hours during continuous operation in order to prevent one-sided wear of the cutting elements. The direction of rotation also changes with each restart.

The control unit is equipped with an emergency stop switch.

The macerator is started and switched off via the control unit. It is possible to connect an external control unit (optional for some versions).

Notice

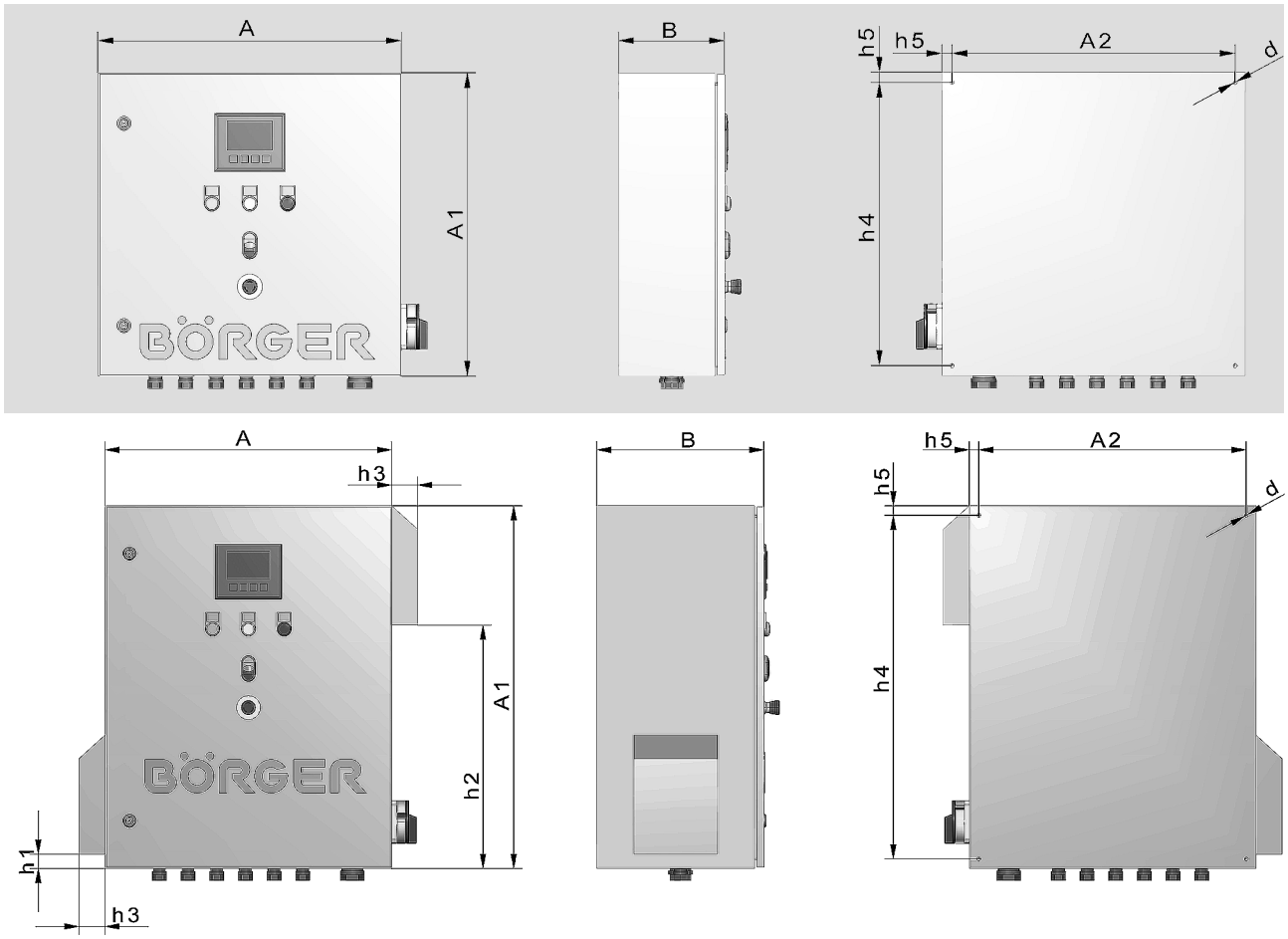
The reversing control unit was specifically pre-programmed for your macerator in line with the specifications provided in the order.

Do not change the programming beyond the measures described in chapter 5 without obtaining written consent from Börger GmbH. Otherwise, you may cause severe damage to the macerator and the drive.

3.3 Technical data

The detailed technical specifications, performance data and maximum loads for the components of the STE-RS control unit are contained in the attached documentation from the manufacturers.

3.3.1 Dimensions



Dimensions of the control cabinet in mm / inches (approx.)

Version	A	A1	A2	B	Ø d	h1	h2	h3	h4	h5	Weight:
without FC	600 **(23.62)**	600 **(23.62)**	560 **(22.05)**	210 **(8.27)**	8.7 **(.34)**	—	—	—	560 **(22.05)**	20 **(.79)**	approx. 40 kg **(88.18 lb)**
with FC	600 **(23.62)**	760 **(29.92)**	560 **(22.05)**	350 **(13.78)**	8.7 **(.34)**	30 **(1.18)**	510 **(20.08)**	55 **(2.17)**	720 **(28.35)**	20 **(.79)**	approx. 65 kg **(143.30 lb)**

3.3.2 Electrotechnical data

Voltage input:	400 V AC
Control voltage:	24 V
Frequency:	50 Hz
No. of phases:	3P/N/PE
Nominal current:	Corresponds to the nominal current of the motor of the connected macerator as stated on the nameplate (see also chapter 3.3.4); when a pump is connected: control unit nominal current = (macerator nominal current + pump nominal current) x 0.8, see nameplate
Mains fuse required:	16 A with 1.5 to 3.0 kW drive
	25 A with 4.0 to 5.5 kW drive
	35 A with 7.5 to 11 kW drive
	50 A with 15 kW drive
	63 A with 18.5 kW drive
	80 A with 22 kW drive
	100 A with 30 kW drive

(When a pump is connected: see specifications in circuit diagram.)

All phases (3P/N/PE), including the neutral conductor, must be properly connected and fully functional.

The residual current device for electric shock protection must be AC/DC sensitive (**RCD, type B**).

3.3.3 Ambient conditions of STE-RS control unit

Ambient temperature:.....0 to 40 °C **(32 to 104 °F)**
Storage temperature:.....-15°C to 40°C **(5°F to 104 °F)**
Operating temperature:.....20°C **(68°F)**
Relative humidity:.....up to 90%

3.3.4 System limits

The basic limits of the macerator and any further components are contained in the operating manuals for these components.

For the standard version of the STE-RS control unit (macerator with control unit), the following values must be observed.

Value	Factory default setting	Limits	Unit
Current consumption limit of the macerator for current-dependent reversing	**Nominal current of the motor:**		
Motor output 1.5 kW	**3**	1-5	A
Motor output 2.2 kW	**4.5**	1-7	A
Motor output 3.0 kW	**6**	1-8	A
Motor output 4.0 kW	**8**	1-10	A
Motor output 5.5 kW	**11**	1-13	A
Motor output 7.5 kW	**15**	1-18	A
Motor output 9.2 kW	**18.5**	1-22	A
Motor output 11.0 kW	**22**	1-26	A
Motor output 15.0 kW	**30**	1-36	A
Motor output 18.5 kW	**37**	1-44	A
Motor output 22.0 kW	**44**	1-52	A
Motor output 30.0 kW	**60**	1-72	A
Response time until the start of reversing when the min. current consumption is exceeded	**2**	0-5	seconds
Current consumption limit of the macerator for motor protection, factory default setting at the motor protection switch / frequency converter	**Nominal current of motor acc. to nameplate**	**Nominal current of motor acc. to nameplate**	A
Motor frequency with version with frequency converter	**50**	25-70	Hz
Duration of a reversing sequence	**2**	1-10	seconds
Number of reversing cycles (with the STE-RS control unit, a reversing cycle consists of two reversing sequences)	**2**	Depending on the duration of a reversing sequence, the duration of the entire reversing process should not exceed 30 seconds	piece(s)
Number of reversing processes within 10 minutes	**5**	2-20	piece(s)

The standard version is supplied for macerators with a motor output of up to and including 5.5 kW with a reversing contactor combination and motor protection switch.

