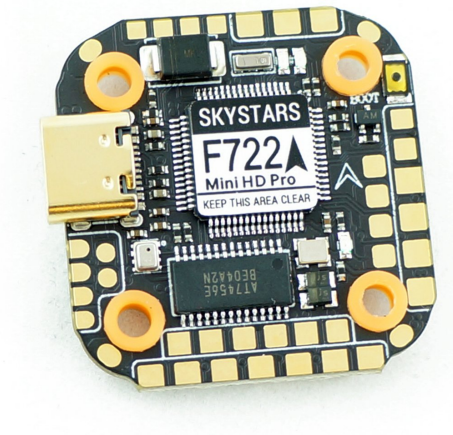
F722 Mini HD Pro

Skystars · flight controller (FC) 20×20 mm
User manual



Read this manual carefully before installation and first power-up and keep it for future reference. Always remove the propellers when configuring and testing the motors.

Rotorama, s.r.o. · www.rotorama.com

Contents

1. Safety instructions

2. Product description

2.1 Intended use

2.2 Package contents

2.3 Specifications

2.4 Top side – solder pads

2.5 Bottom side – connectors

2.6 Serial port assignment

3. Installation and wiring

3.1 Mounting in the frame

3.2 Connecting the electronic speed controller (ESC)

3.3 Receiver

3.4 Digital video transmitter

3.5 Analog camera and video transmitter

3.6 GPS, buzzer and LEDs

3.7 Complete wiring diagram

4. Setting up in Betaflight

5. Legal conditions of operation

6. Before and during the flight

7. Maintenance and troubleshooting

8. Information for the EU and Czech Market

9. Warranty and rights arising from defective performance

1. Safety instructions

1.1 Before you start

The Skystars F722 Mini HD Pro flight controller (FC) is a component for building an FPV drone. It is intended for experienced users who can solder, wire drone electronics and configure them in Betaflight or INAV. This product is not a toy and must be kept away from children.

- Read the whole manual and the wiring diagram in chapter 3 before installation. Keep this manual. The pilot is responsible for the safe operation of the finished drone.
- Do not make any modifications not described in this manual. Damage caused by incorrect wiring, short circuit or reverse polarity is not a product defect.

1.2 Power supply and Li-Po batteries

- Power the flight controller only within the permitted range of **3S to 6S Li-Po** (see chapter 2.3). A higher voltage will permanently damage it.
- Before connecting a battery for the first time, check with a multimeter that there is no short circuit between the positive and negative power terminals. We recommend powering up for the first time through a short-circuit protector (smoke stopper).
- Charge Li-Po batteries only with a suitable charger, under supervision, on a non-flammable surface. Do not use a damaged, swollen or punctured battery.
- A fully charged Li-Po cell has 4.20 V, a LiHV cell 4.35 V. End the flight at 3.5 V per cell at the latest; store the battery at 3.8 V per cell. Always disconnect the battery when working on the drone.

1.3 Soldering and handling electronics

- Use a temperature-controlled fine-tip soldering iron and electronics flux. Do not heat the pads longer than necessary – they may lift off.
- Make sure solder does not bridge adjacent pads. Inspect the joints with a magnifier after soldering.
- Protect the flight controller from static electricity, moisture and conductive debris (carbon dust from the frame, metal filings).
- Do not cover the barometer on the top side of the board or pot it with glue or conformal coating.

1.4 Motor tests

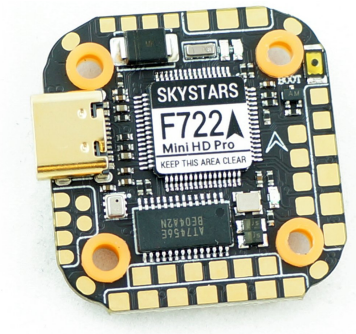
- **Always remove the propellers whenever you configure or test the motors on the bench.**
- Only test Arm (motor start) after checking failsafe and the motor direction without propellers.

