Operating Instructions

REOTRON MEW

Single Phase Power Controller

REO UK LTD
Units 8 -10 Long Lane Industrial Estate
Craven Arms, Shropshire SY7 8DU
Tel: 01588 673411
Fax: 01588 672718
http://www.reo.co.uk
eMail: main@reo.co.uk

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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 specialist 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.

Prescribed Use

The units described herein are electrically powered for use in industrial applications. They are designed for power adjustment of resistive or inductive loads.

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1.0 General

The range of REOTRON MEW Thyristor Regulators are microprocessor based units for controlling the power to resistive and inductive loads. In essence the units comprise inverse parallel connected power semiconductors (thyristors) and the control and regulation electronics. The units have a regulated, AC output. The inverse parallel connected thyristors operate as contact free, power controllers using the phase angle control or the full wave principles. In the phase angle control mode (symetrical load) the equipment can be used as a voltage or current regulator and also there is an option for power regulation. The set point value for the current and voltage can be provided by an external control voltage of 0-10 V, 0-20 mA, DC or a potentiometer. The lowest set point has priority. The effective value is fed back internally from a voltage or current transformer. The maximum current limit of the unit cannot be exceeded in all regulation modes, using phase angle control. Applications with a wide load resistance variation Rcold/Rwarm are possible, and an overloading of the unit is prevented.

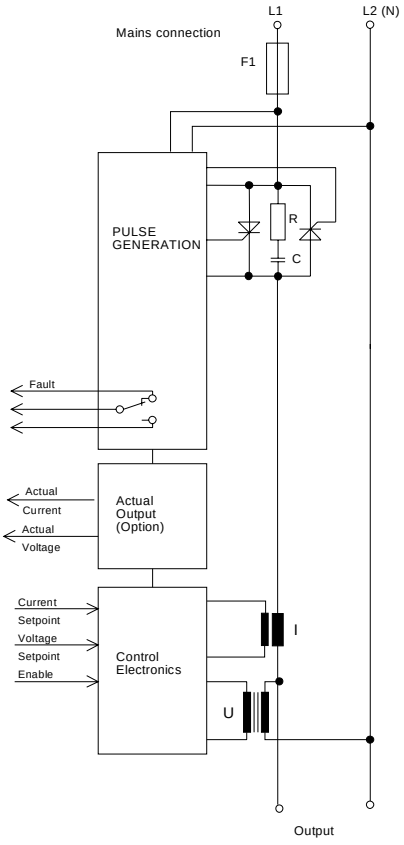
Typical Applications

Industrial Ovens	Steam Generators	Lighting Installations
Infra Red Emitters (Dryers)	Preheating Plants	Air Conditioning Plant
Tunnel Heaters	Room Heating Equipment	Fan Heating Systems
Plastic Moulding Equipment	Extruders	

2.0 Function description

The MEW thyristor control unit was designed to operate with a symetrical load. They include a voltage and current regulator. In the voltage regulation mode the output voltage determined by the set point is held constant by an internal circuit, therefore load or mains variations have no influence on the output voltage. The selected maximum current, however, cannot be exceeded in this mode (current limiting). If the unit is used as a current regulator then the output current of the unit is compared with the setpoint and regulated accordingly. The output voltage can increase to the selected voltage set point. LED's illuminate if the limit Imax or adjustment limits are exceeded.

If both set points are adjusted during operation, the regulator always gives the lower set point priority. During voltage regulation, with underlying current regulation, the voltage regulation is always in operation providing the allowed current limit is not exceeded. If the current limit is reached then the current regulator has priority. Should the unit be used as a pure voltage or current regulator, the other available set point must be linked to the reference voltage (10V DC).



2.1 Effective Current Value

The effective current value is measured inside the unit through a current transformer and a burden resistor. The internal microprocessor determines the effective value of the output current and adjusts this using a PI regulator.

2.2 Effective Voltage Value

The effective voltage value is also measured internally using a voltage transformer and the effective value is controlled by the microprocessor using a PI regulator.

2.3 Current Regulator

Microprocessor controller with PI Characteristics; the P portion is adjustable externally by using trimmer P4. The units maximum output current (Rated Current) is factory set. If the thyristor controller is to be adapted for a small load current, then a correction can be made by using trimmer Imax.
BEWARE: It is possible to obtain an output current which is higher than the rated current because of component and manufacturing tolerances, however, for safety, it is essential that the current limit is not set higher than the rated current
In current regulation mode the LED Imax is permanently illuminated.

