

USER MANUAL FOR DIGR-1502/E CONTROLLER



CONTENTS

1. Technical data.....	3
2. Description	3
3. Connection	7
4. Operating status	11
5. Activation	11
6. R-run / S-stop	12
7. Setting and saving parameters	12
8. Description of parameters	12
9. Maintenance	22
10. Disposal	22
11. Guarantee	22
12. ES Declaration of conformity	23

1. Technical data

Power supply voltage U_{nap}	110-230V 50/60Hz
Power input current	4.5 A
Output voltage	5-100% U_{nap} with 0.5% steps
Output frequency	20-120 Hz with 0.2 Hz steps
2x digital input	24V DC PNP
2x digital output	24V DC max. 120 mA
1x analogue input	0-10V DC
Auxiliary output voltage	24V DC max. 180 mA 10V DC max. 10 mA
Interference suppression	class A according to ČSN EN 55011 ed.4
Overvoltage category	II according to ČSN EN 61010-1 ed.2
Short circuit resistance	450 A
Internal fuse value	T8A
Protection level	IP54
Operational temperature	10-40°C
Altitude	max. 2000 m
Dissipated power	10 W
Weight	1.3 kg

2. Description

The DIGR-1502/E controller is designed for control of vibration feeders driven with an electromagnetic coil. Two basic parameters, i.e. output voltage amplitude and frequency are controlled. The operation of the controller is defined with parameters that are set by the user from the control panel. Control of the controller is possible either from the control panel or using external analogue and digital signals.

The controller is designated for installation outside of the switchboard. The controller includes also a safely separated 24V DC power supply for feeding peripheral devices such as sensors, air valves, and for 10V DC power supply for analogue input feeding.

Small size and effective user functions create prerequisites for deployment of these controllers operating both independently and together with a master control system in most feeder applications.