Starting from a motor output of 7.5 kW, the version with frequency converter is supplied as standard. As an option, frequency converters can also be supplied with lower macerator motor outputs.

Please observe the information related to the order and in the data sheet for special versions with other limits.

4 Transportation, As-delivered Condition, Storage, Installation

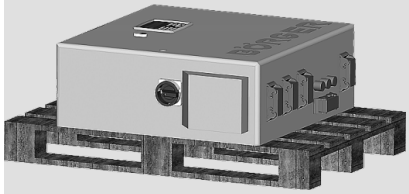
4.1 Transportation

Warning!

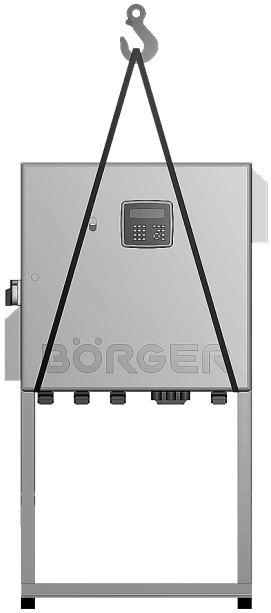
Dangerous crush injuries are possible during the transportation of the control unit.

The control unit may tilt over and fall due to improper lifting and transportation.

- Only use hoists, cranes, auxiliary tools and protective equipment that are suitable for the load.
- Never stand under suspended loads.
- Observe the weight set out in the data sheet.



- Transport the control cabinet lying down, e.g. on a europallet using a forklift truck.



- Lift the control cabinet attached to the individually made mounting frame available as an option with the assistance of a crane or forklift truck and holding belts in the manner shown here.

4.2 As-delivered condition

The control unit is usually set up for each respective application and delivered in a programmed condition.

- Check that the delivery is complete when you receive it.
- Inspect the delivery immediately for any signs of transport damage.
- Ensure that the unit is not put into operation in the event of incorrect or incomplete delivery, or transport damage.
- Inform the shipping agent immediately of any transport damage and contact Börger GmbH.

4.3 Storage / interim storage

4.3.1 Storage

If the control unit is not used immediately, then appropriate storage conditions are as important as the correct installation and maintenance for the subsequent trouble-free operation.

- Adhere to the storage instructions contained in the operating manuals of the manufacturers of the components.
- Adhere to the following storage conditions:
  - The storage room must be evenly ventilated and free of dust and vibrations
  - The relative humidity must be below 65% and the temperature between 15 °C and 25 °C **(59 °F and 77 °F)**
  - Avoid exposure to direct heat sources (sunlight, heating)
- Protect the control unit from heat, dirt, cold, moisture and **particularly from frost.**

4.3.2 Interim storage

- Adopt appropriate measures to prevent the **formation of condensation** inside the control cabinet, e.g. by using a moisture-resistant cover, even in cases of interim storage for short periods.
- Follow the storage instructions as detailed in chapter 4.3.1.

4.4 Installation

- Prior to commissioning, make sure that you are using the correctly preset control unit for your macerator.

Notice

Do not commission the macerator using a control unit without the appropriate settings.

Otherwise, your macerator may not function and damage to the unit, e.g. as a result of incorrect limit definitions or impermissible changes of direction of rotation, cannot be excluded.

4.4.1 Positioning

Notice

Risk of damaging the electronic components!

Protect the STE-RS control unit from heat, cold, moisture and frost.
The control unit may not be exposed to extreme weather conditions which cause the values to fall below or exceed the limits of the components.

- Choose the location in which the control unit is to be installed in such a way that the lateral ventilation openings (if applicable, e.g. in the version with frequency converter) remain uncovered. The unimpeded inlet and outlet of air must be guaranteed.
- Ensure that the protection from heat, cold, moisture and frost is sufficient.
- Choose the location in which the unit is to be installed so that the control unit remains accessible at all times. The service space required for work on the control unit is 1.0 x 1.0 m **(3.28 x 3.28 ft)**.
- In respect of the macerator and any other components, observe the service space as described in the relevant operating manual.

4.4.2 Installing the control cabinet

When a complete macerating system on a base frame is delivered, and in the case of mobile macerating systems, the STE-RS control unit is usually supplied readily mounted on the mounting frame and ready for operation.

A second person is required for installing a control unit, which is supplied separately.

The control unit is wrapped in packaging material to protect it from dirt and scratching.

- Completely remove all the packaging material before commissioning.

Four fixing bores are located on the rear panel of the control cabinet.

- Take any necessary precautions to ensure that the sensitive electronic components are not damaged during installation.
- Install the control unit with four suitable screws and washers on a straight, dry wall using suitable dowels or a suitable holding frame. For installation on a holding frame, use force-locked screw-locking devices, especially with mobile systems.
- Align the control cabinet carefully using a spirit level. Compensate for uneven walls with washers, if necessary, so that the control cabinet is not tilted forward or backward mounted.

4.4.3 Electrical connections

Danger!

Risk of fatal injury due to electric shock!

Electrical connections may only be installed by qualified electricians.

Please observe

— **the instructions and safety regulations** set out in the installation instructions and operating manuals of the manufacturer of electronic components, and

— **the circuit diagram provided in the appendix.**

Notice

Risk of material damage in the event of incorrectly connected electrical connections!

The equipment will not function properly if the electrical connections have been connected incorrectly. Severe material damage to the components may result, e.g. due to an incorrect direction of rotation with connected Multicrushers or Rotorrakes.

Note

Multicrushers and Rotorrakes are designed for a **fixed direction of rotation in line with the flow direction** according to the order. These units must not be operated in the other direction of rotation without conversion, except during the short reversing process.

By default, the control unit as well as the enclosed circuit diagram are designed for **clockwise** operation of the motor.

If your Multicrusher / Rotorrake was designed **for counter-clockwise operation**, **the phase conductor which, according to the circuit diagram, must be connected to outlet U, is to be connected to V and vice versa.**

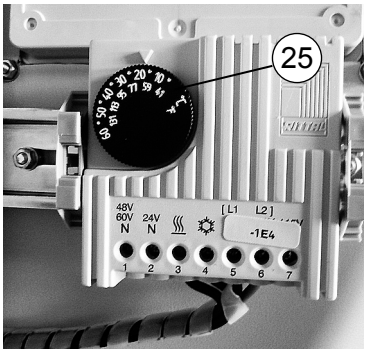
- If the unit supplied is not completely pre-assembled, connect the macerator drive according to the enclosed circuit diagram taking into account the note above.
- Connect any additional components according to the enclosed circuit diagram when the STE-RS control unit has been designed for this purpose.
- With the version with connections for an external control unit, connect any external control devices according to the enclosed circuit diagram if the control unit is to be networked for remote operation.
- Connect the power supply via an AC/DC sensitive residual current device (RCD Type B) according to the enclosed circuit diagram.
- Ensure correct grounding.
- Ensure that the necessary power supply is reliably available.

Note

With the version with reversing contactor combination and motor protection switch:
The overcurrent switchpoint at the motor protection switch is preset according to the **nominal current** of the macerator motor. The motor protection switch is triggered based on a preset heating curve when the nominal current of the motor is exceeded 1.2-fold.
The preset at the motor protection switch must not be changed without prior consultation with Börger customer service. Otherwise, the warranty will be void.

With the version with frequency converter and release contactor:
The overcurrent switchpoint at the frequency converter switch is preset according to the **nominal current** of the macerator motor. The frequency converter switches off the motor with a type and temperature-dependent delay if the nominal current of the motor is exceeded 1.2-fold or more.
The parameter settings of the frequency converter must not be changed without prior consultation with Börger customer service. Otherwise, the warranty will be void.

