Operating Instructions

Controller

IRG1-D

Translation of the Original Operating Instructions EN

- IRG1-D (230 V/ 50 Hz) ⇨ Order no.: 50544383
- IRG1-D (110 V/ 60 Hz) ⇨ Order no.: 50544384
- IRG1-D (230 V/ 50 Hz) ⇨ Order no.: 50574617
- IRG1-D (110 V/ 60 Hz) ⇨ Order no.: 50574618

Dear Customer

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

These operating 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 Automation AG 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

This manual contains important information on assembly, commissioning, functioning and maintenance of the IRG1-D 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 serious injury.

WARNING

Warning!

This safety note points out a potentially hazardous situation which, if not avoided, could result in death or serious 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 standardised symbols are used in this manual to point out the various potential health risks.

Warning - Dangerous electrical voltage.

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 module.
- 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 Automation AG.
- 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 controllers 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. They are designed to control electromagnetic vibratory feeders. Any use beyond the described purpose is not in accordance with the intended use.

The intended use of the module also includes:

- observance of all instructions given in this manual.
- using only original spare parts.

2.3 Foreseeable misuse

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

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 controller.

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,
- 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.

2.4.3 Obligations of the personnel

All personnel working with the controllers are required to:

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

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 asses the risks that may arise from the use of the controllers thus exposing himself and others to the risk of serious 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 wear the personal 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 controllers which have not been described in these operating instructions or approved in writing Afag Automation AG.

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

The controller may not be changed or modified in any way, except with the prior written consent of Afag Automation AG.

2.8 General hazards / residual risks

Despite the safe design of the controller and the technical protective measures taken, there remain residual risks that cannot be avoided, and which present a non-obvious residual risk when operating the controller.

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 Danger due to electricity

DANGER

Danger! Risk of electric shock!

If work on electrical components is required, ensure that the work is carried out properly, failure to do so will 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 IRG 1-D