Fig. 1 - Description of controls

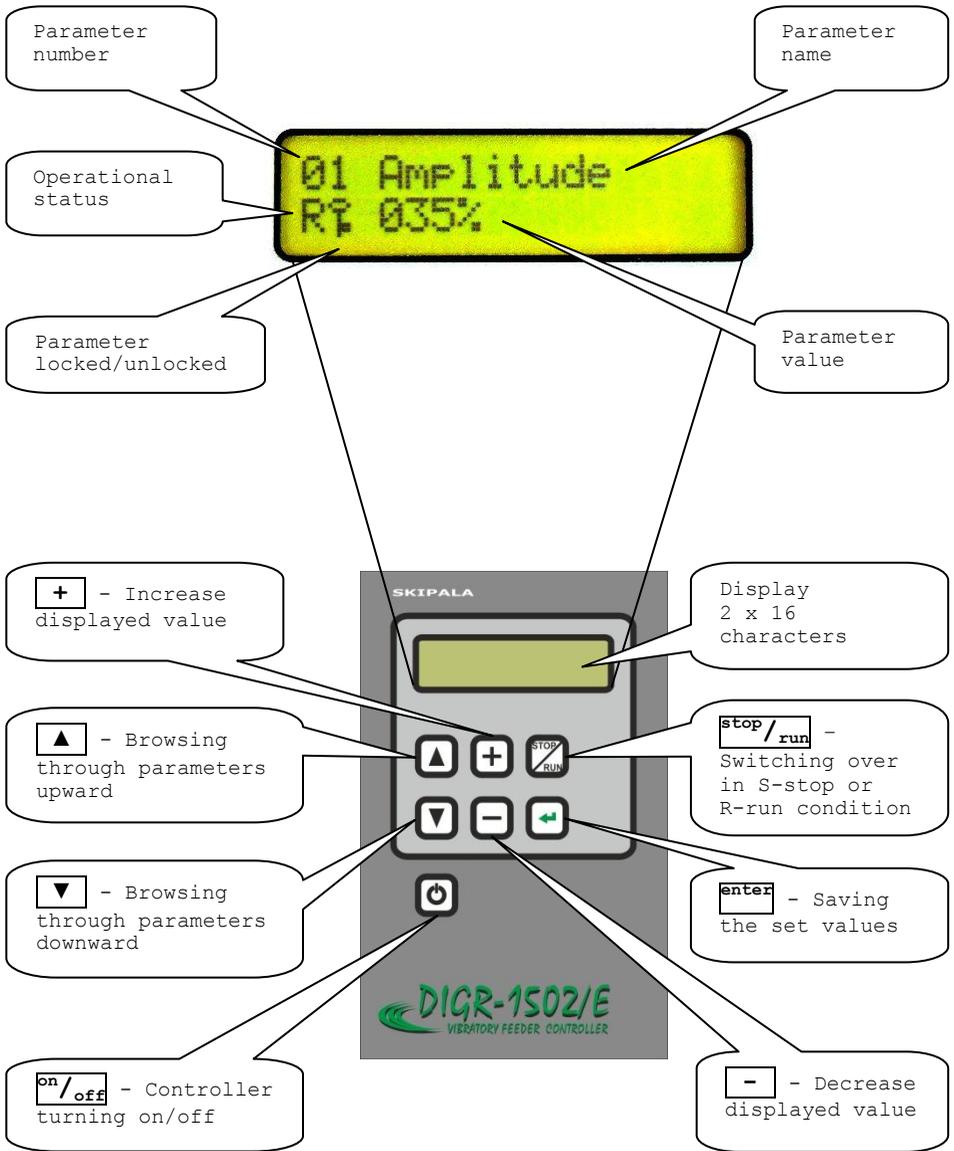


Fig. 2 - Basic dimensions

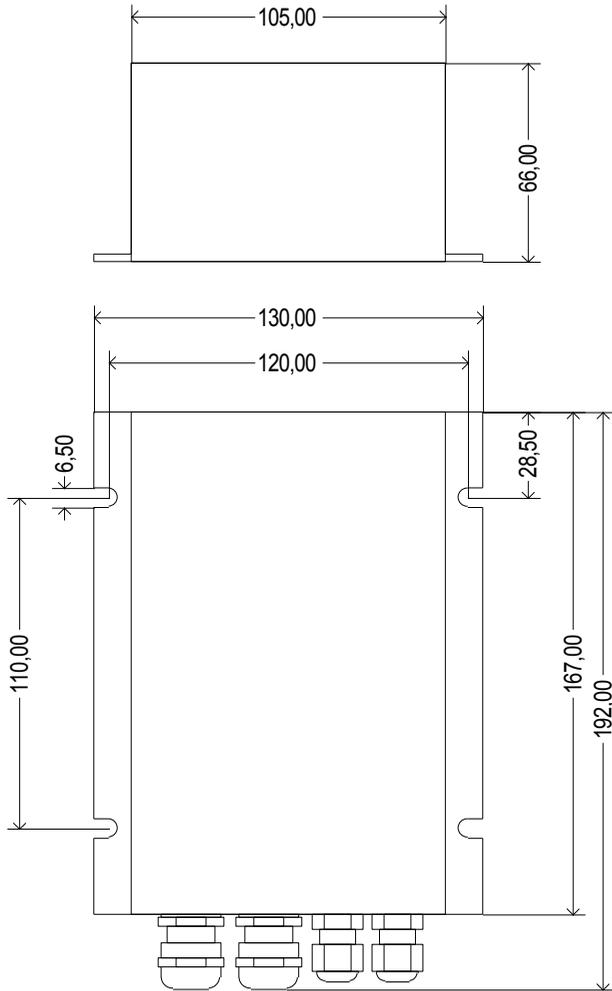
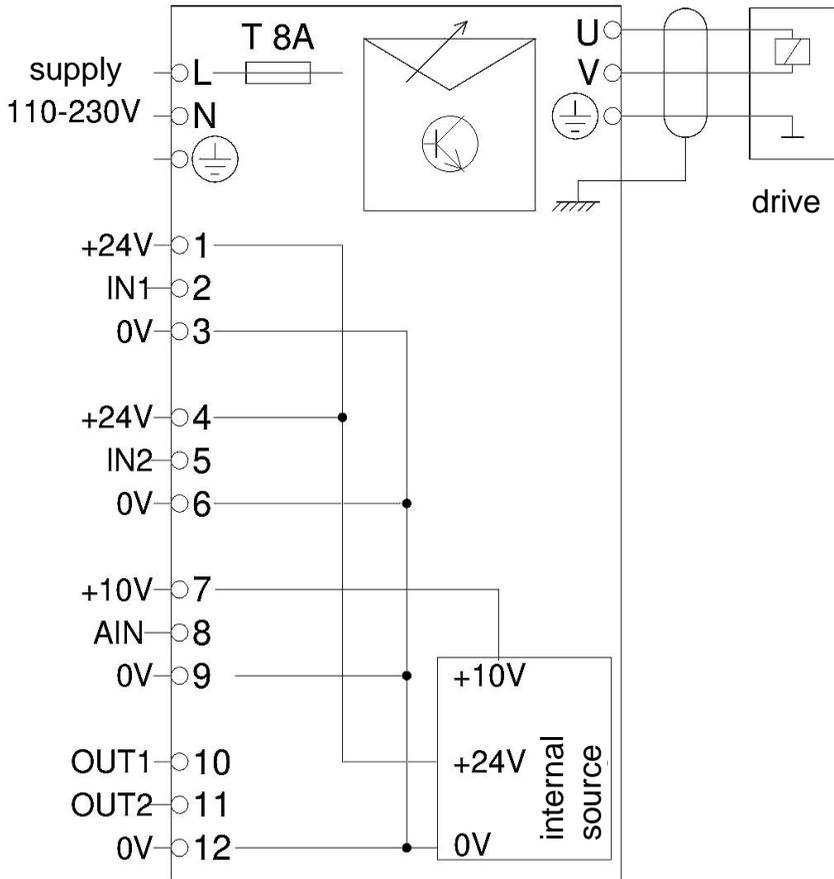