4.4.4 Control cabinet climatization

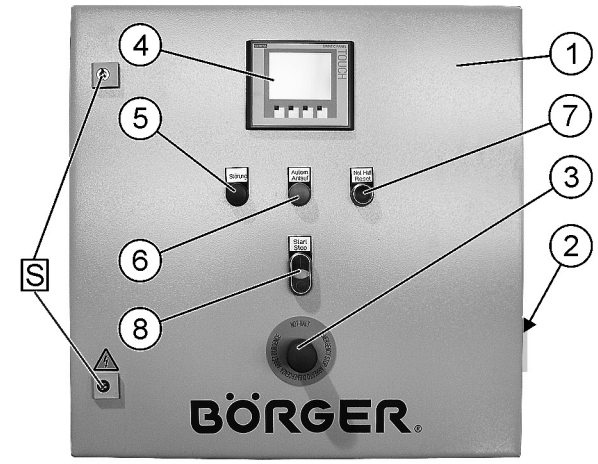


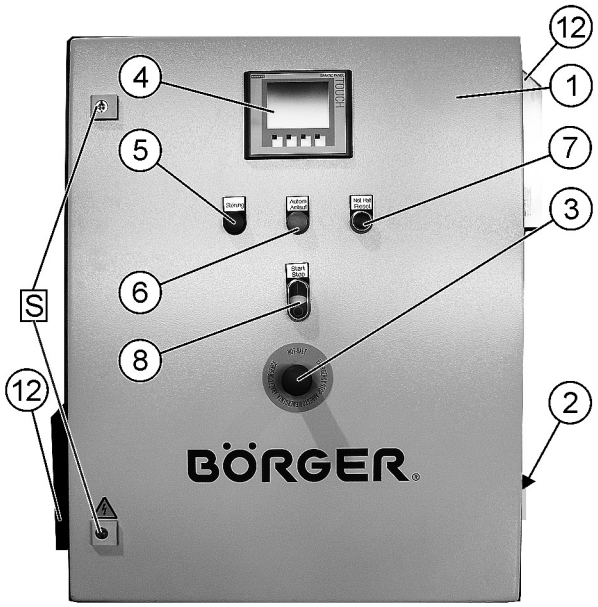
- If available, turn the temperature controller (25) for control cabinet climatization to 20°C **(68°F)**.

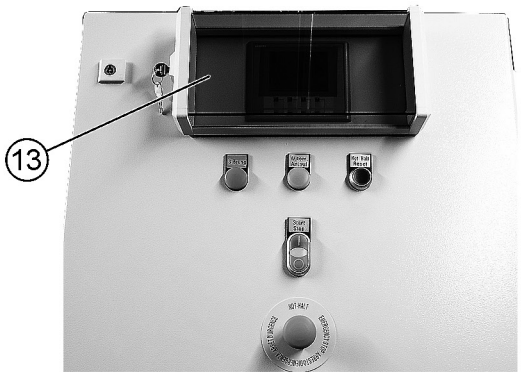
4.4.5 Secure installation / checking fastening screws

- Check that all the terminal and fastening screws, which may have become loose during transportation and installation, are tight and retighten them if necessary.

5 Operation







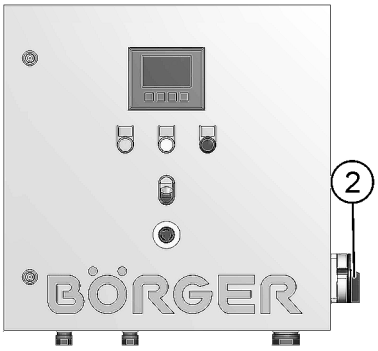
1 Control cabinet with lock (S)
2 Main switch
3 Emergency stop
4 Operating terminal
5 Red LED indicator lamp, is lit in the event of malfunctions
6 Yellow LED indicator lamp, is lit during automatic operation
7 Blue LED illuminated pushbutton for restoring readiness for operation after an emergency stop
8 Start button / stop button for connected components, with indicator light for trouble-free operation

Options:

12 Control cabinet climatization with filter fan hood (supplied as standard in version with frequency converter)
13 UV cover, lockable

5.1 Commissioning

5.1.1 Switching on the control unit and checking the functions



- Turn the main switch (2) to **ON**.

The control unit starts up (approx. 20 seconds).

- When the main menu shows on the operating terminal, check the function of any optional monitoring devices.

5.1.2 Password customization, password input

The functions and menus that permit an adjustment of the preset parameters are protected against unauthorized access with a password.

A password-protected user account for the STE-RS control unit is available to the set-up user by factory default.

The default password for the set-up user is 123456.

Note

The standard settings do not allow the "unregistered operating person" to change any values. They are entitled to

— use inching operation for testing the direction of rotation and functions,
— select the operating mode,
— activate and deactivate automatic (time-dependent) reversing,
— manually start a reversing process during operation,
— view fault notifications and reactivate the system by pressing the **Reset** button,
— call up the menus for review purposes.

The **Set-up user** is also not granted unlimited access to the parameters of the control unit. They are entitled to:

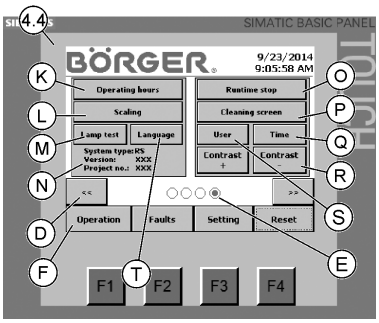
— set the date and time, lock the screen for cleaning, perform the lamp test in the **Setting** menu,

— reset the intermediate meters as described in chapter 5.4,

— perform the settings described in chapter 5 and

— change the password of the set-up user as well as the user name and the login duration.

If changes to the basic settings are necessary, Börger customer service needs to be asked for assistance (possibly through remote maintenance).



In the **Setting** menu (4.4), submenu **User** (S), you can change the password, the login duration and the user name, see explanation below.

On commissioning, the password should be replaced by a secure, individual password.

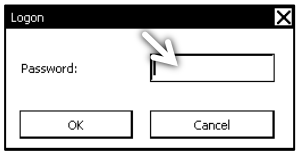
Note

-

Once you have successfully logged in with a password, all the variable parameters remain accessible until no further input that requires a password has occurred for fifteen minutes. The relevant menu areas are then once more protected by a renewed password request.

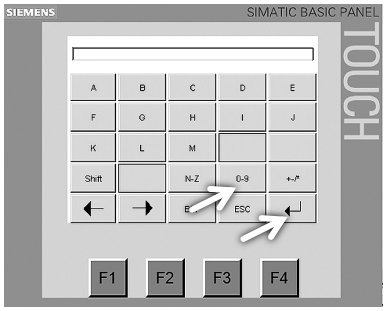
Logging out via the **Logout** field in the **User** submenu immediately restores password protection.

- Keep the above-mentioned general password handy.
- Select the **Setting** menu by touching the relevant field.
- Go to menu 4.4.
- Select the **User** submenu.



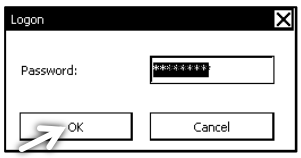
Unless you had already logged in, a login window for logging in with the corresponding password opens.

- Touch the entry field **Password**.

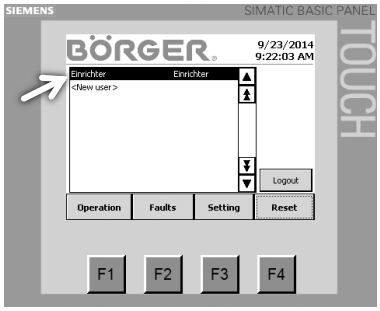


A window with a digital keyboard opens.