2.4 Voltage Regulator

Microprocessor controller with PI Characteristics; the P portion is adjustable externally by using trimmer P3. The units maximum voltage output is factory set to the rated voltage (for 100% set point). Therefore, the setpoint cannot be fully used during voltage regulation since this would not allow for any over voltage. In this operating mode (voltage regulation) either the setpoint must be limited or the maximum unit output voltage must be reduced by using the trimmer Umax.

2.5 Pulse Generation

The pulses required for the control of the thyristors are generated by the microprocessor and are fed to amplifiers prior to the pulse conductors. The secondary windings of the pulse conductors directly control the thyristors.

2.6 Temperature Monitoring

A temperature switch is fitted into the heat sink to monitor its temperature and this switches off the thyristor controller, permanently, if the temperature exceeds a maximum of 80^{o}C. Fault indication is provided by the general fault relay and displayed by the LED on the front panel.

3.0 Control Inputs and Outputs

Control Inputs

Setpoint Input U	0(4)...20 mA, 0-10V DC or Potentiometer 10kΩ
Setpoint Input I	0(4)...20 mA, 0-10V DC or Potentiometer 10kΩ
Enable	12-24V DC or contacts

Outputs:

Effective Current Value	0-10V DC corresponding to 0-100% (Option)
Effective Voltage Value	0-10V DC corresponding to 0-100% (Option)
Fault Indication	Relay Contact 250V/1A (Change over)

3.1 Setpoint Input U **With power regulation here the power setpoint is determined (switch S1/6=ON)**

The value of the output voltage is determined by the setpoint input U. The setpoint can be provided in the form of 0-10 V, 0-20mA, DC or with a 10kΩ Potentiometer. A +10V reference voltage is provided for potentiometer operation.
With setpoint 4...20 mA, put the switch "S1/5" to "ON".

3.2 Setpoint Input I

The strength of the output current is determined by the set point input "I". The setpoint can be provided in the form of 0-10 V, 0-20mA, DC or with a 10k Potentiometer. A +10V reference voltage is provided for potentiometer operation.
With setpoint 4...20 mA, put the switch "S1/5" to "ON".

3.3 Enable (Regulator Inhibit)

A control voltage (12-24V DC) must be applied to terminals 9+ and 15-, to enable the unit, or a connection made between terminals 9 and 10 by using a switch. A permanent link between terminals 9 and 10 is used for operation without an external enable. The firing pulses are inhibited whilst the enable input is not closed.

3.4 Actual Voltage Output (Option) **With power regulation the actual power is given instead of the actual voltage.**

A 0-10 V DC output signal is provided and this corresponds to the units momentary voltage output. This generates 10V for 100% of the units possible output voltage (using the Umax set value).

3.5 Actual Current Output (Option)

A 0-10 V DC output signal is provided and this corresponds to the units momentary current output. This generates 10V for 100% of the units possible output current (using the Imax set value).

3.6 Fault Indication

Relay changeover contacts are provided for indicating that there has been a unit fault.
The following fault conditions energise the relay and cause the unit to switch off:

Over temperature of the power unit
Mains synchronisation not possible

A fault condition must be cancelled with the RESET push button.

4.0 Construction

The thyristor regulator unit is a completely wired, function tested, compact unit. The unit is designed for panel mounting. The connections for the mains supply and load are brought out to screw terminals and the control signals to plug-in screw terminals. The unit front panel incorporates the adjustment components (trimmers, switch and light diodes) to display and control the operating conditions.
The fuses for protecting the semiconductors is built into the front panel are accessed by removing the front panel.

5.0 Adjustment Facilities

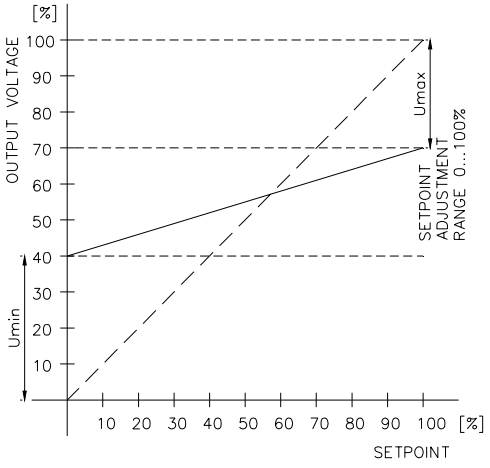
The following parameters can be adjusted on the unit:-

Umax - Maximum Output Voltage	Umin - Minimum Output Voltage
Imax - Maximum Output Current	Imin - Minimum Output Current
P - Characteristic of the Voltage Regulator	P - Characteristic of the Current Regulator
Ramp up time	Ramp down time

The trimmers are adjustable through the front panel.