Type	IRG1-D
A	175 mm
B	80 mm
C	61.5 mm
D	9 mm
E	25 mm
F	52 mm
G	163 mm
ØH	5.5 mm

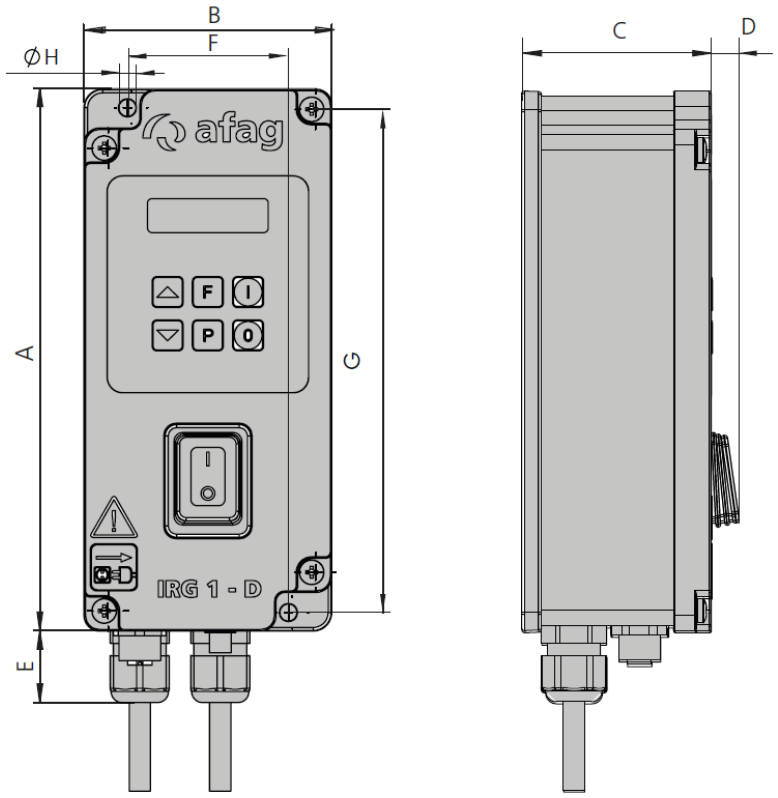


Fig. 1 Dimensional drawing - IRG1-D

3.2 Technical data IRG1-D

IRG1-D				
Type	IRG1-D 230 V/50 Hz	IRG1-D 110 V/60 Hz	IRG1-D 230 V/50 Hz	IRG1-D 110 V/60 Hz
Order number	**50544383**	**50544384**	**50574617**	**50574618**
Oscillation amplitude control	Yes	Yes	No	No
Operating voltage	230 VAC ±10%	230 VAC ±10%	230 VAC ±10%	230 VAC ±10%
Operating frequency	50 Hz	60 Hz	50 Hz	60 Hz
Mechan. vibration frequency (alternation oper. / continuous oper.)	50 Hz / 100 Hz	60 Hz / 120 Hz	50 Hz / 100 Hz	60 Hz / 120 Hz
Output voltage	40-220 VAC	20-105 VAC	40-220 VAC	20-105 VAC
Nominal output current	0-6 A	0-6 A	0-6 A	0-6 A
Protection type	IP 54	IP 54	IP 54	IP 54
Fuses	2 x 6.3 A	2 x 6.3 A	2 x 6.3 A	2 x 6.3 A
Connection type mains	2m cable with Schuko plug	2m cable with NEMA5-15 plug	2m cable with Schuko plug	2m cable with NEMA5-15 plug
Connection type vibratory feeder	2m cable 3 x 1 mm²	2m cable 3 x 1 mm²	2m cable 3 x 1 mm²	2m cable 3 x 1 mm²
Release (optocoupler)	24 VDC	24 VDC	24 VDC	24 VDC
Smooth start	0-60 s	0-60 s	0-60 s	0-60 s
Smooth stop	0-60 s	0-60 s	0-60 s	0-60 s
Operating temperature	0 - 40 °C	0 - 40 °C	0 - 40 °C	0 - 40 °C
Weight	1.06 kg	1.06 kg	1.06 kg	1.06 kg

Even very small magnets can be operated safely on the IRG1-D controller.

NOTICE

Danger of damage controllers!

If the load circuit is interrupted via a switch or relay, the controller may be damaged.

- When the controller is switched on, never plug in, or unplug the unit plug at the operated oscillating drive!
- For applications that require the vibration drive to be switched on and off continuously (e.g. jam shut-off, bunker control, etc.), use the controller input provided.