- Make your selection by touching the number block.
- Enter the password and confirm with **Return** for it to be entered in the entry field.

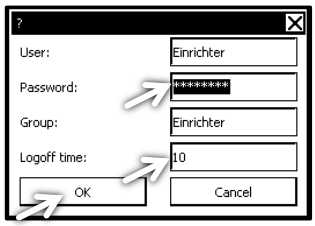


- Confirm your input in the entry field by touching the **OK** button.



- Select **Set-up user ("Einrichter")** as the user by touching it.

A window with the set-up user's login data opens.

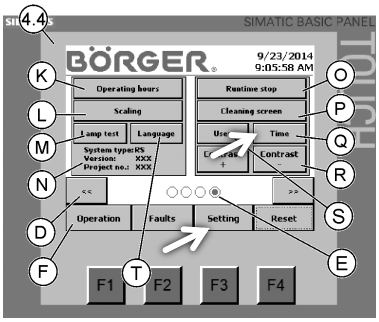


- Use the screen keyboard, which opens when the **Password** field is touched, to enter the new password and accept your entries with **Return**.
- If you wish to change the login duration, enter the required period from login to automatic logout in the entry field **Logoff time**.
- If you wish to change the user name, enter the new user name in the entry field **User**.
- Confirm the inputs with OK.
- Return to the main menu by touching the **Operation** field.

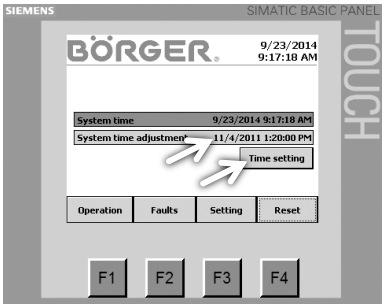
5.1.3 Setting the date and system time

The system time shown on the display can be corrected in order to adapt it to the local time, daylight saving time, or after longer power cuts.

For this work step, the set-up user password is required or you have to be logged in as set-up user already.



- Select the **Setting** menu by touching the relevant field.
- Go to menu 4.4.
- Select the **Time** submenu (Q).



- Touch the entry field **System time adjustment**.
- Enter the new value using the keyboard that opens and confirm the input with **Return**.
- Accept the set time by touching the **Time setting** field.

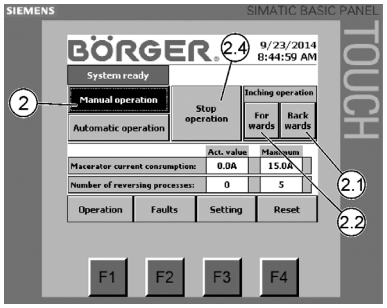
5.1.4 Checking the direction of rotation

If a Multicrusher or Rotorrake or any pumps are connected, the direction of rotation of the motors according to the operating manuals of the components and the drive manufacturer must be verified in **Inching operation**.

This verification is possible without a password.

Note

In **Inching operation**, the motors of connected components start immediately without having to operate the Start button when touching the **Forwards** and **Backwards** selection fields.



- Activate **Manual operation** by touching the relevant field (2) until activation is signaled by the field being highlighted.
- Continuously touch the **Forwards** field (2.2).
- Check the direction of rotation of the motor as described in the operating manual of the macerator.
- Switch the motor back off by releasing the **Forwards** field (2.2).
- For an optional extended control unit design, check the function and direction of rotation of all other components correspondingly. When checking the direction of rotation of a connected rotary lobe pump, ensure that the pump runs without pumped medium for a very short time only, as described in the operating manual for the rotary lobe pump.
- If required, have the direction of rotation of the drives corrected by a qualified electrician (by switching the phase conductors) after the control unit has been shut down via the main switch.

5.1.5 Adjusting the control parameters

Notice

Risk of material damage due to impermissible changes to limit values. The nominal current settings of the motor at the motor protection switch or at the frequency converter must not be changed. Non-compliance may lead to motor damage at the macerator.

Note

Börger GmbH recommends prior consultation with Börger customer service in all cases in which an adjustment of settings appears necessary.

For parameter changes, the set-up user password is required or you have to be logged in as set-up user already.

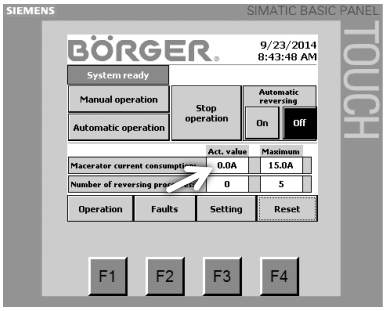
Unit-specific values, limits as well as variable parameters for reversing processes are preset by factory default as described in chapter 3.3.4 or according to the order specifications for the particular case.

Optimum adjustment of the reversing behavior of the STE-RS control unit strongly depends on the dry solids content and structure of the medium being macerated inside the macerator. Other factors that may have an impact on the optimization of the settings include the flow speed and the duration of operating intervals.

A virtually trouble-free continuous operation is possible if all system components interact in an optimum manner.

- Start the system components in the desired standard mode as described in chapter 5.2 once their readiness for operation has been verified and check the actual current consumption of the macerator motor.

5.1.5.1 Current consumption



The **Act. value** for the current consumption must constantly be below the **Maximum** limit.

The largest possible approximation to the max. value without any prompt current-dependent reversing processes would be ideal. If, depending on the DS content and DS structure, the **Act. value** of the current consumption is constantly approx. 10 to 30% below the maximum value which, as a rule, corresponds to the nominal current of the macerator motor, then the settings are okay.

The lower the risk of blockages occurring due to the type of medium being fed, the lower the permitted difference between the actual value and the maximum limit.

If the current consumption permanently remains considerably below the maximum limit, it may be useful to reduce the limit at which reversing processes are triggered in order to prevent blockages and dissolve lumps in due time.

- Reduce the **Tgt value** in the **Setting** submenu (corresponds to the maximum limit for the current consumption of the macerator) bearing in mind the limits in chapter 3.3.4 until the difference to the previously determined **Act. value** is between 10 and 30%.

If the current consumption permanently remains just below the maximum value and frequent reversing processes are triggered, the limit for triggering reversing processes can be slightly increased within the scope of the limits defined in chapter 3.3.4 upon careful examination of alternative options (e.g. stirring the medium, reducing the DS content). This has proved beneficial in the processing of cow dung, for instance.

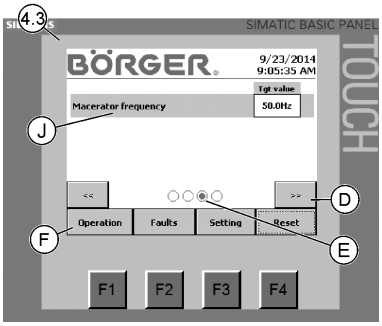
- Increase the **Tgt value** in the **Setting** submenu (corresponds to the maximum limit for the current consumption of the macerator) bearing in mind the limits in chapter 3.3.4 until the difference to the previously determined **Act. value** is between 10 and 30%. Only increase the value in small increments and test the impact first.

5.1.5.2 Parameters for reversing

The **values set for reversing** are suitable for the majority of applications. Depending on the flow medium, adjustments within the scope of the limits defined in chapter 3.3.4 may, however, be useful in individual cases.
Changes to the **Response time** can lead to undesirable results. A response time that is too short or the omission of a response time can lead to frequent system downtimes due to slight, harmless fluctuations in the feed substrate. A response time that is too long may result in damage to the macerator.

- Always make necessary adjustments to the reversal settings in small increments.

5.1.5.3 Frequency



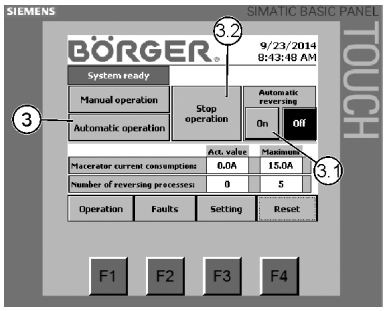
The frequency for the macerator motor is preset to 50 Hz by default.

