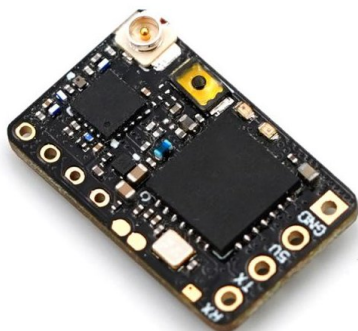




Crossfire Nano RX Pro

TBS CROSSFIRE 868 MHz receiver
User manual



Read this entire manual carefully before installation and first use. In the Czech Republic and the EU, operate the receiver with the CE region only (Chapter 5.1).

www.rotorama.com

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1. Safety instructions

The TBS Crossfire Nano RX Pro receiver is part of a radio control system for models. A mistake during installation or setup can lead to loss of control of the model and thus to property damage or personal injury.

- These long range systems are capable of radio frequency transmissions and output power that may not be allowed in your country. **The user is responsible for the frequency and power settings.** In the Czech Republic and the EU, use the **CE** region (Chapter 5.1).
- Always fly the model within visual line of sight and follow the regulations for unmanned aircraft and models of the country in which you fly.
- Solder and change any wiring only with the power disconnected. Protect the receiver with heat-shrink tubing to prevent short circuits with conductive parts of the model (e.g. a carbon frame).
- The supply voltage must not exceed the value given in the specifications (Chapter 2.2).
- Do not power the receiver without the antenna connected – the receiver transmits telemetry.
- Use only the antenna supplied or specified by the manufacturer; do not modify the antenna or the transmitting section.
- Test the failsafe function before the first flight and after every change of settings – **always with the propellers removed** (Chapter 5.3).
- Always remove the propellers for ground tests with the flight battery connected.
- Before take-off, check that the correct model is selected on the radio – by default, the CROSSFIRE system does not monitor the radio model (Chapter 4.4).
- The receiver is not a toy. Keep it out of the reach of children – small parts can be inhaled or swallowed.

2. Product description

2.1 Introduction

The TBS Crossfire Nano RX Pro is a miniature receiver for the TBS CROSSFIRE (XF) remote control system for FPV drones, airplanes and other models. Compared to the standard Nano RX, the Pro version is a higher telemetry output power option – up to 500 mW – with the same form factor and the same pinout.

The CROSSFIRE system is a long range, two-way radio control link: it transmits control commands from the radio to the model and sends telemetry back (link quality, voltage, data from the flight controller or GPS). The receiver supports CRSF, SBUS, PPM, PWM, MAVLink, SmartAudio and Serial Bridge.

For operation you need a TBS CROSSFIRE transmitter module (e.g. Micro TX, Nano TX or the TBS TANGO radio), which is **not** included.

2.2 Specifications

Designation	TBS Crossfire Nano RX Pro (labeled <i>XF Nano PRO</i> on the board, <i>XF Nano TEL</i> on the first few units)
System	TBS CROSSFIRE – long range two-way RC link
Frequency bands	868 MHz (860–885 MHz) – Europe 915 MHz (902–928 MHz) – America, Australia
Telemetry power (downlink)	adjustable: 25 mW / 100 mW / 500 mW limited to 25 mW in the CE region (Chapter 5.1)
System sensitivity	up to –130 dBm
Outputs	6 pins (4 channel outputs + 2× BST), CRSF, SBUS, PPM, PWM, MAVLink, SmartAudio, DSMX
Number of channels	8 or 12 (serial protocols)
Input power	3.3–8.4 V (max. 2S LiPo)
Antenna connector	U.FL
Size	11 × 18 mm
Weight	0.5 g (receiver only)
Working temperature	0–40 °C
Firmware	requires current TBS CROSSFIRE firmware (older firmware does not support the Pro version)
Manufacturer	Blacksheep Avionics Co. Ltd. (Team BlackSheep), 44-46 Hung To Rd, 12/F, Unit 1204, Century Centre, Kwun Tong, Hong Kong, e-mail: rparker@team-blacksheep.com