Fig. 3 - Connection of controller external parts



3. Connection

Connection of external electric components of the controller may be carried out only by the person with adequate electro-technical qualification. Connection may be done only if the controller is disconnected from the mains.

⚠ Caution! Electric charge remains in capacitors after controller disconnection from the mains. This electric charge may become a cause of **fatal injury!** The lid may be removed only if the controlled has been disconnected from the mains for at least 60 seconds!

⚠ Caution! If the device is used in a manner not specified by the manufacturer, the protection provided by the device may be compromised!

3.1. Installation

The controller can be installed either in the horizontal position or in the vertical position with outlets facing downward.

⚠ Caution! The controller should be mounted to a mechanically stable part of equipment free of direct vibrations.

Drill four holes with a drill with diameter of 4.2 mm in the base plate to which the controller should be mounted and cut M5 threads in them. The pitch of the holes is apparent from Fig. 2. Mount the controller using 4 M5x8 screws with fan washers.

⚠ Caution! Washers are needed so when tightened the layer of elox is cut and the controller is conductively joined to the body of the machine.

3.2. Lid disassembly

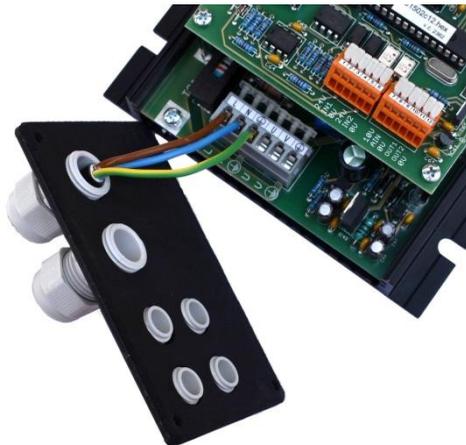
Unscrew four M3 screws mounting the controller lid and remove the lid (Fig. 4).