In rare exceptional cases, it may be useful to adjust the rotational speed of the macerator motor by changing the frequency in the version with frequency converter.

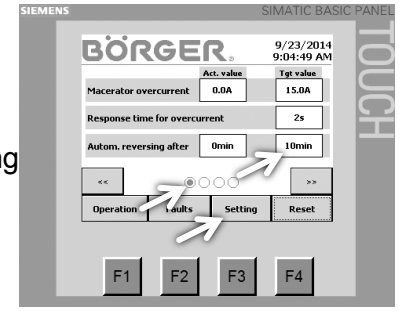
This change to the settings should only be made upon consultation with Börger customer service.

5.2 Normal operation

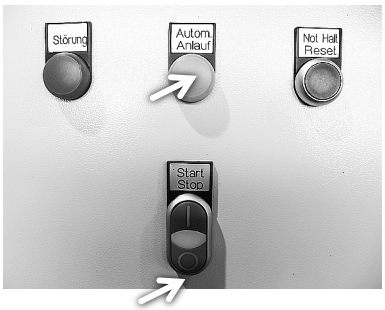
- Select whether you would like time-dependent reversing to be triggered in order to prevent blockages by touching the field **Automatic reversing On** (3.1) or **Off**, independent of the current consumption of the drive.



- This requires time settings for automatic reversing in the Setting menu, submenu 4.1.



- Upon completion of all preliminary tasks, please select the operating mode:
  - **Automatic operation** (3) for controlled operation according to the pump control unit[1)]
  - **Manual operation** for uncontrolled operation
- For **Manual operation**: Press the green start button. The motor of the connected macerator starts up.



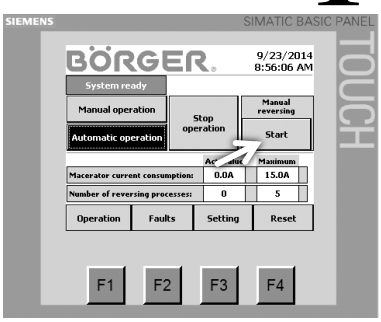
During **Automatic operation**, the motor of the connected macerator starts according to the signals of the pump control unit[1)].

During trouble-free operation, the indicator light of the start-stop button (8) is lit during **Manual operation**.

During automatic operation, the yellow LED indicator lamp **Autom. Start-up** warns of a potential automatic start of the macerator.

[1)] External control unit when no extension of the reversing control unit for controlling the pump has been supplied

Note



After the motors have started, you can manually trigger a reversing process by touching the start button both during manual and automatic operation, e.g. in order to prevent a fault switch-off when the local operating person has identified an increased current consumption.

5.3 Downtimes

5.3.1 Downtimes in automatic operation

If **Automatic operation** has been activated, the control unit remains switched on during regular operation (LED indicator lamp **Autom. Start-up** is lit).

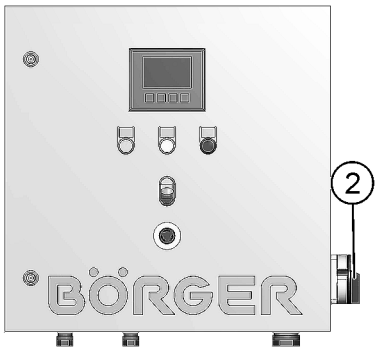
The motor of the connected macerator (and any further components) is switched on and off according to the signals of the pump control unit (networked, external control unit, if applicable).

- Touch the **Stop operation** field in order to end the operating mode.

5.3.2 Downtimes in manual operation

- Switch off the motor of the connected components manually by pressing the red stop button (8) on the control unit. You can also switch off the motor by touching the **Stop operation** field.

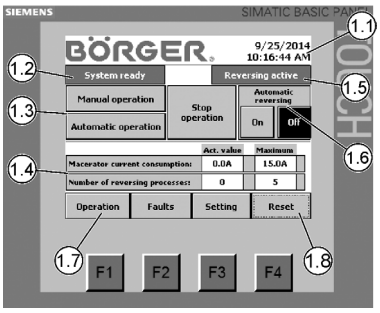
5.3.3 Switching off the control unit



- In order to switch off the control unit, turn the lateral main switch (2) to the **OFF** position.
- For any maintenance work, please ensure that the control unit cannot be switched on again accidentally, for example by locking the main switch with a U-lock.

5.4 Faults

5.4.1 Reversing when the current consumption is exceeded



If the current consumption of the motor of the connected macerator exceeds the preset limit, the reversing process is initiated.

The motor alternatingly runs forwards and backwards for short sequences, according to the preset duration and number.

The display shows **Reversing active** (1.5).

Upon completion of a reversing process, the motor of the macerator is reset to normal operation.

If the fault could not be rectified, the control unit repeats the reversing process as many times as are stored as **Maximum** under **Number of reversing processes** for 10 minutes.

The display (1.4) shows the number of reversing processes permitted within 10 minutes, the number of reversing processes already performed within this time frame as well as the current consumption of the macerator.

If the current consumption of the macerator motor still exceeds the preset limit after completing the **Maximum** number of automatic reversing processes within ten minutes, the control unit switches off the motor of the macerator. The red LED indicator lamp **Fault** lights up.

In the **Faults** menu, the message **Fault, number of reversing processes reached** appears.

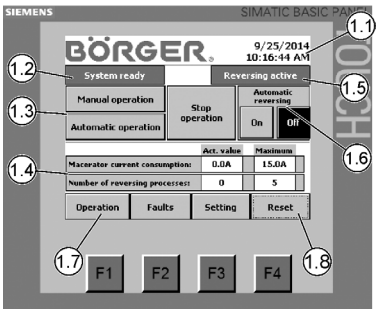
5.4.2 Fault messages and troubleshooting

Warning!

In the event of a malfunction, leave the macerator switched off and immediately shut down any upstream and downstream components **until the cause has been rectified**. Otherwise, damage to the components cannot be ruled out.

If required (e.g. in the event of faulty electronic components of the control unit or when repair work at the macerator becomes necessary), also shut down the control unit via the main switch until the cause has been rectified.

Ensure that it cannot be switched on again unintentionally, e.g. by disconnecting it from the power supply or by locking the main switch with a U-lock.



- Also observe the chapters on possible faults in the operating manuals of connected components.
- **Acknowledge each fault upon rectification of the cause of the fault by pressing the Reset field (1.8) or the function key F4.**

Fault:	Possible causes	• Remedial action
The STE-RS control unit display remains blank	Main switch is switched off (in the **OFF** position)	• Turn main switch to the **ON** position
	Power supply interrupted	• Restore power supply
	Circuit breaker is set to zero	• Rectify any causes for overcurrent, if applicable • Reactivate the circuit breaker

Fault message:	Possible causes	• Remedial action
"Fault, number of reversing processes reached"	Parameter settings incorrect	• Correct duration of reversing sequences, number of reversing cycles and number of reversing processes as described in chapters 5.1.5.2 and 3.3.4
	Blockage inside the macerator cannot be removed by means of automatic reversing	• Repeat reversing process manually, if necessary • Eliminate the cause according to the operating manual of the macerator • Only use the macerator for its intended purpose

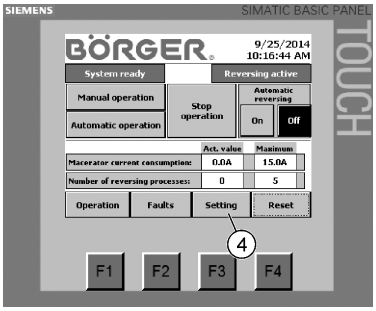
Fault message:	Possible causes	• Remedial action
"Fault, emergency stop pressed", Red LED indicator lamp and blue LED indicator pushbutton are lit	Manual activation of the emergency stop button due to a dangerous situation	• Eliminate the dangerous situation • Unlock the emergency stop button • Press the blue LED indicator pushbutton **Emergency Stop Reset**