2. Product description

2.1 Intended use

The Skystars F722 Mini HD Pro is a 20×20 mm flight controller (FC) with an STM32F722 processor, BMI270 gyroscope, barometer, analog OSD and 16 MB memory for flight data logging (blackbox). The board carries two voltage regulators (BEC), 5 V and 10 V, for powering the receiver, camera, video transmitter and other components.

The flight controller connects to the electronic speed controller (ESC) via an 8-pin connector and to a DJI digital video transmitter via a 6-pin connector. It supports serial receivers (SBUS, iBus, Spektrum, Crossfire) and allows connecting a GPS module, a buzzer and programmable WS2812 LEDs.



Skystars F722 Mini HD Pro – top side

2.2 Package contents

- 1× Skystars F722 Mini HD Pro flight controller with silicone grommets (soft mount)
- 1× accessory kit

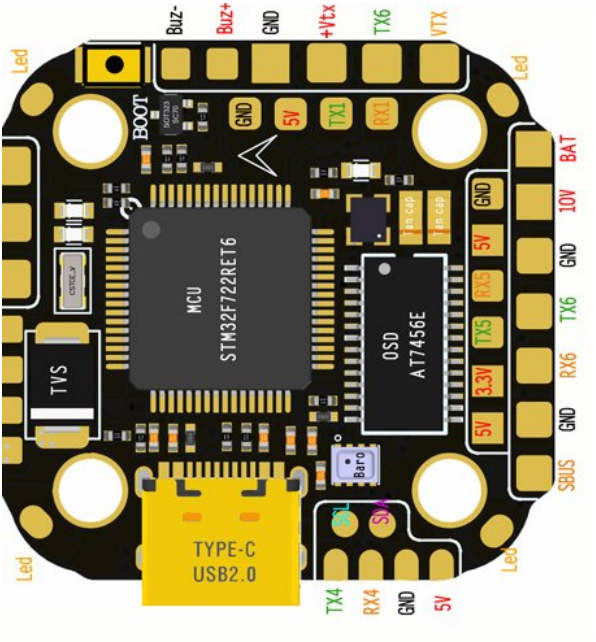
Not included: electronic speed controller (ESC), receiver, camera, video transmitter, GPS module, buzzer, LEDs, battery and frame.

2.3 Specifications

Manufacturer	Shenzhen Skystars Tech Co., Limited
Designation	Skystars F722 Mini HD Pro (marked “Mini F7HD Pro” on the bottom side of the board)
Processor (MCU)	STM32F722RGT6, 216 MHz
Gyroscope and accelerometer	BMI270 (SPI)
Barometer	yes
OSD	Betaflight OSD (AT7456E chip) and DJI HD OSD (UART6)
Blackbox	16 MB
Serial ports	6 hardware UARTs (UART1–UART6)
BEC	5 V / 2 A and 10 V / 2 A
Input voltage	3S–6S Li-Po (12–26 V)
Protection	TVS diode on the power input
USB connector	USB-C
Firmware (target)	Betaflight: SKYSTARSF7HDPRO INAV: SKYSTARSF722HDPRO
Dimensions	35 × 28 × 7 mm
Mounting holes	20 × 20 mm, M3
Weight	4.2 g

2.4 Top side – solder pads

The figure taken from the manufacturer's diagram shows the top side of the board rotated so that the USB-C connector is at the bottom. In the photo in chapter 2.1 the board is rotated – use the USB-C connector and the BOOT button for orientation.



