Operating Instructions

Controller
PSG1

Translation of the Original Operating Instructions EN

■ Controller PSG1 (230 V, 50/60 Hz) ⇨ Order no: 50211833

Dear Customer

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

These operating and installation instructions contain 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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Table of contents

1 General

1.1 Contents and purpose of this manual

These operating and installation instructions contain valuable 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 controllers' 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 handling 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 GmbH.
- 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 devices described here are electrical equipment for use in industrial systems. The controller is designed to control vibratory conveyors with a piezo vibratory system.

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 assembly 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 assembly 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 (➲chap. 2.6).

2.5 Personnel requirements

2.5.1 Personnel qualification

The activities described in the assembly 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 GmbH.

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 Dimensioned drawing controller PSG1

Type	PSG1
A	93 mm
B	205 mm
C	172.5 mm
D	5 mm
E	193 mm
F	60 mm
G	6.5 mm
H	9 mm

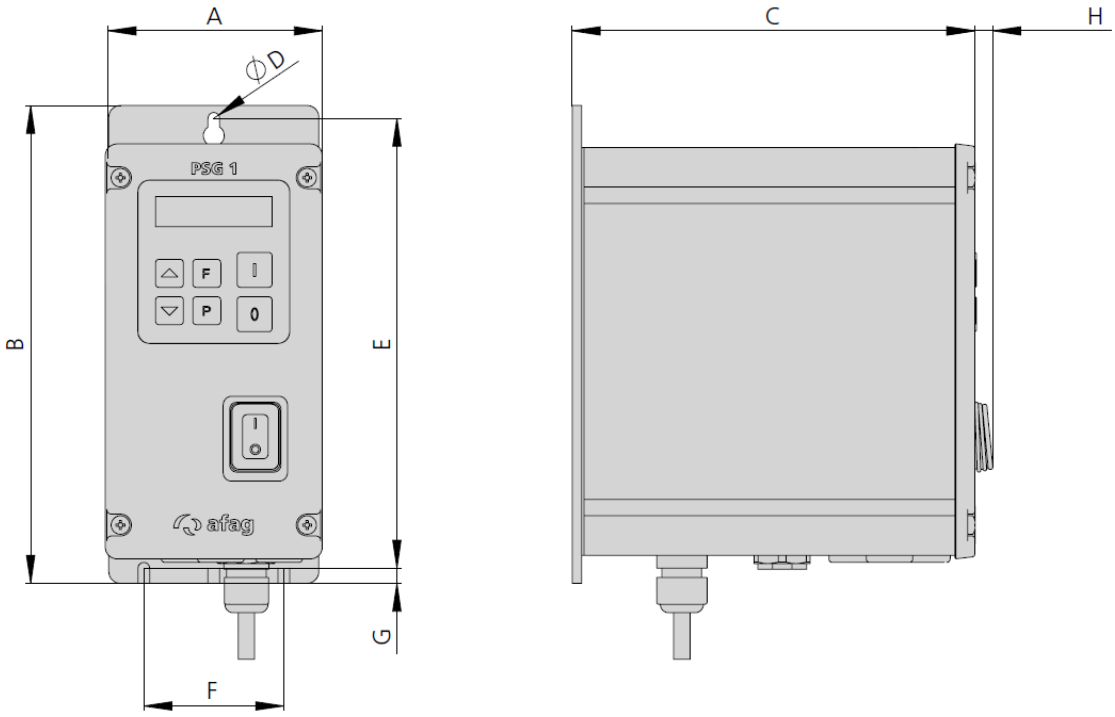

Fig. 1 Dimensional drawing of PSG1 controller

3.2 Technical data

PSG1	
Operating temperature	0 - 45 °C
Bearing temperature	-10 - 80 °C

Type	PSG1
Order number	**50211833**
External target value preset	0 - 20 mA (DC)
Nominal output current	pp/100 mA
Output frequency	5 - 300 Hz (preset: 75 ÷ 300) Hz
Frequency	50/60 Hz
Input voltage	230 VAC
Output voltage	-30 - 150 V
Control input	Contact or 24 VDC
Net weight	2.5 kg
Recommended pre-fuse	10 A, Type D MCB
Protection type	IP54

3.3 Accessories

Type	Designation
plug-and-socket connection	Output connector: Flange connector: 99-4805-00-03

4 Transport, packaging and storage

4.1 Scope of supply

The corresponding documentation is supplied with each controller.