Fault message:	Possible causes	• Remedial action
"Fault, macerator does not start" (Reversing contactor combination or frequency converter signals missing current consumption of the macerator and emits its own fault signal or no signal)	Electrical connection to the motor interrupted	• Ensure that the electrical connection is free of faults and that power is being supplied
	Macerator drive defective or incorrectly installed	• Eliminate the cause of the fault according to the operating manual of the drive manufacturer
	Other causes	• Rectify the cause of the fault according to the operating manual of the reversing contactor combination or the frequency converter • If the reversing contactor combination or the frequency converter is defective, contact Börger customer service

Fault message:	Possible causes	• Remedial action
"Macerator motor protection switch" in version with motor protection switch	Motor protection switch has been triggered, current consumption of macerator was exceeded beyond the permissible limit	• Eliminate cause of overcurrent, e.g. blockage inside the macerator • Reactivate the motor protection switch 
	Other causes (e.g. phase conductor not connected correctly or motor protection switch defective)	• Eliminate cause as described in the operating manual — of the drive — of the motor protection switch • If the motor protection switch is defective, contact Börger customer service
"Fault, macerator frequency converter" in version with frequency converter	Current consumption of macerator was exceeded beyond the permissible limit, error code shown at the frequency converter: E003	• Eliminate cause of overcurrent, e.g. blockage inside the macerator
	Temperature of the macerator motor was exceeded beyond the permissible limit, error code shown at the frequency converter: E002	• Eliminate cause of overheating, e.g. insufficient ventilation, insulating layers
	A phase conductor is not connected correctly or defective, error code shown at the frequency converter: "Network phase error" E007, "Phase error" motor E016	• Establish proper electrical connections • Replace defective cables
	Other causes	• Identify fault according to display at the frequency converter and operating manual of the manufacturer and fix

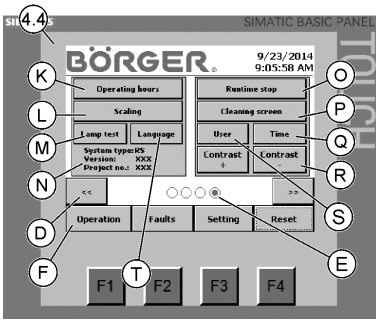
Fault message:	Possible causes	• Remedial action
"Fuse, PLC outputs"	Short circuit / overcurrent at the PLC, circuit breaker set to 0	• Rectify any causes for short circuit / overcurrent, if applicable • Reactivate the circuit breaker
The following applies to versions with a frequency converter: **"Fuse, macerator frequency converter"**	Short circuit / overcurrent at the frequency converter, circuit breaker set to 0	• Rectify any causes for short circuit / overcurrent, if applicable • Reactivate the circuit breaker

5.5 Resetting the intermediate meter

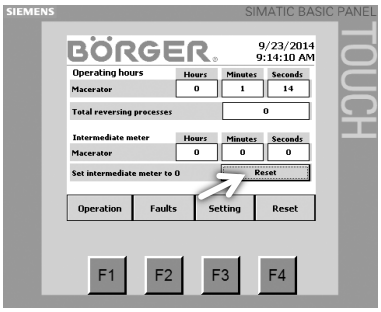


For this work step, the set-up user password is required or you have to be logged in as set-up user already.

- Select the **Setting** menu (4).



Select the **Operating hours** submenu (K).



- Select **Reset** in order to reset the intermediate meter to 0.

6 Maintenance and Repairs

Danger!

Risk of fatal injury due to electric shock!

Electrical connections may only be installed by qualified electricians.
Pay particular attention to **all instructions and safety regulations contained in the operating manuals for electronic components in the appendix**.

Danger!

Danger of serious injury or death from electric shock!

Switch off the STE-RS control unit using the main switch before performing any repair or maintenance work.

Ensure that it cannot be switched back on unintentionally, e.g. by applying a U-lock to the main switch or by disconnecting the plug from the power supply.

Protect the STE-RS control unit from moisture, heat, and frost. In particular, ensure that water cannot enter when the control cabinet is open.

Ensure that all electric connections have been properly reconnected before switching the unit on and that the cables used are undamaged and have not been sharply bent.

Make sure that the control cabinet is always closed and locked before switching on and during operation, and that no unauthorized persons have access to the key.

Warning!

The following applies to versions with a frequency converter:

The frequency converters may carry a dangerous contact voltage for up to 10 minutes after disconnection from the power supply.

Only open the control cabinet 10 minutes after shut down.

Notice

Electrostatic discharges (ESD) can damage electronic components.

Therefore, before touching the electronic components of the control unit, discharge the electricity from your body by touching a grounded metal object.

Repeat this procedure during any work on the electronic components of the control unit from time to time, to discharge any electrostatic charge that may have built up in your body.

- Please obtain the information on maintaining and repairing the individual components from the manufacturers' documentation supplied.
- Read and strictly comply with the applicable regulations and any safety data sheets from the manufacturer as well as the operator's instructions in respect of storage, handling, use and disposal.
- Dispose of the operating materials in a safe and environmentally-friendly manner.

6.1 Machine care

Appropriate machine care helps to maintain the functionality of the control unit in the long term.

Notice

Improper cleaning can result in malfunctions and damage!

Do not use water jets.
Do not use aggressive cleaning agents, solvents or sandpaper, as these can damage the metallic and plastic surfaces, paint and seals.

Do not use metal objects such as scrapers and screwdrivers for cleaning.

Never clean sensitive components with hard scrubbing and strong mechanical pressure.

Do not use high pressure, a vacuum cleaner or a hand brush with plastic bristles etc. to clean the inside because the production of static electricity can damage the electronic components.

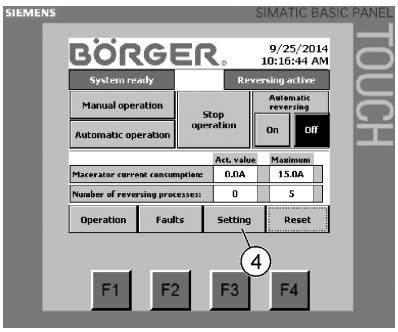
In particular, keep moisture away from all the electronic components.

Observe the operating manuals of the manufacturers of the electronic components in respect of care and maintenance.

6.1.1 Cleaning the outside of the control cabinet

- Only clean the outside of the control cabinet by wiping or brushing it. Use lint-free, anti-static cleaning cloths / hand brushes with natural bristles.
- When required, use a standard aqueous industrial cleaner.
- Keep all markings on the control cabinet in a legible state at all times.

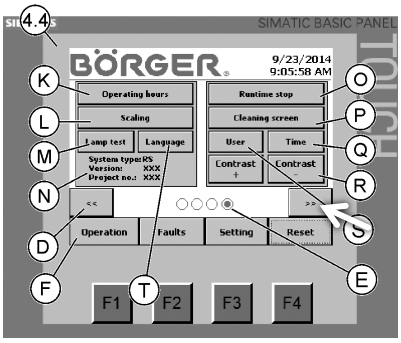
6.1.2 Cleaning the outside of the operating terminal during operation



If the operating terminal is to be cleaned while the control unit is switched on, the program **Cleaning screen** must be activated to prevent touching the screen causing changes to the settings.

For this work step, the set-up user password is required or you have to be logged in as set-up user already.

- Touch the **Setting** field (4) to open the relevant settings menu.



- Touch the field marked with an arrow facing towards the right until the menu shown (4.4) appears.
- Touch the **Cleaning screen** (P) field.

The input function of the screen is switched off for a period of 20 seconds. A cleaning image appears that indicates the remaining duration of the cleaning phase.

- During this time, clean the display using suitable agents (screen cleaner, anti-static cloth).
- If necessary, repeat the input lock by touching the **Cleaning screen** field again.

