

Operating Instructions  
Controllers  
for  
Vibratory Drive Systems

ESG 2000

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## Declaration of Conformity

According to the Low-Voltage Directive 2014/35/EU  
and Electromagnetic Compatibility Directive 2014/30/EU

We hereby declare that the product meets the following requirements:

Low-Voltage Directive 2014/35/EC  
Electromagnetic Compatibility Directive 2014/30/EU

Applied harmonised standards:           DIN EN 60204 T1  
  EN 61439-1

Remarks:

Rhein-Nadel-Automation  
-----

Managing Director  
Dr. Tobias Hensen



## 1. About this document



### **Attention**

Read this document carefully and observe the safety directives before commencing any work.

### **Document description:**

This document provides assistance in choosing your product. You will also find information on mechanical and electrical installation, operation, product extensions and accessories.

Non-observance may cause trouble with the product or the environment, reduce the product lifetime or lead to other damage.

## 2. Safety information

### 2.1. Design of safety directives



### **Notice**

This notice identifies useful tips for use of the controller.



### **Attention!**

This symbol identifies hazardous situations.

Non-observance of such warnings may cause irreversible injury or even death!

### 2.2. Fundamental safety directives

Non-observance of the following fundamental safety measures and directives may lead to severe injury and damage to property!

Meeting the requirements given in the related documentation is a precondition for safe and trouble-free operation and for achieving the product properties specified. Further additional safety directives in the other sections must be observed as well.

### 2.3. Personnel



### **Attention!**

Any work on electrical equipment of the machine/system shall be carried out exclusively by a professional electrician, or by instructed persons working under the direction and supervision of a professional electrician, according to electrotechnical rules.

Only qualified professionals are allowed to work on or with the product. IEC 60364 or CENELEC HD 384 define the qualification of these persons:

- They are familiar with set-up, installation, commissioning and operation of the product.
- They possess the qualification required for performance of their work.
- They know all regulations for the prevention of accidents, directives and laws applicable to set-up, installation and commissioning on site, and they are able to apply the same.
- They have knowledge and skills of First Aid.

## 2.4. Intended use

Please observe the following directives for intended use of the controllers:

- The devices herein described must only be stored, fitted and operated under the conditions specified in this documentation.
- Here you are not concerned with domestic devices! They are solely intended to be used as components for commercial or professional applications pursuant to EN 61000-3-2.
- They satisfy the protection requirements of 2014/35/EU: Low Voltage Directive.
- They do not constitute a machine as defined by 2006/42/EU: Machinery Directive.
- A machine comprising the product must not be commissioned or put into operation for the intended use until it has been declared to be in conformity with the EC Directive 2006/42/EU: Machinery Directive; Observe EN 60204-1.
- Commissioning or starting operation for the intended use is only permitted in compliance with the EMC Directive 2014/30/EU.
- Use of the product in living areas may lead to EMC disturbance. The user is responsible for taking interference suppression measures.
- They are optimised for operation of RNA bowl feeders and linear feeders. Observe the limits indicated in the technical specification.

### Attention!



- Prior to start-up make sure that the protective earth conductor is connected and in proper condition. Make the PE conductor test with approved test devices only.
- Never start up despite detected damage.
- Do not make any technical modifications to the device, except as described in this document.
- Never start up in an incompletely installed state.
- Never operate the device without the required guards in place.
- Connect, disconnect or change any electrical connections only in the absence of voltage.

## 2.5. Residual hazards

Residual hazards may remain even if all directives have been observed and protective measures taken. Such residual hazards must be considered by the user in the risk assessment of his machine/equipment. Non-observance may lead to severe injury and damage to property!

### 2.5.1. Device

Pay attention to the warning signs fitted to the device!

Symbol	Description
	<b>Hazardous voltage:</b> Prior to commencing any work on the product check for absence of voltage on all power connections.
	<b>Leakage current:</b> Make fixed installation and PE connection according to EN 60204-1!

### 2.5.2. Protection of the drive system

Certain device parameter settings may cause overheating of the connected drive magnet, e.g., due to prolonged operation with an incorrect voltage setting.

### 2.5.3. Degree of protection - Protection of persons and equipment

- All specifications relate to installed condition ready for operation.
- All slots not used must be closed by protection caps or dummy plugs in order not to reduce the protection against accidental contact.