3.3 Accessories

Sensor angle IRG1-D	
Order number	50549361
Net weight	0.28 kg

Acceleration sensor SWC 62	
Order number	50547573
Net weight	0.03 kg

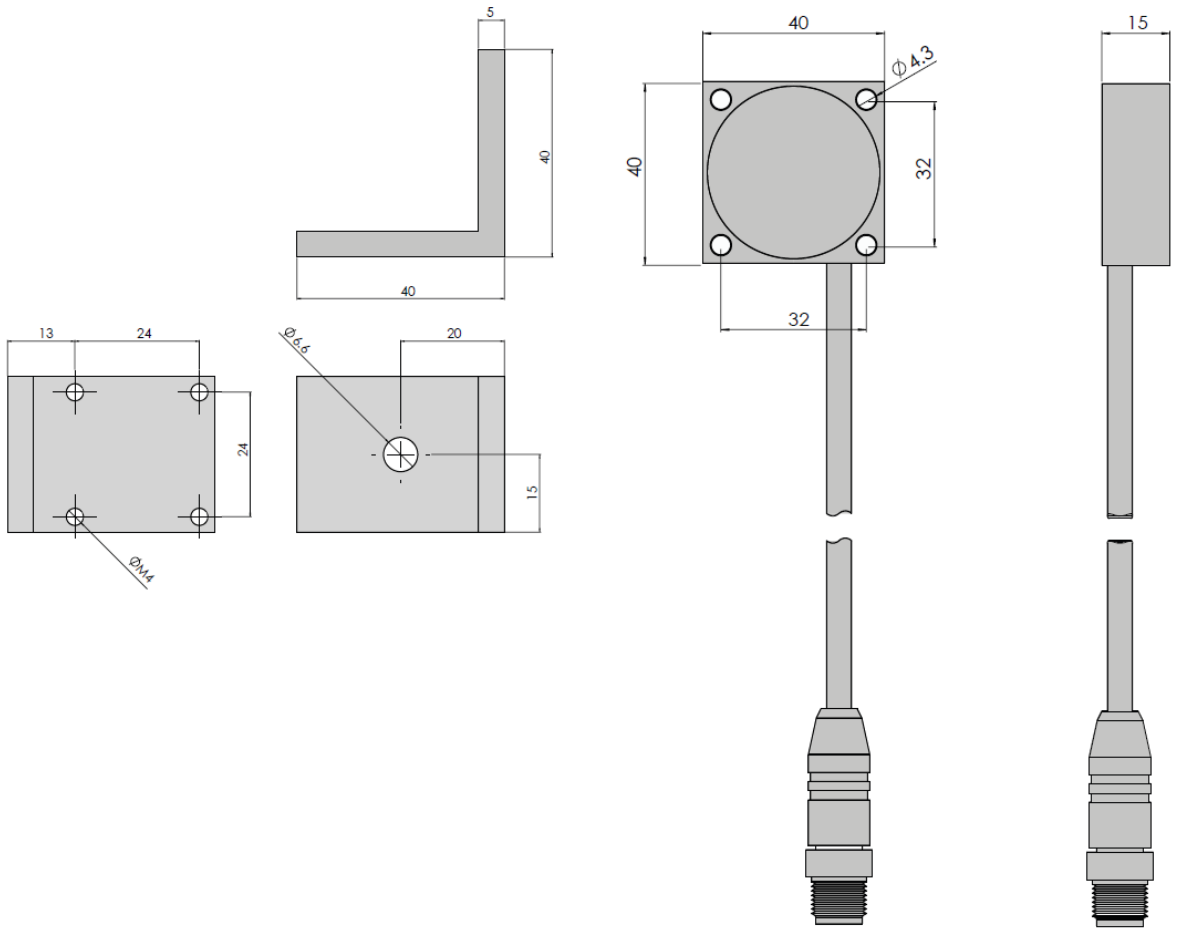


Fig. 2 Accessories

4 Transport, packaging and storage

4.1 Safety instructions

The controllers are packed in the original packaging (cardboard box). Carefully remove the controller from the original packaging.

4.2 Scope of supply

The corresponding documentation is supplied with each controller (e.g. operating instructions, etc.).

Fig. 3 Scope of supply IRG1-D

Qty.	Designation
1 x	Controller IRG1-D
1 x	Operating instructions

4.3 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: 0-50 °C
- Relative air humidity: < 90%, non condensing

4.4 Packaging

The controller is transported in the Afag Automation AG 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.

4.5 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 IRG1-D

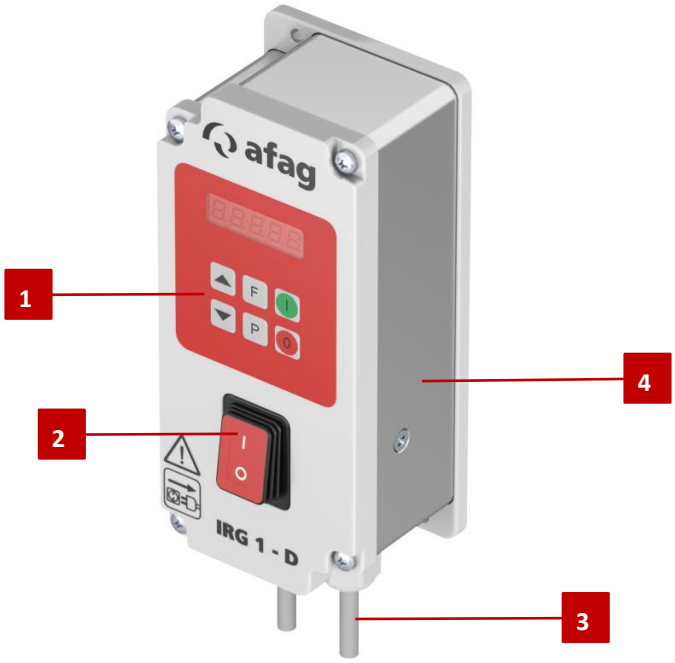


Fig. 4 Structure of IRG1-D

1. Membrane keypad
2. On/off switch
3. Connection
4. Housing

5.2 Description of the controller

The electronic controller IRG1-D is used for the stepless control of inductive loads such as bowl feeders and linear feeders.

The controller operates according to phase-angle control and thus generate a variable output voltage for the drive solenoid. The delivery rate of the unit is adjusted via the membrane keypad integrated in the front panel (Fig. 4, 1).