6.0 Adjustment Instructions

Preparatory Steps
Connect unit according to connection drawing, disconnect the enable and adjust set point to zero. The unit will now operate with the basic factory settings: output current = rated current, output voltage = rated input voltage[1)], Umin = 0, phase angle control, regulation mode.
The setpoint control curve can be determined by using trimmers Umin/Umax and Imin/Imax ie the setpoint control range. At this stage, it is also possible, to make permanent adjustments, without external setpoints.
The range minimum always extends from zero to the adjusted range maximum. The maximum value must be set first.



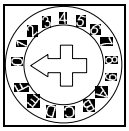
Adjustment of the MAX - Values
Umax
Hint: If the output voltage is to be regulated at the maximum set point, then the maximum output voltage must be limited at a value which reduces the regulation range.
Switch on the mains voltage and enable the unit. Set the current set point to maximum. Now increase the voltage set point until the required output voltage level is reached (observe current limit indicator). If the set point source is not yet at maximum, then the output voltage must be reduced again by using trimmer Umax and then the voltage set point can be further increased until the maximum value of the voltage set point is achieved. If there is no risk of damaging the load with an over voltage then the output voltage can be set by using trimmer Umax with the set point turned fully up. Anticlockwise adjustment increases the output voltage.

Imax
Remove the unit enable. Adjust voltage set point to maximum and current setpoint to zero. Turn trimmer Imax fully clockwise (10 turn pot). Next enable the unit and adjust the current setpoint to maximum. Set the maximum current value by turning trimmer Imax anti-clockwise.

Adjustment of the MIN - Values:

Umin

Trimmers P1 and P2 are used to adjust the MIN value, however these trimmers are used for various other functions. Below is the recommended adjustment procedure.

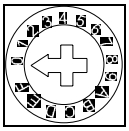


Set rotary switch 'S2' on the front panel to position '1' and press the RESET button. Next adjust the trimmers P1 (coarse) and P2 (fine) to the required minimum voltage and afterwards press the SETUP button. To return to normal operation put the rotary switch 'S2' back to '0' and press the RESET button.

Imin

This adjustment is only meaningful for pure current control, if a current free condition of the load is to be avoided.

This adjustment is also carried out by using trimmers P1 and P2. Set rotary switch 'S2' on the front panel to position '2' and press the RESET button. Next adjust the trimmers P1 (coarse) and P2 (fine) to the required minimum current and afterwards press the SETUP button. To return to normal operation put the rotary switch 'S2' back to '0' and press the RESET button.

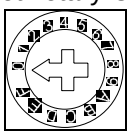


Ramp up /down times

The ramp up time for when the unit is switched on, using the enable input (set point 100%) or when the set point suddenly rises, giving 0 to 100% of the maximum output value, and also the run down time to reach an output value for a set point change in the direction of zero.

This adjustment is similarly achieved using the trimmer P1 for Ramp up and P2 for Ramp down times. With the voltage set point at zero and the current set point at maximum.

Set rotary switch 'S2' on the front panel to position '3' and press the RESET button. Next set the required ramp time (0.1-10s) using trimmer P1 and test for a set point change from zero to 100%; afterwards set the ramp down time with trimmer P2 and again test by changing the set point. When the required values have been chosen, once again press the "SETUP" button, return rotary switch 'S2' back to '0' and press the RESET button.



Proportional Characteristic Voltage Regulation

The speed of regulation (sensitivity) of the voltage regulator. Adjust, using the actual load, using trimmer P3.

Proportional Characteristic Current Regulation

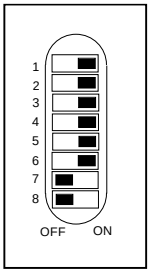
The speed of regulation (sensitivity) of the current regulator. Adjust, using the actual load, using trimmer P4.

Hint

To return the unit to the factory settings, the procedure is as follows:-

Rotate selector switch "S2" to position "F" and press the RESET button. Afterwards press the SETUP button and return selector switch "S2" to position "0" and press the RESET button once more. The factory settings are now reinstated.

Selector Switch S1 (Operating Mode)



S1/1 OFF = Phase angle control	ON = Full wave control
S1/2 not active	
S1/3 not active	
S1/4 not active	
S1/5 OFF = 0...20 mA	ON = 4...20 mA (Setpoint)
S1/6 OFF = U/I - Regulation	ON = Power Regulation
S1/7 OFF = Without data interface	ON = with data interface
S1/8 OFF = Reserved	

The RESET button must be pressed before a change of the switch settings.

