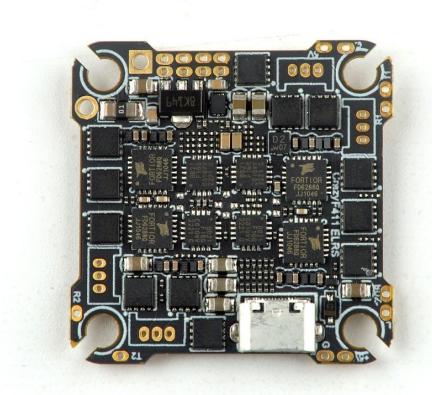
CrazyF411 ELRS

AIO board: F411 flight controller + 4× 20 A ESC +
ExpressLRS 2.4 GHz receiver (UART)
Happymodel · 2–4S · 25.5 × 25.5 mm



Read this manual carefully before installation and before connecting a battery for the first time. Always remove the propellers when configuring and testing the motors.

User manual · Importer: Rotorama, s.r.o. · www.rotorama.com

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1. Safety instructions

1.1 Before you start

The CrazyF411 ELRS board is an electronic component for building an FPV drone. Installation, soldering and configuration require basic experience with electronics and with the Betaflight software. Read this entire manual before connecting a battery for the first time and keep it for future reference.

- This product is not a toy. It is not intended for children or for persons without experience with electrically powered models.
- Work in a dry and clean environment, on a non-flammable surface, with sufficient lighting.
- Never power the board if it is mechanically damaged, wet or contaminated with metal debris.

1.2 Soldering and wiring

- Solder only with the battery and the USB cable disconnected.
- Before connecting a battery for the first time, check the **power polarity** (BAT+ and GND) and use a multimeter to verify that there is no short circuit between BAT+ and GND. Reverse polarity or a short circuit will irreversibly destroy the board.
- No solder or clipped wire ends may remain between adjacent pads.
- We recommend using a current-limiting protection device (a so-called smoke stopper) when connecting a battery for the first time.
- Do not load the board beyond the stated current and voltage values (chapter 2.3).

1.3 Rotating propellers

- Always have the **propellers removed** when configuring in Betaflight and when testing the motors.
- Motors may start unexpectedly – after connecting the battery, do not lean over the drone and keep your hands out of reach of the propellers.
- Before every flight, verify the Arm/Disarm function and the failsafe settings (chapter 5.8).

1.4 Li-Po and LiHV batteries

- The battery is not included. Use only undamaged Li-Po batteries (or LiHV, see chapter 4.4) with an XT30 connector.
- Charge batteries only with a charger designed for the given cell type, under supervision and on a non-flammable surface.
- Do not use a swollen or otherwise damaged battery. Always disconnect the battery after flying.

2. Product description

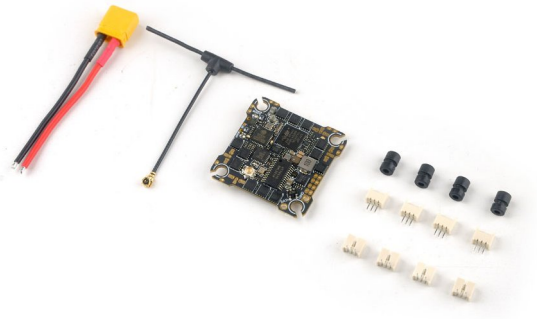
2.1 Intended use

The Happymodel CrazyF411 ELRS is an AIO (all-in-one) board for lightweight FPV drones, typically 2–3" quadcopters (toothpicks). On a single board with a 25.5 × 25.5 mm mounting pattern it combines:

- a **flight controller (FC)** with an STM32F411 processor and Betaflight OSD,
- a **4-in-1 electronic speed controller (ESC)** rated 20 A with Bluejay firmware,
- an **ExpressLRS 2.4 GHz receiver** connected to the flight controller via the UART2 serial port (CRSF protocol),
- a 5 V voltage regulator (BEC) and voltage and current sensors.

The receiver is the same as the standalone Happymodel EP1 receiver. It has its own ESP8285 processor and its own ExpressLRS firmware, which can be updated independently of Betaflight – via Wi-Fi or via Betaflight passthrough (chapter 5.6).

2.2 Package contents



Package contents (manufacturer's photo)

Qty	Item
1	CrazyF411 ELRS board (AIO)
1	ELRS receiver antenna with IPEX connector
1	Power cable with XT30 connector
1	Set of small parts (according to the manufacturer's photo: rubber damping grommets and connectors)

Not included: battery, motors, propellers, frame, camera, video transmitter (VTX), radio transmitter or USB-C cable.

