

## Basic technical data:

Supply voltage:	DC 6 to 42 V.
Output voltage:	0 to 100 % (or different preset able limits) of input voltage.
Output current:	0 to 25 A, 30 A/10 s.
Output voltage controlling ways:	by potentiometer or by external DC voltage.
Range of controlling voltage:	preset in range 0 to 5 V.
Under voltage protection:	preset from 6 to 42 V.
Over current protection:	preset from 5 A to 40 A.
Speed of output voltage rising:	preset able to no limits, 0.8 s, 1.6 s, 3.2 s or 6.4 s per PWM range.
Speed of output voltage falling:	preset able to no limits, 0.8 s, 1.6 s, 3.2 s or 6.4 s per PWM range.
Frequency of PWM:	preset able to 32 kHz, 16 kHz, 8 kHz, 4 kHz, 2 kHz, 1 kHz, 500 Hz, 250 Hz, 125 Hz, 63 Hz, 32 Hz, 16 Hz, 8 Hz, 4 Hz or 2 Hz.
Resolution of PWM:	256 levels.
High temperature protection:	switches off output voltage when temperature is over 110 °C.
Dimensions:	60 x 47 x 20 mm.

## Notices, advices, experiences:

Connect to the controller load with adequate power. When mounting the controller, make sure that was not heat insulated and the heat overloaded. Current protection monitors the current drawing by the power transistor. It is not always same value as load current. Both currents are equal only when controller is fully opened (PWM = 100%). Supply controller by battery only, if you want to power it from an AC adapter, connect to its output capacitor with a capacity at least 2000 µF, otherwise the controller could be damaged. Power supply must not be greater than 45 V! The optimal frequency for most of the loads is 4 to 8 kHz, low frequencies are suitable for heating appliances or electrolysis. The controller can also controlled by external DC voltage, which can range from 0 to 5 V.

**Warranty:** Warranty is 24 months from date of sale.

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# PWM voltage controller DRN 4225

## Basic description:

PWM voltage controller DRN 4225 is designed to control voltage for electrical motors, light bulbs or heat devices. The output voltage is controlled by pulse width modulation (PWM) from 0 to 100% of supply voltage. Regulation is low-loss with high efficiency energy conversion. The controller has adjustable current and under voltage protection. User can adjust speed of rise or fall of output voltage and PWM frequency. It is also possible to set limit position of control potentiometer (control voltage) and corresponding minimum and maximum PWM. The security fuse can prohibit switch-on output power until potentiometer is set to minimum. All parameters can be set using the button that is on the controller board. Controller has its own EMF filter and protection against thermal overloading (thermal sensor is between the heat sinks). Examples of use: motor speed control, regulation of light bulbs, heating power control, temperature control of wire saw of polystyrene, temperature of glow plugs etc.

## Power supply, control potentiometer and switch connecting:

**Supply voltage:** connected to terminals **POWER MINUS** (minus) and **POWER PLUS** (plus).

**Load:** connected to terminal **LOAD MINUS** (minus) and **LOAD PLUS** (plus).

**Control potentiometer:** connected to terminals **POTENTIOMETER**, the first pin of potentiometer to the left terminal, the middle pin of the potentiometer to the middle terminal and the third pin to the right terminal. If it is used to control an external control voltage, plug wires between the right terminal **POTENTIOMETER** (minus the external control voltage) and the middle terminal **POTENTIOMETER** (plus an external control voltage).

**Switch:** connected to terminals **SWITCH**. Note: switch turns off low-power circuits of the controller (just switch for small current), the high-power circuit is still under voltage.

## LED diode indication:

**LED flashes briefly every 2 seconds:** the controller is waiting to setting the potentiometer to the starting position.

**LED lits continuously:** potentiometer (control voltage) is in voltage regulation position and output is on.

**LED blinks rapidly:** current limitation reduces output voltage.

**LED flashes slowly:** under voltage or thermal protection reduces output voltage.

**LED blinks once briefly in the setting mode:** button has been pressed briefly.

**LED blinks once long in the setting mode:** button has been pressed long, pre-set parameter has been accepted and setting is continuing.

**LED blinks once long and five times briefly in the setting mode:** button has

been pressed long, preset parameter has been saved, setting has returned to the beginning and controller is ready for next parameter setting.

