

Operating Instructions

Controller Smart Box



Translation of the Original Operating Instructions EN

■ Controller Smart Box (230 V/50 Hz) ⇨ Order no: 50371863

Dear Customer

Thank you for choosing our products and placing your trust and confidence in our company!

This software manual contains all essential information you need about your product. Our aim is to provide the required information as concisely and clearly as possible. If, however, you still have any questions on the contents or suggestions, please do not hesitate to contact us. We are always grateful for any feedback.

Our team will also be glad to answer any further question you may have regarding the controller or other options.

We wish you every success with our products!

With kind regards

Your Afag team

© Subject to modifications

The controllers have been designed by Afag GmbH according to the state of the art. Due to the constant technical development and improvement of our products, we reserve the right to make technical changes at any time.

Updates of our documentations



Unlike the printed documents, our digital instructions manuals, product data sheets and catalogues are being continuously updated on our website.

Please keep in mind that the digital documents on our website are always the latest versions.

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1 General

1.1 Contents and purpose of this manual

These assembly instructions contain essential information on assembly, commissioning, functioning and maintenance of the controller to ensure safe and efficient handling and operation.

Consistent compliance with these operating instructions will ensure:

- permanent operational reliability of the controllers,
- optimal functioning of the controllers,
- timely detection and elimination of defects (thereby reducing maintenance and repair costs),
- prolongation of the controller's service life.

The illustrations in this manual shall provide you with a basic understanding of the module and may vary from the actual design of your module.

1.2 Explanation of symbols

The safety notes are marked by a pictogram and a signal word. The safety notes describe the extent of the hazard.

DANGER



Danger!

This safety note indicates an imminently hazardous situation which, if not avoided, will result in death or severe injury.

WARNING



Warning!

This safety note points out a potentially hazardous situation which, if not avoided, could result in death or severe injury.

CAUTION



Caution!

This safety note points out a potentially dangerous situation which, if not avoided, can result in minor or slight injuries.

NOTICE




This safety note points out a potentially dangerous situation which, if not avoided, can cause substantial damage to property and the environment.



This note contains important additional information as well as useful tips for safe, efficient, and trouble-free operation of the controllers.

Further warning signs:

Where applicable, the following standardized symbols are used in this manual to point out the various potential health risks.

	Warning - Dangerous electrical voltage.
	Warning - Risk of hand and finger injury due to uncontrolled movements of components.
	Warning - Magnetic field

1.3 Additional symbols

In these assembly instructions the following symbols are used to highlight instructions, results, references, etc.

Symbol	Description
1.	Instructions (steps ...)
⇒	Results of actions
↻	References to sections
■	Enumerations not ordered

1.4 Warranty

The warranty terms for Afag feeding components and handling systems are the following:

- 24 months from initial operation and up to a maximum of 27 months from delivery.
- Wear parts are excluded from the warranty (The customer is entitled to a product free of defects. *This does also apply to defective accessories and wear parts. Normal wear and tear are excluded from the warranty.*)

The warranty covers the replacement or repair of defective Afag parts. Further claims are excluded.

The warranty shall expire in the following cases:

- Improper use of the handling system.
- Non-observance of the instructions regarding installation, commissioning, operation, and maintenance.
- Improper assembly, commissioning, operation, and maintenance.
- Repairs and design changes carried out without prior technical instructions of Afag.
- Removing the serial number from the product.
- Non-observance of the EC Machinery Directive, the Accident Prevention Regulations, the Standards of the German Electrotechnology Association (VDE) and these safety and assembly instructions.

1.5 Liability

No changes shall be made to the controllers unless described in this manual or approved in writing by Afag.

Afag accepts no liability for unauthorized changes or improper assembly, installation, commissioning, operation, maintenance, or repair work.

2 Safety instructions

2.1 General

This chapter provides an overview of all important safety aspects to ensure safe and proper use of the controllers and optimal protection of personnel.

Safe handling and trouble-free operation of the controller requires knowledge of the basic safety regulations.

Every person carrying out installation, commissioning, maintenance work or operating the controllers must have read and understood the complete user manual, especially the chapter on safety instructions.

Beyond this, there are rules and regulations regarding accident prevention that are applicable to the place of installation which must be observed.



Failure to follow the directions and safety instructions given in this instructions manual may result in serious hazards.

2.2 Intended use

The electronic controllers are designed for use in industrial systems. The Smart Box is used for vibratory conveyor technology to link external controllers, sensors, and valves to form self-sufficient functional units.

The intended use of the module also includes:



- observance of all instructions given in this manual.
- compliance with the inspection and maintenance work and the specifications in the data sheets,
- using only original spare parts.

Improper use of the controller will invalidate the warranty.

2.3 Foreseeable misuse

Any use other than or beyond the intended use described is considered a misuse of the controller.

WARNING

Risk of injury if the controller is not used for its intended use or if it is foreseeable used incorrectly!



The improper use of the controller poses a potential hazard to the personnel.

- The controllers may only be used in a technically perfect condition in accordance with its intended use and the instructions in this manual as well as in compliance with the safety requirements!

2.4 Obligations of the operator and the personnel

2.4.1 Follow these instructions

A basic prerequisite for safe and proper handling of the controllers is a good knowledge of the basic safety instructions.



This manual, particularly the safety instructions contained therein, must be observed by all persons working with the controllers.

2.4.2 Obligations of the operating company

In addition to the safety instructions given in this manual, the operating company must comply with the safety, accident prevention and environmental protection regulations valid for the field of application of the controller.

The operating company is required to use only personnel who:

- have the necessary professional qualifications and experience,
- are familiar with the basic rules regarding occupational safety and accident prevention,
- have been instructed in the correct handling of the controllers,
- have read and understood these operating instructions.