Fig. 2 Scope of delivery PSG1

[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 Packaging

The controller is transported in the Afag GmbH transport packaging. If no Afag packaging is used, the controller must be packed in such a way that it is protected against shocks and dust.

NOTICE

Risk to the environment due to incorrect disposal of the packaging material.

Environmental damage can be caused by incorrect disposal of the packaging material.

- Dispose of the packaging material in an environmentally sensitive way in accordance with the local environmental regulations.

4.4 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 description

5.1 Design of the controller

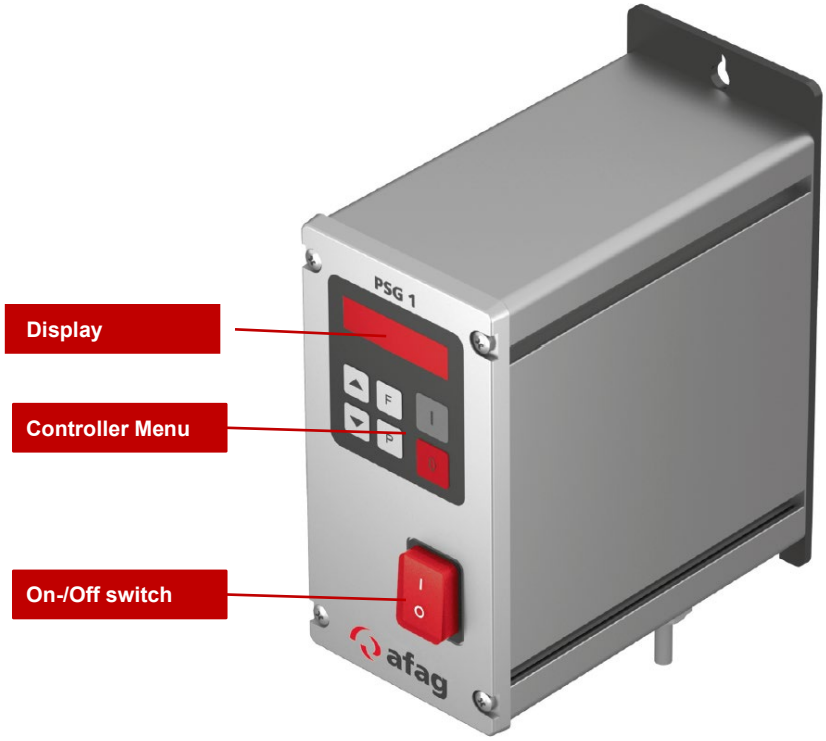

Fig. 3 Design of the PSG1 controller

Even the smallest solenoids can be operated safely on the PSG1 controller!

5.2 Description

The PSG1 is a frequency inverter for operating vibratory conveyor systems with piezo drive. It generates an adjustable drive frequency that is independent of the mains frequency. The output voltage is adapted to the piezo unit so that voltages in the range between -30 and 150 V are generated.

The device also offers a constant delivery rate in the event of mains voltage fluctuations thanks to internal compensation. The device can be controlled via an enable input without causing the upstream capacitors to charge and discharge (start/stop).

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6 Mounting, installation and commissioning

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 warranty will be granted for damage caused by improper installation on the part of the operating company.

Observe the safety instructions in ➲ chap. 2 "Safety instructions" of this manual as well as the instructions in ➲ chap. 6.

6.2 Assembly

Fastening the controller

There are three slotted holes on the back of the controller for fastening. The controller can be operated vertically or horizontally.

6.3 Installation / 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.

NOTICE

Risk of malfunction or damage to the circuit board!

Incorrectly set slide switches can lead to a malfunction or damage to the circuit board.

- Set the slide switch only for the respective application!

NOTICE

Danger of malfunction!

Electrical appliances, equipment and rooms must be protected from the influence of electrical, magnetic, and electromagnetic fields by shielding to prevent faulty operation.

- The connection between the controller and the vibratory conveyor must be made with a shielded cable!

NOTICE

Charging current peak at switch-on!

Internal capacitors cause a charging current peak at the moment of switch-on. If several appliances are switched on at the same time, the upstream fuses may be tripped.