## 3. Product information

### 3.1. Characteristic features

The compact controller is designed for operation of a vibratory drive system.

The unit offers the following characteristic features:

- One feed rate output: Bowl feeder, linear feeder max. 10A, variable
- External enabling input, 24 VDC
- Two optocouplers for status messages and other links.
- Membrane keypad for setting and changing the operating parameters in the set-up menus.
- Plug-type connections for
  - Vibratory drive
  - Communication with higher-level controller
- Bipolar main disconnect switch.

### 3.2. EC conformity

The controller is compliant with the following standards:

**EC EMC Directive 2014/35/EU**  
**EC Low-Voltage Directive 2014/30/EU**

Applied harmonised standards:

**DIN EN 60204, part 1**  
**EN 61439-1**

The controller is also available in a UL/CSA compliant version.

### 3.3. Technical data

<b>Mains voltage:</b>	230 V AC, 50/60 Hz, +20 / -15% 115 V AC, 50/60 Hz, +10 / -10%
<b>Output voltage:</b>	0 ... 208V <sub>eff</sub> at 230V mains voltage; 0 ... 98V <sub>eff</sub> at 115V mains
<b>Load current:</b>	10 A <sub>eff</sub> .
<b>Minimum load current:</b>	80 mA
<b>Internal fuse:</b>	F1 = 10A med.time lag
<b>Control-circuit fuse:</b>	2A med.time lag
<b>Soft start time:</b>	0 ... 5 sec. separately selectable
<b>Enabling input:</b>	24V DC (10-24VDC)
<b>2 status outputs (optocoupler):</b>	2 optocouplers, max. 30VDC 10mA,
<b>Ambient temperature:</b>	0 ... 50° C
<b>Cooling:</b>	free convection
<b>Mounting:</b>	vibration-free
<b>Degree of protection:</b>	IP54
<b>Leakage current</b>	Less than 2mA
<b>Power loss</b>	max. 30W

### 3.4. Accessories

Tag	Designation	Type	RNA article code
XS1	Load connector	5-pin	31002323 (100Hz drive)
XS1	Load connector	5-pin	31002322 (50Hz drive)
XS4	Female connector	7-pole, straight	35051153
XS4	Female connector	7-pole, right-angled	35002545

## 4. Notes on start-up

### Attention:

Make sure that following points are checked prior to making connection to power supply and switching on the controller:



- Is the controller casing properly closed with all screws tightened?
- Are all plug hooks engaged / firmly screwed in place?
- Are all cables and glands in proper condition?
- Is operation for the INTENDED USE made sure?
- Does the supply voltage specified on the controller match the local supply system?
- Does the supply frequency specified on the vibratory drive match the local supply system?
- Is the correct mode set on the controller? (See description under "Modes of Operation")
- Is sufficient cooling of the controller ensured?
- Is the controller mounting vibration-free?

Only if you can clearly answer all the above questions with "Yes" should the controller be put into operation.



### Attention:

Set the controller to minimum output before switching-on for commissioning or start-up after repairs or replacement of controllers/vibratory drives. Then check for proper operation while the output is increased.

### 4.1. Modes of operation

RNA vibratory drive systems employ mechanical spring vibrators which are set to a vibrating frequency near the mains frequency or near double mains frequency depending on weight and/or size.

This is why two modes of operation are possible:

Mode 1: Asymmetric half-wave mode:  
The vibrating drive operates at mains frequency.

Mode 2: Symmetric full-wave mode:  
The vibrating drive operates at double mains frequency.

To assist the operator the cable glands on the drive connector are colour-coded.

Mode 1: Black  
Mode 2: grey

In terms of the vibrating frequency this means:

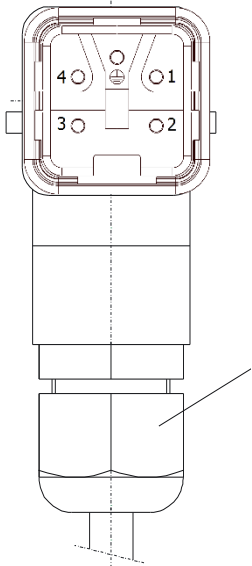
	Mains frequency 50 Hz	Mains frequency 60 Hz	Cable gland colour
<b>Mode 1 Half-wave mode</b>	Vibrating frequency 50 Hz $\triangleq$ 3000 min <sup>-1</sup>	Vibrating frequency 60 Hz $\triangleq$ 3600 min <sup>-1</sup>	Black
<b>Mode 2 Full-wave mode</b>	Vibrating frequency 100 Hz $\triangleq$ 6000 min <sup>-1</sup>	Vibrating frequency 120 Hz $\triangleq$ 7200 min <sup>-1</sup>	grey