2.3 Package contents

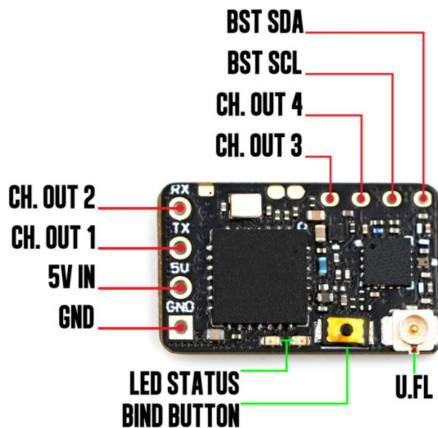
- 1× TBS Crossfire Nano RX Pro receiver
- 1× TBS Crossfire Immortal T V2 antenna (U.FL connector)
- 1× spare heat-shrink tube
- 6× 30 AWG silicone connection wires (2 black, 2 red, 1 white, 1 yellow)
- 1× pin header 1×4

Not included: TBS CROSSFIRE transmitter module, radio, flight controller (FC) or BST cable.



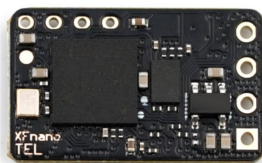
Package contents (illustrative photo)

2.4 Receiver overview



Front side of the receiver – pins and controls

Label	Function
GND	ground (–)
5V IN	power input +3.3 to 8.4 V
CH. OUT 1 (TX)	output 1 – default CRSF TX
CH. OUT 2 (RX)	output 2 – default CRSF RX
CH. OUT 3	output 3 – default PWM channel 3
CH. OUT 4	output 4 – default SmartAudio
BST SCL / BST SDA	BST bus (outputs 5 and 6)
LED STATUS	status LED (Chapter 7.1)
BIND BUTTON	Bind button
U.FL	antenna connector



Back side of the receiver
labeled XF Nano PRO / XF
Nano TEL

3. Installation and wiring

3.1 Wiring the receiver

The receiver does not come with any connectors on-board, this is intended to allow for flexible and more varied setups, i.e. it is easier to add a connector than to remove a pre-soldered one. Solder the wires directly to the soldering pads or use a 2.54 mm pin header to mount the receiver to a motherboard.

After wiring and connecting the antenna, use heat-shrink tubing to protect the receiver.

3.2 Connection to a flight controller (FC)

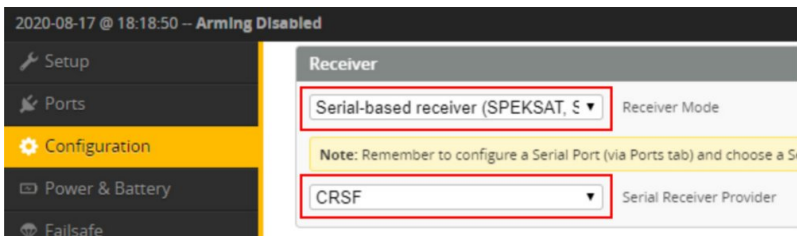
The manufacturer recommends using **CRSF** whenever possible. By default, outputs 1 and 2 are set to CRSF, so simply wire the receiver as follows:

Receiver		Flight controller (FC)
GND	→	GND
5V IN	→	5 V
CH. OUT 1 (CRSF TX)	→	RX of a UART
CH. OUT 2 (CRSF RX)	→	TX of the same UART

- The RX and TX wires must be on **the same UART** of the flight controller.
- If you use an F4 flight controller, make sure you don't use UARTs labeled *SBUS* or *S-PORT* – those UARTs have a hardware inverter installed which does not work with CRSF.
- CRSF does not work on Soft Serial ports.
- If you use SBUS or any other protocol besides CRSF or MAVLink, you only need to connect the receiver's TX line. The output must be changed in the output map (Chapter 5.4).

