Boerdson

ProX-Dual speed controller

Operating instructions
Status: 2024/01/08

Contents

Explanation of symbols

This symbol, an exclamation mark in a filled triangle, indicates important operating or safety instructions in these operating instructions. Always read this information carefully.

This symbol indicates a tip and/or a special operating recommendation to make things easier for you.

Safety instructions

- Read these instructions, keep them in a safe place and only pass the device on with these instructions.
- Observe all warnings, follow all instructions and use the appliance only for the purpose and in the manner described in this manual.
- The product is not a toy. Keep it away from children and pets.
- Do not leave the packaging material lying around carelessly. Otherwise it could become a dangerous toy for children.
- Protect the product from extreme temperatures, direct sunlight, strong impacts, high humidity, moisture, flammable gases, vapors and solvents.
- Do not expose the product to mechanical stress.
- If safe operation is no longer possible, take the product out of operation and protect it from unintentional use. Safe operation is no longer guaranteed if the product:
  - shows visible damage,
  - no longer functions properly,
  - has been stored under unfavorable environmental conditions for a longer period of time or has been exposed to considerable transport stresses.
- Always handle the product with care. Impacts, knocks or even falling from a low height can damage the product.
- Avoid short circuits at the inputs and outputs.
- Never connect the battery with reversed polarity.
- Disconnect the battery from the speed controller after the ride.
- Before charging the battery, disconnect it from the speed controller.
- Check the model vehicle and the speed controller/motor for damage before each use. If you notice any damage, do not continue to use the model vehicle or speed controller/motor!
- Some parts of the speed controller can become very hot during operation. Risk of burns!
- Never block existing ventilation openings.
- Sufficient cooling of the speed controller must be ensured when operating the model. For this reason, do not wrap the speed controller in foam or similar material; heat dissipation must be ensured.
- The drive must not be blocked. The resulting currents can cause irreparable damage to the motor and/or the speed controller.
- Make sure that you do not get any part of your body or other foreign objects caught in moving components when handling model vehicles. There is a risk of injury! Therefore, always jack up the model safely when making adjustments.
- Always switch on the transmitter first and move its control lever for motor control to the neutral position. Only then may the speed controller be fitted with a battery pack and switched on. When
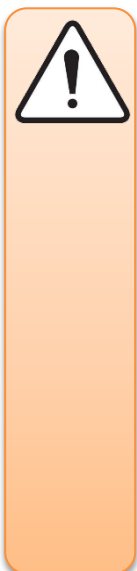
switching off, proceed in reverse order. This means that you first switch off the speed controller, disconnect the battery and only then switch off the transmitter.

- Before the transmitter is switched off, the speed controller must always be switched off first and the connection to the battery disconnected if necessary.
- The connection between the battery and speed controller must always be disconnected when the speed controller is no longer required.
- The maximum permissible power of the speed controller is limited. The maximum permissible current values vary depending on the battery voltage used. Please be sure to observe the technical data in these operating instructions. Failure to observe the limit values may result in irreparable damage to the motor and/or the speed controller. In the event of such damage, all guarantee/warranty claims are excluded!
- Only have maintenance work and repairs carried out by qualified specialists. Take the appliance to customer service if it has been exposed to rain or moisture, if liquid or foreign bodies have got into it or if it is not working normally.

Intended use

The speed controller is used for stepless, electronic speed control of brushed motors and is connected to a free channel of a remote control receiver for model vehicles. For safety and licensing reasons, you must not modify and/or change the product. If you use the product for purposes other than those described above, the product may be damaged. In addition, improper use can cause short circuits, fires or other hazards. This product fulfills the legal national and European requirements.

Liability and warranty

The statutory warranty provisions valid at the time of purchase apply. Intended use for non-commercial purposes is a prerequisite. Damage caused by improper handling or water is excluded. Tampering and modifications invalidate the warranty. Liability is limited to the purchase price. Liability for consequential damage is excluded. We reserve the right to make technical changes. All company names and product designations are trademarks of their respective owners. All rights reserved.