The control curve of the external setpoint input can be set via the parameters "o." / "P." (U_{min} / U_{max}) so that the full control range of 0...100 % can always be used. Vibratory feeders can be operated with a vibration frequency of 6000 S/min (100Hz) or 7200 S/min (120Hz) or 3000 S/min (50Hz) or 3600 S/min (60Hz) (full-wave or half-wave operation).

The operating mode can be set via an internal parameter. An adjustable smooth start ensures that when the unit is switched on via the mains switch or the control input, the feeder starts up without jerks.

Via an enable input, the controller can be switched on or off by a higher-level system, e.g. PLC, by means of a 24 VDC signal voltage or a potential-free contact (with factory setting, the controller switches "Off" when a control voltage is present).

Mains voltage fluctuations are eliminated via an internal compensation circuit, so that a constant delivery rate is guaranteed.

6 Installation, assembly & setting

6.1 Safety instructions

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

6.2 Assembly & attachment

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

No warranty will be granted for damage caused by improper installation on the part of the operating company.

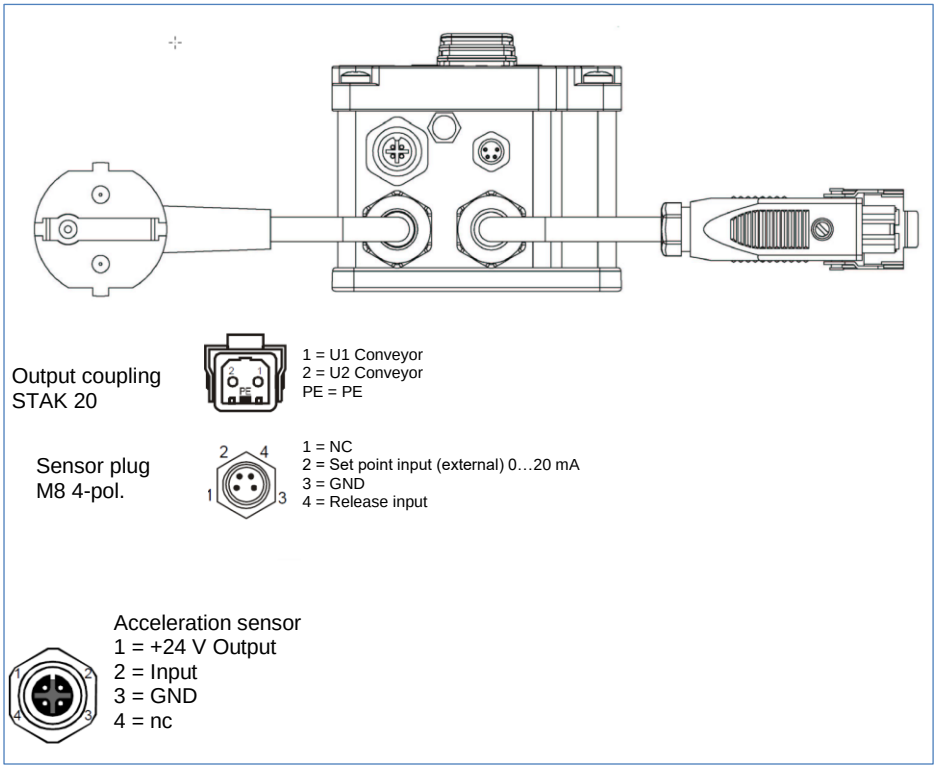


Fig. 5 Connection options

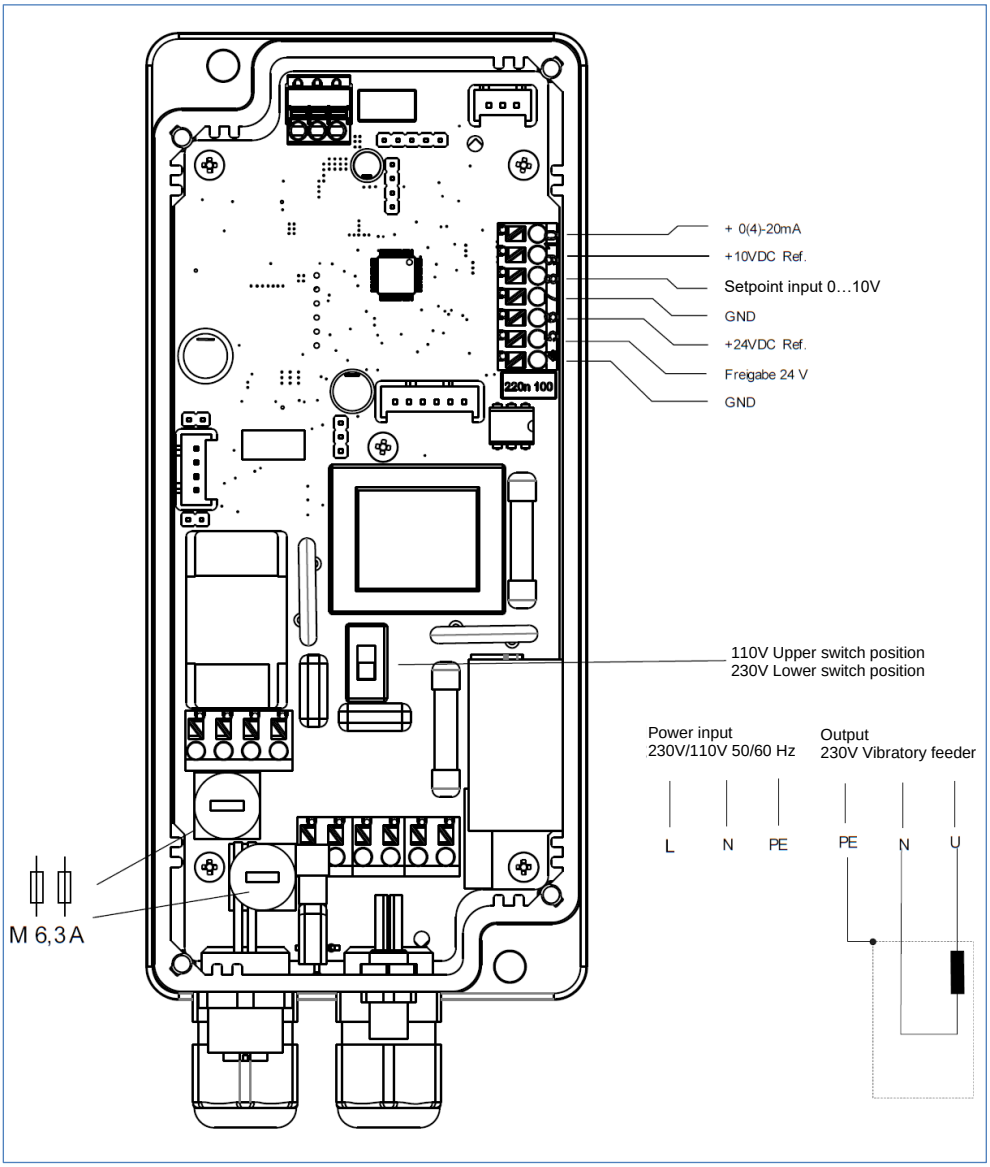


Fig. 6 Sectional view of the IRG1-D

NOTICE