The operating company is also required to:

- monitor on an ongoing basis that the personnel work safely considering any potential hazard involved and the operating instructions are observed,
- ensure that the operating instructions are always kept at hand at the installation in which the controllers are mounted,
- observe and communicate universally applicable laws and regulations regarding accident prevention and environmental protection,
- provide the necessary personal protective equipment (e.g., protective gloves) and instruct the personnel to wear it.

2.4.3 Obligations of the personnel

All personnel working with the modules are required to:

- read and observe these operating instructions, especially the chapter on safety,
 - observe the occupational safety and accident prevention regulations,
 - observe all safety and warning signs on the modules,
 - refrain from any activity that might compromise safety and health.
-



In addition, the personnel must wear the personal protective equipment required for carrying out their work. (➔Chapter 2.6).

2.5 Personnel requirements

2.5.1 Personnel qualification

The activities described in the operating instructions require specific requisites at the level of professional qualifications of the personnel.

Personnel not having the required qualification will not be able to assess the risks that may arise from the use of the controllers thus exposing himself and others to the risk of severe injury. Therefore, only qualified personnel may be permitted to carry out the described activities on the controllers.

These operating instructions are intended for skilled personnel (installers, system integrators, maintenance personnel, technicians), electricians and operating personnel.

The following is a description of the professional skills (qualifications) required for carrying out the different activities:

Qualified personnel:

Qualified personnel with appropriate training who are qualified due to their special knowledge and fully familiar with the machine and who have been given instructions on how to carry out the task entrusted to them safely.

Qualified electrician:

Persons who have obtained their electrical qualifications through appropriate professional training and complementary courses that enables them to identify risks and prevent hazards resulting from electricity.

Operator (trained personnel):

Authorized persons who due to their specialized professional training, expertise and experience can identify risks and preventing hazards arising from the use of the machine.

2.6 Personal protective equipment (PPE)

The personal protective equipment serves to protect the personnel from hazards affecting their safety and health at work.

When working on/with the controller, the personnel must use the protective equipment assigned by the safety officer of the operating company or as required by safety regulations. In addition, the personnel are required to:

- wear the personal protective equipment provided by the operating company (employer),
- check the personal protective equipment for proper condition, and
- immediately notify the person responsible on site of any defects found on the personal protective equipment.

2.7 Changes and modifications

No changes may be made to the controller which have not been described in these operating instructions or approved in writing by Afag.

Afag accepts no liability for unauthorized changes or improper assembly, installation, commissioning, maintenance, or repair work.

2.8 General hazards / residual risks

Observe the safety instructions in this chapter and in the other sections of this manual to avoid damage to property and dangerous situations for the personnel.

2.8.1 General hazards at the workplace

The controller has been built according to the state-of-the-art and the applicable health and safety requirements. However, improper use of the controller may cause the following hazards to the personnel:

- danger to life and limb of the operator or third parties,
- on the controller units themselves,
- property damage.

2.8.2 Danger due to electricity



DANGER

Risk of injury due to electric shock!

Work on the electrical system carried out unprofessionally can cause serious or fatal injuries.

- Work on the machine's electrical equipment may only be performed by skilled electrician or trained personnel under the supervision of a skilled electrician in accordance with all relevant electrical regulations.
-