Environmental protection

Waste electrical and electronic equipment does not belong in household waste! Please use the free municipal disposal points.

Scope of delivery

- Speed controller
- Flyer

Contact us

Do you have a problem or questions? Write us an e-mail to hilfe@boerdson.de, we will be happy to help you!

Overview of properties

- PWM without whistling (16kHz)
- Integrated (non-hooking) electronic HF brake
- Very smooth ride
- Two independent channels for controlling two motors
- Freely configurable warning and switch-off limit for batteries
- All batteries can be used (NiCd, NiMh, LiPo, LiFe etc.)
- 24V motors can be used
- Integrated current measurement per channel
- Integrated voltage measurement per channel
- Integrated temperature measurement
- Integrated complex mixer (electronic differential)
- High PWM resolution to the motors: 2048 steps
- Extremely high resolution for signal acquisition: 18600 steps
- Safe-start function: The controller only starts when both inputs are in the appropriate range
- Safe-off function: If one of the signals is lost or is outside the sensible range, the controller switches off immediately.
- Status signal as LED flashing and motor sound
- Monitoring of the input signal (period and pulse width)
- Configuration via transmitter
- Configuration via USB using PC software
- (planned) configurable via Bluetooth using the Android app

Description

The ProX-Dual is an electronic speed controller (ESC) for brushed motors. With its two independent channels, it can be used flexibly, e.g. in tractor, caterpillar or ship models. It is also perfectly suited for a wide variety of auxiliary drives. It can also be used as a lighting driver/dimmer.

Various operating modes allow the following control options, for example:

Dual" mode

The two channels work completely independently of each other.

- Crawler or tracked models (control with two throttle sticks)
- Power take-offs
- Truck model (one main engine plus one auxiliary drive)
- Ship models (main drive and transverse rudder)
- Lighting/dimmer

Differential" mode

A mechanical differential is simulated. When cornering, the inner wheels turn more slowly according to the model dimensions.

- Tractor models (two engines at the rear)
- Tractor models (four motors - left two on channel A, right two on channel B)
- Truck models (two engines at the rear)

Chain" mode

One control stick accelerates, another steers the model. If the steering stick is moved more than halfway, the inner chain starts to turn backwards. This makes it possible to turn on the spot.

- Caterpillar or tracked models (control like a car, throttle stick and steering stick)

In the extended case, two controllers can be matched to each other to simulate a third center differential (e.g. for tractor models with four independently connected motors)