6.1.3 Cleaning the inside

- Observe the warnings in chapter 6.
- Keep the interior free of dust and dry.
- If necessary, use a compressed air spray to clean the inside, e.g. the DEKRA-approved *Dust Off 67* compressed air spray from CRC Kontakt-Chemie.
- Only use lint-free, anti-static cleaning cloths.

6.2 Maintenance and inspection

- Observe the warnings in chapter 6.

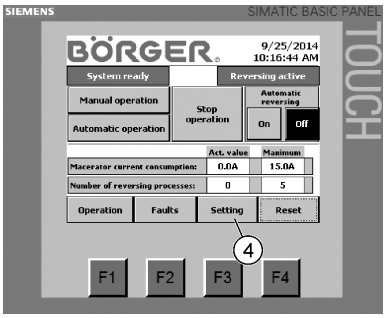
The following intervals are guidelines. **These intervals may be significantly reduced depending on the operating conditions, e.g. a dusty environment.**

Inspection / maintenance	Interval (approx.)	Measures
Cleaning the outside	N	See chapter 6.1 *Machine care*
Cleaning the inside	N	See chapter 6.1 *Machine care*
Checking the relays	N	Replace relays, if necessary, according to the manufacturer's specifications and the attached circuit diagrams
Checking the display	W	Contact Börger if there are display errors
Checking the LED elements (**Lamp test**)	W	Replace defective LED elements
Checking the filter ventilator (if applicable)	½ Y	Replace filter, if necessary, according to the manufacturer's specifications
Checking the outlet filter (if applicable)	½ Y	Replace filter, if necessary, according to the manufacturer's specifications
Checking the electrical lines and connections, e.g. — Are the protective sheaths intact? — Are the lines still positioned safely? — Have the lines not been sharply bent?	Y	Remedy shortcomings immediately, replace defective cables, taking the attached circuit diagrams into account
Checking the fuses	Y	Replace fuses, if necessary, according to the manufacturer's specifications and the attached circuit diagrams

N = when necessary **M** = monthly
D = daily **Y** = yearly
W = weekly

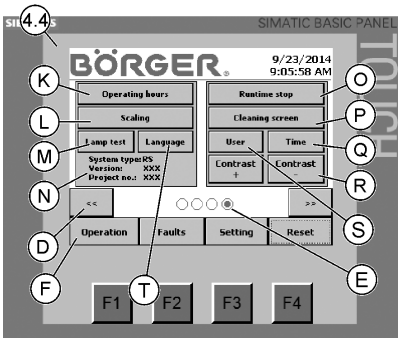
- Also observe the maintenance intervals for the components according to the operating manuals in the appendix.

6.2.1 Lamp test



The correct functioning of the LED elements (indicator lamps and indicator lamp of the start-stop button) can be checked when the system is idle or during operation.
For this work step, the set-up user password is required or you have to be logged in as set-up user already.

- Touch the **Setting** field (4) to open the relevant settings menu.



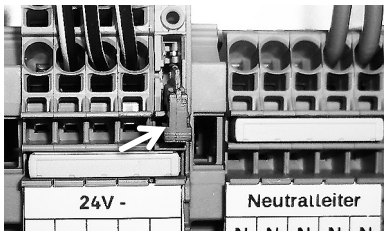
- Touch the **Lamp test** field (M).

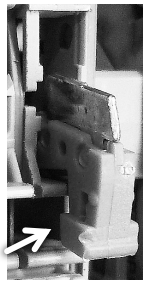
The LED indicator lamps (see chapter 3.1.1.3) are lit when functioning properly.

Failing this, no proper connection to the corresponding power supply may have been established or the respective LED element may be defective.

- Ensure that there is a proper connection to the power supply or replace the LED element, if necessary.

6.2.2 Insulation measurements



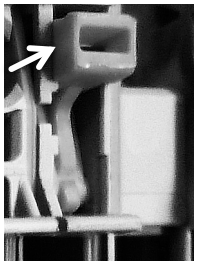


Notice

Risk of severe material damage due to improper insulation measurements!

Insulation measurements (measuring voltage 500 V) may only be performed by a suitably trained qualified electrician.

The disconnect/test terminal must be unlocked (locking bar facing downwards, see figure on the left) before insulation measurement are performed. Otherwise, the measuring voltage may cause damage to components of the control unit.



After performing the measurement, the locking bar must be pressed all the way to the top until it stops (see figure on the right). Otherwise, protection by the circuit breaker (24 V) is ineffective.

6.3 Repairs

If repairs to the control unit are required that are not covered by the described maintenance measures, we recommend contacting Börger customer service immediately.

The factory can only accept repair orders for a complete unit if a completed safety certificate / declaration of decontamination accompany the device submitted for repair, as well as any necessary safety data sheets for the substrate and / or cleaning agent.
The relevant form is also available as a download from our website under the service menu.

7 Disposal

7.1 Environmental protection

Caution!

Water-polluting materials

Such materials can pollute the soil and groundwater and enter the sewage system.

Comply with the legal obligations regarding waste avoidance and the proper recycling / disposal of waste during all work on and around the machine.

Water-polluting materials such as grease and lubricating oil must not pollute the soil or enter the sewage system, especially during installation, repair and maintenance work.

These materials must be collected, stored, transported and disposed of in suitable containers.

The applicable legal regulations must be strictly adhered to when disposing of operating materials or replacement materials during maintenance or decommissioning of the control unit, the system or individual components.

7.2 Oil, oily waste and grease

Oil, oily waste and grease pose a significant risk to the environment. Therefore, disposal of such materials must be handled by a specialist company.

- Collect any oil and oily waste and only dispose of them according to the legal requirements through authorized waste disposal companies / authorities.

7.3 Plastics

- Sort any plastic waste as thoroughly as possible.
- Dispose of plastics according to the legal requirements through authorized waste disposal companies / authorities.

7.4 Metals

- Sort and separate different metal types.
- Dispose of these metals according to the legal requirements through authorized waste disposal companies / authorities.

7.5 Electrical and electronic waste

Electrical and electronic waste must be disposed of separately. Electrical and electronic waste must not be disposed of with domestic waste.

- Only dispose of electrical or electronic waste according to the legal requirements through authorized waste disposal companies / authorities, e.g. recycling plants.

7.6 Final decommissioning

- Check which materials can be recycled and make the appropriate arrangements.

8 Accessories

If your STE-RS control unit has been equipped with special accessories, the corresponding data sheets and / or operating manuals can generally be found in the appendix or in the packaging of the units, if delivered as originally packed.

9 Appendix

9.1 Circuit diagrams, complete parts list and data sheets

The appendix contains the circuit diagram, the complete parts list, as well as the relevant data sheets of the electronic components of the STE-RS control unit.

- Observe these documents.

9.2 Type code

Type code	1-3 Equipment group	4-5 Type	6 Macerator	7 Version and display	8 Output (acc. to macerator)	9 Extension with reversing contactor for pump	10 Extension with FC for pump	11 Extension for controlling macerator when pump is connected	12 Pressure control extension for connected pump	13 Temperature control extension for connected pump	14 ff Special equipment	Version
1-3	**Equipment group**											
Control unit	**STE**											
4-5	**Basic type**											
Reversing control unit		**RS**										
6	**Macerator the control unit is designed for**											
Multichopper, P series			**M**									
Rotorrake, RR series			**R**									
Multicrusher, HAL, HPL, HCL, HFL, HLA series			**U**									
7	**Version and display**											
Operation of the macerator with PLC, reversing contactor combination and motor protection switch, limit adjustment via 4" STN display, 4 gray scales, 512 KB memory				**2**								
Operation with PLC, frequency converter, limit adjustment via 4" STN display, 4 gray scales, 512 KB memory				**3**								
Special version, e.g. operation with FC, display with 256 colors				X								
8	**Output according to macerator motor**											
Output 1.5 kW					A							
Output 2.2 kW					B							
Output 3.0 kW					C							
Output 4.0 kW					D							
Output 5.5 kW					E							
Output 7.5 kW (only available with FC)					F							
Output 9.2 kW (only available with FC)					G							
Output 11.0 kW (only available with FC)					H							
Output 15.0 kW (only available with FC)					I							
Output 18.5 kW (only available with FC)					J							
Output 22.0 kW (only available with FC)					K							
Output 30.0 kW (only available with FC)					L							
Special version					X							
9	**Extension of the control unit with reversing contactor combination for pump** (identical or max. two output levels above the macerator output)											
Output 1.5 kW (direct start)						A						
Output 2.2 kW (direct start)						B						
Output 3.0 kW (direct start)						C						
Output 4.0 kW (direct start)						D						
Output 5.5 kW (direct start)						E						
Output 7.5 kW (with star-delta connection)						F						
Output 9.2 kW (with star-delta connection)						G						
Output 11.0 kW (with star-delta connection)						H						
Output 15.0 kW (with star-delta connection)						I						
Output 18.5 kW (with star-delta connection)						J						
Output 22.0 kW (with star-delta connection)						K						
Output 30.0 kW (with star-delta connection)						L						
without extension with reversing contactor combination for pump						0						
Special version						X						

