

Technical Description

REOVIB R45 / 499 - 115

REOVIB R45 / 499 - 230

REOVIB R45 / 499 - 400

Thyristor control unit for vibratory feeders

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REOVIB

Control units for vibratory feeder engineering

Technical Safety Information for the User

This description contains the necessary information for the correct application of the product described below. It is intended for use by technically qualified personal.

Qualified personnel are persons who, because of their training, experience and position as well as their knowledge of appropriate standards, regulations, health and safety requirements and working conditions, are authorised to be responsible for the safety of the equipment, at all times, whilst carrying out their normal duties and are therefore aware of, and can report, possible hazards (Definition of qualified employees according to IEC 364).

Safety Instructions

The following instructions are provided for the personal safety of operators and also for the protection of the described product and connected equipment.



Warning!

Hazardous Voltage.

Failure to observe can kill, cause serious injury or damage.

- Isolate from mains before installation or dismantling work, as well as for fuse changes or post installation modifications.
- Observe the prescribed accident prevention and safety rules for the specific application.
- Before putting into operation check if the rated voltage for the unit conforms with the local supply voltage.
- Emergency stop devices must be provided for all applications. Operation of the emergency stop must inhibit any further uncontrolled operation.
- **The electric connections must be covered!**
- **Earth connection must be checked for safe function after assembly!**

Use According to Destination

The units described herein are electrical controllers for installation in industrial plants. They are designed for use in control and automation engineering. They are not determined for private households.

The equipment described herein conforms with the Regulations 89/336/EWG EMC-Regulations.

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1.0 General

The REOVIB R45/499 range of units are used for controlling the throughput of vibratory feeders. The units operate as controllers with output voltage regulation or as amplitude regulators whereby the amplitude of the feeder is kept constant. Power adjustment is achieved by using thyristors with phase angle control.

They can be used with vibratory feeders which have a mechanical vibrating frequency of 50 Hz or 100 Hz and 60 Hz or 120 Hz (3000/6000 and 3600/7200 vibrations/minute).

The set point source can be derived from a potentiometer, a control voltage of 0-10 V, DC or a control current of 0-20 mA or 4-20 mA. The effective set point range can be adjusted by using the internal trimmers 'MIN' and 'MAX'.

An enable input allows the unit to be switched remotely eg from a PLC or computer.

The units are provided with an adjustable soft-start to prevent mains surges when they are switched on. The controllers operate as regulators whereby either the output voltage or amplitude of the feeder is kept constant. A sensor must be fitted (eg type SW 07) to monitor the amplitude, ie the acceleration of the feeder unit, to maintain constant amplitude. The operating mode, either output voltage or amplitude regulation is selected with an internal switch.

There is an optional, fault relay with potential free, change-over contacts which are brought out to terminals. The relay operates when there is no output voltage ie failure of the sensor feedback signal.

All control terminals are isolated from the mains for safety.

The power semiconductors are protected from short circuits on the output side by a super, quick acting, fuse. External fuses must be fitted for protecting the controller.

2.0 Function description

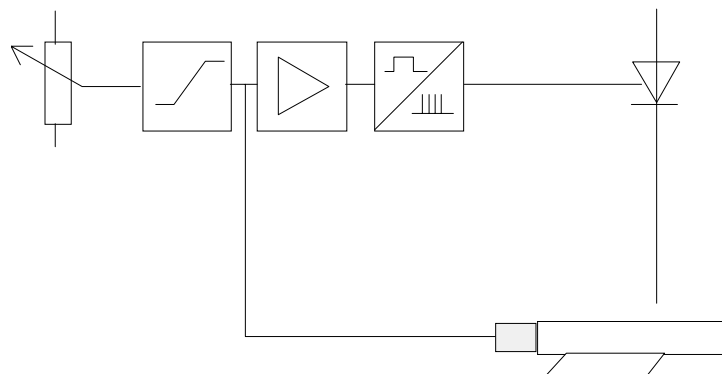
The main parts of the unit are the power stage, comprising two, inverse parallel, thyristors and the electronic control circuit. The mains carrying, power section is isolated from the control circuit by impulse transformers.

The electronic control circuit includes a set point conditioner with an integrator, which provides the adjustable soft start, a regulation stage for the output voltage and the pulse generators to control the thyristors. To allow the externally provided set point to be adapted to different vibratory feeders, the control curve can be set with trimmers Umin and Umax so that the whole adjustment range of the set point is always available.