Cabling

The following diagram shows an example of the wiring of the ESC.
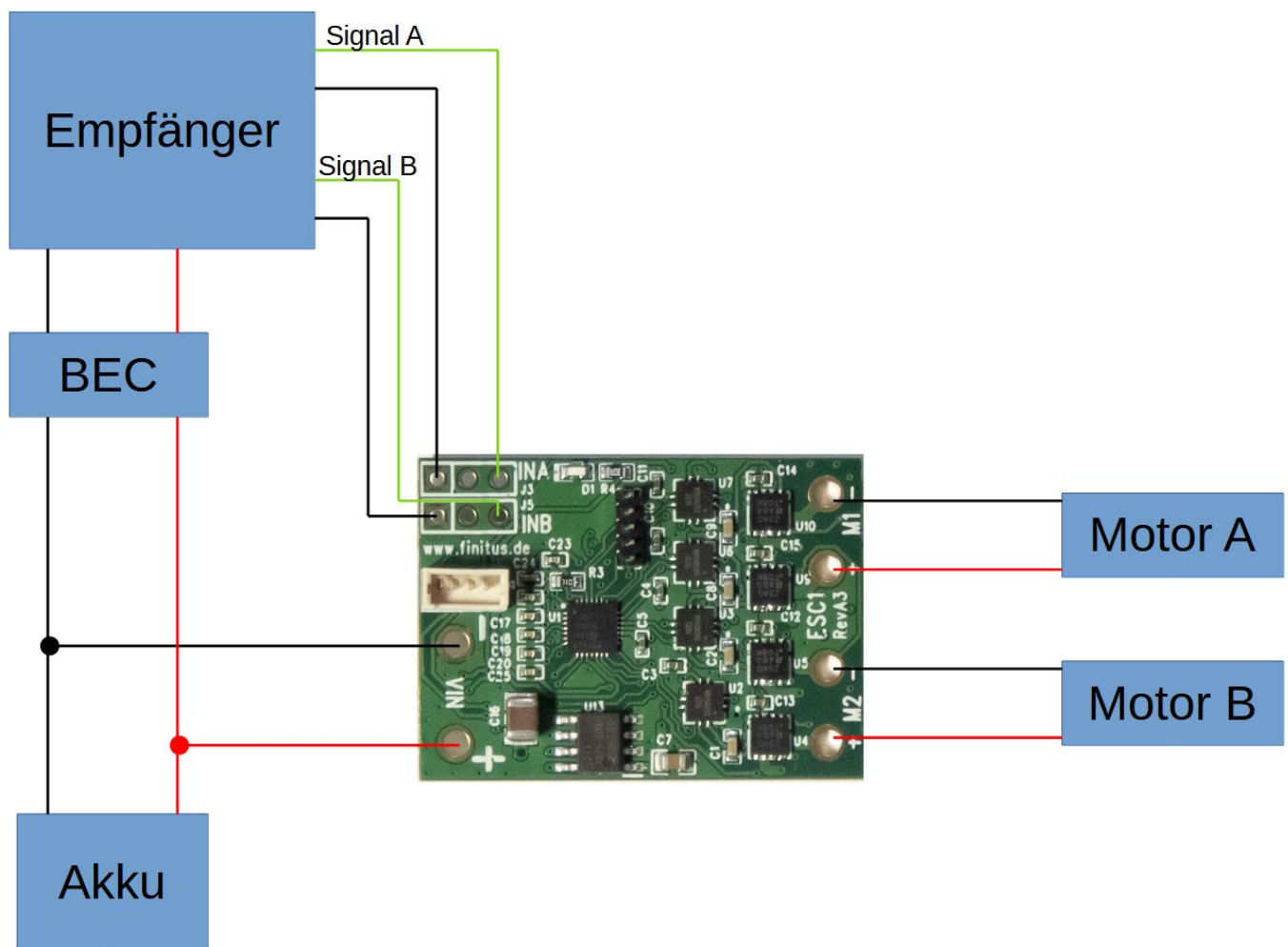
Input channel A controls motor A and input channel B controls motor B. For "Differential" and "Chain" modes, channel A must be the throttle channel and channel B the steering channel.

The ProX-Dual is also available with pre-soldered cables!

Configuration

Many parameters of the ESC can be configured and thus adapted to your own use and taste. Configuration is very convenient using the USB programmer and the corresponding Configurator software for your PC. You can access all configurable parameters via USB.

You can purchase the programmer in our store: www.boerdson.de. The software can be downloaded free of charge from the store.

Configuration can also be carried out using the transmitter sticks (this method only allows you to set the most important parameters). You can navigate through the menu by moving the control stick from channel A to the "Min" and "Max" positions (e.g. all the way back and all the way forward). As the ESC moves through the menu, it simultaneously emits various flashing signals via the LEDs and sounds via the motors. Every first menu item, even in the submenus, is the return or exit from the respective menu.

If you get confused, the ESC will exit the entire menu if you do not make an entry for 20 seconds.

Configuration via stick

To access the configuration menu, carry out the following steps:

1. Switch off ESC (switch off supply voltage)
2. Move control stick A to the "Min" position.
3. Switch on ESC (switch on supply voltage)
4. After 5 seconds, the ESC acknowledges the configuration mode with a short flash and sound
5. Now the ESC moves through the menu, if you want to select an item, move the stick to the "Max" position and then back.