7.0 Technical Data

TYPE	**Rated Voltage** 50/60 Hz	**Output Voltage**[2)]	**Output Current** MAX.
MEW 10/230	230 V +6% -10%	0-230 V	10 A
MEW 10/400	400 V +6% -10%	0-400 V	10 A
MEW 20/230	230 V +6% -10%	0-230 V	20 A
MEW 20/400	400 V +6% -10%	0-400 V	20 A
MEW 50/230	230 V +6% -10%	0-230 V	50 A
MEW 50/400	400 V +6% -10%	0-400 V	50 A
MEW 80/230	230 V +6% -10%	0-230 V	80 A
MEW 80/400	400 V +6% -10%	0-400 V	80 A
MEW 110/230	230 V +6% -10%	0-230 V	110 A
MEW 110/400	400 V +6% -10%	0-400 V	110 A
MEW 150/400	400 V +6% -10%	0-400 V	150 A

Load Types	resistive / resistive - inductive; for transformers max. induction 1,45 Tesla
Setpoint source	5 / 10 kΩ Potentiometer 0-10V, DC 0-20 mA
Ramp up/down time	0,1 - 10 sec.
Enable	Switch 12-24 V, DC
Actual value output I	0-10 V, DC
Actual value output U	0-10 V, DC
Fault relay	1 change over contacts 250 V, 1 A
Ambient temp.	0-45 °C

Dimensions approx. (**HxBxD**)

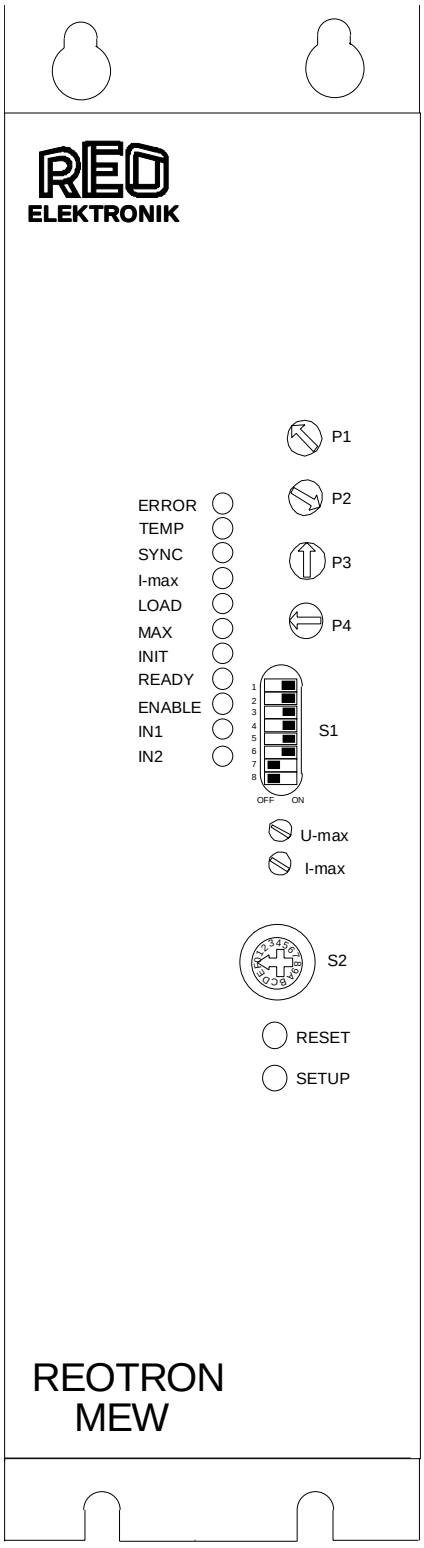
MEW 10/XXX	MEW 20/XXX	MEW 50/XXX	MEW 80/XXX	MEW110/XXX	MEW150/XXX
290x70x205	290x110x205	290x110x205	320x150x205	320x180x205	320x180x205

[2)] The output voltage is subject to a voltage loss across the semiconductors.