Fig. 4 - dismantling of the cap



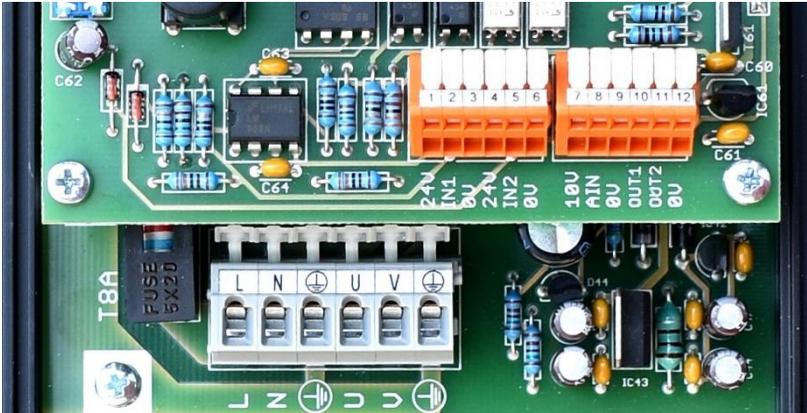
To allow better access to the terminal block, we recommend dismantling also the part with outlets (Fig. 5).

Fig. 5 - Removal of the part with outlets



There are connecting terminals under this lid (Fig. 6).

Fig. 6 - Connecting terminals



3.3. Connection of the power section

The controller is equipped with a 2P + PE terminated lead cable. Connect the plug to a standard 230V socket that is triggered by a circuit breaker with a maximum rated current of 16A characteristic B. The fork acts as a disconnect device and must be placed in a convenient, easily accessible position near the controller.

If the controller is incorporated into the wiring of a superior unit such as a machine, the connection is made by a flexible cable of 3x 1.5 mm² which is triggered by a circuit breaker with a maximum rated current of 16A characteristic B. This installation must be equipped with a disconnecting device that disconnects all conducting currents.

Connect the feeder coil to the PE, U, V terminals (Fig. 8). We recommend using a shielded cable. If more controllers are connected to the equipment, it is necessary to connect them to different phase wires or ensure their sequential switching on, because of the current peak.

Termination of the power cables is illustrated in Fig. 7. Select the wire section areas as follows:

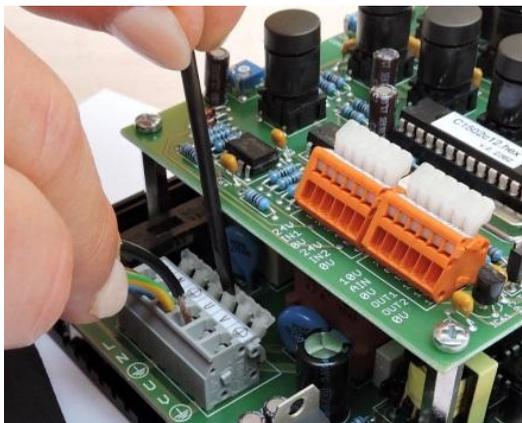
Wire cross section area	0.75 - 1.5 mm ²
Cable diameter	8 - 10 mm

⚠ Caution! The protective wire should be at least by 15 mm longer than the other wires.

Fig. 7 - Termination of power cables



Fig. 8 - Connection of wires



3.4. Connection of the control section

Wire cross section area	0.08 - 0.5 mm ²
Cable diameter	3 - 6.5 mm

Connect the sensors, valves, digital and analogue signals as required by a specific application, in accordance with Fig. 3. Detailed explanation - please see Section 8.7.. The inputs and outputs are fed with safely separated voltage of 24V DC. Use PNP sensors (the output signal is switched to +24V).

3.5. Lid reassembly

After completing connection of the external parts of the controller, carry out reassembly of the part with grommets and top lid. Only then you can turn power supply on.

4. Operational condition

Operational condition is shown on the display as the first symbol of the bottom line (Fig. 1). The controller can be in one of four statuses:

- ⚡ The controller is energized, however, all activities are turned off.
- S STOP - The controller is turned on and it is in the S-stop condition. Output power voltage is blocked, the feeder is idle. Viewing and modifications of all parameters and saving the parameters in the memory is possible.
- R RUN (operation)- The controller is turned on and it is in the R-run condition. Output voltage is connected and the feeder is vibrating. Viewing and modifications of all parameters are possible.
- W WAIT - The controller is turned on and it is in the W-wait condition. Output power voltage is blocked, the feeder is idle. The controller waits for a signal from sensors or from a master control system. Viewing and modifications of all parameters are possible.