## 4.2. Automatic mode change

Vibratory drive systems by RNA do not require the operator to take care of selecting the right operating mode. The operating mode is determined by a code in the RNA vibrating drive connector. A wire jumper from pin 3 to 4 in the connector switches the controller to mode 2: 100 or 120 Hz. In the absence of this wire jumper the controller operates in mode 1: 50 or 60 Hz.

The RNA vibratory drive systems come with the right code in the connector.

Mode changes are made only and exclusively via the coding in the vibrating drive connector.



### M20 gland

Black: 50/60Hz vibrating frequency  
Grey: 100/120Hz vibrating frequency  
(EMC metal gland if frequency controllers are used.)

(Where frequency controllers with selectable output frequency are used, an EMC metal gland and a shielded cable are provided.)

## 4.3. Status outputs

The status outputs are used for remote diagnostics of the controller status or of the links of several controllers with one another. They are designed as freely available NPN-doped transistor circuits and they are floating. With the status output **READY** the transistor circuit is switched through whenever the controller is connected to power supply and switched on by its power switch closed.

The status output **ACTIVE** requires the same conditions for switching-through as "READY". In addition, channel 1 must be operating actively, the transistor blocks in case of ACCUMULATION, OFF or STOP.

The status outputs and inputs as well as the external enabling input are to be wired via plug connector XS4.



## 5. Operation

### 5.1. General



#### Controller plug connections

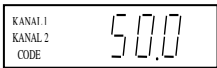
<u>Main disconnect switch</u>	Double-pole isolation of the controller from power supply
<u>Channel 1</u>	Connector for vibratory feeder (<10 A)
<u>XS 4</u>	Connector for optocoupler outputs and external enabling input

#### The controller display (membrane keypad)

	<u>On / Off</u> Pressing this button switches off all connected devices. The display shows "OFF". The controller remains ready for operation.
	<u>Cursor up and cursor down</u> Use these buttons to scroll through the controller menu or set the parameters.
	<u>Enter</u> Press this button to acknowledge the parameters entered with the cursor.
	<u>Decimal point in the display</u> The decimal point is not blinking. You cannot make any entry. The decimal point is blinking, an entry can be made.

## 5.2. Starting-up the controller

To start up the controller, close the main disconnect switch. The main menu appears on the display showing the last setpoint entered (feed rate of the vibratory feeder or linear feeder).

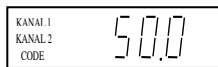


Alternatively, the following may appear on the display depending on the switching status of the device:

	External enabling signal has been activated but it is withdrawn from the device at the moment. (low priority)
	Device has been switched off by operating the top left button of the membrane keypad, inhibiting all functions. (high priority)

## 5.3. Main menu / Setpoint entry and display for channel 1.

Display of setpoint or feed rate of channel 1 (vibratory feeder)

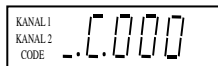


No entry possible

Alternatively: STOP, OFF  
(see above)

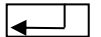


**Entry of the codes to change or execute the required settings.**

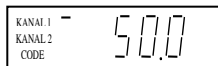


**Enter code.**

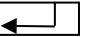
For description of codes see section 4.4.



**Setpoint entry for channel 1 (vibratory feeder)**






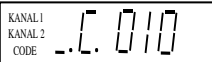
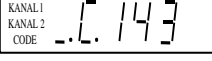

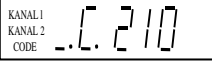
Entry in %; return to display mode for saving



Use the cursor buttons (UP/ DOWN) to scroll through these three basic screens of the main menu. In each individual item of the main menu you can press ENTER to activate this item for setting or changing. Upon pressing of the ENTER button the decimal point starts blinking. Now you can make changes using the cursor buttons (UP/DOWN). Press ENTER again to acknowledge the entries made. The decimal point is no longer blinking. Using the cursor buttons you can continue scrolling in the menu. Same procedure analogously applies to the code menus described below.

