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INSTRUCTION MANUAL FOR THE CONTROLLER DIGR-1201/E

CONTENTS

1. Technical data

Power supply voltage U_{nap}	230V 50/60Hz
Maximum output current	8 A
Output voltage	20-99% of U_{nap}
Output frequency	100Hz, 50Hz, 33Hz, 25Hz, 20Hz
2x digital input	24V DC
1x digital output	24V DC max. 10 mA
1x analogue input	0-10V DC
Auxiliary output voltage	24V DC max. 50 mA
	5V DC max. 10 mA
Protection level	IP54
Operational temperature	10-55°C
Dissipated power	10W
Interference suppression	EN 55011/A
Short circuit resistance	1.5 kA
Hmotnost	1.3 kg

2. Generally

The DIGR-1201/E controller (hereinafter the controller) is primarily designed for control of vibration feeders driven with an electromagnetic coil (hereinafter the feeder), however, use also for different applications is not excluded. Output voltage is a basic control parameter. A triac that is connected with a phase shift is the controller power element. The controller also allows step setting of oscillation frequency: 100 Hz, 50 Hz, 33 Hz, 25 Hz, 20 Hz. The operation of the controller is defined with 10 different 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 sensors and for 5V 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 (PLC) in most feeder applications.

<u>*Fig. 1*</u> *– Description of controls*

Energized
operational
status

Parameter
value

Parameter
number

Operational
status RUN/STOP

+ – Increase
displayed value

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FUNCTION   VALUE

SET – Switching
over in parameter
setting mode
RUN/STOP

– – Decrease
displayed value

SET ◄ ► ↵

enter – Saving
the set values

◄ – Browsing
through parameters
downward

► – Browsing
through parameters
upward

on/off –
Controller turning
on/off

DIGR-1201/E
VIBRATORY FEEDER CONTROLLER

Fig. 2 – Basic dimensions

105,00

66,00

130,00

120,00

6,50

28,50

110,00

167,00

195,00

Fig. 3 – Connection of controller external parts
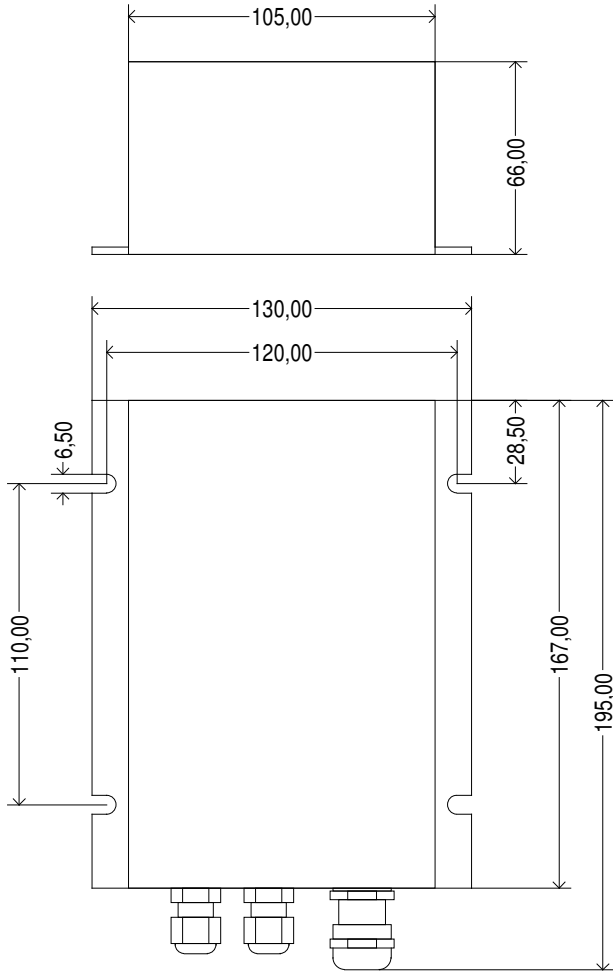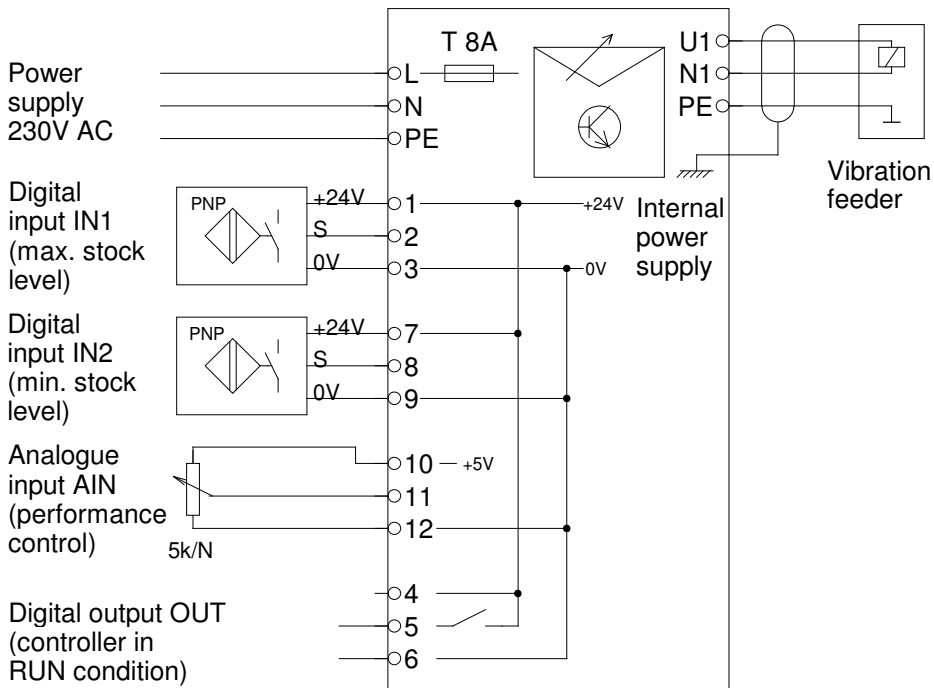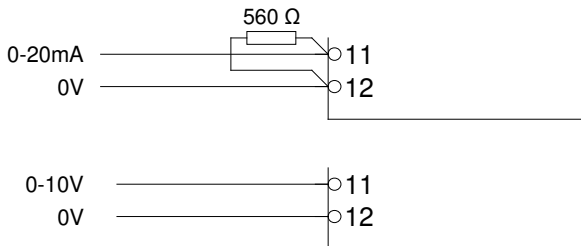