## Settings:

Memory of controller processor can save several parameters: the outer position of the potentiometer (control voltage), minimum and maximum PWM, minimum supply voltage, maximum output current, speed of output voltage increasing or decreasing, output voltage frequency and protection against accidental starting. If you want to adjust the control parameters, connect the power supply, load control potentiometer and switch (open). Then press the setup button, hold it down and switch on the switch (or switch the power supply). LED begins to light. When you release the LED goes down and the controller is in the setting mode. Parameter selection is done with short (to 2 seconds) button pressing, confirmation or saving is done with long (over 2 seconds) button pressing. A short press is indicated by one flash of the LED when you release the button, long press and parameter saving is indicated by long or long and fire short LED flashings. Every parameter can be set separately. Adjustment is necessary (and it is possible at any step) to stop by power supply unplugging. So if the controller is in setting mode, follow these steps:

**Initial and end positions of the control potentiometer (control voltage) setting:** press the button one time long to choose potentiometer position setting. Then set by the potentiometer minimal required output voltage (PWMmin). Press and hold the button until LED flashes and actual PWM is saved. Then set by the potentiometer maximal required output voltage (PWMmax). Note: both positions determine the sense of output voltage controlling. Then press and hold the button, the position is saved, LED flashes one time long and five times briefly and setting is returned to the beginning.

**Minimum and maximum output voltage (PWMmin, PWMmax) setting:** press the button one time briefly and one time long to choose limit PWM setting. Set the potentiometer to the initial position and press the button short. This press unlocks the voltage control and you can adjust with potentiometer the output voltage in the range 0 to 100%. Set by potentiometer minimal required output voltage (PWMmin). Then press and hold the button, the minimum output voltage is saved and setting is moved to the next parameter setting (PWMmax). Then set by the potentiometer maximal required output voltage (PWMmax). Then press and hold the button, the maximum output voltage is saved, LED flashes one time long and five times briefly and setting is returned to the beginning.

**Minimum supply voltage setting:** press the button two times briefly and one time long to choose minimal supply voltage setting. Then press the button briefly repeatedly (0-4 times), how many tens of volts required voltage has. Then press and hold the button, the choice is saved and setting is moved to the minimal supply voltage units setting. Press the button briefly repeatedly (0-9 times) how many units of volts required voltage has. Then press and hold the button, the choice is saved and setting is moved to the minimal supply voltage two-tenth setting. Press the button briefly repeatedly (0-4 times) how many two-tenths of volts

required voltage has. Then press and hold the button, the minimal supply voltage is saved and setting is returned to the beginning. Note: the program automatically sets the minimal voltage protection voltage to 6 V or 42, if you try to set it outside this range.

**Maximum current setting:** press the button three times briefly and one time long to choose maximum current setting. Then don't press the button briefly to switch-off current limitation or press the button briefly one time to set limitation to 5 Amps, 2x for 10 Amps, 3x for 15 A, 4x for 20 A, 5x for 25 A, 6x for 30 A, 7x for 35 A or 8x for 40 A. Then press and hold the button, the maximum current is saved and setting is returned to the beginning.

**Speed of rise of output voltage setting:** press the button four times briefly and one time long to choose speed of rise setting. Then press the button briefly 0x to set speed rising without delay, 1x (slope is 0.8 s per full range of PWM), 2x (slope 1.6 s per range), 3x (slope is 3.2 s per range), 4x (slope is 6.4 s per range). Then press and hold the button, the speed of rise is saved, LED flashes one time long and five times briefly and setting is returned to the beginning.

**Speed of fall of output voltage setting:** press the button five times briefly and one time long to choose speed of fall setting. Then press the button briefly 0x to set speed falling without delay, 1x (slope is 0.8 s per full range of PWM), 2x (slope 1.6 s per range), 3x (slope is 3.2 s per range), 4x (slope is 6.4 s per range). Then press and hold the button, the speed of fall is saved, LED flashes one time long and five times briefly and setting is returned to the beginning.

**PWM frequency setting:** press the button six times briefly and one time long to choose PWM frequency setting. Then press the button briefly 0x, if you want PWM frequency 32 kHz or 1x (16 kHz), 2x (8 kHz), 3x (4 kHz), 4x (2 kHz), 5x (1 kHz), 6x (500 Hz), 7x (250 Hz), 8x (125 Hz), 9x (63 Hz), 10x (32 Hz), 11x (16 Hz), 12x (8 Hz), 13x (4 Hz) or 14x (2 Hz). Then press and hold the button, the frequency is saved, LED flashes one time long and five times briefly and setting is returned to the beginning.

**Fuse of an accidentally start setting:** press the button seven times briefly and one time long to choose fuse of an accidentally start setting. Then press the button 0x briefly, if you want to be forced to move the potentiometer to the starting position (PWMmin) to unlock the output voltage control or 1x if you want the output voltage was immediately controlled (its size depends on actual position of the potentiometer). Then press and hold the button, the fuse is saved, LED flashes one time long and five times briefly and setting is returned to the beginning.

**Output voltage under initial potentiometer position settings:** press the button eight times briefly and one time long to choose output voltage under initial potentiometer position. Then press the button 0x briefly, if you want, that if the potentiometer is "under the" initial position, the output voltage would be zero or 1x, if you want that if the potentiometer is "under the" initial position, output voltage would be PWMmin. Then press and hold the button, the choice will be saved, setting is finished and LED starts constantly flash. Then press and hold the button, the output voltage is saved, LED flashes one time long and five times briefly and setting is returned to the beginning.