2.3 Technical data

▶ Flight controller (FC)

Processor	STM32F411CEU6 (100 MHz, 512 kB flash)
Gyroscope / accelerometer	ICM42688P, BMI270 or LSM6DSV16X – depending on production batch (SPI)
OSD	Betaflight OSD (SPI)
Betaflight firmware target	CRAZYBEEF4DX
BEC	5 V / 1.5 A
Voltage meter scale	110
Amperage meter scale	470
Mounting holes	25.5 × 25.5 mm, M2
Dimensions	32 × 28 × 9 mm
Weight	approx. 5 g
USB connector	USB-C

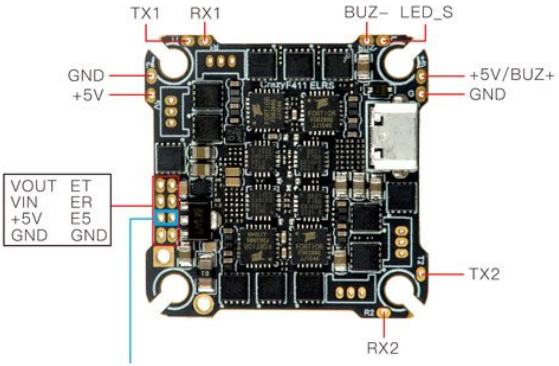
▶ 4-in-1 electronic speed controller (ESC)

Power supply	2–4S Li-Po / LiHV (manufacturer states 7–17 V)
Current	20 A continuous, 25 A peak (5 s) per motor
ESC processor	EFM8BB21
Firmware	Bluejay (BLHeli_S), programmable
Supported protocols	DShot150, DShot300, DShot600

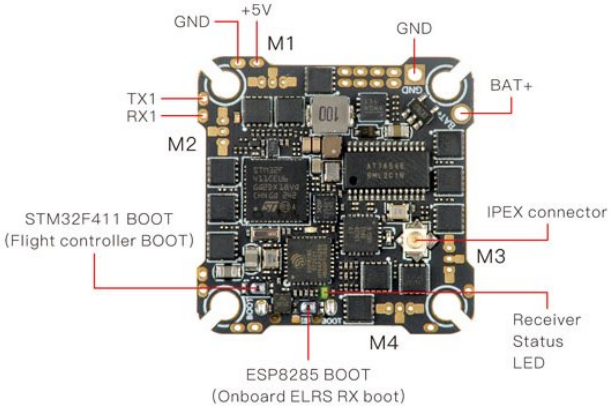
▶ ExpressLRS 2.4 GHz receiver

Frequency band	2.4 GHz
Telemetry output power	< 12 dBm (manufacturer's data)
RF chip / processor	SX1280 / ESP8285
Packet rate	25 / 50 / 150 / 250 / 500 Hz
Protocol to FC	CRSF, port UART2
Antenna connector	IPEX
ExpressLRS firmware target	HappyModel EP1/2 2400 RX

2.4 Pads and connectors



Side A: USB-C connector, UART pads and receiver service pads (manufacturer's drawing)



Side B: processor, receiver, motor connectors M1–M4, BOOT buttons and IPEX antenna connector (manufacturer's drawing)

Pad	Function
BAT+, GND	power supply from a 2–4S battery (XT30 cable)
M1–M4	motor connectors 1–4
TX1, RX1	UART1 serial port (e.g. VTX control or GPS)
TX2, RX2	UART2 – in the factory state **occupied by the onboard ELRS receiver**
+5V, GND	5 V output from the BEC for peripherals
BUZ−, +5V/BUZ+	buzzer

Pad	Function
LED_S	data output for an LED strip (can be remapped to SoftSerial, chapter 4.6)
VIN, VOUT	video signal input from the camera / video signal output with OSD to the VTX
ET, ER, E5	service pads of the ESP8285 receiver processor (chapters 5.6 and 5.9)
IPEX	receiver antenna connector
STM32F411 BOOT	flight controller bootloader button
ESP8285 BOOT	receiver button (among other things, enables Wi-Fi)

2.5 Receiver status LED

Green LED	Meaning
solid	receiver is bound, link to the radio established
double flash	receiver is in bind mode
slow flash	no signal from the transmitter module
continuous fast flash	receiver Wi-Fi enabled

3. Legal requirements for operation in the Czech Republic and the EU

3.1 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 the national implementing rules differ from country to country – registration portals, minimum pilot age, geographical zones, mandatory insurance, permitted frequency bands and maximum transmit powers. 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.