- It is recommended to use slow-blow fuses or automatic circuit breakers with a slow tripping characteristic (e.g.: "D")!

6.3.1 Connection options

External connection

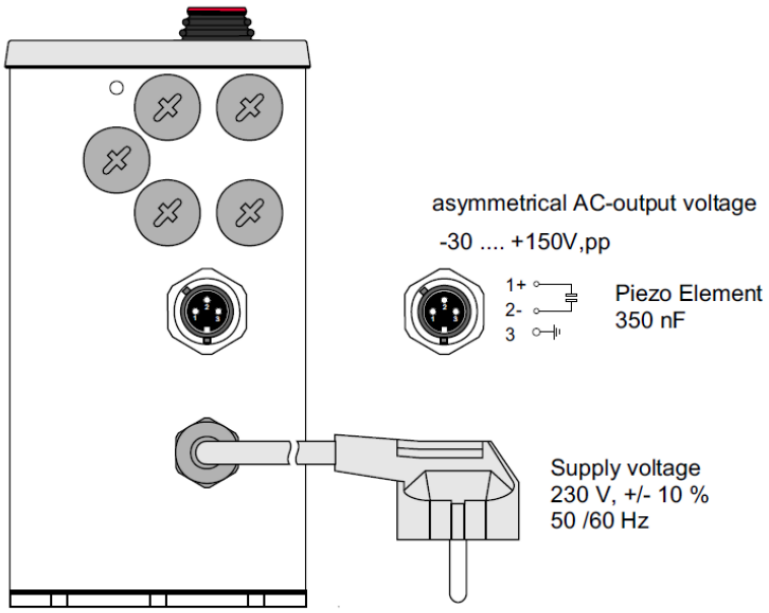


Fig. 4 External connection PSG1

Internal connection

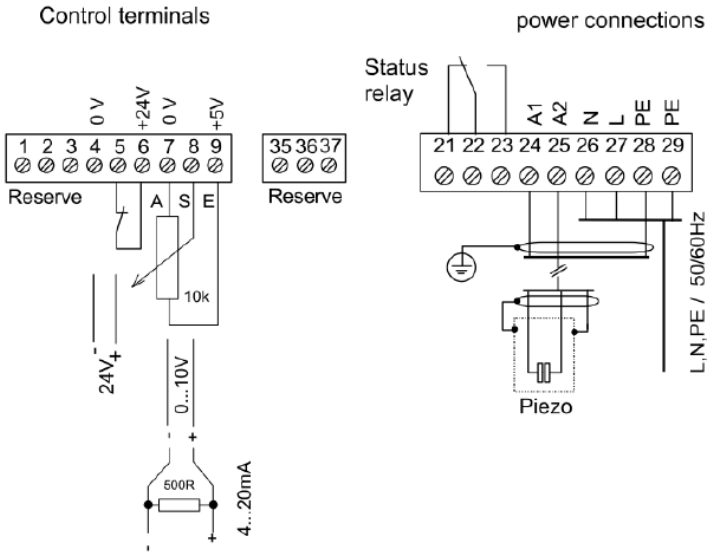


Fig. 5 Internal connection PSG1

Designation for plug connectors (see also Accessories ➲ chap. 3.3).
Output connector: Flange connector: 99-4805-00-03

6.3.2 Notes on the electrical connection

- Disconnect the supply voltage before assembly or disassembly work, as well as when changing fuses or modifying the structure.
- The rated voltage must match the local mains voltage!
- 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!
- Ensure correct earth connections!

6.4 Commissioning

The following points must be checked or ensured before commissioning:

- The mains voltage, the operating voltage of the conveyor and the device input voltage must match.
- The connected load of the conveyor must be within the device power range.
- Determine the type of mechanical oscillation frequency of the conveyor.
- Ensure correct earth connections!

Procedure for commissioning:

1. Before commissioning, check whether the rated voltage of the device matches the local mains voltage.
2. Plug in the mains plug of the controller.
3. Switch on the controller.
4. Set the operating frequency of the vibratory feeder according to the setting instructions on the keypad.

   ⇨ The process is completed.

7 Operation

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!

NOTICE

Damage to the controller due to incorrect control input!

If the load circuit is interrupted via a switch or relay, the controller may be damaged in certain applications if the wrong control input is used!