Risk of damage to the printed circuit board!

Incorrect setting of the slide switches can cause a malfunction or damage to the PCB.

- Set the slide switch only for the respective application.

7 Operation

7.1 General

All necessary settings for the vibratory drive are made via the display!

7.2 Control panel and keyboard

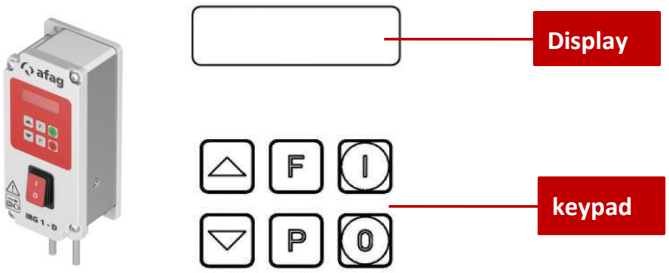


Fig. 7 Control panel IRG1-D

Keys	Meaning / Function
"I" / "O"	Switching the output on and off
"F" / "P	Change menu items
"↑" / "↓"	Set parameters in the menu item

7.2.1 Display indication

Display indication	Meaning / unit status
General	
Lo.Po.	low voltage potential immediately on switching On
STOP	Unit switched Off via membrane keypad "O"
OFF	Membrane keypad "I" on and enable signal missing
. 55	Smooth start to amplitude value 55*
. OFF	Smooth stop in the absence of clearance
.STOP	Smooth spout switched off via membrane keypad "O"
Control mode	
55	Display of the set amplitude value*
Regular operation	
A 55	"A" indicates that the control mode is active*
ACC Error	missing sensor or defective sensor
¯100	max. permitted control value reached, setpoint not reached**

* 55 is an example of a set value of 55%
** 100 Maximum permissible control variables, adjustable under parameter "¯."
Error messages are reset by pressing the green "I" key. 100% refers to 4.5V in control mode. Flashing dot in the display indicates that the IRG is approaching the indicated state.