All the following display screens show the default setting. If the actual indication on the controller differs from what is shown here, the default setting has been changed in individual codes to suit a specific application.

**5.4. Description of individual codes for controller programming.**

 <p>KANAL1 KANAL2 CODE C.001</p>	<p><b>Settings for channel 1</b> In this sub-menu you can set or limit the following functions for channel 1:</p> <ul style="list-style-type: none"> <li>- Vibrating amplitude</li> <li>- External enabling, signal direction of external enabling input</li> <li>- Soft start and stop delay</li> <li>- Selection of vibratory or belt feeder drive</li> </ul>		
 <p>KANAL1 KANAL2 CODE C.003</p>	<p><b>Sealing a setpoint</b> In this sub-menu you can lock the setpoints (vibrating amplitude) of the main menu. It is no longer possible to change the setpoints for channel 1 in the main menu. This avoids accidental changes to performance parameters. You can only make any changes now through code C001.</p>		
 <p>KANAL1 KANAL2 CODE C.009</p>	<p><b>Show status</b> This sub-menu serves for checking of the set vibrating frequency.</p>		
 <p>KANAL1 KANAL2 CODE C.010</p>	<p><b>Calling-up the software version</b> Definition: 411. 59. 10. 23.11.99</p>	<p>Date Version No. Device type Internal No.</p>	<p>Device type: 59 = ESK 2001 58 = ESG 2001 57 = ESK 2000 56 = ESG 2000</p>
 <p>KANAL1 KANAL2 CODE C.143</p>	<p><b>Saving parameters</b> You can save the (application-specific) settings previously made in various sub-menus under code 143.</p>		
 <p>KANAL1 KANAL2 CODE C.200</p>	<p><b>Inhibiting all setting functions</b> With the aid of this code you can disable all input facilities of the controller. It is no longer possible to change any values. The only way now to enable the menu again is through this code.</p>		
 <p>KANAL1 KANAL2 CODE C.210</p>	<p><b>Retrieving parameters</b> Inn this sub-menu you can return the controller to the default settings. You can also return to application-specific settings, if previously saved.</p>		

## 5.5. Application-specific changes to default settings

### 5.5.1. Code C001 for channel 1

**Objective:** Setting and limiting the vibration amplitude, external enabling, soft start delay and soft stop delay.

<b>Select code</b>				Set code	
<b>Code C001</b>					
<b>Set vibrating amplitude</b>				0 - 100 %	
<b>Limit vibrating amplitude</b>				50 - 100 % (*)	
<b>External enabling signal</b>				I = active 0 = not active	
<b>External enabling signal direction</b>				I = Start = 24V DC 0 = Stop = 24V DC	
<b>Soft start time</b>				0 - 5 sec.	
<b>Soft stop time</b>				0 - 5 sec.	
<b>Return</b>				Save and return to main menu	

For RNA feeders with 200V magnets = 90 %

### 5.5.2. Code C003 Seal setpoint

**Objective:** Sealing-in the setpoints in the main menu. A direct change of the values is no longer possible. You can only make changes now through code C001.

For RNA feeders with 200V magnets = 90 %

<b>Select code</b>				Set code	
<b>Code C003</b>					
<b>Setpoint (vibrating amplitude)</b>				1 = adjustable 0 = input inhibited	
<b>Return</b>				Save and return to main menu	

### 5.5.3. Code C009 Show status

**Objective:** Checking of set vibration frequency.

<b>Select code</b>						Set code	
<b>Code C009</b>							
<b>Channel 1 external enabling signal</b>						I = active 0 = not active	
<b>Channel 1 vibrating frequency</b>						I = 50 Hz 0 = 100 Hz	
<b>Return</b>						Save and return to main menu	



Under menu item HA = half wave you can check whether the operating mode (100 - 50 Hz) is selected correctly.

### 5.5.4. Code C200 Inhibiting all settings-related functions

**Objective:** An (accidental) change of the set values by the user is not possible any more.

<b>Select code</b>						Set code	
<b>Code C200</b>							
<b>Inhibiting the setting functions</b>						I = enable 0 = disable	
<b>Return</b>						Save and return to main menu	



Only code C200 is accepted!!!