3.2 Radio frequencies and transmit power

The onboard ExpressLRS receiver operates in the 2.4 GHz band and transmits telemetry back to the radio. The manufacturer states a telemetry output power of less than 12 dBm.

Band	Limit in the CZ	Source
2400–2483.5 MHz	25 mW e.i.r.p.	ČTÚ, general authorisation VO-R/10

- The user is responsible for the transmit power settings of the entire RC system and of the video transmitter (VTX).
- Outside the Czech Republic, the frequencies and limits of the respective country apply.

3.3 Operating a drone built with this board

The board itself is not a drone. A drone you build with it is operated in the EU under Regulation (EU) 2019/947, usually in the open category as a privately built unmanned aircraft system. In the Czech Republic the competent authority is the Civil Aviation Authority (ÚCL).

- **Operator registration** is mandatory if the drone has a camera – regardless of it weighing less than 250 g. The registration number must be displayed on the drone.
- Basic limits of the open category: a maximum height of 120 m, flight within visual line of sight, no flying over assemblies of people.
- When flying with FPV goggles, an **observer** who watches the drone directly with their own eyes must stand next to the pilot.
- Liability insurance is not mandatory for a small drone in the Czech Republic, but we recommend it.

4. Installation and wiring

4.1 What else you need

- a frame for a board with a 25.5 × 25.5 mm hole pattern and M2 screws,
- four brushless motors suitable for 2–4S, with connectors for the M1–M4 sockets or for soldering,
- a camera and a video transmitter (analog or digital),
- a radio with an ExpressLRS 2.4 GHz module (internal or external),
- a 2–4S Li-Po battery with an XT30 connector and a suitable charger,
- a computer with Betaflight Configurator and a USB-C cable,
- a soldering iron, solder and flux.

4.2 Mounting to the frame

- Mount the board in the 25.5 × 25.5 mm holes with M2 screws through the rubber damping grommets supplied. Do not overtighten the screws – the grommets would lose their damping effect.
- Orient the board so that the motor positions match the M1–M4 markings. A different orientation can be compensated in Betaflight (*Configuration → Board and Sensor Alignment* tab).
- The board must not touch the carbon frame – carbon is electrically conductive.

4.3 Connecting the motors

Plug the motors into connectors M1–M4. The numbering and direction of rotation must match the diagram in Betaflight (*Motors* tab). The direction of rotation is changed either by swapping two motor phase wires or in software in the ESC (chapter 5.7).

4.4 Power supply and choice of battery

Solder the power cable with the XT30 connector to the **BAT+** (red wire) and **GND** (black wire) pads. The board is designed for 2–4S batteries. Always insert a **fully charged** battery before flying.

State	Li-Po cell	LiHV cell	2S Li-Po	3S Li-Po	4S Li-Po
fully charged	4.20 V	4.35 V	8.4 V	12.6 V	16.8 V
end flight	3.5 V	3.5 V	7.0 V	10.5 V	14.0 V
storage	3.8 V	3.8 V	7.6 V	11.4 V	15.2 V

※ The manufacturer states a supply range of 7–17 V. A fully charged 4S LiHV battery (17.4 V) exceeds this value – for 4S, therefore, use Li-Po batteries. Use LiHV only in a 2S or 3S configuration (fully charged 8.7 V or 13.05 V respectively).

4.5 Receiver antenna

- Snap the antenna onto the IPEX connector straight from above, without side pressure. The connector is fragile – secure the antenna cable against being pulled out.
- Route the active part of the antenna as far as possible from carbon, motors and power wires and out of reach of the propellers.
- Never power the receiver without the antenna connected.

4.6 Peripherals: VTX, camera, GPS, buzzer

- **Analog camera and VTX:** camera video signal to VIN, VTX to VOUT, power supply according to the requirements of the camera and VTX.
- **VTX control** (SmartAudio / Tramp) and **GPS** are connected to the UART1 serial port (TX1, RX1).
- **Buzzer** to the BUZ− and +5V/BUZ+ pads.
- The total current drawn by all peripherals powered from the +5V output must not exceed 1.5 A.