Fig. 3 – Connection of controller external parts

3. 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.

4. 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.

4.1. Lid disassembly

Unscrew four M3 screws mounting the controller lid (Fig. 4) and remove the lid (Fig. 5).

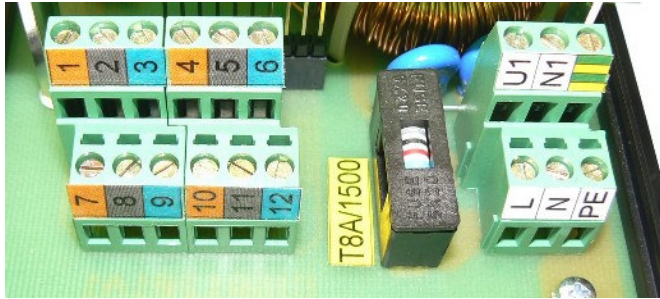*Fig. 4 – Lid disassembly*

Fig. 5 – Lid removal

To allow better access to the terminal block, we recommend dismounting also the part with outlets (Fig. 6).

Fig. 6 – Removal of the part with outlets

There are connecting terminals under this lid (Fig. 7).

Fig. 7 – *Connecting terminals*

4.2. Connection of the power section

The controller is provided with an internal T8A fuse that protects the device against a short circuit, however, it does not protect it against overloading. Select a preliminary protection with respect to the real size of the connected load. If more controllers are connected to a device, it is necessary to connect these controllers to different phase wires because of a current peak.

Perform connection in accordance with Fig. 3. If the power supply cable delivered is not suitable for you, remove it and feed power voltage to the L, N, PE terminals. Connect the coil of the vibration feeder to the U1, N1 terminals and to the protective terminal provided with green-yellow marking. If the coil cable length exceeds 1.5 m, we recommend using a shielded cable for this connection. Terminate shielding using a special steel outlet that can be ordered for the controller.