### 5.5.5. Code C143 Saving parameters

**Objective:** Saving of application-specific parameters

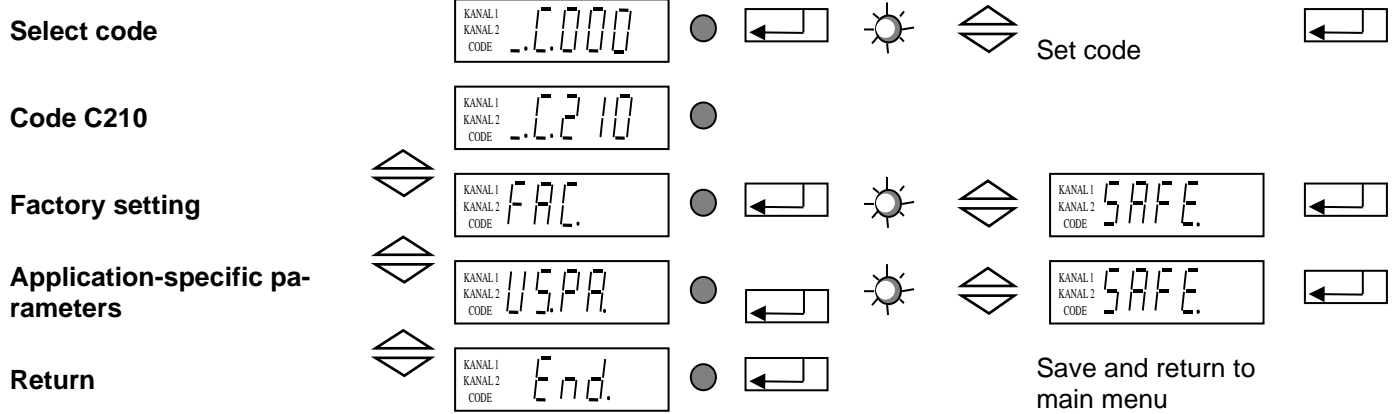
<b>Select code</b>						Select code	
<b>Code C143</b>							
<b>Save</b>							
<b>Return</b>						Save and return to main menu	



Having pressed ENTER to acknowledge PUSH you can save the selected parameters separately by pressing a cursor button.

### 5.5.6. Code C210 Retrieving parameters

**Objective:** Resetting to default values or retrieving stored application-specific settings



**FAC** Select and acknowledge FAC to apply the factory default settings

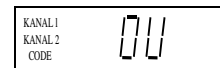
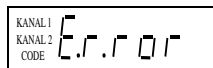


**US.PA.** Select and acknowledge US.PA to retrieve the application-specific set of parameters previously saved under C143.

## 6. Error messages

If a fault occurs during operation the controller switches itself off automatically and the display alternates between blinking ERROR and an error message. Power down and power up to reset.

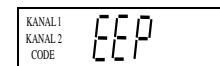
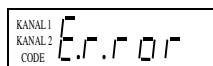
### Overvoltage cut-out



The supply voltage is or was too high.

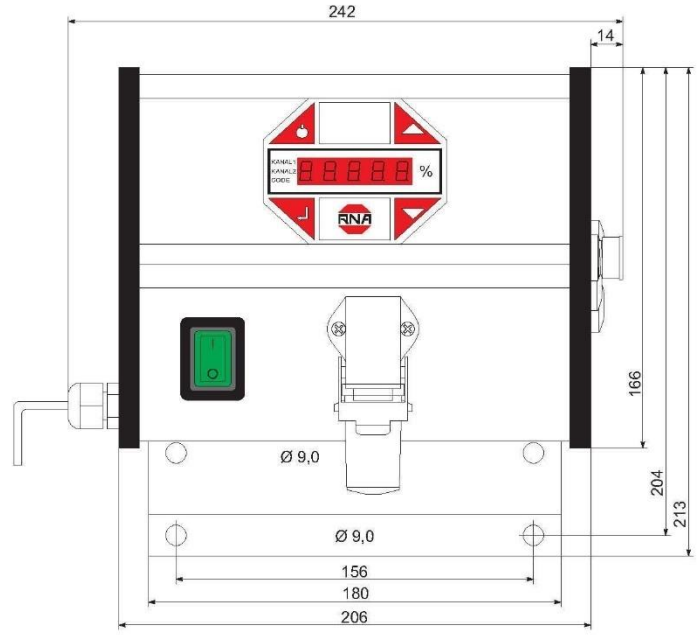
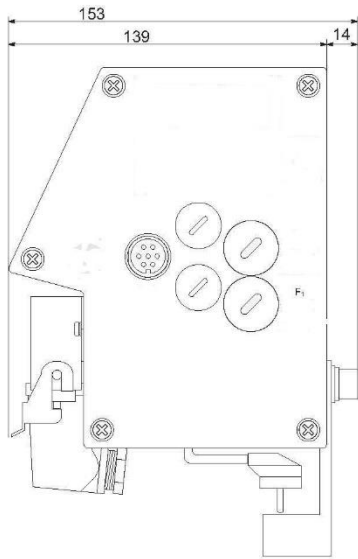
Check supply voltage. This error message is often caused by transient mains voltage peaks (e.g. by switching of inductive consumers). Install upstream filter, use other circuit, eliminate inductance, as necessary.