8.0 Ordering Codes

Type	ID-Number	Description
REOTRON MEW 10/230	6311	10 A/230 V Standard unit
REOTRON MEW 10/400	6312	10 A/400 V Standard unit
REOTRON MEW 10/230 DA	6316	10 A/400 V with D/A-Module
REOTRON MEW 10/400 DA	6317	10 A/400 V with D/A-Module
REOTRON MEW 10/230 RS	6315	10 A/400 V with RS 232 Interface
REOTRON MEW 10/400 RS	6318	10 A/400 V with RS 232 Interface
REOTRON MEW 10/230 IS	6313	10 A/400 V with INTERBUS-S Interface
REOTRON MEW 10/400 IS	6314	10 A/400 V with INTERBUS-S Interface
REOTRON MEW 20/230	6321	20 A/230 V Standard unit
REOTRON MEW 20/400	6322	20 A/400 V Standard unit
REOTRON MEW 20/230 DA	6328	20 A/230 V with D/A-Module
REOTRON MEW 20/400 DA	6327	20 A/400 V with D/A-Module
REOTRON MEW 20/230 RS	6329	20 A/230 V with RS 232 Interface
REOTRON MEW 20/400 RS	63210	20 A/400 V with RS 232 Interface
REOTRON MEW 20/230 IS	6324	20 A/230 V with INTERBUS-S Interface
REOTRON MEW 20/400 IS	6325	20 A/400V with INTERBUS-S Interface
REOTRON MEW 50/230	6331	50 A/230 V Standard unit
REOTRON MEW 50/400	6332	50 A/400 V Standard unit
REOTRON MEW 50/230 DA	6338	50 A/230 V with D/A-Module
REOTRON MEW 50/400 DA	6337	50 A/400 V with D/A-Module
REOTRON MEW 50/230 RS	6339	50 A/230 V with RS 232 Interface
REOTRON MEW 50/400 RS	63310	50 A/400 V with RS 232 Interface
REOTRON MEW 50/230 IS	6333	50 A/400 V with INTERBUS-S Interface
REOTRON MEW 50/400 IS	6334	50 A/400 V with INTERBUS-S Interface
REOTRON MEW 80/230	6341	80 A/230 V Standard unit
REOTRON MEW 80/400	6342	80 A/400 V Standard unit
REOTRON MEW 80/230 DA	6348	80 A/230 V with D/A-Module
REOTRON MEW 80/400 DA	6347	80 A/400 V with D/A-Module
REOTRON MEW 80/230 RS	63410	80 A/400 V with RS 232 Interface
REOTRON MEW 80/400 RS	6349	80 A/400 V with RS 232 Interface
REOTRON MEW 80/230 IS	6343	80 A/400 V with INTERBUS-S Interface
REOTRON MEW 80/400 IS	6344	80 A/400 V with INTERBUS-S Interface
REOTRON MEW 110/230	6351	110 A/230 V Standard unit
REOTRON MEW 110/400	6352	110 A/400 V Standard unit
REOTRON MEW 110/230 DA	6358	110 A/400 V with D/A-Module
REOTRON MEW 110/400 DA	6357	110 A/400 V with D/A-Module
REOTRON MEW 110/230 RS	6355	110 A/400 V with RS 232 Interface
REOTRON MEW 110/400 RS	6356	110 A/400 V with RS 232 Interface
REOTRON MEW 110/230 IS	6353	110 A/400 V with INTERBUS-S Interface
REOTRON MEW 110/400 IS	6354	110 A/400 V with INTERBUS-S Interface
REOTRON MEW 150/400 DA	2057	150 A/400 V with D/A-Module

9.0 Adjustment Components



LED Indicator Functions

ERROR	System fault
TEMP	Over temperature
SYNC	Mains synchronisation fault
I-Max	Current limit reached ie current regulator active
LOAD	Impedance fault / peak current reached
MAX	Max. adjustment limit reached
INIT	Initialisation phase
READY	Ready to operate
ENABLE	Enable
IN1	External Input 1 (Reserved)
IN2	External Input 2 (Reserved)

S2	S2 = 1	S2 = 2	S2=3
P1 =Umin/coarse P2 = Umin/fine		Imin/coarse Imin/fine	Ramp up Ramp down times
P3 = P-Characteristic voltage regulator P4 = P-Characteristic current regualtor			

Selector Switch S1

S1/1 - OFF = Phase angle control ON = Full wave control
S1/2 -
S1/3 - Reserved for curent controller
S1/4 -
S1/5 – OFF = 0...20 mA ON = 4...20 mA (Setpoint)
S1/6 - OFF = I/U-Regulation ON = Power regulation
S1/7 - OFF = without data interface ON = with data interface
S1/8 - OFF = Reserved

Selector Switch S2

0 = Normal operation (Regulator)
1 = Adjustment Umin
2 = Adjustment Imin
3 = Adjustment ramp up/down times
4 = Reserved
5 = Uncontrolled operation (no regulation / no current limiting)
6-E = Reserved
F = Reinstate factory settings

RESET = System reset-Button
SETUP = Enter new parameters

10.0 Fuse change

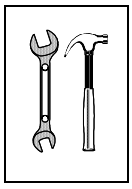
Switch unit off before changing fuse!