Termination of the power cables is illustrated in Fig. 8. Select the wire section areas as follows:

Wire cross section area $0.5 - 1.5 \ \text{mm}^2$
Cable diameter $8 - 10 \ \text{mm}$

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

Fig. 8 – Termination of power cables
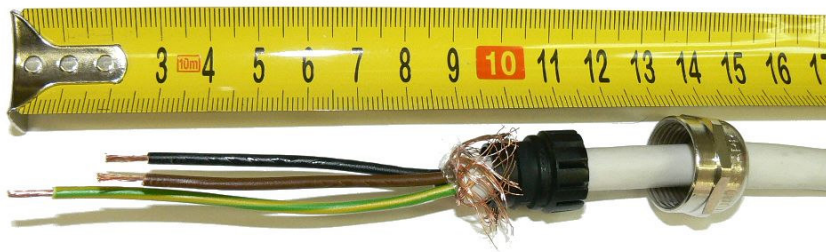
4.3. Connection of the control section

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

Connect the sensors, digital and analogue signals as required by a specific application, in accordance with Fig. 3.   The sensors are fed with safely separated voltage of 24V DC. Use the PNP type sensors (output signal is connected to +24V).

4.4. 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.

5. Operational condition

The operational condition is indicated on the display with decimal dots at the parameter number and between numerals giving parameter value (see Fig. 1).   The controller can be in one of three statuses:

a)   The controller is energized, however, all activities are turned off. The status is indicated with lighting up the decimal dot between the numerals giving parameter value.

b)   The controller is turned on and it is in the STOP condition. Output power voltage is blocked, the feeder is idle. The controller waits for a signal from sensors or master control system or has been

brought in the STOP condition by depressing the
SET key.
The status is signalled with lighting up the
decimal dot at the parameter number.

c) The controller is turned on and it is in the RUN
condition. Output voltage is connected and the
feeder is vibrating. Modification of the parameter
No. 0 Performance is possible. The digital output
is connected in this status. The status is
signalled with extinguishing the decimal dot at
the parameter number.

6. Turning on

Controller turning on can be carried out using two
methods:

a) Turning on is to be carried out by depressing the
button $^{on}/_{off}$ (Fig. 1). 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! The status is
indicated with lighting up the decimal dot
between the numerals giving parameter value.

b) Turning on is carried out automatically after
power supply voltage connection. For this
purpose, it is necessary to set the parameter
No. 5 After turning on to 1. This method of
turning on is suitable when controller power
supply is connected through a switching component
(contactor) from a master electric device.

7. RUN / STOP

The controller is ready for operation after turning
on. It is either in the RUN or STOP condition in
dependence upon setting of functions of digital inputs
(parameter No. 1, see Section 9.2.). If the controller
is in the RUN condition, it can be switched over in the
STOP condition by depressing the SET button. When the
button is depressed again, the controller is switched

over from the STOP in the RUN condition or it remains in the STOP condition and waits for a signal from sensor.

8. Setting of parameters

To set the parameters, it is necessary to depress the SET key at first. After depressing it, a parameter number lights up in the left-hand part of the display. Select the required parameter using the ◄ and ► keys. Parameter value can be modified using the + or − keys. Saving can be carried out by depressing the enter button. All parameters are saved together in the memory.

Value of the parameter No. 0 Performance (see Section 9.1.) can be set using the + or − keys during operation of the controller when the number of the parameter is not displayed. Saving is to be carried out by depressing the enter button.

9. Description of parameters

9.1. Parameter No. 0 Performance

Setting of output voltage intensity within the range of 20–99% with step of 0.5%. The value of 0.5% is indicated on the display with lighting up the decimal dot after the numeral expressing units. The effective value of output voltage is not linearly depending on the parameter value. The range of setting can be restricted with a value of the parameter No. 6 Minimum performance and No. 7 Maximum performance.

☹ **Caution!** If the output frequency of 100 Hz has been set, the maximum admissible output setting is 50%. If a higher setting value is selected, the vibrator itself will switch over to the frequency of 50 Hz. This phenomenon results already from the principle of controller operation and cannot be changed.

Slight output oscillation caused with interference from the power supply mains during controller operation is acceptable.

9.2. Parameter No. 1 Digital inputs

Use of the digital inputs can be defined by setting this parameter. The controller can operate as required by a specific application either without sensors or with one or two sensors.