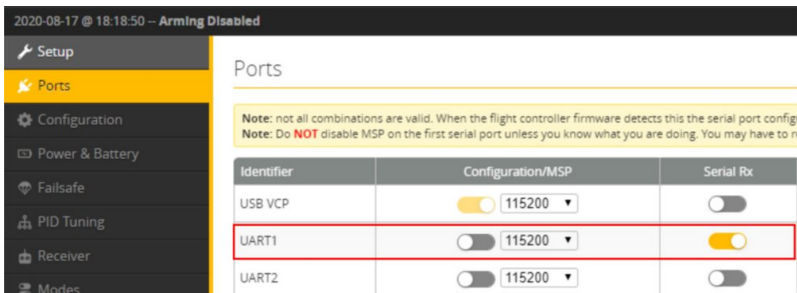
3.3 Betaflight setup

① In Betaflight Configurator, open the *Configuration* tab (*Receiver* in newer versions), select *Serial-based receiver* as *Receiver Mode* and *CRSF* as *Serial Receiver Provider*.



Selecting the serial receiver and the CRSF protocol

② In the *Ports* tab, enable *Serial Rx* for the UART where your receiver is connected.



Enabling Serial Rx on the respective UART

③ The manufacturer recommends entering the following CLI command:

set failsafe_recovery_delay = 1

KISS / FETtec flight controllers: connect the receiver by CRSF to the RC input port and select *CRSF* as RC type in the configurator. With any other flight controller, set the output map according to the protocol that it can use.

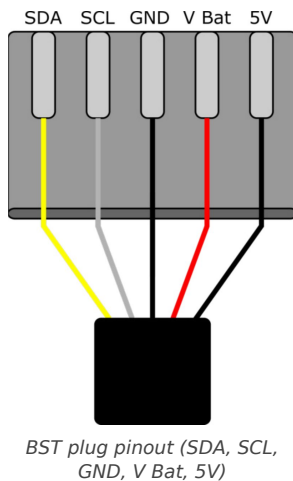
3.4 Antenna

Connect the antenna with the U.FL connector to the socket on the receiver. To ensure that it does not disconnect or unseat, run the coax cable across the receiver board over to the servo channel end and secure it with the heat-shrink tubing. Place the antenna as far as possible from carbon parts and sources of interference.

3.5 BST bus

BST (Blacksheep Telemetry) is a bus system used by TBS to connect devices such as the TBS GPS, CORE PRO or FPVision. All devices are connected in parallel, and the BST bus needs clean 5 V power.

The Nano receiver does not have the complete BST plug. Just connect **SCL to SCL**, **SDA to SDA** and ground (GND). The best practice is to use a BST cable, cut the connector and the unused wires on one end, and solder the required wires. BST plug pinout:



❖ **Even if a non-TBS GPS or compass has the same labels (SCL and SDA), it does not work on the BST bus.**

4. Binding and firmware update

Binding is an easy task and does not require any special jumpering. Power your model with a LiPo while binding – in some cases, USB power to the flight controller alone is not strong enough to properly power the receiver in bind mode.

4.1 Putting the transmitter into bind mode

First, set your transmitter module into bind mode. The procedure depends on the radio and transmitter type:

Method	Procedure
Lua script (OpenTX / EdgeTX)	turn on the radio → run the <i>AGENT LITE</i> Lua script → open <i>CROSSFIRE Transmitter</i> → select <i>Bind</i>
TBS TANGO 1	turn on the radio → hold the rocker switch to enter the main menu → <i>Devices</i> → <i>CROSSFIRE Transmitter</i> → <i>Bind</i>
TBS AGENT (desktop / web)	connect the transmitter by USB → open <i>CROSSFIRE Transmitter (Manage)</i> → <i>Configure</i> tab → under <i>Device</i> , click <i>Bind</i>
Button (Micro TX)	power up the transmitter → push the button on the module once
Display (Standard / Lite TX)	hold the joystick down until the menu opens → <i>CROSSFIRE Transmitter</i> → <i>General</i> → <i>Bind</i> and click the joystick

※ If you use EdgeTX and the Lua script does not load any data, set the Baudrate of the CROSSFIRE model to the maximum available speed.