- For applications that require constant ON and OFF switching of the vibratory drive (e.g., accumulation shut-down, hopper control, etc.), the control input provided for this purpose must be used!

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

7.2 Controller Menu

The setting is made via a menu control. The various parameters are reached by entering an access code.

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

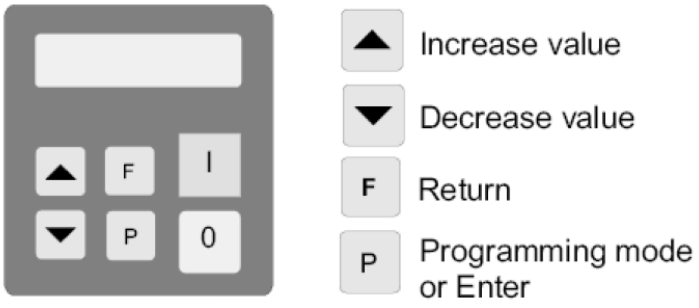


Fig. 6 Keyboard PSG1

Setting behavior

Pressing the arrow buttons briefly increases/decreases the display by one digit, pressing them for longer increases/decreases by a power of ten.

Setting values are saved after 60 seconds after leaving the menu or not pressing the buttons.

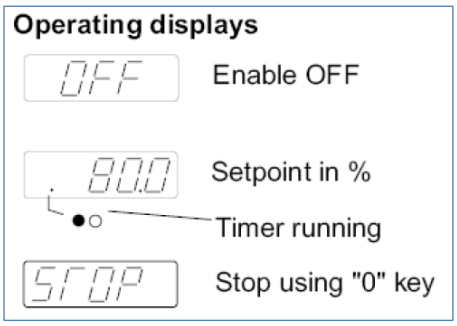


Fig. 7 Keyboard PSG1

- Brand new devices have a default setting ex works (➲ chap. 7.3).
- If the device setting is unknown, first restore the basic setting via menu C 000 "FAC".

7.3 Settings

Carry out the setting:

1. Set system-specific values.
2. Save with menu C 000 "PUSH".

   ⇨ The process is completed.

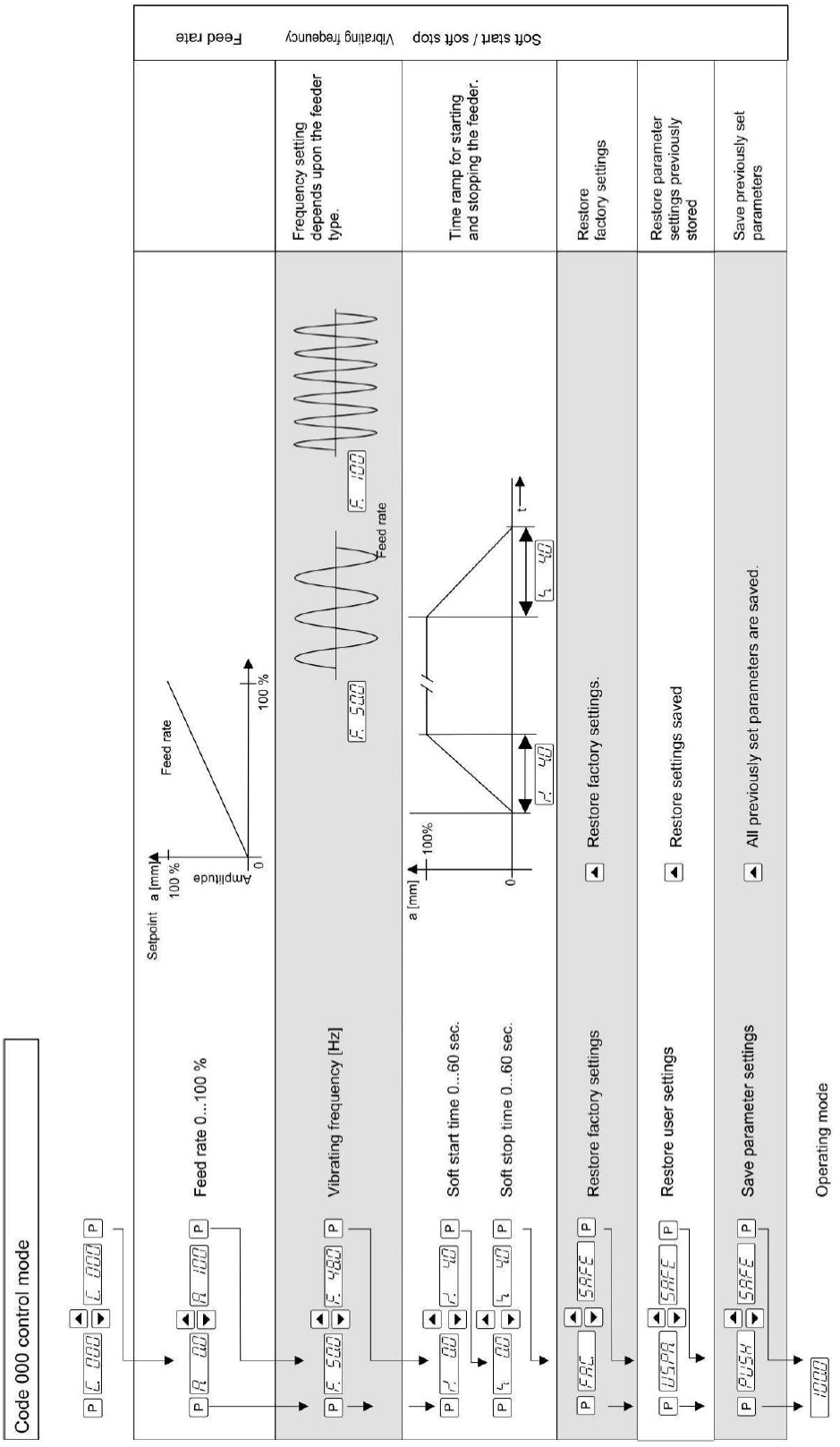
Setting can be restored with **C 000 "US.PA"**.