7.2.2 Settings

Setting options	Menu code	Display indicator	Setting range	Default setting
Vibration drive				
Set point (U_{min})	000	o.	0...100%	0.0%
Setpoint setting 0...20 mA / 4...20 mA	003	4.20	0 ± 1	0
Oscillation frequency (divisor f. half-waves)	003	d.	1 ± 2	1
Maximum output voltage (Umax)	003	P.	0...100%	100.0%
Smooth start	003	/.	0.1…60 Sek.	3.0
Smooth stop	003	\.	0.1…60 Sec.	0.0
External setpoint	003	E.S.P.	0 ± 1	0
Enable input inversion	003	-En.	0 ± 1	1
Control variable voltage	050**	S.	0.0 …100.0	
Voltage limitation	080*	-.	0...100%	100.0
Vibration amplitude controller	080*	En.r.	0 ± 1	0
Proportional part controller	080*	A.	0.01 …100.0	10.0
Service				
Hide parameter menu	117	Hd.C.	0 ± 1	0
Service menu	127	En.S.	0 ± 1	1
Reset factory setting	210	FAC.		
Load user settings	210	US.PA		
Save user settings	143	PUSH		

*These menus can only be opened by activating the service menu C127.

**Menu item only has a display character.

7.2.3 Minimum output voltage „Umin“

Adapt the voltage range to the feeder so that the full setting range of 0...100 % can always be used.

Select code "C 000" and set the setpoint to the desired value using the arrow keys.

7.2.4 Maximum output voltage „Umax“

To limit the output voltage, it can be limited using menu C 003 with parameter "P.".

7.2.5 Operating voltage

The unit can be connected to mains voltages of 115 V or 230 V (50Hz/60Hz). The internal slide switch must be in the corresponding position.

7.2.6 Setpoint setting

Selection: Membrane keypad and/or external setpoint (control current 0(4)... 20 mA) (control voltage 0(2)... 10 V) (alternative).

7.2.7 Full and half wave

Setting the correct oscillation frequency is crucial, as the wrong frequency can lead to thermal overload of the magnets. The setting is made under menu C003 with parameter "d.".

The mechanical vibration frequency of the feeder must be known for this.

7.2.8 Smooth start and smooth stop

The smooth start and smooth stop of the output voltage is set under menu C003 with the parameters "/." and "\." (0.1...60 sec).

7.2.9 Release inversion

The release inversion is done under menu C003 with parameter "-En.

8 Fault elimination

8.1 Safety instructions

CAUTION

Danger of injury due to improper fault elimination!

Improperly carried out activities to eliminate faults can result in considerable material damage and serious injury.

- Only use trained specialist personnel to carry out the activities.

8.2 Fault causes and remedy

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

Fault	Possible cause	Remedy:
Function of the controller impaired	▪ Mains voltage incorrect	▪ Check mains voltage, check or replace fuse if necessary
	▪ Control signals incorrect	▪ Check control signals
Feeder does not perform	▪ Vibration frequency incorrect	▪ Check whether the correct oscillation frequency is set, readjust if necessary
	▪ Mains frequency incorrect	▪ Check mains frequency (50/60Hz). Vibration frequency and mains voltage must match
	▪ Max. output voltage "P" U_{max} too low	▪ Setting the max. output voltage "P" U_{max}
Feeder vibrates too much, magnet strikes (unusual noises)	▪ Incorrect setting of the oscillation frequency or amplitude **CAUTION!** Magnet can be destroyed by overheating (damage to the magnet by stop operation).	▪ Setting of max. output voltage "P" U_{max} too high, adjust U_{max} if necessary.
Feeder is regulated slowly. Feeder slowly reaches preset speed	▪ Proportional part incorrect	▪ Increase proportional part controller „A“
Feeder speed not constant. Speed changes from fast to slow and vice versa	▪ Proportional part incorrect	▪ Reduce proportional part controller „A“
Magnet gets hot	▪ Wrong mains voltage solenoid	▪ Check mains voltage
	▪ Incorrect oscillation frequency	▪ Set oscillation frequency

9 Maintenance and repair

9.1 General notes

The controllers are maintenance-free. Nevertheless, maintenance activities may be required to ensure the operating condition of the controller.