Configuration menu overview

0. Exit main menu (two short signals)
1. Enter mode menu (one long signal)
    1.0. Exit mode menu (two short signals)
    1.1. Select dual ESC mode (one long signal)
    1.2. Select electronic differential mode (two long signals)
    1.3. Select chain mode (three long signals)
2. Enter calibration menu (two long signals)
    2.0. Exit calibration menu (two short signals)
    2.1. Calibrate throttle range (one long signal)
3. Enter soft drive menu (three long signals)
    3.0. Exit soft drive menu (two short signals)
    3.1. Switch off softdrive (one long signal)
    3.2. Switch on softdrive (two long signals)
4. Enter the recovery menu (four long signals)
    4.0. Exit the restore menu (two short signals)
    4.1. Reset to factory settings (one long signal)

Example 1: Calibrating the throttle range

To fully utilize the maximum control of the motors, the throttle travel must be adjusted depending on the transmitter/receiver combination. The ESC reads in the minimum and maximum possible value of your receiver signal.

In the following, short signals (flashing and sound) are shown as asterisks *. Long signals are shown as dashes− . The menu is controlled exclusively via control stick A.

1. Switch off ESC (switch off supply voltage)
2. Move the control stick to the "Min" position.
3. Switch on ESC (switch on supply voltage)
4. After 5 seconds, the ESC acknowledges the configuration mode with a *
5. Leave stick in "Min" and watch/listen to signals
6. ** Point 0.→ continue waiting
7. − Point 1.→ continue to wait
8. −− Point 2.→ Move stick to "Max"
9. *→ ok, ESC has understood
10. Move the stick to "Min" and wait (ESC is now in the "Calibration menu")
11. ** Point 2.0.→ continue to wait
12. − Point 2.1.→ Move stick to "Max"
13. *→ ok, ESC has understood
14. Move stick to "Min" (ESC measures minimum value)
15. Move stick to "Max" (ESC measures maximum value)
16. Move stick to "Min" and wait (ESC returns to menu)
17. ** Point 2.0.→ Stick after "Max"
18. *→ ok, ESC has understood
19. Move stick to "Min" and wait (ESC exits "Calibration menu")
20. ** Point 0.→ Stick to "Max" to exit the main menu
21. *→ ok, ESC has understood
22. Stick to "Min" (and leave "Main menu")
23. Stick in the middle→ ESC saves your entries and starts

Frequently asked questions (FAQ)

- Can I also connect 24V motors to the controller?
    - → Naturally! You can use all brush motors. Make sure that the motor is designed for the full battery voltage. Also make sure that the motor is not "too strong" for the controller, i.e. that the maximum current consumption of the motor matches the controller, see "Permissible loads"
- I would like to install four motors in my tractor model in order to realize all-wheel drive. Can I connect two motors (on each side) in parallel to one ESC channel?
    - → Of course! Just make sure that the parallel connection is within the characteristic map of the controller. See "Permissible loads"
- I would like to control a motor on channel A and control a dimmable light on channel A, is that possible?
    - → Yes, this is possible without any problems. Make sure that the light is designed for the full battery voltage. Use series resistors if necessary.
- My tractor model "pushes" in the curve, although I use the "Differential" mode, what can I do?
    - → First make sure that everything is connected correctly. On tractor models with four motors, for example, the motors on the same side are connected in parallel, i.e. the front left motor and rear left motor are connected together to one channel and the front right motor and rear right motor are connected in parallel to the other channel.
    - → The cornering also depends on the dimensions of your model. You can configure these parameters using the USB module in the ESC.
- I have an old speed controller, can I update its firmware to get the latest functions?
    - → Yes, you can send us the controller for an update. Please enquire about the process and the costs in advance by e-mail: info@boerdson.de
- Why does the ProX-Dual not have a BEC?
    - → The Pro X-Dual is deliberately equipped without a BEC to make it as compact as possible. A separate BEC also enables more flexible installation in models with limited space.