The PI characteristic, for the output voltage and amplitude regulator has is adjusted with a trimmer. Optimisation is necessary, especially with amplitude control. The fault relay switches to give an external indication of feedback signal failure eg sensor damage or cable break.

The individual functions are described in more detail on the following pages.

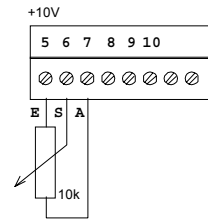
Block Schematic



2.1 Set point source

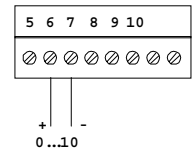
10 kOhm potentiometer

A 10 VDC reference voltage source is provided for set point adjustment using a potentiometer. The potentiometer is connected to terminals 5 (E), 6 (S) and 7 (A). Switch S5 are set to open.



0-10 VDC control voltage

An external set point signal voltage is connected to terminals 6 (+) and 7 (-). Switch S5 are set to open.

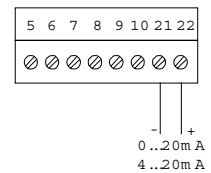


0-20 mA control current

An external set point current of 0-20 mA (input impedance of 250 Ohm) is connected to terminals 22 (+) and 21 (-). Switch S5 is set to open.

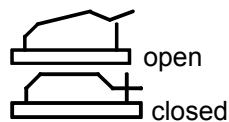
4-20 mA control current

An external set point current of 4 - 20 mA (input impedance of 250 Ohm) is connected to terminals 22 (+) and 21 (-). Switch S5 must be closed.



2.2. Vibrating frequency

Changeover switch S1



3000 cycles per minute (Half wave)
6000 cycles per minute (Full wave)

2.3 Operating modes of the regulators

Changeover switch S2

Voltage regulation (operation without an external feedback signal)

The output voltage is regulated when the vibratory feeder operates without a feedback sensor. The switch S2 must be put in position "2". The output voltage is monitored by an internal transformer and fed back to the regulation stage. The output voltage is held constant to $\pm 2\%$ irrespective of voltage variations, as well as temperature sensitive load changes, for example.

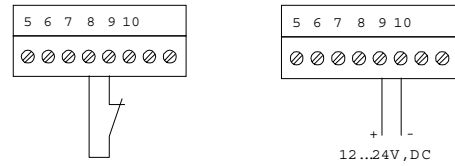
Amplitude Regulation (operation with external accelerometer)

The supply voltage required for an accelerometer eg type SW 7 is provided on terminals 13 (+12V), 14 (GND) and 15 (-12V). The output from the accelerometer is connected to terminal 11. The switch S2 must be put in position "1".

The trimmers for the P and I characteristics must be adjusted for operation with an accelerometer (rate of change of the feeder unit).

2.4 Regulator enable

When the unit is used with a supervisory control system, there is a facility to switch the power output ON and OFF through an enable input. A 12 - 24 V control signal applied to terminals 9 (+) and 10 (-) switches the unit ON. When there is no external voltage signal available then the unit can be switched ON and OFF by closing contacts across terminals 8 and 9.



Operation without enable signal

When the enable input is not used then a fixed link must be connected between terminals 8 and 9.

2.5 Faulty relay

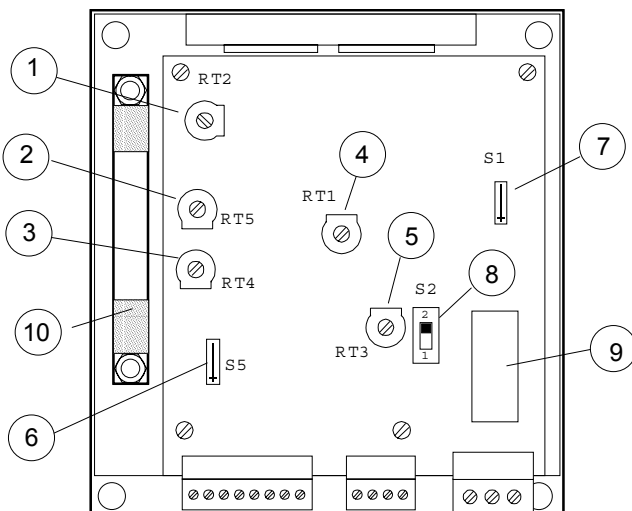
The fault relay is provided primarily for amplitude regulation (sensor monitoring) eg a break in the sensor cable or a defective sensor. The output voltage is monitored in the voltage regulation mode. The relay switches on when a feedback signal is present. The relay status must be confirmed externally. At the moment the unit switches on, with the set point at "zero" or without an enable signal, the relay fails to open. The failure indication must be validated externally. Furthermore, when the feedback of the effective value is lost, the power semiconductor is restricted to prevent uncontrolled vibration of the feeder, especially in amplitude regulation mode.