9.2 Safety instructions

CAUTION

Danger of injury due to improper maintenance!

Improperly carried out maintenance activities can cause considerable damage to property and injury.

- Only use trained specialist personnel to carry out the activities.

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

9.3 Maintenance work

9.3.1 Overview

Fig. 8 Controller IRG1-D

No.	Maintenance point	Maintenance work	Interval	System [On/Off]	Remarks
1	Controller	Check fuse	As required	[Off]	-
			▪ Always unplug the controller before opening it! 1. Loosen the housing cover screws. 2. Exchange the defective fuse. 3. Close the housing again.		

9.3.2 Further maintenance

Further maintenance is not required, if the ambient conditions listed below are complied with:

- Clean working area
- No use of splash water
- No abrasion or process dusts
- Environmental conditions as specified in the technical data

9.4 Spare parts and repair work

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

After expiry of the warranty period, the customer may replace or repair defective controllers or wear parts himself or send them to the Afag repair service.

Please note that Afag does not assume any warranty for controllers that have not been replaced or repaired by Afag!

10 Decommissioning, disassembly, 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 serious injury.

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

10.2 Decommissioning

If the controllers are not used for a longer period, they must be properly commissioned and stored as described in ➲ chapter 4.5.

10.3 Disposal

The controllers must be disposed of properly at the end of their service life and the raw materials used must be recycled. Observe the legal regulations and company requirements.

The controllers must not be disposed of as a complete unit. Dismantle the controller into individual parts and separate the various components according to type of material and dispose of them properly:

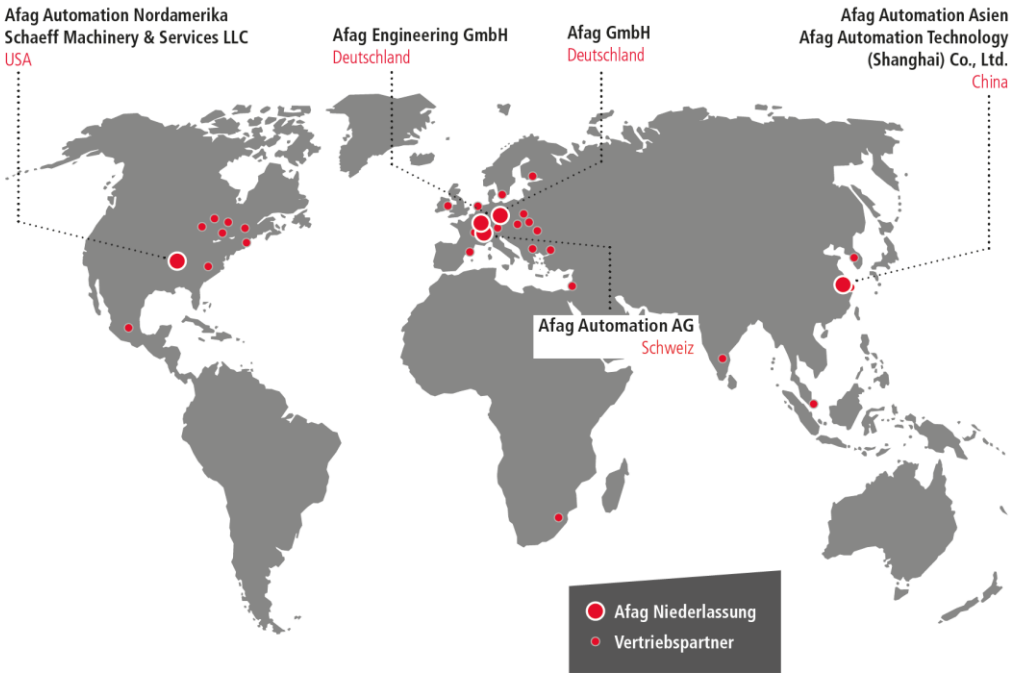
- Scrap the metallic materials.
- Hand over plastic parts for recycling.
- Sort the rest of the components by their material properties and dispose of them accordingly.

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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