Top side – pad layout (source: Skystars)

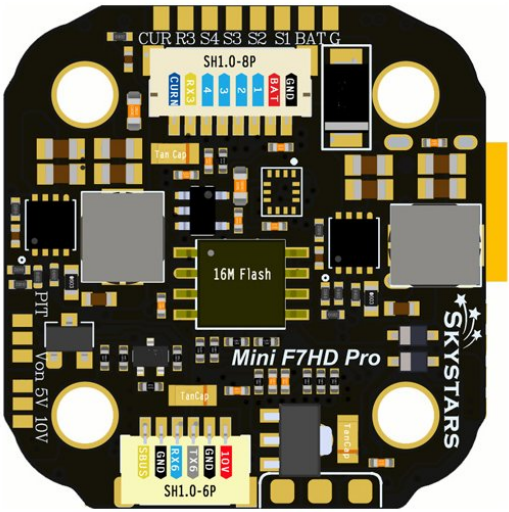
Pad	Function
BAT, GND	direct battery voltage (e.g. for powering a digital unit)
10V, 5V, 3.3V	10 V, 5 V and 3.3 V regulator outputs
+Vtx	switched power for the video transmitter (see chapter 2.5)
VTX	video signal (with OSD) for an analog video transmitter
TX1, RX1	UART1 – receiver
TX2, RX2	UART2 – free port
TX4, RX4	UART4 – free port (e.g. GPS)
TX5, RX5	UART5 – free port
TX6, RX6	UART6 – digital video transmitter / VTX
SBUS	SBUS receiver input
SCL, SDA	I²C bus (e.g. GPS module compass)

Pad	Function
CAM	video signal from an analog camera
Buz+, Buz−	buzzer
Led (4×, in the corners)	data output for WS2812 LEDs
BOOT	button for DFU mode (firmware flashing)

The pads on the left edge (cropped in the figure) are, from top to bottom: CAM, GND, 5V, TX2, RX2, GND, 5V. Their wiring is shown in the diagram in chapter 3.7.

2.5 Bottom side – connectors

The bottom side carries two SH 1.0 mm connectors and solder pads for selecting the video transmitter power.



Bottom side – connectors (source: Skystars)

Connector	Pins
SH1.0, 8-pin (ESC)	CUR (current sensor), R3 (ESC telemetry – RX3), S4, S3, S2, S1 (motor signals), BAT (battery voltage), G (GND)
SH1.0, 6-pin (DJI)	SBUS, GND, RX6, TX6, GND, 10V
PIT, Von, 5V, 10V	solder pads for the +Vtx output power

❖ For the PIT, Von, 5V and 10V pads the manufacturer states: “Use Pit mode for VTX” and “Use 10V for +VTX”. The factory state of the jumpers is not specified by the manufacturer – before connecting a video transmitter, measure the voltage on the +Vtx pad with a multimeter and check that it matches the input of your VTX.

2.6 Serial port assignment

The manufacturer recommends the following use of the UART ports:

Port	Recommended use
UART1	receiver (Serial RX)
UART2	free
UART3	ESC telemetry (pin R3 in the ESC connector)
UART4	free (GPS in the manufacturer's diagram)
UART5	free
UART6	DJI FPV / video transmitter (VTX)

3. Installation and wiring

3.1 Mounting in the frame

- Mount the flight controller on M3 screws with 20 × 20 mm spacing using the supplied silicone grommets. Do not overtighten the screws – the grommets dampen vibration.
- After mounting, check the orientation of the flight controller in the 3D view on the *Setup* tab. If the model does not follow the movement of the drone, set the rotation in Betaflight (*Configuration → Board and Sensor Alignment*).
- The board must not touch the carbon frame – carbon is conductive.
- Keep the USB-C connector accessible.

3.2 Connecting the electronic speed controller (ESC)

Connect the electronic speed controller (ESC) with a cable to the 8-pin connector on the bottom side (CUR, R3, S4, S3, S2, S1, BAT, G). Through this cable the flight controller receives battery power, measures voltage and current and sends the motor signals to the ESC.

- Compare the wire order in the cable with the pinout on both the FC and the ESC. Cables from different manufacturers have different wire orders – incorrect wiring can destroy both the FC and the ESC.
- Solder a low-ESR capacitor to the ESC power input according to the ESC manufacturer's instructions. Skystars explicitly points this out in its diagram.