3 Technical data

3.1 Dimensional drawing of controller Smart Box

Type	Smart Box
A	175 mm
B	80 mm
C	61.5 mm
D	10 mm
E	25 mm

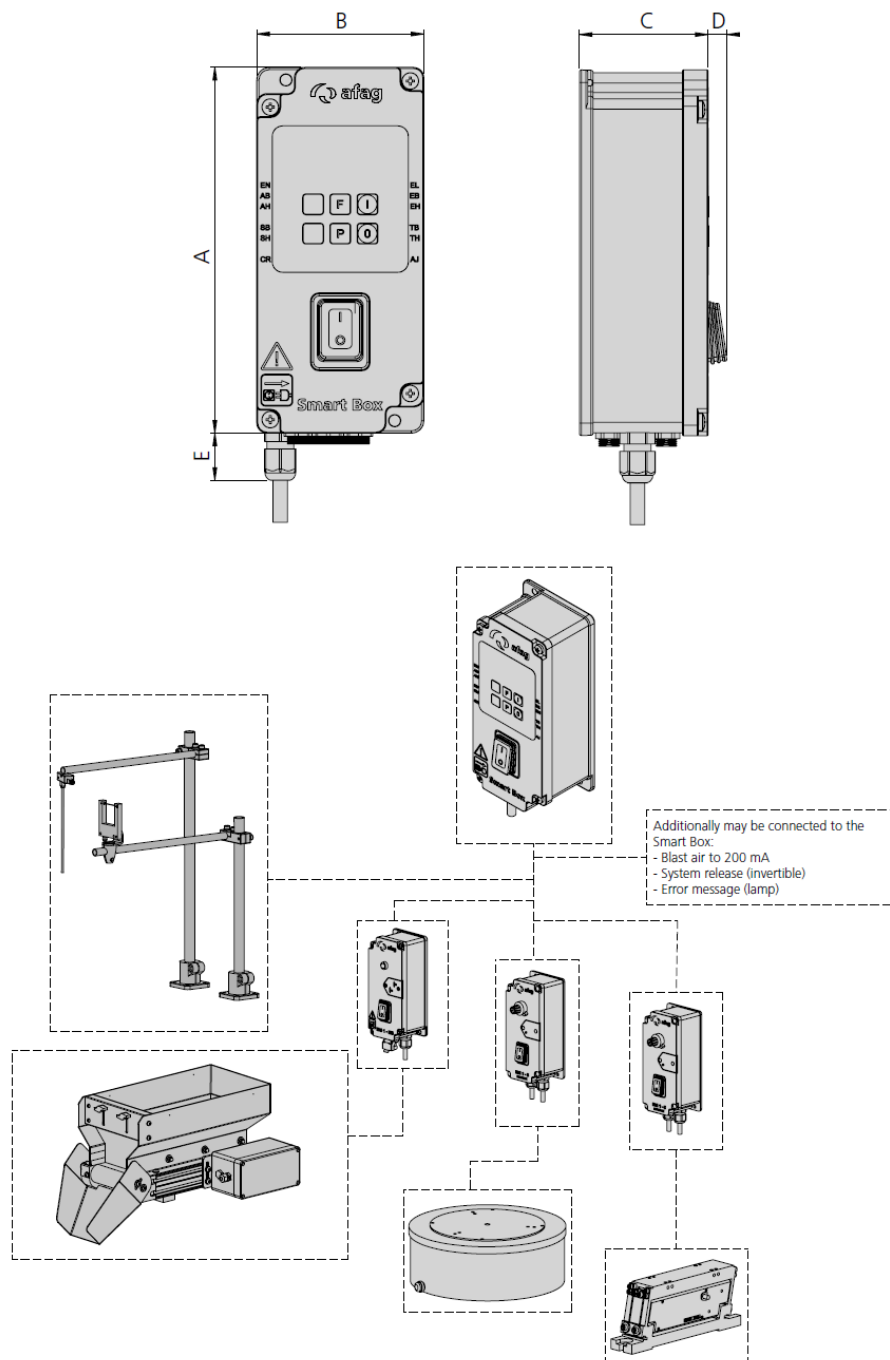


Fig. 1 Dimensional drawing of controller Smart Box

3.2 Technical data

Smart Box	
Operating temperature	0 - 45 °C
Type	Smart Box
Order number	50371863
Short-circuit proof	•
Max. current blast air valve	200 mA
Max. current sensor	1 A
Input voltage	230/115 VAC
Output voltage	24 V
Control input	24 VDC
Net weight	0.8 kg
Blast air valve	M8/3
Fuses	M2A/250 V
Conveyor outputs	3 x M8/4-pol.
Operating mode display	LED
Sensor inputs	2 x M8/3-pol.
Multi-function output	M8/3-pol.
System release	M8/3-pol.
Protection type	IP54

Note: • = existent

3.3 Accessories

Type	Designation	Order Number
Support	for 1 IRG	50450178
	for 2 IRG	50450179
	for 1 IRG extended	50450145
	for 2 IRG extended	50450147

3.4 Connection cable

Type	Designation	Order Number
M8, 3pin	Connection cable 0.3 m	15131112
	Connection cable 0.6 m	15057366
	Connection cable 1.0 m	15140502
	Socket with 5.0 m cable	15072201
M8, 4pin	Connection cable 0.3 m	50404465
	Connection cable 0.6 m	50404464
	Connection cable 1.0 m	50404370
	Socket with 5.0 m cable	15157148
Assembly key	For M8 with torque	50165144

4 Transport and storage

4.1 Scope of supply



The corresponding documentation is supplied with each controller.



Fig. 2 Scope of delivery Smart Box

[Unt]	Designation
1 x	Controller
1 x	Operating Instructions

4.2 Transport



No liability can be assumed for damages caused by improper installation on the part of the operating company.



The following conditions must be complied with for transport and storage:

- Storage temperature: 0-+45 °C
 - Relative air humidity: < 90%, non condensing
-

4.3 Storage

If the controller is stored for an extended period, observe the following:

- Store the controller in the transport packaging in a place.
- Do not store the telescope spindle axes outdoors or expose them to weather conditions.
- The storage space must be dry and dust free.
- Room temperature of the storage space: 0-50 °C.
- Relative air humidity: < 90% non condensing.
- Protect the controller from dirt and dust.

5 Design and function

5.1 Design of the controller

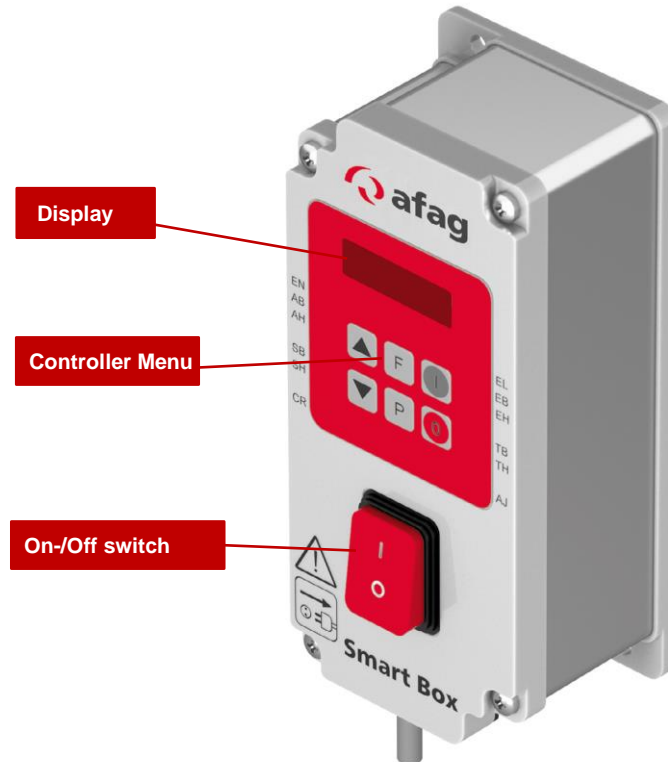


Fig. 3 Design of the Smart Box controller

5.2 Functional description

The Smart Box is used for vibratory conveyor technology to link external controllers, sensors, and valves to form self-sufficient functional units.

The Smart Box can be used to create the necessary functional links for a complete feeding station with linear, spiral and hopper conveyors. In addition, a air jet valve with adjustable lead and after-running time can be operated.