The semiconductor fuse can be found in the left hand section of the front panel. To change the fuse the two screws marked "x" must be loosened. The cover can then be removed by sliding it to the right. For MEW/xxx type units the fuse can be found in the front panel.

Fuse Types:

MEW 10/xxx	FF 16
MEW 20/xxx	ET 35
MEW 50/xxx	ET 80
MEW 80/xxx	EET 140
MEW 110/xxx	EET 160
MEW 150/xxx	6.6 URB 000 BS88/250

When ordering spare fuses use capital letters for fuse types.



11.0 Installation Guidelines

The unit is designed for panel mounting. It should be installed vertically with the terminals at the bottom. Ensure that there is sufficient air space in unventilated cabinets.
The units can be placed side by side with a minimum clearance of 30mm. If the units are mounted one over the other, then there must be a clearance of approximately 250mm.

The control cables should be shielded and the shield should be connected to earth.

12.0 Guidelines on Electromagnetic Interference

INTERBUS-S is a serial data transfer system which was conceived for applications in an industrial environment. When correctly installed, INTERBUS-S complies with all the requirements specified in the standard IEC 801 for data transfer systems in a harsh industrial environment. When the interface module is used in an electromagnetic, interference prone, area, then the possible sources of interference should be suppressed.
Interference can be due, in particular, to:

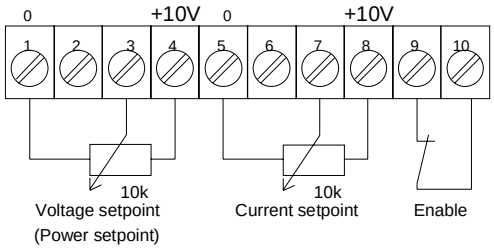
- Protection devices
- Switching of inductive loads
- Solenoid valves

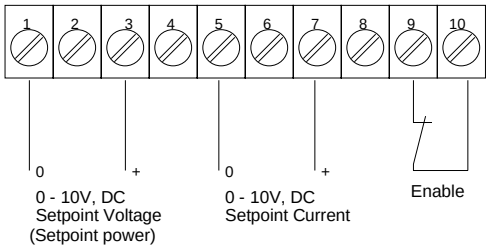
RC networks and varistors suppress interference. Manufacturers supply correctly sized components for suppressing solenoid coils.
Electrical spikes, which can affect bus cables in an industrial environment, can be suppressed by a correctly fitted screen. The following measures provide the best screening results:

- Cover fixing screws of bus cable plugs and conductors at equal potentials.
- Only use connectors with a metal or metalised housing.
- Spread out the screen in connectors.