5. Turning ON

Controller turning on can be carried out using two methods:

- a) Turning on is to be carried out by depressing the button  . Turning off can be carried out by depressing the button again.

This method of turning on is suitable in case that the controller operates independently without link to any other electric equipment.

⚠ Caution! Internal circuits of the controller are still energized and for that reason, such turning off cannot be considered as safe disconnection from the mains! This condition is indicated on the display with the symbol ⚡ .

- b) Turning on is carried out automatically after power supply voltage connection. For this purpose, it is necessary to set the parameter A36 to "automatic". This method of turning on is suitable if controller power supply is connected through a connecting

component (contactor) from a master electric device.

6. R-run / S-stop

The controller is ready for operation after turning on. It is either in the R-run or W-wait condition in dependence upon setting of functions of digital inputs (parameter A19, A21). The controller is switched over in the S-stop condition after depressing the button. When depressing the button again, the controller will be switched from the S-stop in R-run or W-wait condition.

7. Setting and saving of parameters

Select the required parameter using the and buttons. If it has not been locked (key symbol), the value of parameter can be modified using the or keys. Press the button to save, all parameters are saved in the memory at once. It is recommended to save in the S-stop status.

First, locked parameters must be unlocked by typing the password, parameter A41 (Chapter 8.28.).

8. Description of parameters

The controller contains a set of parameters marked A10 - A41. Parameter numbers do not form a continuous series of numbers for compatibility with other controllers.

8.1. A10 Amplitude

The controller controls output voltage amplitude within the maximum range of 5-100% with 0.5% steps. The effective value of voltage depends on power supply voltage. Range of setting is restricted with the value of the parameter A17 Maximum amplitude and A18 Minimum amplitude.

8.2. A11 Frequency

The controller controls output voltage frequency within the range of 20-120 Hz with 0.2 Hz steps.

8.3. A12 Delay ON A13 Delay OFF

The parameters sense if at least one sensor is connected to the controller monitoring the filling of

the output storage tank of the feeder. We recommend setting parameters to 0 s.

If the controller is in the W-wait status parts are taken from the storage and their movement causes a short interruption of the signal from the filling sensor. The Delay ON (parameter A12) must be longer than the interruption of the signal. Then the interruption will be ignored and the controller switches into the R-run status after the storage tank is discharged. The same occurs after the storage tank is filled. Individual parts pass around the sensor and create short impulses. The Delay OFF (parameter A13) must be longer than these impulses. Then they will be ignored and the controller switches into the W-wait status after the actual filling of the magazine. The parameters can be set from 0-25 s.

8.4. A14 Ramp up/down

This parameter can be used when starting and running down the feeder to change the value of the amplitude so that the feeder starts to run fluently. The setting range is 0-6 s. The time relates to starting from 0% to 100% and running down from 100% to 0%.

8.5. A15 Batch ON

A16 Batch pause

In some cases, the feeder needs to work with interruptions, in batches. Use parameter A15 to set the time during which the batch is supplied, parameter A16 the time of the pause between batches.

 **Tip for you:** The vibrating feeder serves as a pre-storage tank that delivers the parts to the circular feeder on the basis of the full sensor signal. If you take advantage of the batch function, the pre-storage tank fulls only one batch, waits, then evaluates the status of the full sensor and, if necessary, gives a next batch. Parts of the hopper will spread evenly during the pause. This ensures that the hopper does not overflow.

8.6. A17 Amplitude Maximum limit

A18 Amplitude Minimum limit

Use these parameters to restrict the amplitude setting in parameter A11.

 **Tip for you:** The operators can correct the value within the permitted range without greatly affecting the correct work of the feeder.

8.7. A19 Input IN1

Determining the use of digital input IN1.

Not used - The input is not used or is only monitored and its state is transferred to the output (Chapter 8.12).

Start - The +24V signal must be supplied so that the feeder can be activated. If the remaining conditions are fulfilled as well (according to the configuration for additional inputs), then upon supply of the 24V signal the feeder will be in the R-run status. Otherwise, the feeder is in the W-wait status. Switching from the W to R status and vice versa is immediate, the parameters A12, A13 do not affect this.