The Smart Box contains two input sockets (M8) for 24V PNP sensors, which are assigned to the accumulation monitoring, fill level monitoring, presence monitoring and linear feeder start/stop functions. The function of all sensor inputs can be inverted.

The external controllers for the vibratory feeders are controlled via 24V output signals via their enable inputs (start/stop).

A 24V air jet valve can be connected directly to the corresponding output.

The time delays for the individual function levels can be set via the integrated display. The states of the inputs and outputs are shown on the display via LEDs.

6 Mounting and installation

For safe operation, the module must be integrated into the safety concept of the system in which it is installed.



The system operator is responsible for the installation of the controller in a system!

6.1 Safety instructions



DANGER

Risk of injury due to electric shock!

Work on the electrical system carried out unprofessionally can cause serious or fatal injuries.

- Work on the machine's electrical equipment may only be performed by skilled electrician or trained personnel under the supervision of a skilled electrician in accordance with all relevant electrical regulations.
 - Disconnect the power supply before assembly and disassembly work and when making changes to the installation!
-



No liability for damages can be assumed for damages caused by improper installation on the part of the operator.



Observe the safety instructions in ➔ chap 2 „Safety instructions“ of these instructions

6.2 Assembly

Two holes are provided on the lower part of the housing for fastening the controller. These are separated from the interior of the housing.

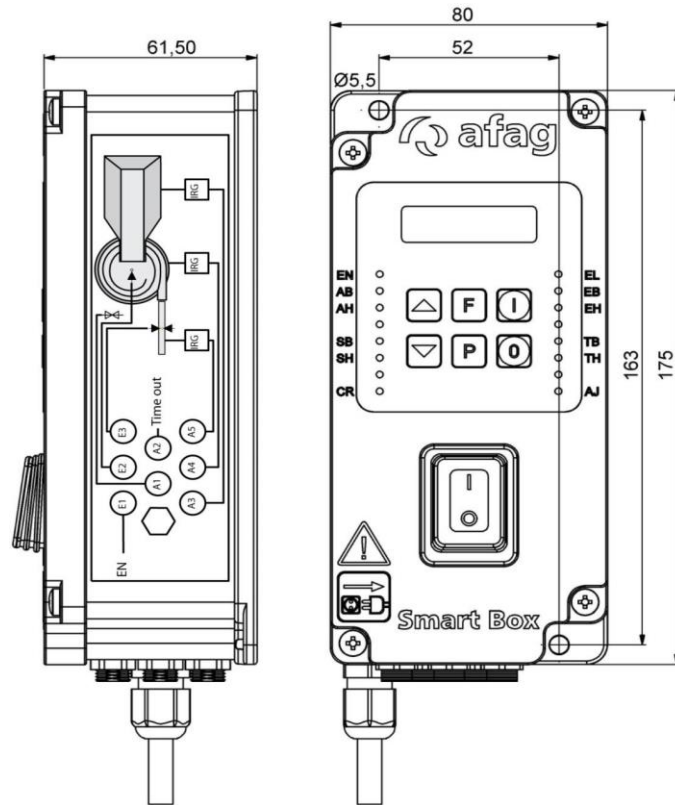


Fig. 4 Fixing holes for the Smart Box

6.3 Electrical connection

DANGER



Risk of injury due to electric shock!

Work on the electrical system carried out unprofessionally can cause serious or fatal injuries.

- Work on the machine's electrical equipment may only be performed by skilled electrician or trained personnel under the supervision of a skilled electrician in accordance with all relevant electrical regulations.

Important notes on the electrical connection

- Disconnect the supply voltage before assembly or disassembly work, as well as when changing fuses or modifying the structure.
- Emergency-STOP devices must remain effective in all operating modes. Unlocking the Emergency-STOP devices must not cause an uncontrolled restart!
- The electrical connections must be covered!
- Protective conductor connections must be checked for proper function after installation!
- Connect the device according to the connection instructions.
- Ensure correct earth connections!