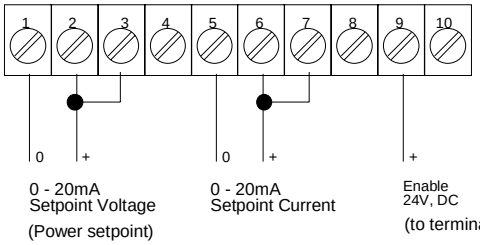
13.0 Connection Diagrams

Control Terminals

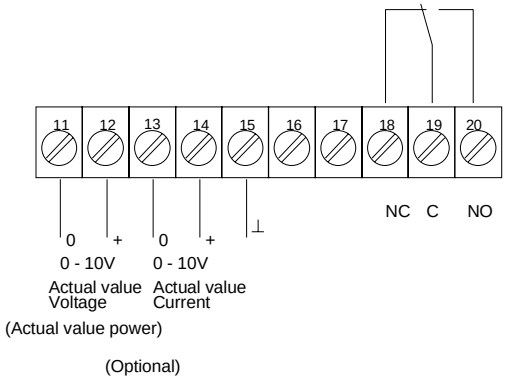




Potentiometer setpoint source

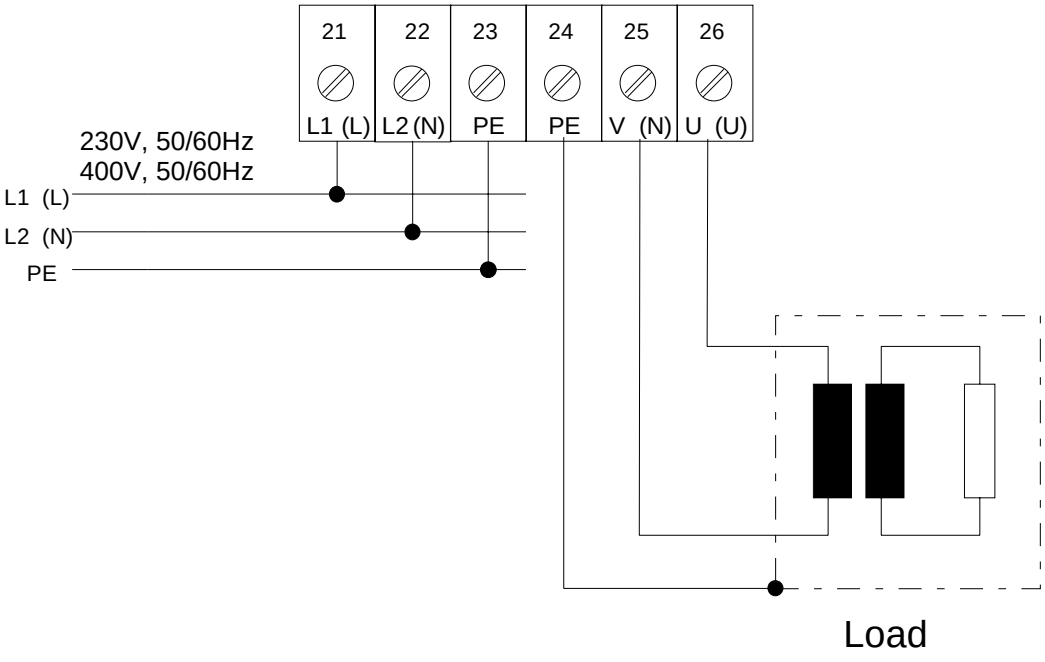


Setpoint source using
0-10 V, DC control voltage

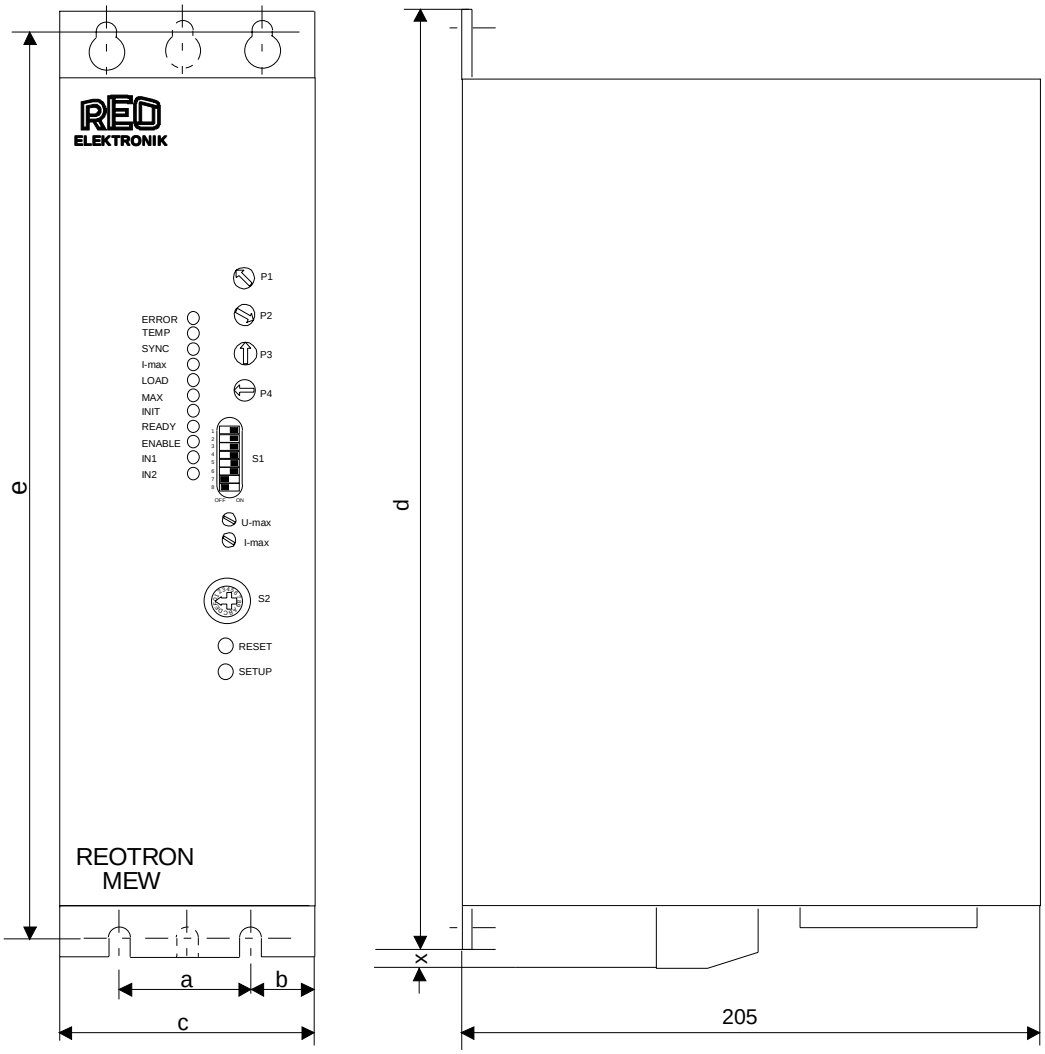


Setpoint source using
0-20 mA control current

Power terminals

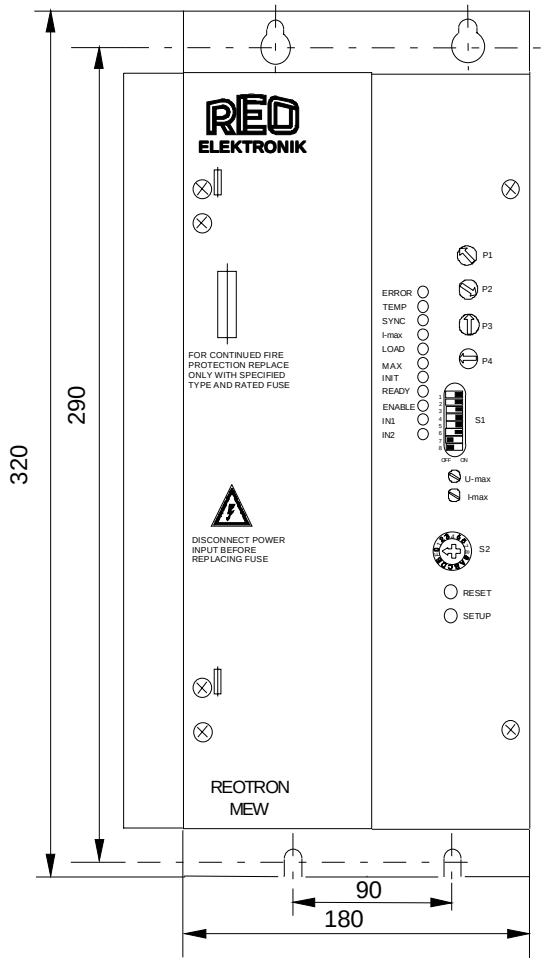