Permitted batteries

Battery type	Cells	Suitability	Recommended warning limit	Recommended switch-off limit
LiPo	<=1S	No		
LiPo	2S	Yes	7.4V	6.6V
LiPo	3S	Yes	11.1V	9.9V
LiPo	4S	Yes	14.8V	13.2V
LiPo	5S	Yes	16.5V	18.5V
LiPo	6S	Yes	22.2V	19.8V
LiPo	7S	conditional[*1]	25.9V	23.1V
LiPo	>=8S	No		
LiFe	<=1S	No		
LiFe	2S	conditional[*1]	6.6V	5.0V
LiFe	3S	Yes	9.9V	7.5V
LiFe	4S	Yes	13.2V	10.0V
LiFe	5S	Yes	16.5V	12.5V
LiFe	6S	Yes	19.8V	15.0V
LiFe	7S	Yes	23.1V	17.5V
LiFe	8S	conditional[*1]	26.4V	20.0V
LiFe	>=9S	No		
NiMh/NiCd	<=4	No		
NiMh/NiCd	5	conditional[*1]	6.0V	4.5V
NiMh/NiCd	6	Yes	7.2V	5.4V
NiMh/NiCd	7	Yes	8.4V	6.3V
NiMh/NiCd	8	Yes	9.6V	7.2V
NiMh/NiCd	9	Yes	10.8V	8.1V
NiMh/NiCd	10	Yes	12.0V	9.0V
NiMh/NiCd	11	Yes	13.2V	9.9V
NiMh/NiCd	12	Yes	14.4V	10.8V
NiMh/NiCd	13	Yes	15.6V	11.7V
NiMh/NiCd	14	Yes	16.8V	12.6V
NiMh/NiCd	15	Yes	18.0V	13.5V
NiMh/NiCd	16	Yes	19.2V	14.4V
NiMh/NiCd	17	Yes	20.4V	15.3V
NiMh/NiCd	18	conditional[*1]	21.6V	16.2V
NiMh/NiCd	19	conditional[*1]	22.8V	17.1V
NiMh/NiCd	20	conditional[*1]	24.0V	18.0V
NiMh/NiCd	>=21	No		

[*1] These ranges are already outside the normal operating range. They are still within the maximum values, but are still not recommended.

Permissible loads

The following diagram shows the possible operating range of the controller, the so-called characteristic map, with pure convection cooling.