3.0 Application guidelines

The REOVIB R45/499 range of units are fitted with a semiconductor fuse which protects the internal semiconductor against a short circuit on the output. Shortage to earth protection is not provided on the uncontrolled phase using two phase supplies. Furthermore, the internal fuse is not provided for protection of the control circuits or against an overload.

During installation the user should ensure that the required throughput can be achieved at approximately 85-90% of the mains supply voltage. This will allow for maximum adjustment range of the feedback regulator when there is a low supply voltage.

4.0 Einstellmöglichkeiten



1	RT2	I - Characteristics	Regulator parameter Integral characteristic
2	RT5	t-on	Soft start
3	RT4	Umin	Output voltage (amplitude) for 'set point MIN'
4	R1	P - Character.	Regulator parameter Proportional charact.
5	RT3	Umax	Output voltage (amplitude) for 'MAX' set point
6	S5	set point control current	0...20 mA / 4...20 mA (open = 0...20 mA)
7	S1	3000 / 6000	Vibrating frequency (open = 3000 Schw./min))
8	S2	U / A	Voltage regulation (Pos 2) amplitude regulation (Pos 1)
9			Fault relay

4.1 Adjustment instructions

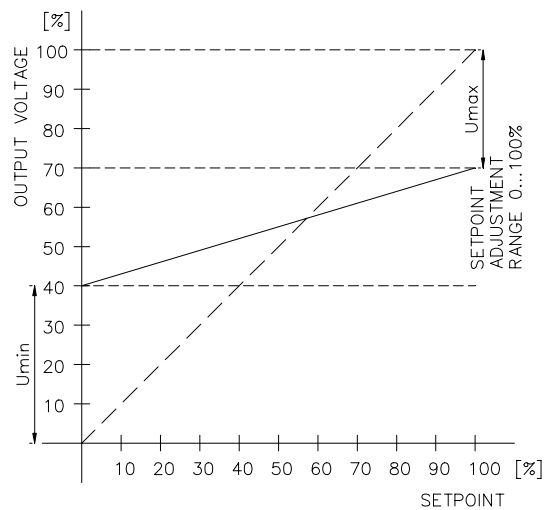
The internal trimmers U_{min} and U_{max} provide the possibility to match the set point adjustment range to the usable operating range of the load.

“MIN” adjustment

Put the external set point or set point potentiometer to the minimum position and then adjust the U_{min} trimmer to the required position.

“MAX” adjustment

Put the set point or set point potentiometer to the maximum position and then adjust the U_{max} trimmer to the required position. To allow regulation at the maximum set point eg at lower mains voltage level, the maximum value should be adjusted so that it is at least 10-15% below the mains supply voltage.



Soft start

An adjustable soft start is provided to prevent surges in the vibratory system (hammering) during start-up or quick set point changes. The soft start controls the output so that it ramps up to the set point value of the regulator. The soft start is adjusted with trimmer “ton” (clockwise increases the ramp up time).

Regulation adjustment

Adjustment is not so critical for output voltage regulation and so the trimmers for the P and I characteristics do not need to be altered (original settings P characteristic in the middle position and I characteristic fully anti-clockwise). However, because there are so many different feed systems, it is necessary to tune the regulator to match the response of the feeder. The procedure is as follows:-

Starting with the trimmers settings:-

- U_{min} , t, P characteristic: fully anticlockwise
- I characteristic, U_{max} : middle position

Adjust set point to approximately 75%.

Slowly turn P characteristic trimmer clockwise and if oscillation occurs, remove this by turning the I characteristic trimmer. The response to amplitude variations becomes faster the more that P characteristic trimmer is turned but as a result the system becomes more unstable.