4.2 Binding the receiver

- ① The transmitter is in bind mode.
- ② Power up the receiver.
- ③ Within 1 minute after power-up, push the Bind button on the receiver. Slow green blinking of the LED means the receiver is in bind mode.
- ④ Within a few seconds the binding is completed (message on the radio, the receiver LED turns solid green).

If it doesn't bind, please verify that both the transmitter and the receiver have the newest firmware.

4.3 Receiver update (OTA)

The firmware is updated with **TBS AGENT** (desktop or web): connect the transmitter module by USB and run the update. The receiver then gets the update over the air (OTA) during the next binding.

With the transmitter and the receiver both in bind mode, you will get a message on the radio or in TBS AGENT telling you that the receiver needs to be updated. Follow the instructions shown there – when the transmission is finished, the receiver flashes itself, and both are then bound and ready to be used.

► Auto-bind

After updating the transmitter firmware, you need to rebind the receiver. If the receiver was bound before, you don't need to press the Bind button again: power up the transmitter, set it into bind mode, power up the receiver and wait a few seconds for the update prompt.

4.4 When do I need to bind again

- you changed the region / frequency setting*,
- you updated your transmitter firmware,
- you enabled Multi-bind*,
- you did a factory reset on the receiver,
- you changed your model ID / receiver number in OpenTX / EdgeTX.

* You can avoid rebinding if you change these settings while the receiver is bound and powered up.

► Model match

By default, the CROSSFIRE does not monitor the radio model – you can control any model, even if you changed the model in your radio. Always make sure that you selected the right model in your radio before you power up the receiver. Newer versions of OpenTX / EdgeTX support model match; if the model has a receiver number other than 00, the receiver may appear unbound – in that case set the number back to 00 or rebind the receiver.

► Multi-bind

Multi-bind allows you to use all your CROSSFIRE transmitters with all your receivers without rebinding them each time. The transmitters must be synchronized with your TBS account via the built-in WiFi module and TBS AGENT, and the *Multi-bind* option must be enabled under *XF Transmitter* → *General* on every transmitter.

5. Receiver settings

The receiver is configured wirelessly through the transmitter – by the Lua script on the radio, in TBS AGENT or in the TBS TANGO menu. The receiver must be bound and powered up.

5.1 Region and frequency

Frequency and region are set in the transmitter (*CROSSFIRE Transmitter* → *General*) and affect both the transmitter and the receiver. Once a region is selected, the CROSSFIRE limits frequency, output power and the used band according to the law of that region, and the region and frequency options disappear from the menu.

Region	Frequency	Max. power
Open	not limited	not limited
CE	868 MHz, LBT technique	25 mW
FCC	915 MHz	1 W
C-Tick	915 MHz	1 W

In the Czech Republic and the EU, set the CE region. In the Czech Republic, a maximum of 25 mW e.r.p. is permitted in the 863-870 MHz band (higher power only in the narrow 869.40-869.65 MHz band, which the frequency-hopping CROSSFIRE system cannot keep to). The 860-863 MHz, 870-885 MHz and 915 MHz (FCC) bands must not be used in the Czech Republic. Outside the Czech Republic, the regulations of the country of operation apply.

※ The limits in the Czech Republic are based on the general authorisation of the Czech Telecommunication Office No. VO-R/10 (short range devices).

5.2 Telemetry power (Pro version)

In the receiver settings you can adjust the telemetry (downlink) power under *XF Nano RX Pro* → *General* → *Power* to one of three power levels:

Min	Mid	Max
25 mW	100 mW	500 mW

Use the Mid and Max levels only where the regulations allow it. In the CE region the power is limited to 25 mW.