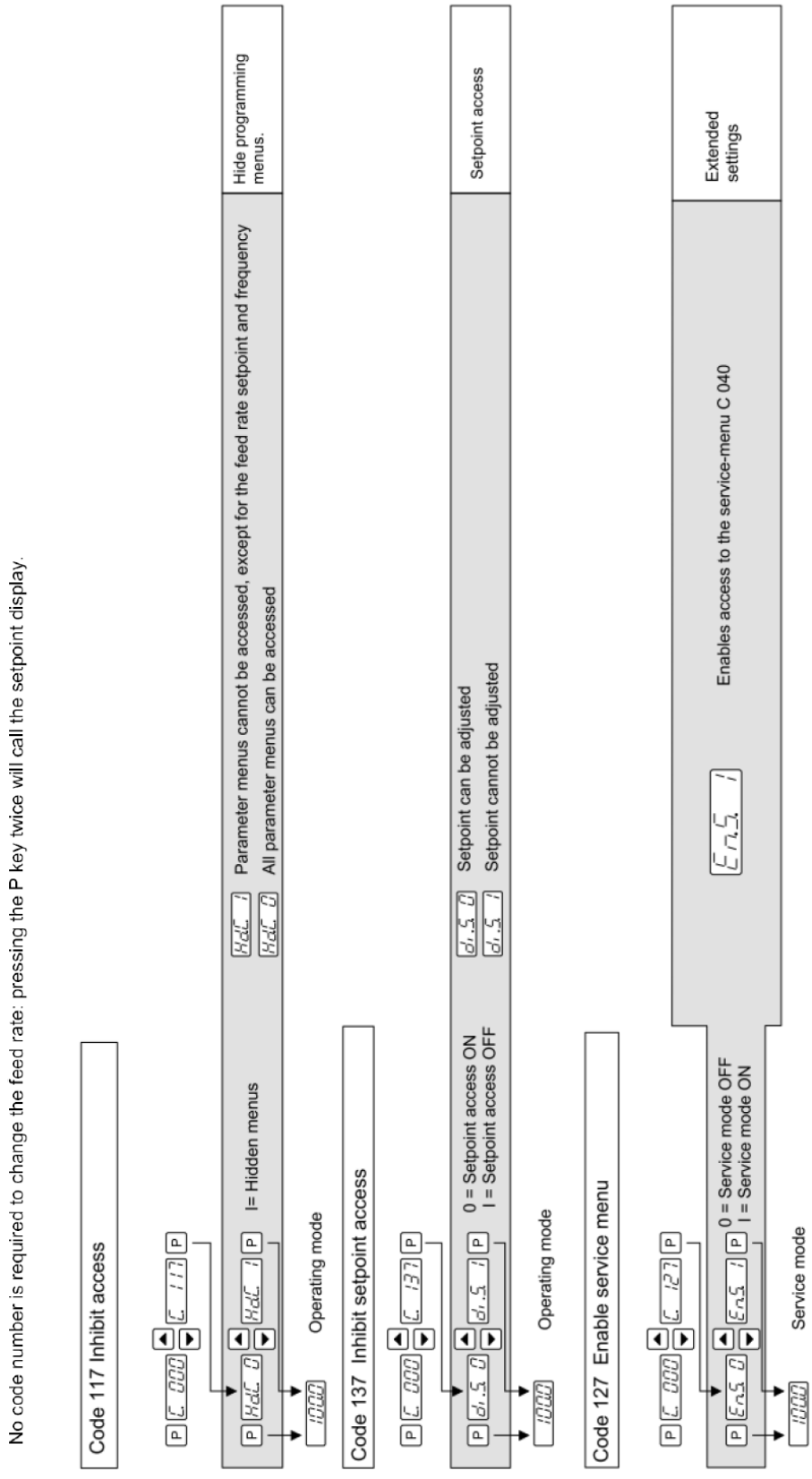
Overview of the setting options:

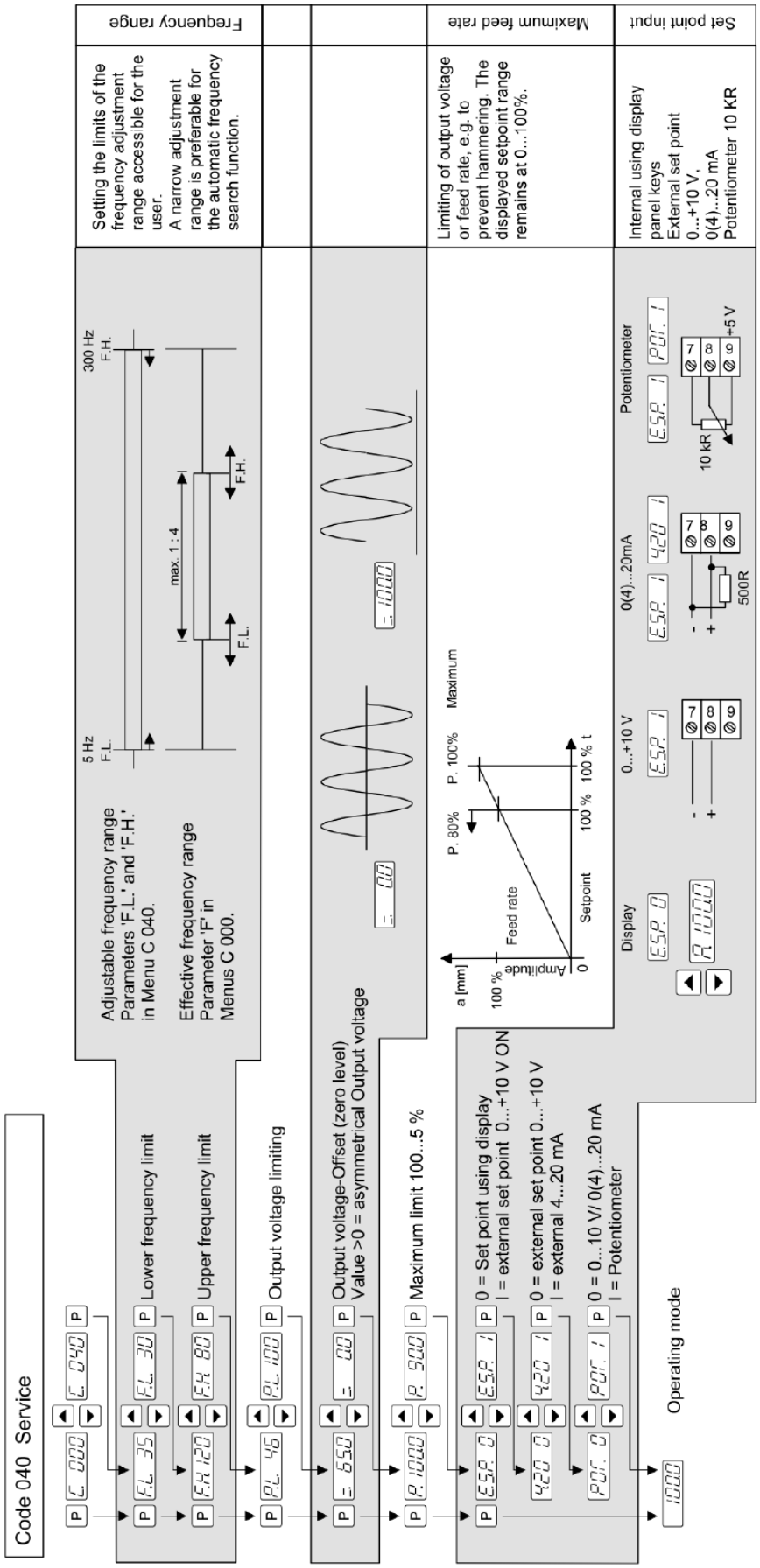
Settings	Range	Code	Factory settings	Menu code
Amplitude (feed rate)	0... 100 %	A.	0 %	000
Vibrating frequency	75...300 Hz	F.	100 Hz	000
Soft start ramp up	0... 60 Sec.	/.	0.1 Sec.	000
Soft stop ramp down	0... 60 Sec.	\.	0,1 Sec.	000
Restore factory settings		FAC.		000
Restore user settings		US.PA.		000
Save user settings		PUSH.		000