0- Digital inputs are not used and the feeder is in the RUN condition after turning on.
1- One max. stock sensor is connected to the digital input IN1. If the sensor is active (+24V present on the terminal No. 2), the feeder is in the STOP condition. If this not the case, the feeder is in the RUN condition. Switching over from the STOP condition in the RUN condition and vice versa takes place with a delay that is given by the parameter No. 2 and No. 3 (see Section 9.3. and Section 9.4.).
2- Two sensors – for max. stock level and min. stock level – are connected to the digital inputs IN1 and IN2. If the min. stock level sensor on the input IN2 is not active (0V is present on the terminal No. 8), the controller will be switched over in the RUN condition. It will get in the STOP condition if both sensors are active on the inputs IN2 as well as IN1 (+24V is present on the terminals No. 8 and No. 2). Switching over from the STOP condition in the RUN condition and vice versa takes place with a delay that is given by the parameter No. 2 and No. 3.
3- One max. stock level sensor is connected to the digital input IN1. It behaves just on the contrary than in case of value 1. If the sensor is not active (0V present on the terminal No. 2), the feeder is in the STOP condition. If this not the case, the feeder is in the RUN condition. Switching over from the STOP condition in the RUN condition and vice versa takes place with a delay that is given by the parameter No. 2 and No. 3.

☺ **A hint for you:** Use this setting also in case when you control the feeder from a master PLC control system. Supply the START signal from PLC to the terminal No. 2 and supply common

zero potential of the control voltage to the terminal No. 3.

4- Two sensors – for max. stock level and min. stock level – are connected to the digital inputs IN1 and IN2. They behave just on the contrary than in case of value 2. If the min. stock level sensor on the input IN2 is active (+24V is present on the terminal No. 8), the controller will be switched over in the RUN condition. It will get in the STOP condition if both sensors are not active on the inputs IN2 as well as IN1 (0V is present on the terminals No. 8 and No. 2). Switching over from the STOP condition in the RUN condition and vice versa takes place with a delay that is given by the parameter No. 2 and No. 3.

9.3. Parameter No. 2 Delay at switching over in the RUN condition

If at least one sensor monitoring feeder output magazine filling (parameter No. 1) is not connected to the controller, we recommend setting the delay to the value of 0 s. If one or two sensors are connected, the delay has the following meaning:

The controller is in the STOP condition. If switching over in the RUN condition should take place on the basis of information received from sensors, it does not occur immediately but with a certain time delay. The setting range is 0–99 s. Use of the delay is explained using the following example: The feeder has filled the output magazine and is idle. Progressive withdrawal of components from the magazine takes place. Components are shifted in the magazine, which may result in a short interruption of the signal from the stock level sensor. If the delay would be set to 0 s, switching over in the RUN condition would occur in spite of the fact that the output magazine has not been emptied. The delay should be longer than the signal interruption time. This interruption will be ignored then and the controller will be switched over in the RUN mode only after real magazine emptying.

9.4. Parameter No. 3 Delay at switching over
in the STOP condition

   If at least one sensor monitoring feeder output magazine filling (parameter No. 1) is not connected to the controller, we recommend setting the delay to the value of 0 s. If one or two sensors are connected, the delay has the following meaning:

   The controller is in the RUN condition. If switching over in the STOP condition should take place on the basis of information received from sensors, it does not occur immediately but with a certain time delay. The setting range is 0–99 s. Use of the delay is explained using the following example: the feeder is in the RUN condition and fills the output magazine. Individual components are passing the level sensor and create brief impulses. If the delay would be set to 0 s, switching over in the STOP condition would occur in spite of the fact that the output magazine has not been filled up. The delay should be longer than the duration of the signal created with one component passing the level sensor. This interruption will be ignored then and the controller will be switched over in the STOP condition only after real magazine filling up.

9.5. Parameter No. 4 Analogue input

   Use of the analogue input can be defined by setting this parameter.
   0- Analogue input is not used; the value of output is set using the parameter No. 0.
   1- The value of output is given by the analogue signal of 0–5 V. This setting is suitable for potentiometer connection with use of an internal power supply of 5 V. The parameter No. 0 is ignored.
   2- The value of output is given by the analogue signal of 0–10 V. If you use the current signal of 0–20 mA, it is necessary to connect a resistor of 560 Ω between the terminals No. 11 and No. 12. The parameter No. 0 is ignored.