Connecting the controller

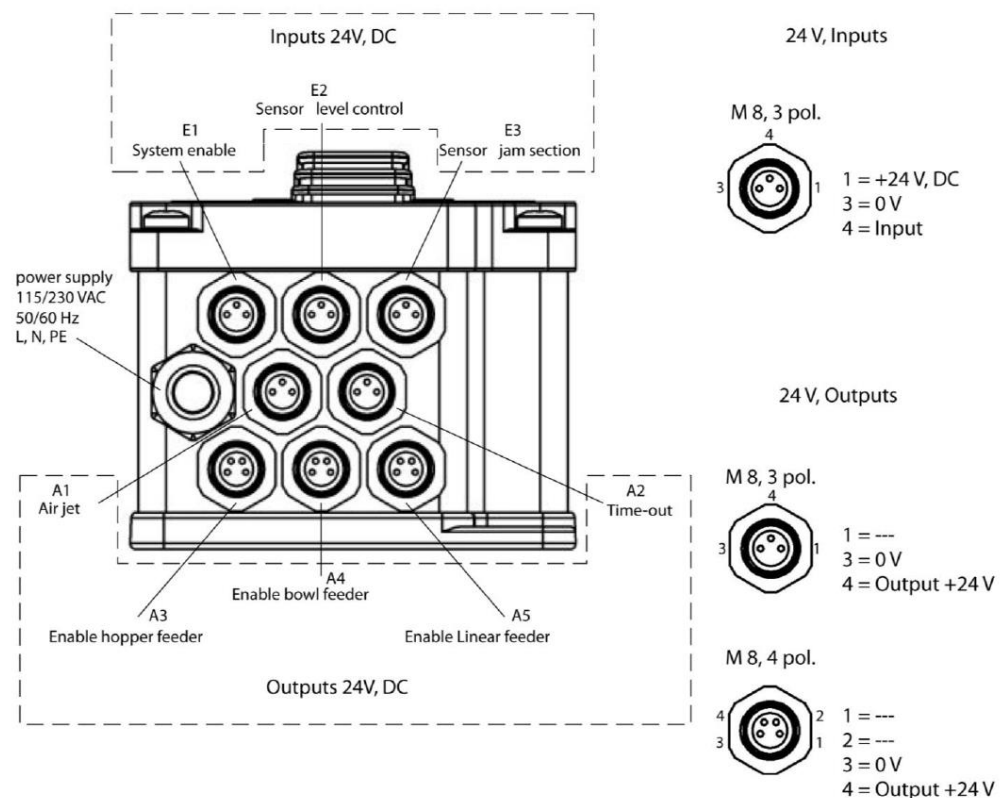


Fig. 5 Connection options for the Smart Box

7 Operation and settings

7.1 Safety instructions

NOTICE

Damage of the controller!

If the controller plug is plugged in or unplugged from the vibratory drive when the controller is switched on, the controller may be damaged!

- Never connect or disconnect the device plug to the vibratory drive when the controller is switched on!

7.2 General notes on settings



Basic settings:

New devices are supplied with basic settings ex works (➡ chap. 7.4.1).

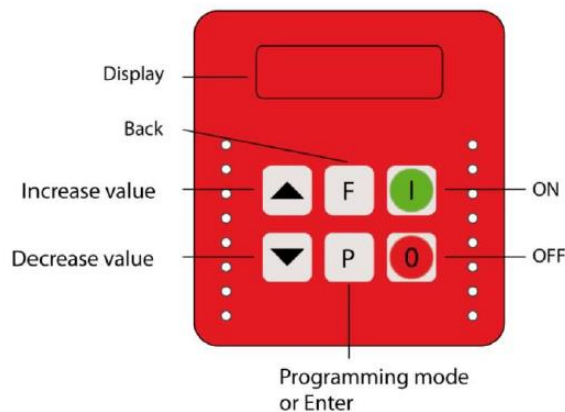
- If the device setting is unknown, first restore the basic setting via **menu 210 "FAC»**.

System-specific setting:

- Set system-specific values, then save with **menu C 143 "PUSH"** (can be restored via **C 210 "US.PA"**).

7.3 Menu control and displays

The controller settings are made via a menu control.




The various parameters are set by entering an access code.

All settings start by pressing the P button, followed by selecting the menu number using the arrow buttons.

Procedure:

- Increase/decrease display by one digit: ➡ Press arrow keys briefly
- Increase/decrease display by a power of ten: ➡ Press and hold arrow keys.
- Save changed settings: Setting values are saved after 60 seconds after leaving the menu or not pressing the buttons.

Description of the messages:

Messages	
FILL	Linear feeder filling process
STOP	Stop via  button
Hold	System release = "Off"
FULL	with the bowl feeder switched off

Description of the Smart Box displays:

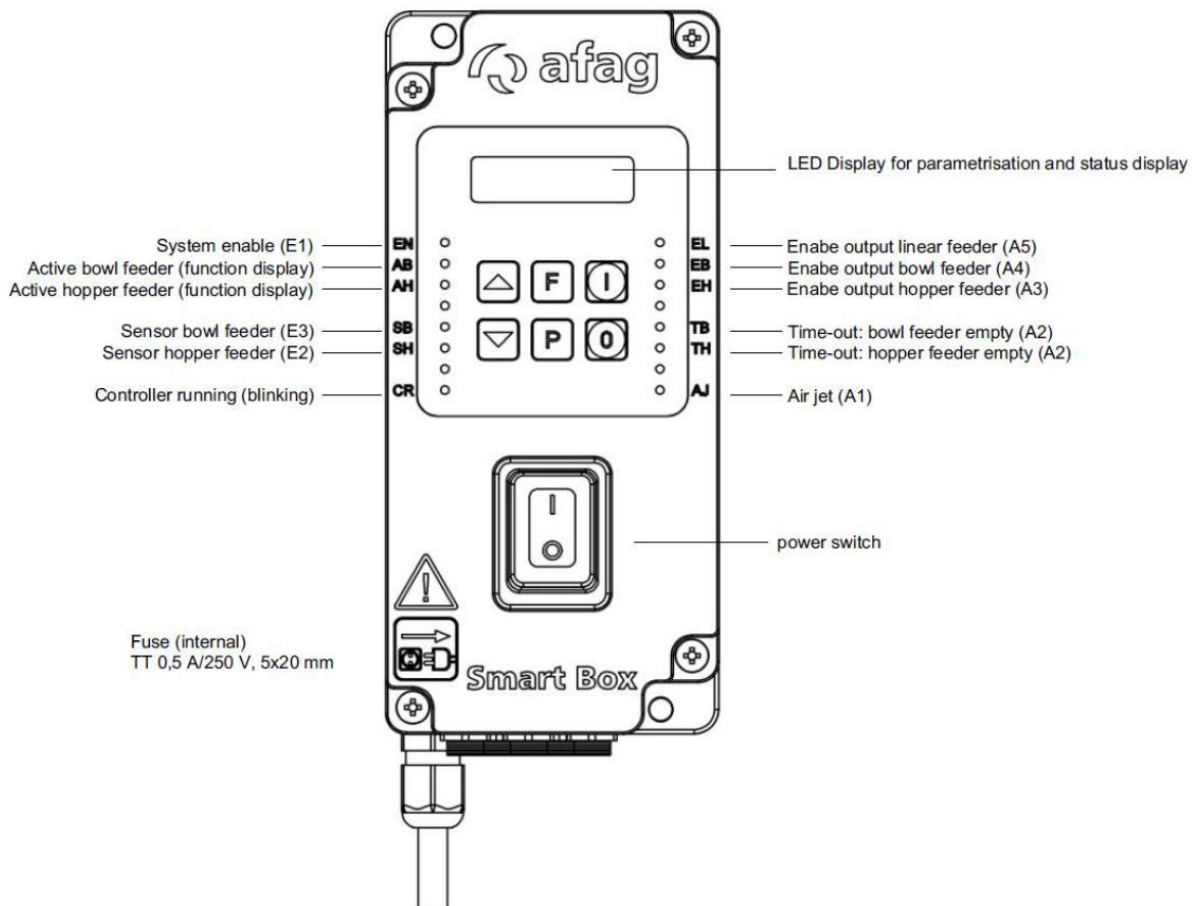


Fig. 6 Smart Box displays


7.4 Settings

7.4.1 Setting options

Setting options	Area	Code	Factory settings	Menu code
Invert system release	0 / I	-En	1	003
Switch-on delay hopper conveyor	099.9 Sec.	u.1.	1.0 Sec.	004
Switch-off delay hopper conveyor	099.9 Sec.	u.0.	1.0 Sec.	004
Sensor invert hopper conveyor	0 / I	u.-S.	0	004
Cycle operation hopper conveyor	0 / I	o.H.E.	0	004
Cycle On Time		H	0	004
Cycle Off time		h	0	004
Switch-on delay bowl feeder	0.. 99.9 Sec.	o.1.	1.0 Sec.	007
Switch-off delay bowl feeder	099.9 Sec.	o.0.	1.0 Sec.	007
Invert sensor bowl feeder	0 / I	o.-S	0	007
Air jet after-running time	099.9 Sec.	b.0.	1.0 Sec.	007
Air jet lead time	099.9 Sec.	b.1.	1.0 Sec.	007
Time-out (empty) STOP bowl feeder	0 / I	o.E.E.	0	015
Time-out (empty) Time bowl feeder	1... 240 Sec.	o.E.	240 Sec.	015
Time-out (empty) STOP hopper conveyor	0 / I	u.E.E.	0	015
Time-out (empty) time bunker conveyor	1... 240 Sec.	u.E.	240 Sec.	015
Invert time-out	0 / I	E.-E.	0	015
Hide program menus	0 / I	Hd.C.	0	117
Save user settings		PUSH.		143
Restore factory settings		FAC.		210
Restore user settings		US.PA.		210

Error messages

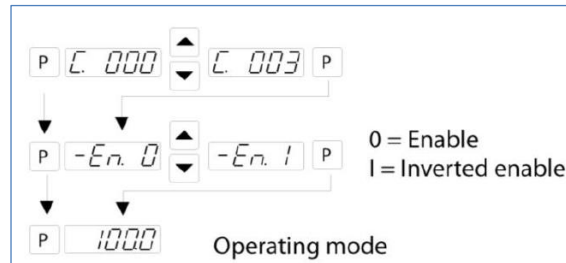


Error messages must be reset in menu no. C 009 with "Cl.err." .

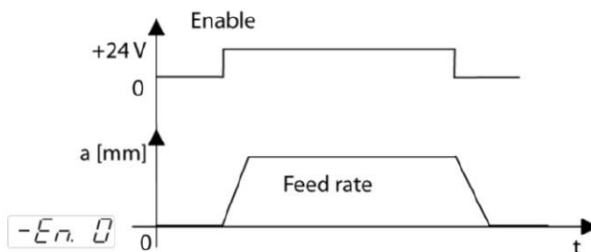
Please contact the manufacturer in the event of frequent error messages that are not described in this chapter!

7.4.2 System release - Code C 003

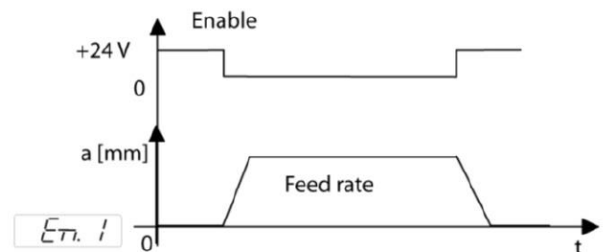
Input E1



+24 V signal or closed contact releases output

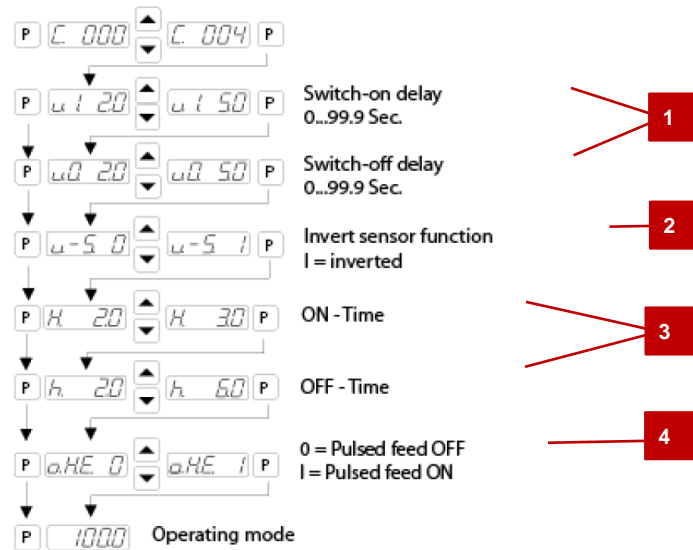
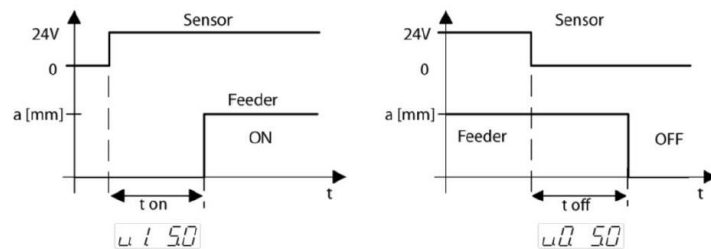
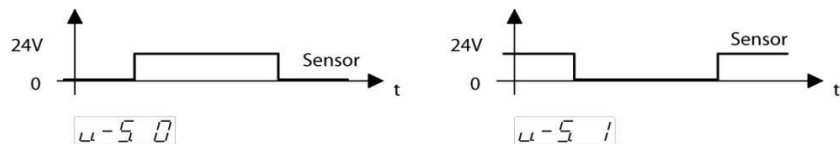
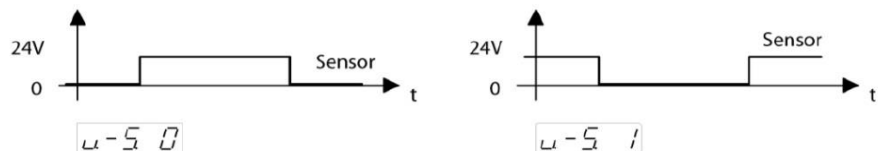
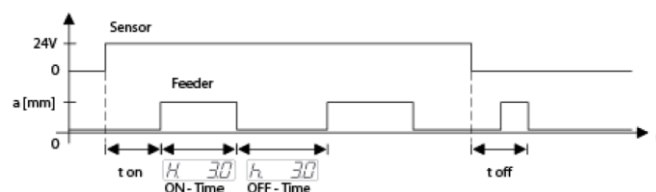