 **Tip for you:** Use this setting if the feeder is controlled from a master control system.

Maximum stock - The sensor is connected to the input monitoring the maximum stock in the storage tank being filled by the feeder. If the sensor is active during the period stated by the parameter A13, the feeder is stopped and switched to the W-wait status. Returning to the R-run status depends on whether the second input is defined as the minimum stock. If so, the feeder is activated according to the status of this sensor (see below). The feeder is switched to the R-run status after the maximum stock sensor is not active for the time stated by the parameter A12.

 **Tip for you:** By setting parameters A12, A13 properly only one sensor is sufficient for monitoring the storage tank.

Minimum stock - This setting is only used if the second output is defined as the maximum stock. The sensor monitoring the minimum in the storage tank is connected to the input being filled by the feeder. The feeder is switched to the R-run status after the minimum stock sensor is not active for the time stated in parameter A12. If

both stock sensors are active for the time in parameter A13 activity stops.

Ejector IN - The input controls the ejector together with the digital output OUT1, OUT2 (Chapter 8.12.).

8.8. A20 Sensor 1 type

Type of sensor connected to input IN1.

Normal open (NO) - 24V is on the output of the sensor if the supplied part is present.

Normal close (NC) - 24V is on the output of the sensor if the supplied part is not present.

8.9. A21 Input IN2

Determining the use of digital input IN2. The setting is identical as for input IN1 (Chapter 8.7.).

8.10. A22 Sensor 2 type

Determining the type of the sensor connected to input IN2. The setting is identical as for input IN1 (Chapter 8.8.).

8.11. A23 Analogue AIN

Determining the use of analogue input AIN. It can be configured as analogue 0-10V, or digital 0/24V.

Not used - The input is not used.

Amplitude - The input is configured as analogue. The 0-10V voltage is used to set the amplitude and intensity of vibrations of the feeder from 5-100% with 0.5% steps. The setting range can be restricted by parameters A17, A18. The set value is displayed in parameter A11.

JOG-min - The input is configured as digital. 24V signal on the input causes the amplitude to switch to the minimum value, which is determined by parameter A18. ☺ Tip for you: Use this setting if you need to decrease the speed of the feeder during the activity. For example, when pouring material on the scale when approaching the desired weight.

Start - The input is configured as digital. The supply of the +24V signal is the condition for

the feeder to be activated. ☺ **Tip for you:** Use this setting if you need to control the feeder from the master control system and digital inputs IN1, IN2 are occupied by the connected sensors.

Stop - The input is configured as digital. The supply of the +24V signal causes the controller to stop.

8.12. A24 Output OUT1

Determining the use of digital output OUT1.

☺ **Tip for you:** A pneumatic valve which controls the air jets, switches or ejectors, for example, can be connected to the digital output. The master control system PLC or signaling beacon can be used as the signal, or as the signal if the controllers are connected in a cascade.

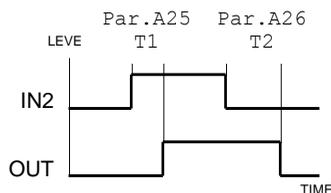
Not used - The input is not used.

Run status - Output is always switched when the drive is in the R-run status.

Air jet - The output controls the air supply valve into the feeder. The valve is switched on before activation of the feeder. The time is set using parameter A25 (Timer T1). When the feeder is turned off, the air is turned off with a delay, which is set using parameter A26 (Timer T2).

Ejector E1 (Fig. 9a) - The output is connected to the valve controlling the ejector i.e. equipment removing incorrectly oriented or redundant parts from the route of the feeder. One of the inputs, e.g. IN2, must be set to the ejector function (Chapter 8.9.). The sensor is connected to the input reading the parts. Use Timer T1 (parameter A25) batch ON to set the delay so that the ejector does not respond to short impulses from the sensor. Use Timer T2 (parameter A26) batch OFF to change the ejection time.