ProX-Dual Characteristic map (cooling: convection)
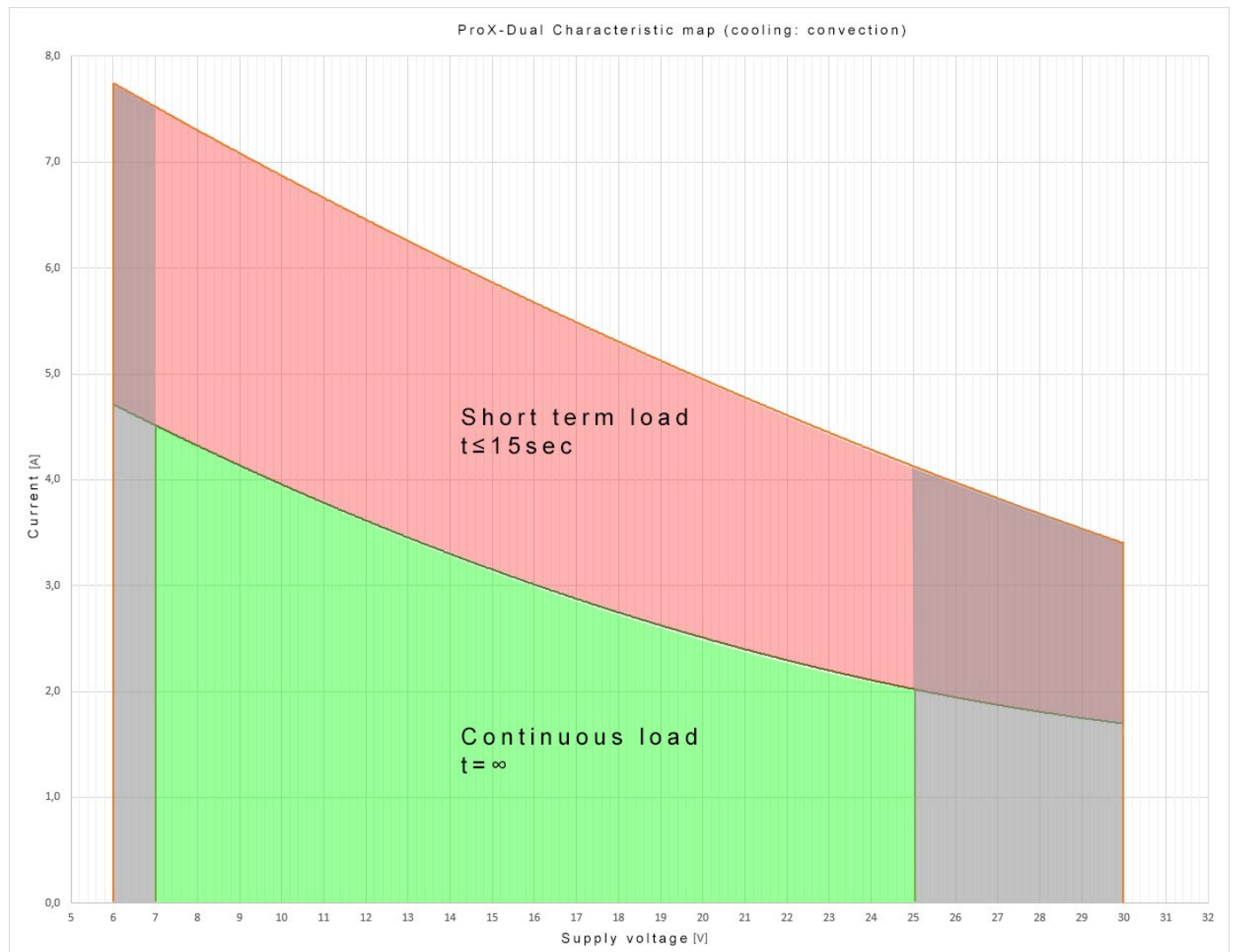
Here you can easily see which loads or which motors you are allowed to operate and how.

Example:

A 12V motor requires 2A for operation at rated data. When operating at maximum power output, the motor requires 5A.
 In the characteristic diagram, move your finger along the x-axis (horizontally) up to 12V and then along the y-axis (vertically) up to 2A. This point is still in the continuous load range and is not a problem.
 However, the point for operation at maximum power output is in the short-term range. If the motor is heavily loaded, this can cause the controller to protect itself and switch off.

Electrical data

Absolute maximum values

Parameters	Icon	Condition/Comment	Min	Type	Max	Unit
Supply voltage	V_{CC}		6	12	30	V
Pulse output current	I_{DM}	T_A =25°C, t=100µs			100	A
Peak output current	I_D	V_{CC} =7V, R_L =0.76R, T_C =50°C, t=15s			10	A

Recommended values

Parameters	Icon	Condition/Comment	Min	Type	Max	Unit
Supply voltage	V_{CC}		7	12	25	V
Output current short time RMS	I_{DK}	V_{CC} =7V, R_L =0.76R, T_C =50°C (convection cooling), t=∞			7.5	A
Output current duration RMS	I_D	V_{CC} =7V, R_L =1.27R, T_C =55°C (convection cooling), t=∞			4.7	A
Output power duration RMS	P_D	V_{CC} =25V, R_L =12.48R, T_C =51°C (convection cooling), t=∞			47	W
"On" resistance	$R_{DS(on)}$		4.2	8	13.7	mΩ
PWM frequency	F_{PWM}			15.6		kHz
PWM output resolution	A_O			2048		
Input resolution	A_I			18600		

Technical data

Parameters	Icon	Condition/Comment	Value	Unit
Number of inputs	N_I		2	
Number of motor outputs	N_O		2	
Cable diameter	D_K	Connection holes for battery and motor cable	2	mm
Cable diameter	D_S	Servo cable connection holes	1	mm
Length	L	Without cable	36	mm
Width	W		26	mm
Height	H	including components	5.5	mm
Weight	G	Without cable	5	g