+24 V signal or closed contact blocks output



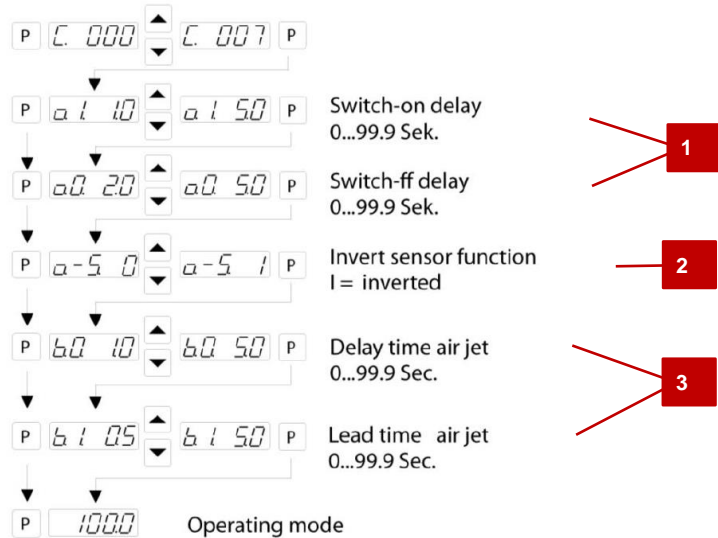
7.4.3 Hopper conveyor level control - Code C 004

Sensor input E2, output A3


1 Setting the switch-on and switch-off delay

2 Invert sensor function

3 Output clocks with adjustable ON-OFF times

4 Setting the cycle time


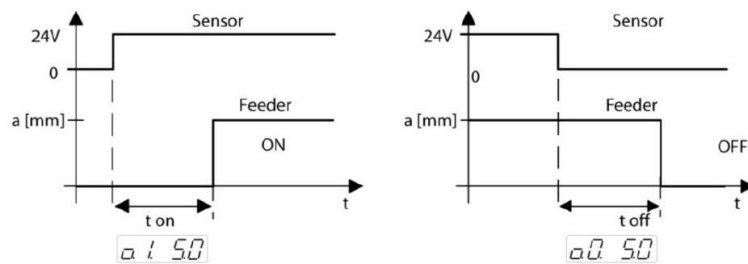
7.4.4 Bowl feeder status line, air jet - Code C 007

Sensor input E3, air jet A1, output A4



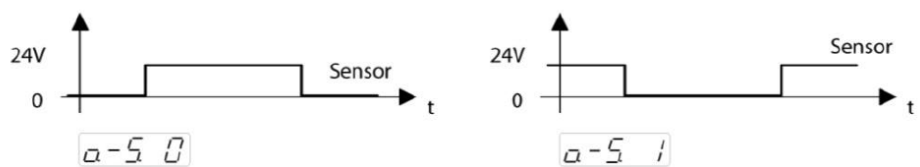
Setting the switch-on and switch-off delay (without air jet)