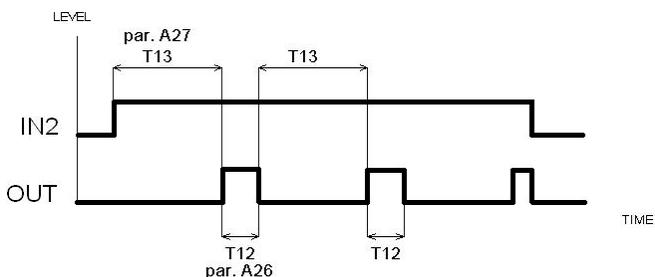
Fig. 9a - activity of the ejector E1



Ejector E2 (Fig. 9b) - is similar to the ejector E1, except that it uses three timers. Timer T11 (parameter A25) suppresses short impulses at the input IN2. Timer T13 (parameter A27) determines the delay between the signal IN2 and switching output OUT. Timer T12 (parameter A26) determines the length of switching output OUT.

☺ **Tip for you:** Ejector E2 is good for example for detecting the stuck parts. If parts are not passing under the sensor for time T13 (parameter A27) the output OUT is switched, which is connected to the valve that controls air nozzles, which blow off stuck parts from the feeder track.

Fig. 9b - activity of the ejector E2



Monitor IN1 ON - The output monitors the activated status of digital input IN1. This is only monitored when the drive is in the status RUN - operating. If during the period set by parameter A27 (Timer T13), there is signal 24V on input IN1, the output OUT switches on. The signal on the monitored input can be protected from short impulses, which are caused by the movement of parts under the sensor. Impulses from status 0 to status 1 are suppressed by setting parameter A25 (Timer T11). Impulses from status 1 into status 0 are suppressed by setting parameter A26 (Timer T12). All impulses which are shorter than the set time, will be ignored.

☺ **Tip for you:** This setting can be used, for example, if connecting the signalling beacon on the input, to signal the shortage of components in the magazine.

Monitor IN1 OFF - The output monitors the off status of digital input IN1. The setting and functions are the same as when monitoring input IN1 ON.

Monitor IN2 ON - The output monitors the on status of digital input IN2. The setting and functions are the same as when monitoring input IN1 ON.

Monitor IN2 OFF - The output monitors the off status of digital input IN2. The setting and functions are the same as when monitoring input IN1 ON.

8.13. A25 Timer T11

Universal timer where the use is determined by setting parameter A24 (Output OUT1).

8.14. A26 Timer T12

Universal timer where the use is determined by setting parameter A24 (output OUT1).

8.15. A27 Timer T13

Universal timer where the use is determined by setting parameter A24 (Output OUT1).

8.16. A28 Output OUT2

Determining the use of digital output OUT2. The setup is similar to the parameter A24 (output OUT1). The difference is in the numbers (marks) of the timers, that are utilized by the output. Instead of timers T11, T12, T13 (parameters A25, A26, A27) uses output OUT2 timers T21, T22, T23 (parameters A29, A30, A31).

8.17. A29 Timer T21

Universal timer where the use is determined by setting parameter A28 (Output OUT2).

8.18. A30 Timer T22

Universal timer where the use is determined by setting parameter A28 (Output OUT2).

8.19. A31 Timer T23

Universal timer where the use is determined by setting parameter A28 (Output OUT2).

8.20. A32, A33

Reserved for future use.

8.21. A34 Wave type

It defines the course of output voltage.

full wave

half wave -equivalent of unidirectional rectification

8.22. A35

Unused parameter for this type of controller.

8.23. A36 Switch ON

States how the controller behaves after connecting the supply voltage.

Press button - After connecting the supply voltage, the controller is off. It is activated by pressing the button .

Automatic - After connecting the supply voltage the controller is automatically activated. This setting does not exclude activation and deactivation by pressing.

8.24. A37 Service functions

For servicing.

Not used - Service functions are not activated.

RND stop - When testing the feeder actual operational behaviour can be simulated. The feeder is disconnected and connected at irregular intervals.

8.25. A38 Lock/unlock

Use this parameter to lock or unlock the editing of parameters A10 - A16. First, type the password by parameter A41 (Chapter 8.28.). Then, using the or button set the number of the parameter to be locked or unlocked. Press the button. The key icon appears after the parameter number. This means that the selected parameter is locked. It can be unlocked in the same way. By pressing the button the key icon disappears and the parameter is unlocked. Parameters are locked if the password is disabled.