9.6. Parameter No. 5 After turning on

It defines controller behaviour after power supply connection.

Value   0: automatic turning on is blocked

              1: controller automatic turning on is carried out after power supply voltage connection

9.7. Parameter No. 6 Performance, minimum limit

It is possible to limit setting of the minimum performance value in the parameter No. 0 using this parameter.

9.8. Parameter No. 7 Performance, maximum limit

It is possible to limit setting of the maximum performance value in the parameter No. 0 using this parameter.

☺ **A hint for you:** If it is ascertained that the feeder operates optimally within a certain performance range, set the ascertained limitation using the parameters No. 6 and No. 7. The operator can then correct the performance value in the admissible range only without any more significant effect on correct operation of the feeder.

9.9. Parameter No. 8 Oscillation frequency

Oscillation frequency can be set within the range of 20-100 Hz. The principle of frequency modification consists in omitting a certain number of half-waves of the controlled voltage sinusoid. It means that a change does not take place continuously but in steps. The value of the parameter can be selected from the range of 0-4 to which the frequency values of 100 Hz, 50 Hz, 33 Hz, 25 Hz, 20 Hz correspond.

☹ **Caution!** If the output frequency of 100 Hz has been selected, the maximum admissible output setting of the parameter No. 0 Performance is 50%. If a higher setting value is selected, the vibrator itself will switch over to the frequency of 50 Hz. This phenomenon results already from the principle of controller operation and cannot be changed.

9.10. Parameter No. 9 Starting time

It is desirable in some cases the feeder to be started and stopped smoothly. The value of performance at feeder starting and stopping is modified with this parameter. The range of setting of this value is 0-5 s. The time interval applies to starting from 0% to 100% and stopping from 100% to 0%. If e.g. the parameter No. 0 Performance is set to 50% and the parameter No. 9 Starting time is set to 4 s, performance will be increased continuously for 2 s during starting and also reduced continuously for 2 s during stopping.

10. Digital output

The controller is provided with 1 digital output. It is fed from safely separated power supply of 24V DC. The maximum current with which the output can be loaded is 10 mA. The output is connected if the controller is in the RUN condition.

☺ **A hint for you:** The digital output can be used as a signal for master PLC control system.

11. Maintenance

The controller does not require any special maintenance. Only regular inspections in accordance with ČSN 33 2000-1 and ČSN 34 3100 standards and regulation No. 50/78 Coll. should be carried out. In the event of any defect, any repairs are forbidden and it is necessary to send the controller to the manufacturer for repair.

In case of any complications in controller operation, it is possible to carry out RESTART during which the factory settings of all parameters will be restored. RESTART is to be carried out as follows:

- disconnect the regulator from the power supply mains and wait for at least 10 seconds until capacitors are discharged
- depress the SET button and hold it depressed
- connect the controller to the mains
- release the SET button

The values of parameters for factory settings are listed in the table below (see Fig. 10).

12. Disposal

After expiration of service life of the controller, the controller should be handed over to a specialized company or to the manufacturer for professional disposal.

Fig. 10 – *Table of parameters*

parameter	value range	factory values	values for your application
0 Performance	20-99%	31%	
1 Digital inputs	0-4	0	
2 Delay from STOP to RUN	0-99s	0s	
3 Delay from RUN to STOP	0-99s	0s	
4 Analogue input	0-2	0	
5 After turning on	0-1	0	
6 Performance, min. limit	20-89	20%	
7 Performance, max. limit	30-99	99%	
8 Frequency	0-4	1	
9 Starting time	0-5s	0	

13. Declaration of conformity

In accordance with the act No. 22/97 Coll. on technical requirements for products, the manufacturer declares herewith the product to be safe when observing the conditions of standard use and intended use defined in its manual and that such measures have been undertaken through which conformity with the technical documentation, with the basic requirements of the regulation of the government No. 17/2003 Coll. and No. 18/2003 Coll. and with the requirements of technical regulations and related standards is assured. The Certificate No. 1060967 granted by the authorized entity – Electro-Technical Testing Institute – represents a background document for issuing the declaration above.

14. Guarantee

The product is covered with the guarantee with the period of duration of 12 months from the date of sale.

Serial number:

Seller: Date of sale:

15. Manufacturer

This controller is manufactured and its service provided by the company:

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560 02 Česká Třebová
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