### Memory error



Repair required

# 7. Dimensioned drawing









Rhein-Nadel Automation GmbH

*Headquarters*

Rhein-Nadel Automation GmbH  
Reichsweg 19-23  
D-52068 Aachen  
Phone: +49 (0)241-5109-0  
E-mail: [vertrieb@RNA.de](mailto:vertrieb@RNA.de)  
[www.RNA.de](http://www.RNA.de)

*Further RNA group companies:*



PSA Zuführtechnik GmbH

PSA Zuführtechnik GmbH  
Steinackerstraße 7  
D-74549 Wolpertshausen  
Phone: +49 (0)7904-94336-0  
E-mail: [info@psa-zt.de](mailto:info@psa-zt.de)  
[www.psa-zt.de](http://www.psa-zt.de)



RNA Automation Limited

RNA Automation Ltd.  
Unit C Castle Bromwich Business Park  
Tameside Drive Birmingham B35 7AG  
Great Britain  
Phone: +44 (0)121-749-2566  
E-Mail: [sales@rnaautomation.com](mailto:sales@rnaautomation.com)  
[www.rnaautomation.com](http://www.rnaautomation.com)



HSH Handling Systems AG

HSH Handling Systems AG  
Wangenstraße 96  
3360 Herzogenbuchsee  
Switzerland  
Phone: +41 (0)62-956 10-00  
E-mail: [info@handling-systems.ch](mailto:info@handling-systems.ch)  
[www.handling-systems.ch](http://www.handling-systems.ch)



RNA Vibrant S.A.

RNA Vibrant S.A.  
Carrer de l'Energia  
08940 Cornellà de Llobregat (Barcelona)  
Spain  
Phone: +34 (0)93-377-7300  
E-mail: [info@vibrant-RNA.com](mailto:info@vibrant-RNA.com)  
[www.vibrant-RNA.com](http://www.vibrant-RNA.com)



RNA Digital Solutions GmbH

RNA Digital Solutions GmbH  
Reichsweg 19-23  
D-52068 Aachen  
Phone: +49 (0)1515-99 28 255  
E-mail: [kontakt@rnadigital.de](mailto:kontakt@rnadigital.de)  
[www.designforfeeding.com](http://www.designforfeeding.com)  
[www.rnadigital.de](http://www.rnadigital.de)

*Further manufacturing sites  
of the RNA Group*

*Lüdenscheid site*

Rhein-Nadel Automation GmbH  
Nottebohmstraße 57  
D-58511 Lüdenscheid  
Phone: +49 (0) 2351 -41744  
E-mail: [werk.luedenscheid@RNA.de](mailto:werk.luedenscheid@RNA.de)

*Ergolding site*

Rhein-Nadel Automation GmbH  
Ahornstraße 122  
D-84030 Ergolding  
Phone: +49 (0) 871 -72812  
E-mail: [werk.ergolding@RNA.de](mailto:werk.ergolding@RNA.de)

*Remchingen site*

Rhein-Nadel Automation GmbH  
Im Hölzlerle 3  
D-75196 Remchingen-Wilferdingen  
Phone: +49 (0)7232-7355-558  
E-mail: [werk.remchingen@RNA.de](mailto:werk.remchingen@RNA.de)