7.3.1 Code 000 Conveyor

No code number needs to be entered to adjust the delivery rate; pressing the P button twice leads directly to the setpoint entry.




No code number is required to change the feed rate: pressing the P key twice will call the setpoint display.
Code 117 Inhibit access
Hide programming menus.
Parameter menus cannot be accessed, except for the feed rate setpoint and frequency
All parameter menus can be accessed
I= Hidden menus
Operating mode
Code 137 Inhibit setpoint access
Setpoint access
Setpoint can be adjusted
Setpoint cannot be adjusted
0 = Setpoint access ON
I = Setpoint access OFF
Operating mode
Code 127 Enable service menu
Extended settings
Enables access to the service-menu C 040
0 = Service mode OFF
I = Service mode ON
Service mode


Code 040 Service
C. 000
C. 040
F.L. 35
F.L. 30
F.H. 120
F.H. 80
P.L. 45
P.L. 100
= 50
= 650
P. 1000
P. 5000
ESP. 0
ESP. 1
420. 0
420. 1
POT. 0
POT. 1
1000
Operating mode
Lower frequency limit
Upper frequency limit
Output voltage limiting
Output voltage-Offset (zero level)
Value >0 = asymmetrical Output voltage
Maximum limit 100...5 %
0 = Set point using display
I = external set point 0...+10 V ON
0 = external set point 0...+10 V
I = external 4...20 mA
0 = 0...10 V/ 0(4)...20 mA
I = Potentiometer
Adjustable frequency range
Parameters 'F.L.' and 'F.H.'
in Menu C 040.
Effective frequency range
Parameter 'F' in
Menus C 000.
5 Hz
F.L.
300 Hz
F.H.
max. 1 : 4
F.L.
F.H.
= 50
= 650
a [mm]
100 %
Amplitude
Feed rate
P. 80%
P. 100%
Maximum
0
Setpoint
100 %
100 % t
Display
0...+10 V
0(4)...20mA
Potentiometer
500R
10 kR
+5 V
Frequency range
Maximum feed rate
Set point input
Setting the limits of the frequency adjustment range accessible for the user.
A narrow adjustment range is preferable for the automatic frequency search function.
Limiting of output voltage or feed rate, e.g. to prevent hammering. The displayed setpoint range remains at 0...100%.
Internal using display panel keys
External set point
0...+10 V,
0(4)...20 mA
Potentiometer 10 KR

7.4 Error messages

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

Error messages	
Error OL.	Overload (output current too high). Possible cause: Feeder too large, frequency too low
Error OC.	Short-circuited output Possible cause: Incorrect wiring
Error OU	Input voltage too high Cause: Mains voltage too high.
Error PEA.	Current spike limit Frequency set too low or altered too rapidly during setting up

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

8 Fault elimination

8.1 Safety instructions

Observe the safety instructions in ➲ chap. 2 "Safety instructions" of these installation instructions as well as the safety instructions of the controller manufacturer.