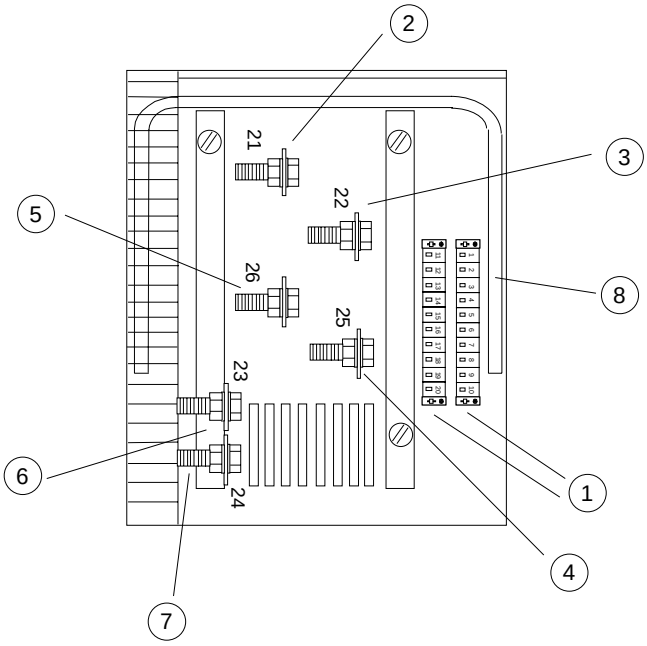
14.0 Dimensions



Dimension	MEW10	MEW20	MEW50	MEW80	MEW110
a	-	70	70	60	90
b	35	15	15	30	30
c	70	110	110	150	180
d	290	290	290	320	320
e	280	280	280	304	304
x	-	5	5	5	10

14.1 Dimensions MEW 150/XXX





1	Control terminals
2	Power terminal Input L1
3	Power terminal Input L2 (N)
4	Power terminal Output V (N)
5	Power terminal Output U (U)
6	PE
7	PE
8	Plexiglass cover