1



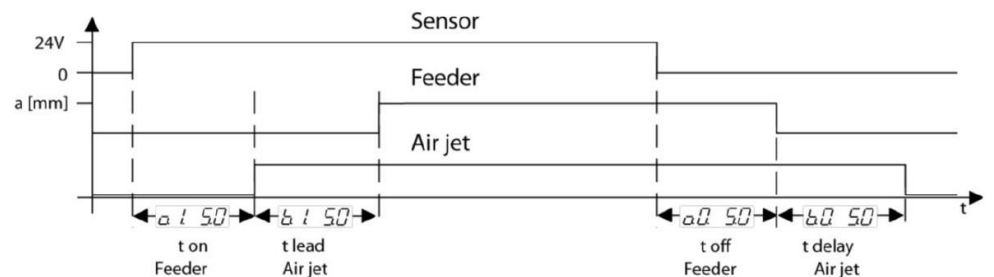
2

Invert sensor input



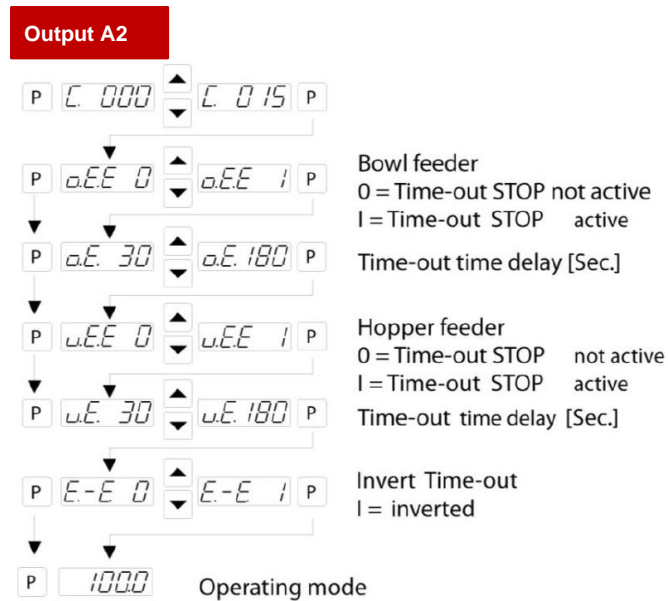
3

Air jet



Additional setting of the lead and after-running time for 24 V blast air output. To deactivate the air jet: set b.1 to 0.0 sec.

7.4.5 Sensor time-out (empty signal) - Code C 015



Time-out STOP

Activate STOP sensor monitoring.

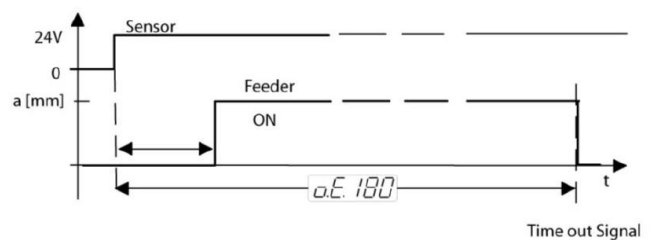


If no conveyor section is detected after the set time-out time has elapsed, a 24 V, DC signal is generated.

With set o.E.E. = 1, the conveyor switches off.

- o.E.E. 0 STOP not active
- o.E.E. 1 STOP active

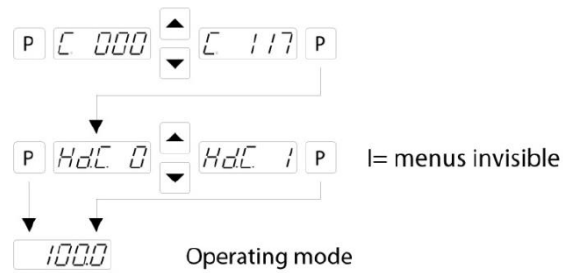
STOP active = feeder will be turned off after timeout



To quit the "Time-out"-notification or "Time-out STOP" :

- press or: enable flank: < 0,5 Sec.

7.4.6 Block access - Code C 117



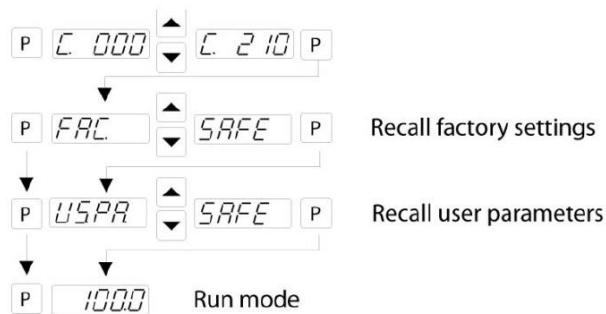
Hide program menus

- HdC 1 Parameter menus cannot be accessed
- HdC 0 Parameter menus can be accessed

7.4.7 Saving user parameters - Code C 143



7.4.8 Load user parameters - Code C 210



8 Maintenance

8.1 Safety instructions

DANGER



Risk of injury due to electric shock!

Work on the electrical system carried out unprofessionally can cause serious or fatal injuries.

- Work on the machine's electrical equipment may only be performed by skilled electrician or trained personnel under the supervision of a skilled electrician in accordance with all relevant electrical regulations.




Also observe the safety instructions in  chap. 2 „Safety instructions“ in this manual.

8.2 Maintenance activities and maintenance intervals



The controller is maintenance-free. Only the fuse needs to be replaced if necessary.

8.2.1 Maintenance point

No.	Maintenance point	Maintenance work	Interval	System [On/Off]	Remarks
1	Fuse	Check, replace if necessary 	As required	[Off]	-

- Replace the fuse as needed:

8.2.2 Replacing the fuse

Procedure:

1. Pull out the mains plug.
 2. Loosen the housing cover screws and remove the housing.
 3. Replace defective fuse (1).
 4. Close the housing again.
- ⇒ The process is completed.

8.3 Spare and wear parts, repairs

Afag offers a reliable repair service. Defective devices can be sent to Afag for warranty repair within the warranty period.



Repair work may only be carried out by qualified personnel! We recommend that you have the repair carried out at our premises.

9 Decommissioning and disposal

The controller must be properly dismantled after use and disposed of in an environmentally friendly manner.

9.1 Safety instructions



WARNING

Risk of injury due to improper decommissioning and disposal!

Improperly carried out activities can result in considerable material damage and severe injury.

- Only use trained specialist personnel to carry out the activities.
 - Disconnect the media supply before dismantling the module!
 - Only remove module when the controller is switched off and secured!
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9.2 Disposal

Appliances that are no longer usable should not be dismantled and recycled as a whole unit, but rather in individual parts and according to the type of material. Non-recyclable components must be disposed of appropriately.

NOTICE

Risk to the environment due to incorrect disposal of the controllers!

Environmental damage can be caused by improper disposal.

- Electronic parts, electrical scrap, auxiliary and operating materials must be disposed of by approved specialist companies.
 - Information on proper disposal can be obtained from the responsible local authorities.
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