5.3 Failsafe

Failsafe determines what the receiver does when the link is lost. Setting it up correctly is crucial for the safety of your model. The setting is located in the receiver menu under *General*, item *FS. Mode*:

- **Cut** – if the link breaks up, the receiver outputs no signal. Use this setting if your model has a flight controller (FC) that handles a failsafe routine for you (e.g. Betaflight, return to home).
- **Position** – the receiver outputs a previously taught position for all channels. Use it on models without an FC or with an FC that requires a special stick position.

If you have set up the Position mode and did not teach a position afterwards, the receiver will output the last position before the link broke up.

► Teaching a failsafe position

- ① Power up your bound receiver and your radio with the CROSSFIRE transmitter.
- ② Open the transmitter / receiver menu.
- ③ Hold the sticks and switches in the position you want them to be in a failsafe situation (a second person may be needed).
- ④ Select *Set fs. Mode* and wait for the confirmation of the set position. If the mode was set to Cut, it changes to Position after you accept the request.

► Failsafe test

- ① Remove the propellers of your model.
- ② Power up the radio and the model.
- ③ Arm the model (with FC) or move your sticks into a certain position (no FC).
- ④ Shut down your radio.
- ⑤ Check that the model behaves according to the set failsafe mode.

5.4 Output map

On all receivers, you can select what is output on which pin. According to the manufacturer, the Pro version has the same pinout as the Nano RX:

Pin	Options	Default
1	PWM CH1 (PWM Ch1 to 12), PPM, RSSI, LQ, RSSI/LQ, SBUS, n.i. SBUS, CRSF TX, MAVLink TX, SmartAudio, DSMX	CRSF TX
2	PWM CH2 (PWM Ch1 to 12), RSSI, LQ, RSSI/LQ, CRSF RX, MAVLink RX	CRSF RX
3	PWM CH3 (PWM Ch1 to 12), RSSI, LQ, RSSI/LQ, CRSF RX, MAVLink RX, Serial RX, GPS RX	PWM Ch. 3
4	PWM CH4 (PWM Ch1 to 12), RSSI, LQ, RSSI/LQ, SBUS, n.i. SBUS, CRSF TX, MAVLink TX, Serial TX, SmartAudio, DSMX, GPS TX	SmartAudio
5 (BST)	PWM CH5 (PWM Ch1 to 12), RSSI, LQ, RSSI/LQ, BST SCL	BST SCL
6 (BST)	PWM CH6 (PWM Ch1 to 12), RSSI, LQ, RSSI/LQ, BST SDA, GPIO	BST SDA

- **CRSF** – fast full-duplex serial protocol by TBS with low latency; can be selected on multiple outputs at the same time.
- **SBUS** – inverted signal (on F4, use an input with an inverter); **n.i. SBUS** – not inverted SBUS.
- **MAVLink** – telemetry and RC channels for MAVLink flight controllers; connect MAVLink TX to the FC telemetry RX pin and vice versa.
- **PWM** – standard 50 Hz signal for servos; **PPM** – up to 12 channels, only for old-style flight controllers without serial RC input.
- **RSSI, LQ, RSSI/LQ** – signal strength / link quality as PWM 1000–2000 µs for old-style OSDs.
- **SmartAudio** – control of the video transmitter (VTX); **GPS** – connection of a UBLOX GPS for telemetry without an FC.
- **GPIO** – switching output 3.3 V, do not exceed 5 mA; high when the channel exceeds 30 %.
- **DSMX** – use of the CROSSFIRE as a backup system for Spektrum receivers.