3.3 Receiver

- **ExpressLRS / Crossfire (CRSF) receiver:** receiver TX to RX1, receiver RX to TX1, power to 5V and GND.
- **SBUS receiver:** SBUS signal to the SBUS pad, power 5V and GND.
- **FrSky receiver (SBUS and S.Port):** the manufacturer states that a non-inverted signal is needed when connecting S.Port to a UART TX pin.
- Power a Spektrum Satellite receiver from the 3.3 V output.

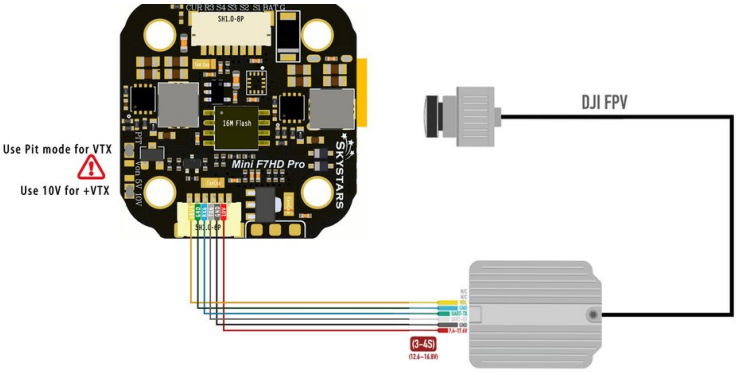
Enable the port to which the receiver is connected as *Serial RX* in Betaflight (chapter 4.3).

3.4 Digital video transmitter

A DJI digital video transmitter connects with a cable to the 6-pin connector on the bottom side (SBUS, GND, RX6, TX6, GND, 10V). It is powered from the 10 V BEC of the flight controller and communicates via UART6 (OSD display in DJI goggles).

- Connect Caddx / Walksnail digital units to the RX6, TX6, GND and power pads according to the diagram in chapter 3.7.
- Always compare the wire order in the unit's cable with the connector pinout on the FC. Cables of different units are not interchangeable.

- Check the supply voltage range of the unit in its manufacturer's manual.
- In Betaflight, enable the *MSP* function on UART6 (chapter 4.3).



Connecting a DJI FPV unit (source: Skystars)

3.5 Analog camera and video transmitter

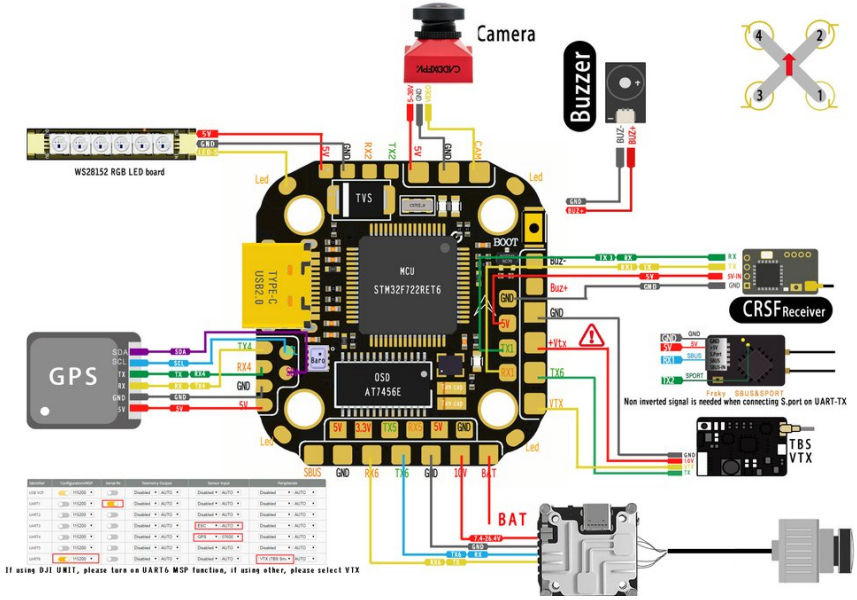
- **Camera:** video signal to the CAM pad, power 5V and GND.
- **Video transmitter:** power from the +Vtx pad and GND, transmitter video input to the VTX pad and its control wire (e.g. SmartAudio) to TX6 according to the manufacturer's diagram.
- Always connect the antenna before powering the video transmitter for the first time. Operating without an antenna will damage the transmitter.
- In Betaflight, set the protocol of your VTX (e.g. TBS SmartAudio) on UART6 in the *Peripherals* column.