5.0 Technical Data

Unit type	R 45/499 - 115	R 25/499 - 230	R 25/499 - 400
Supply voltage	115 V +/-10% 50/60 Hz	230 V +/-10% 50/60Hz	400 V +/-10% 50/60 Hz
Output voltage	20 - 105 V	40 - 210 V	60 - 380 V
Output current	0,2 - 45 A	0,2 - 25 A	0,2 - 25 A
Set point	Potentiometer 10 K Ω 0 - 10 V, DC / Ri = 22 k Ω 0(4) - 20 mA../ Ri = 250 Ω		
Control input	Switch 12 - 24V, DC Ri = 4k7		
Fault relay	Changeover contacts max. 250 V, 1A		
Regulator	P-I Regulator		
Soft start	0,1 - 5 sec.		
Max. ambient temperature	0 - 45 °C		
Dimensions mm (W x L x H)			
Standards	EN 50081-1, EN 50082-2, VBG 4		

6.0 Declaration of Conformity

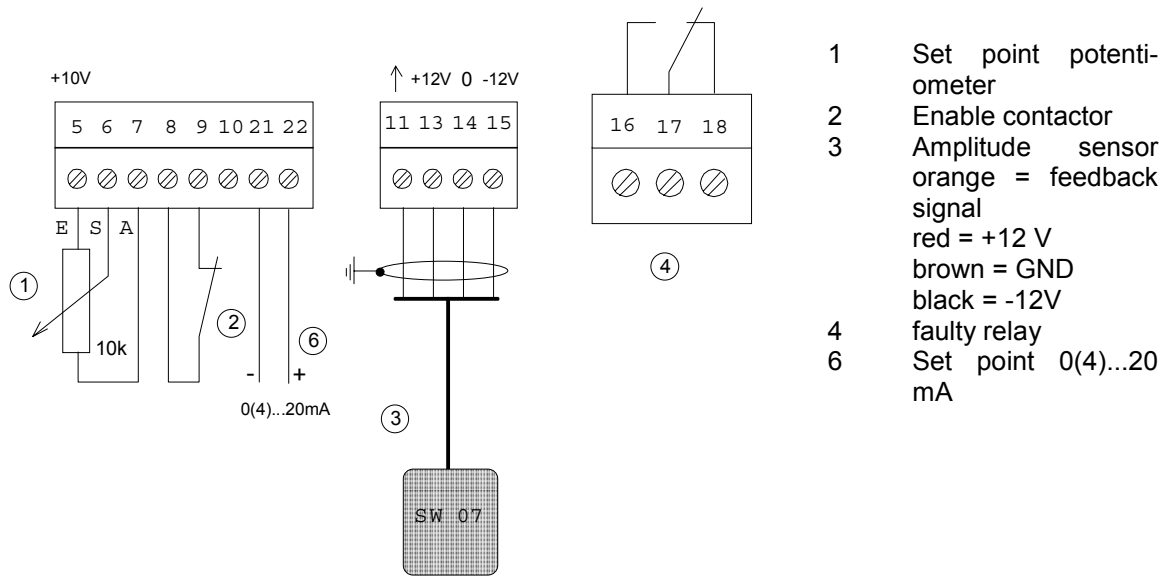


We declare that these products conform with the following standards : EN 50081-2 and EN 50082-2 in accordance with the regulations of guidelines 89/336/EWG.