5.5 Other settings

- **Channel map** – changes the channel order (also for serial protocols) and injects LQ / RSSI into a channel.
- **Channel number** – 8 or 12. Use the 8 channel setting whenever you can – it ensures the best performance of your RC link.
- **RF Profile** – *Dynamic* (recommended; switches between 150 Hz and 50 Hz based on link quality), *50Hz* (if you encounter issues with your link), *150Hz* (low latency, limited range – race use only).
- **Telemetry** – enables / disables telemetry. If disabled, dynamic power no longer works and the link switches to 50 Hz mode; the manufacturer recommends disabling it at races or when you get black lines in your video feed.
- **Voltage Sensor** – the receiver measures its supply voltage (max. 2S LiPo). If it interferes with another voltage sensor, disable it under *Receiver* → *General*.

6. Link quality

- **LQ (Link Quality)** – the number of packets that arrive correctly. In TBS OSDs it is scaled 0–300 % (0–100 %: 50/4 Hz mode, 170–300 %: 150 Hz mode); as a radio sensor it stays at 100 % in 150 Hz mode.
- **RSSI** – how “loud” the signal is that the receiver “hears”, including noise, in dBm. The link holds down to –130 dBm; double the range results in a drop of about 6 dB.
- **SNR** – signal-to-noise ratio. Positive numbers mean the signal is louder than the noise. The system can receive signals down to –6 dB.

Sensor	Prewarning	Critical
RSSI	30 % / –100 dBm	20 % / –106 dBm
LQ (Dynamic or 50 Hz)	70 %	60 %
LQ (fixed 150 Hz)	40 %	30 %
RSSI/LQ	30 %	20 %
SNR	4 dB	0 dB

The easiest way to set up your OSD or radio warning is by using **LQ** – it is linear and easier to monitor than the logarithmic RSSI.

► Betaflight

Betaflight reads RSSI (in dBm) and LQ directly from the CRSF stream. Disable the RSSI channel in the *Receiver* tab, disable the `RSSI_ADC` option and activate the LQ and RSSI dBm elements in the *OSD* tab. Recommended CLI commands for warnings:

RF Profile	CLI commands
Dynamic or 50 Hz	<pre>set osd_link_quality_alarm = 70 set osd_RSSI_dbm_alarm = -100</pre>
fixed 150 Hz	<pre>set osd_link_quality_alarm = 40 set osd_RSSI_dbm_alarm = -100</pre>

7. Status LED and troubleshooting

7.1 Status LED

LED	Description
solid green	the link is up and running OK
solid red	no packets received from the transmitter, receiver is in failsafe mode
slow red blinking	the receiver needs an update, confirmation on the TX is required
slow green blinking	the receiver is in bind mode
fast green blinking	receiver bootloader active or firmware upgrade running
double green blinking	authentication running / error; rebinding your receiver if it remains longer than a few seconds
red / green blinking (any pattern)	firmware issue - run the emergency update (Chapter 7.4), then rebinding the receiver

7.2 Troubleshooting

Problem	Solution
the receiver does not bind	update the transmitter and receiver firmware; power the model from a battery, not USB only; press Bind within 1 minute after power-up
double green blinking after update or binding	shut down the receiver → set the TX in bind mode → power up the receiver → push Bind; the pattern may return briefly, then disappears
receivers unbound after a radio update	check the receiver number (model match) of the model in the radio and set it back to 00
Lua script does not load data (EdgeTX)	increase the Baudrate in the model settings
Betaflight gets no signal	check the wiring TX → RX and RX → TX on the same UART, Serial Rx enabled and CRSF selected; do not use an inverted UART or Soft Serial
telemetry sensors missing on the radio	disable <i>Ignore Instances</i> in the telemetry settings of your radio and discover the sensors again
black lines in the video feed	use shielded or twisted cables; disable telemetry if needed

7.3 Factory reset

- ① Power up the receiver (bound to the transmitter).
- ② In the receiver menu, open *About* and select *Factory reset*.
- ③ Follow the instructions on your display / radio.
- ④ When the reset is finished, power cycle the receiver and rebind it by pushing the Bind button.