3.6 GPS, buzzer and LEDs

- **GPS:** module TX to RX4, module RX to TX4, power 5V and GND. Module compass (SCL, SDA) to the SCL and SDA pads.
- **Buzzer:** Buz+ and Buz−, observe the polarity.
- **WS2812 LEDs:** data wire to one of the Led pads in the corners of the board, power 5V and GND.

3.7 Complete wiring diagram

The manufacturer's diagram shows the wiring of all peripherals. The view is of the top side of the board. The motor order is shown at the top right (top view, arrow pointing forward). At the bottom left is an excerpt from the Betaflight *Ports* tab with the manufacturer's note: *"If using DJI UNIT, please turn on UART6 MSP function, if using other, please select VTX"*.



Wiring diagram (source: Skystars)

※ The supply voltages of the camera, receiver and video transmitter shown in the diagram next to the individual components are data of the specific products in the diagram. Always check the supply range of your components in their manuals.

4. Setting up in Betaflight

4.1 Connecting to a computer

- Install Betaflight Configurator (betaflight.com).
- Connect the flight controller with a USB-C cable that has data wires. A battery does not need to be connected for configuration via USB – but always remove the propellers anyway.
- If the computer does not recognise the flight controller, try another USB cable and on Windows install the drivers from Betaflight Configurator.

4.2 Firmware and updates

The manufacturer specifies the firmware target **SKYSTARSF7HDPRO** for Betaflight and **SKYSTARSF722HDPRO** for INAV. Before updating, back up your settings (command *diff all* in the CLI tab).

① On the *Firmware Flasher* tab select the SKYSTARSF7HDPRO target and the required version.

② If the flight controller does not enter flashing mode by itself, disconnect USB, hold the **BOOT** button and reconnect the USB cable (DFU mode).

③ Flash the firmware and afterwards restore the settings from the backup or configure the flight controller again.

4.3 Port configuration

On the *Ports* tab configure the ports according to the connected peripherals:

Port	Setting
UART1	Serial RX (receiver)
UART3	Sensor Input: ESC (ESC telemetry)
UART4	Sensor Input: GPS (if GPS is connected)
UART6	DJI unit: Configuration/MSP other VTX: Peripherals – VTX protocol

On the *Receiver* tab select the receiver type (e.g. CRSF for ExpressLRS and Crossfire, SBUS for SBUS receivers) and check that the stick movements match the channels.

4.4 Voltage and current measurement

- The flight controller measures the battery voltage via the BAT pin in the ESC connector. Compare the value on the *Power & Battery* tab with a multimeter.
- Current is measured via the CUR pin from the current sensor in the ESC. Set the *Scale* and *Offset* values according to the data of the ESC manufacturer.

4.5 Motor order and direction

The motor order follows the Betaflight standard for an X quadcopter (top view, arrow forward): 1 rear right, 2 front right, 3 rear left, 4 front left.

- **Without propellers**, spin up each motor in turn on the *Motors* tab and check that the correct motor spins in the correct direction.
- Set the ESC protocol (DShot etc.) on the *Configuration* tab according to the protocols supported by your ESC.
- On the *Setup* tab calibrate the accelerometer on a level surface and check that the model in the 3D view follows the movement of the drone.

4.6 Arm, Disarm and failsafe

- Assign Arm (motor start) and Disarm (motor stop) on the *Modes* tab to a switch on the radio transmitter, never to a stick.
- On the *Failsafe* tab set the behaviour on signal loss. Test failsafe without propellers by switching off the radio transmitter – the motors must stop.
- Before the first take-off check that Disarm reliably stops the motors.