8.2 Fault causes and remedy

The following table contains an overview of fault causes and how to proceed to eliminate them.

Fault	Cause	Remedy:
Device does not work	▪ Mains voltage incorrect / fuses defective ▪ Control signals incorrect	▪ Check mains voltage, check/ replace fuse if necessary ▪ Check control signals
Feeder does not perform	▪ Incorrect oscillation frequency setting	▪ Check whether the correct oscillation frequency is set, readjust if necessary
Feeder vibrates too much, magnet strikes (unusual noises) ➲ See warning below!	▪ Incorrect setting of the oscillation frequency or amplitude ▪ Setpoint too high	▪ Check oscillation frequency and correct if necessary ▪ Correct setting
Magnet gets hot	▪ Incorrect setting of the oscillation frequency	▪ Check oscillation frequency setting, correct if necessary
Control input does not work	▪ Control voltage polarity reversed	▪ Check control voltage

NOTICE

Damage to the solenoid due to overheating / stop operation!

Excessive vibrations of the conveyor can damage the magnet due to overheating or stop operation!

- Avoid excessive vibrations of the conveyor at all costs!

9 Maintenance and repair

9.1 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.

9.2 Maintenance activities and maintenance intervals

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

9.2.1 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:		

9.3 Spare and wear parts, repairs

Afag GmbH 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.

10 Decommissioning and disposal

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

10.1 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 dismounting the module!
- Only remove module when the controller is switched off and secured!

10.2 Disposal

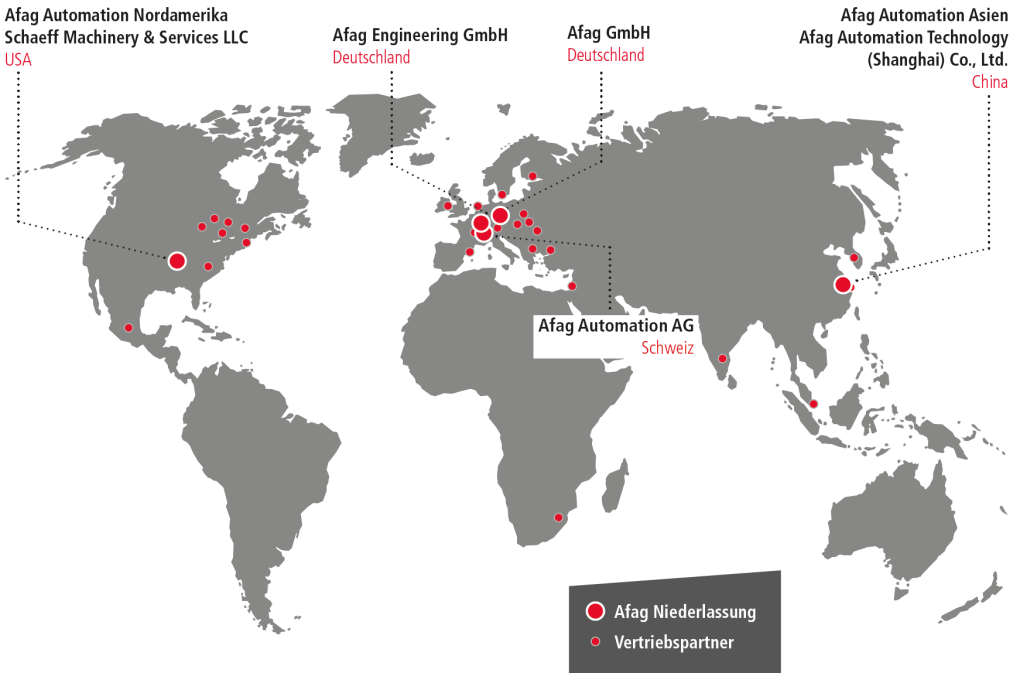
Appliances that are no longer usable should not be dismantled and recycled as a whole unit, but rather in individual parts and according to the type of material. Non-recyclable components must be disposed of appropriately.

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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