All settings are set back to default. Check them and teach the failsafe position again if you want to use it.

7.4 Emergency update

When the update of the receiver fails and it no longer works, restore the “golden” firmware stored in the receiver:

- ① Hold the Bind button and power up the receiver – the LED starts to flash rapidly.
- ② Release the button.
- ③ Push and hold the button again – the LED starts to blink in a double pattern.
- ④ As soon as the LED switches to rapid flashing again, release the button.
- ⑤ When the pattern changes back to slow, single blinking, the emergency update is finished.

The receiver is then automatically in bind mode. Power up your transmitter, start the binding and run the OTA update again (Chapter 4.3).

For further information, see the official TBS CROSSFIRE manual at www.team-blacksheep.com.

8. Information for the EU and Czech Market

8.1 Importer and responsible person in the EU

The product is placed on the European Union market by the importer stated below, who is at the same time the responsible person within the meaning of Article 16 of Regulation (EU) 2023/988 of the European Parliament and of the Council on general product safety (GPSR).

Importer / responsible person in the EU	Rotorama, s.r.o.
Company ID (IČO)	051 57 692
VAT ID (DIČ)	CZ05157692
Registered office	Okrajová 1351, 674 01 Třebíč, Czech Republic
E-mail	info@rotorاما.cz
Phone	+420 252 252 098
Website	www.rotorاما.com

8.2 Product conformity



- The product bears the **CE** marking and complies with the requirements of the applicable European Union harmonisation legislation.
- A copy of the **EU Declaration of Conformity** is available from the importer at the address stated above or at the e-mail address info@rotorاما.cz.
- **Product identification:** the type designation (TBS Crossfire Nano RX Pro) is printed on the receiver board as *XF Nano PRO* (*XF Nano TEL* on the first few units).

8.3 Disposal of electrical equipment



- The crossed-out wheeled bin symbol on the product, its packaging or in the documentation means that at the end of its service life the product **must not be disposed of together with mixed municipal waste.**
- Hand it over at a take-back point for electrical equipment – at a collection yard, at a take-back point of a collective system, or at the retailer when purchasing a new equivalent product. Take-back is free of charge for the end user.
- The obligations under Act No. 542/2020 Coll., on end-of-life products, are fulfilled by the importer through a collective take-back system.
- Proper disposal helps prevent negative impacts on the environment and human health and contributes to the reuse of secondary raw materials.

Through its contractual partner **ASEKOL a.s.**, the company ensures the take-back of waste electrical equipment from households and the separate collection of waste electrical equipment, batteries and accumulators in accordance with the applicable legislation. The customer is entitled to hand over old electrical equipment or a battery or accumulator at any collection point of the above contractual partner. The addresses of these take-back points are listed at www.asekol.cz, www.ecobat.cz and also <https://visoh2.mzp.cz/RegistrMistZO/RegistrMistZOPublic/MapaMistZpetOdberu>.

9. Warranty and rights arising from defective performance

The rights and obligations of the contracting parties are governed by Czech law, in particular by Act No. 89/2012 Coll., the Civil Code, and Act No. 634/1992 Coll., on consumer protection.

- The seller is liable to the buyer for the product being free of defects on receipt. If the buyer is a consumer, a defect may be notified **within two years of receipt** of the product (Section 2165 of the Civil Code).
- If a defect appears within **one year** of receipt, the product is deemed to have been defective already at the time of receipt (Section 2161(5) of the Civil Code).
- When purchasing online, a consumer has the right to **withdraw from the contract within 14 days** of receiving the goods without giving a reason (Section 1829 of the Civil Code).
- Claims should be made with the retailer from whom you purchased the product. The importer's contact details are given in Chapter 8.1.
- The competent body for out-of-court settlement of consumer disputes is the **Czech Trade Inspection Authority**, Štěpánská 796/44, 110 00 Prague 1, www.coi.cz.