REO ELEKTRONIK GMBH, D-42657 Solingen

7.0 Connection

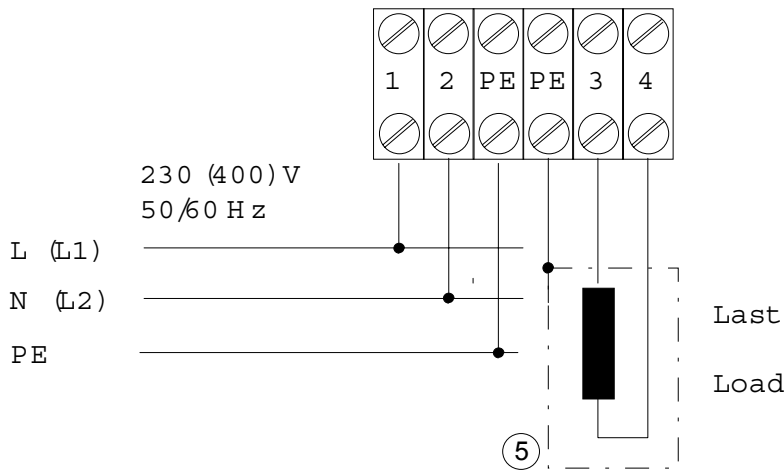
Control Terminals



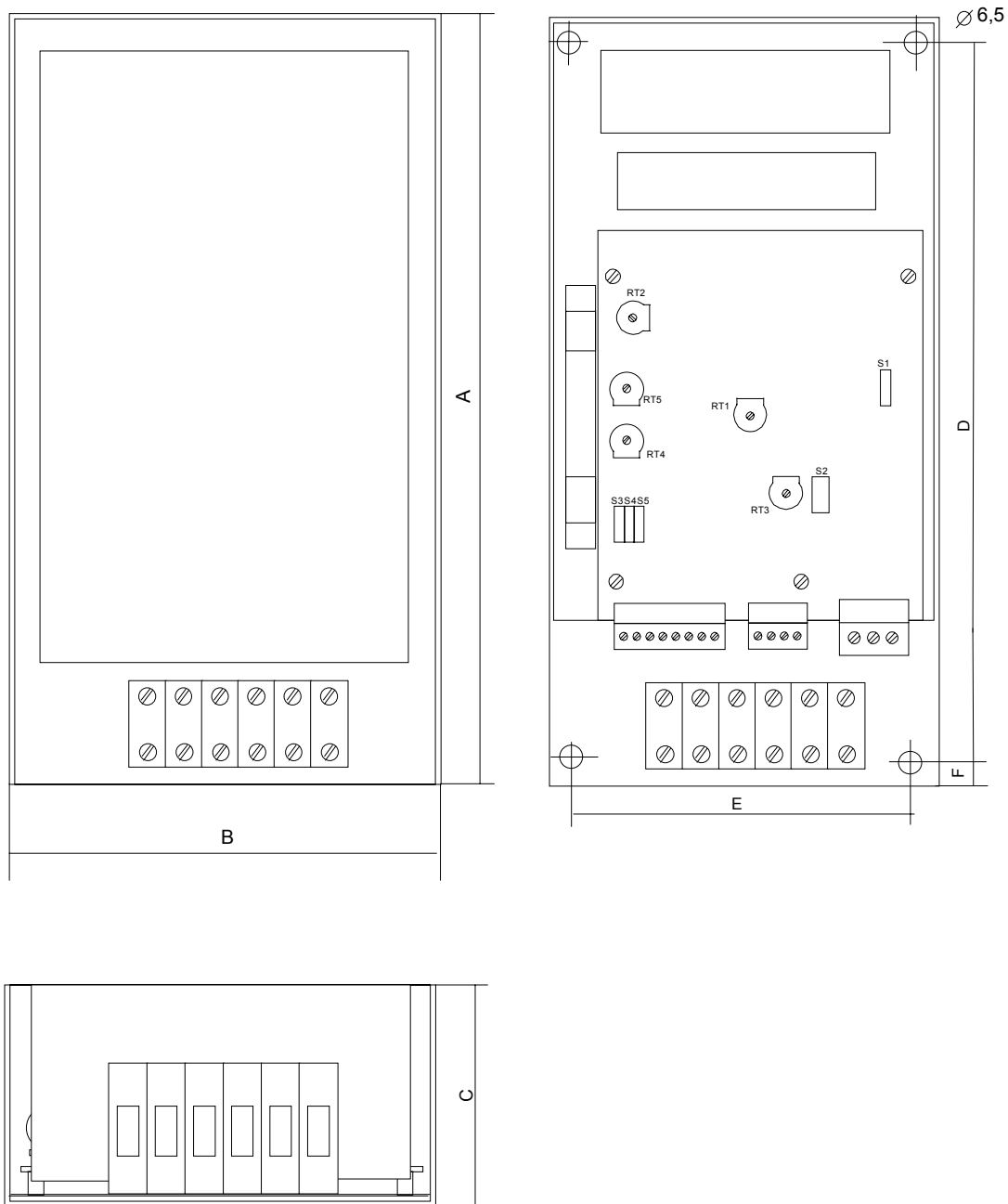
Screened signal cable is recommended

Power connections

5 Magnet



8.0 Dimensions



	R45 / 499
A	300
B	130
C	80
D	280
E	105
F	6

[mm]