Type code	1-3 Equipment group	4-5 Type	6 Macerator	7 Version and display	8 Output (acc. to macerator)	9 Extension with reversing contactor for pump	10 Extension with FC for pump	11 Extension for controlling macerator when pump is connected	12 Pressure control extension for connected pump	13 Temperature control extension for connected pump	14 ff Special equipment	Version
10	**Extension of the control unit with frequency converter for pump** (identical or max. two output levels above the macerator output)											
Output 1.5 kW							A					
Output 2.2 kW							B					
Output 3.0 kW							C					
Output 4.0 kW							D					
Output 5.5 kW							E					
Output 7.5 kW							F					
Output 9.2 kW							G					
Output 11.0 kW							H					
Output 15.0 kW							I					
Output 18.5 kW							J					
Output 22.0 kW							K					
Output 30.0 kW							L					
Special version							X					
11	**Extension for controlling the macerator (when a pump is connected)**											
For external controlling (not as standard with integrated pump!)								A				
For float switch for fill level measurements								B				
For infrared sensor for fill level measurements ("IR sensor")								C				
For pressure probe for fill level measurements								D				
Version for radio control								E				
No extension in this category								0				
12	**Extension for evaluating pressure monitoring devices for controlling a connected pump**											
For Börger pressure monitoring device									A			
For pressure transmitter									B			
For pressure transmitter and evaluation unit (e.g. RIA45 by Endress and Hauser)									C			
No extension for evaluating pressure measurements									0			
13	**Extension for evaluating temperature monitoring devices for controlling a connected pump**											
With evaluation unit WIKA CS4R for PT100 on mounting rail inside the control cabinet										A		
With evaluation unit WIKA CS4R for PT100 in control cabinet door										B		
Extension for temperature transmitter (via PLC)										C		
Evaluation unit for temperature transmitter										D		
No extension for evaluating temperature measurements										0		
14 ff	**Special equipment**											
Version for more than one macerator											X	
Integrated timer control or function for interval operation											X	
Other special equipment according to order											X	
	Serial number											
Version as of August 2014												V2
Your type code												V2

9.3 Checklist for commissioning

This checklist can be used as an additional aid when commissioning a macerator with a STE-RS control unit.
It is not a substitute for careful reading of the operating manual before commissioning the unit.

Customer:		**Börger order confirmation no.:**	
Machine number:		**Type code:**	
Your project:		**Order number:**	
Commissioning date:		**Delivery date:**	
Test point		**Carried out by:** (date / signature)	**Checked by:** (date / signature)
1	Operating manual and its appendices read and understood		
2	The factory default operating parameters are adequate for the application, the substrate being fed is appropriate		
3	System components professionally mounted according to the operating manuals of the components; control unit professionally mounted on a straight, dry wall / a suitable holding frame.		
4	Secure position of terminal and fastening screws checked and tightened again, where necessary		
5	Macerator installed correctly as described in the operating manual and ready for operation		
6	Power supply and any external control units properly connected		
7	Control unit closed, keyholder duty assigned		
8	Function check according to chapter 5.1.1 and 5.1.4 carried out without faults		
9	Data entry permissions discussed and password changed and safely stored according to chapter 5.1.2.		
10	Actual current consumption of macerator tested, current consumption is acceptable (i.e. constantly lies below the stored limit for reversing as described in chapter 5.1.5)		
11	If required, parameters for reversing adjusted as described in chapter 5.1.5		
12	UV cover, if applicable, closed during operation		
13	Maintenance and inspection intervals organized for the machine		

9.4 EC Declaration of Conformity

EG-Konformitätserklärung

EC-Declaration of conformity
Déclaration de conformité EC
EG-Conformiteitsverklaring

Börger GmbH
Benningsweg 24
46325 Borken-Weseke
Deutschland

Hiermit erklären wir, dass die folgenden Produkte:
Herewith we declare, that the product described below:
Par la présente, nous déclarons ci après que les produit suivantes:
Hiermee verklaren wij, dat de navolgende producten:

Produktbezeichnung: Type of machinery: Nom type: Productomschrijving:	Steuerung Control cabinet Commande Bediening
Produktlinie: Productline, Ligne de produits, Productlijn:	Reversiersteuerung Reverse Control Unit
Typenbezeichnungen: Models, Modèles, Typeaanduidingen:	STE-RSM XXX STE-RSR XXX STE-RSU XXX

Seriennummer: ab / valid as from / valable dès / geldig sinds: 13000000 – 1.X
Serial numbers, Numéro de série, Serial numbers:

Baujahr: ab / valid as from / valable dès / geldig sinds: 2013
Year of manufacture, Année de construction, Bouwjaar:

Die Steuerung entspricht allen Bestimmungen der Richtlinien **Elektrische Betriebsmittel (2006/95/EG)** und **Elektromagnetische Verträglichkeit (2004/108/EG).**
The control is complying the **Low Voltage Directive (2006/95/EC)** and the **EMC Directive (2004/108/EC)**.
L'ensemble de ces produits sont conformes aux directives **Basse tension (2006/95/CE)** et **électromagnétique (2004/108/EC).**
De machines voldoen alle eisen van de richtlijn **Elektrische bedrijfsmiddelen (2006/95/EG)** en **Elektromagnetische verdraagbaarheid (2004/108/EG).**

Folgende harmonisierte Normen wurden angewandt:
Used European standards:
Les normes suivantes ont été harmonisées:
Navolgende geharmoniseerde normen zijn van toepassing:

EN 50178
EN 60529
EN 60204-1
EN ISO 12100

Name und Adresse des Dokumentationsbevollmächtigten: Ansgar Riers - Börger GmbH
The person authorised to compile the relevant technical documentation:
Nom du rédacteur documentaire et adresse:
Naam en Adres van de documentatiegevolmachtigde:

Borken-Weseke,

23.09.2014 — Datum / Date

Alois Börger – Geschäftsführer
Unterzeichner und Angaben zum Unterzeichner
Authorized subscriber / Signataire et indications concernant le signataire

Unterschrift / Signature

Börger GmbH | Benningsweg 24 | 46325 Borken-Weseke | GERMANY | Tel: +49 (0) 28 62 / 91 03-0 | www.boerger.de

9.5 Additional documentation

Further, separate supplementary operating manuals for special versions are part of this operating manual.

- Observe these documents.

9.6 Supplier documentation

- You must completely read the separate supplier documentation and consider it accordingly.

We hope that we have clearly described all the relevant operating steps in this operating manual. However, the operating conditions are so multi-faceted that a general operating manual cannot answer all questions entirely.

If you have any questions, please contact Börger customer service. We will be happy to help.

We would also be grateful to receive feedback on any errors or unclear passages in this operating manual. This will help us to improve and develop this document and to offer you and all of our customers the best possible service.