5. Legal conditions of operation

5.1 The law of the country where you fly applies

Regulations (EU) 2019/947 and 2019/945 apply in all member states of the European Union, but national implementing rules differ from country to country – registration portals, minimum pilot age, geographical zones, mandatory insurance, permitted frequency bands and maximum transmit power. The information in this chapter describes the situation in the Czech Republic. If you operate a drone in another country, you must follow the regulations of the country in which you fly.

5.2 A drone built with this flight controller

- A drone assembled from components has no C0–C4 class. It is usually operated as a privately built unmanned aircraft system in the open category: in subcategory A1 with a take-off mass below 250 g, otherwise in subcategory A3, or within a model aircraft club.
- If the drone has a camera, the operator must be registered (in the Czech Republic with the Civil Aviation Authority) regardless of the drone's mass. Mark the registration number on the drone.
- Fly up to 120 m, within visual line of sight and never over assemblies of people. In subcategory A3 keep a distance of 150 m from residential, commercial, industrial and recreational areas.
- When flying with FPV goggles, an observer who watches the drone directly must stand next to the pilot.
- We recommend taking out third-party liability insurance.

5.3 Radio equipment on the drone

The flight controller itself does not transmit. The receiver and video transmitter you connect to it are radio equipment and the user is responsible for setting their power. In the Czech Republic the following applies under the general authorisations of the Czech Telecommunication Office (ČTÚ):

Band	Limit
2400–2483.5 MHz	25 mW e.i.r.p.
5725–5875 MHz	25 mW e.i.r.p.

Outside the Czech Republic the frequencies and limits of the respective country apply.

6. Before and during the flight

6.1 Pre-flight check

- Insert a **fully charged** battery (4.20 V per Li-Po cell, 4.35 V per LiHV cell) and check that it is secured.
- Check the propellers, the FC mounting and the condition of the cables. No wire may reach into the propellers.
- Check that an antenna is connected to the video transmitter.
- After switching on the radio transmitter, verify that the channels respond correctly and that Disarm works.

6.2 Voltage monitoring and ending the flight

- Display the battery voltage in the OSD (value from the BAT pin).
- End the flight at 3.5 V per cell at the latest (3S 10.5 V, 4S 14.0 V, 6S 21.0 V). Under load the voltage drops temporarily – the voltage after reducing throttle is decisive.
- After a crash, Disarm immediately and disconnect the battery.

7. Maintenance and troubleshooting

7.1 Maintenance and storage

- After a crash, inspect the board, solder joints and connectors. Cracked or blackened components indicate damage – stop using the flight controller.
- Remove dust and dirt with a dry brush. Do not spray water or solvents onto the board.
- Store in a dry place at room temperature. Store batteries disconnected at the storage voltage of 3.8 V per cell.

7.2 Troubleshooting

Problem	Possible cause and solution
Computer does not recognise the FC	cable without data wires – use another cable; drivers missing; try DFU mode (BOOT button)
Receiver does not respond	TX and RX swapped; port not set as Serial RX; wrong receiver type on the Receiver tab; receiver not bound
No OSD in DJI goggles	MSP not enabled on UART6; RX6/TX6 wires connected incorrectly
Analog video without OSD	camera not connected via the CAM pad; OSD disabled on the OSD tab
Motors spin wrongly or the wrong motors spin	order of signals S1–S4 does not match – change the motor remapping or the wiring; change the direction in the ESC
Drone flips or flies away right after take-off	wrong FC orientation (Board Alignment), wrong motor order or direction, propellers reversed
Voltage or current reading is wrong	adjust the calibration on the Power & Battery tab according to a multimeter and the ESC manufacturer's data
Cannot Arm	the cause is shown on the Setup tab (Arming Disable Flags) – e.g. tilt, active failsafe, throttle not at minimum

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@rotorama.cz
Phone	+420 252 252 098
Website	www.rotorama.com

8.2 Product conformity

CE

- 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@rotorama.cz.
- **Product identification:** the type designation (Skystars F722 Mini HD Pro) is printed on the flight controller; the firmware version is shown by Betaflight Configurator on the *Setup* tab.

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.