8.26. A39 Language

Language selection.

English - Always available.

Czech - Is delivered if another language version has not been ordered. As standard Russian or German can be ordered or another language agreed on.

8.27. A40 Information

For more information about this product, visit our Internet pages <http://www.skipala.cz>

8.28. A41 Password

Typing the password temporarily unlocks blocked parameters.

The password is delivered by the firm as a 3-digit number 108 and can not be changed. Its purpose is to protect the controller against accidental overwriting of locked parameters. The password cannot be typed if it is changed or the controller disconnected.

8.29. Factory settings

If there are complications with controller, RESTART it to reset the factory settings of all parameters. RESTART as follows:

- Disconnect the controller from the supply network and wait at least 60 seconds to discharge condensers (the character ⚡ disappears on the display)
- press the button and hold it down
- connect the controller to the supply network
- release the button

The parameter values of the factory settings are given in the table (*Fig. 10*).

Fig. 10 - table of parameters

number of parameter A	factory values	values of application	values of application
10 Amplitude	32.0 %		
11 Frequency	50.0 Hz		
12 Delay ON	00.0 s		
13 Delay OFF	00.0 s		
14 Ramp up/dwn	02.0 s		
15 Batch ON	00.0 s		
16 Batch pause	00.0 s		
17 Ampl. MAX	100.0 %		
18 Ampl. MIN	05.0 %		
19 Input IN1	not used		
20 Sensor 1 type	normal open		
21 Input IN2	not used		
22 Sensor 2 type	normal open		
23 Analogue AIN	not used		
24 Output OUT1	not used		
25 Timer T11	00.0 s		
26 Timer T12	00.0 s		
27 Timer T13	000 s		
28 Output OUT2	not used		
29 Timer T21	00.0 s		
30 Timer T22	00.0 s		
31 Timer T23	000 s		
34 Wave type	full wave		
36 Switch ON	press button		
37 Service fnc	not used		
38 Lock/unlock			
39 Language	english		
40 Info	www.skipala.cz		
41 Password			

9. Maintenance

The controller does not require any special maintenance. Carry out Pergorm only regular inspection in accordance with ČSN EN50110-1 ed.3 and Regulation No. 50/78 Sb. In the case of failure do not repair - send the controller to the manufacturer for repair. When changing the fuse, observe the prescribed T8A value.

 **Tip for you:** In the case of complications with the operation of the controller, reset the factory setting of the parameters (Chapter 8.29.).

10. Disposal

At the end of its service life the controller must be handed over for professional disposal to a specialized firm or the manufacturer.

11. Guarantee

The guarantee for the product is 12 months from the day of sale.

Serial number:

Seller:

Date of sale:

12. ES DECLARATION OF CONFORMITY

In accordance with Act No. 90/2016 Coll. on conformity assessment of specified products when they are placed on the market, as amended.

Manufacturer: **Skipala s.r.o.**

Rybník 162, 560 02 Rybník

Czech Republic

Id. No.: 06607551

<http://www.skipala.cz>

Identification of the product:

Name: Digital controller for vibratory feeders

Model: **DIGR-1502/E**

We declare that the above-mentioned product fulfils the respective provisions of the following EU regulations:

Government Directive No. 118/2016 Coll. (Directive of the European Parliament and the Council 2014/35/EU)

Government Directive No. 117/2016 Coll. (Directive of the European Parliament and the Council 2014/30/EU)

Description of the product: The product is designed for regulating vibration feeders driven by an electromagnetic coil.

List of technical and harmonized standards used:

ČSN EN 61010-1 ed.2:11, ČSN EN 61326-1 ed.2:13,

ČSN EN 61000-6-2 ed.3:06, ČSN EN 61000-6-4 ed.2:07+A1:11

Source materials for issuing the EC Declaration of Conformity: **Certificate No. 1180684** issued on October 15, 2018 by the Electrotechnical testing institute on the basis of meeting the requirements of the "EZÚ certificate" certification scheme.

The two last digits of the year in which the CE indication was attached to the product: 18

In Rybník on October 31, 2018

Karel Skipala
CEO