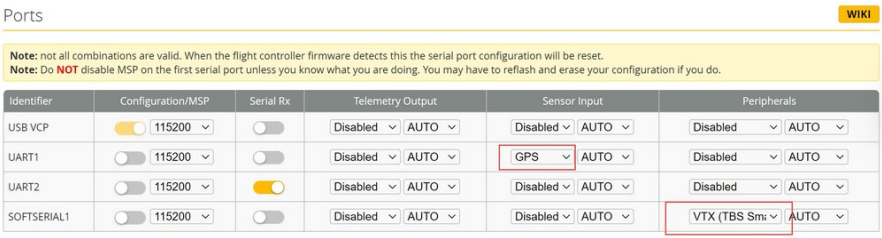
▶ GPS and VTX control at the same time (SoftSerial)

UART2 serves the onboard receiver and UART1 is usually occupied by VTX control. If you also want to connect a GPS, the manufacturer recommends connecting the GPS to UART1 and controlling the VTX via SoftSerial on the LED_S pad:

① Solder the VTX data wire to the **LED_S** pad. In Betaflight, enable the **SOFTSERIAL** feature on the *Configuration* tab.

② On the *CLI* tab, enter the commands:
resource LED_STRIP 1 none
resource SERIAL_TX 11 A00
save

③ On the *Ports* tab, set *Sensor Input → GPS* for UART1 and *Peripherals* for SOFTSERIAL1 according to the VTX type (e.g. VTX (TBS SmartAudio)).



Example settings on the Ports tab: GPS on UART1, receiver on UART2, VTX on SOFTSERIAL1

5. Setup

5.1 Connecting to a computer

Remove the propellers. Connect the board to the computer with a USB-C cable and start Betaflight Configurator. Via USB both the flight controller and the onboard receiver are powered; the motors will not spin without a battery. If the board does not connect, check that the USB cable transfers data and, if necessary, install the drivers according to the Betaflight documentation.

5.2 Betaflight firmware and sensors

- Firmware target: **CRAZYBEEF4DX**. A ready-made firmware file and a backup configuration (dump) are published by the manufacturer on the product page at www.happymodel.cn.
- Newer board batches have an **LSM6DSV16X** gyroscope. When flashing firmware to such a board, add the custom define **ACCGYRO_LSM6DSV16X** in Betaflight Configurator (*Custom Defines*). You can find out the gyroscope type on the *CLI* tab with the **status** command.
- On the *Power & Battery* tab, set **Voltage Meter Scale 110** and **Amperage Meter Scale 470**.
- Always save a backup of your settings before flashing (CLI command **diff all**).

5.3 Accelerometer calibration

Place the drone on a flat, level surface and click *Calibrate Accelerometer* on the *Setup* tab. Check that the 3D model on the *Setup* tab tilts in the same way as the real drone.

5.4 Binding the receiver

The firmware of the ExpressLRS transmitter module must have the same major version as the firmware of the onboard receiver.

① Power the board via the USB cable. Wait until the green receiver LED goes off and immediately disconnect the power. Repeat this procedure. After the **third** power-up, the green LED starts double flashing – the receiver is in bind mode.

② On the radio, open *TOOLS* → *ExpressLRS* (ExpressLRS Lua script) and select **[Bind]**.

③ The green LED first flashes slowly and then lights up solid – binding was successful.

④ If the LED keeps double flashing after binding, change the *Model Match* item in the ExpressLRS Lua script from “Off” to “On” or vice versa.

In the factory settings the receiver is connected to UART2. On the *Ports* tab, UART2 must have *Serial Rx* enabled, and on the *Receiver* tab *Serial (via UART)* and the **CRSF** protocol must be selected. Check the receiver function on the

Receiver tab – stick movements must be reflected in the channel bars.

5.5 Alternative binding via Wi-Fi

If you cannot put the receiver into bind mode, you can bind it to the radio via the web interface:

① On the radio, open *TOOLS* → *ExpressLRS*, turn on *Model Match* and note down the ID number displayed.

② Power the board via USB and let the receiver enter Wi-Fi mode: wait 60 seconds, or hold the **ESP8285 BOOT** button until the green LED starts flashing rapidly and continuously.

③ Connect your phone or computer to the **ExpressLRS RX** Wi-Fi network, password **expresslrs**.

④ In a browser, open the address **10.0.0.1**.

⑤ On the *Model* tab, in the *Model Match* section, enable Model Match, enter the ID from the radio and save the settings.

⑥ If you use your own binding phrase, enter it on the *Options* tab (case sensitive). Select *Save and Reboot* and disconnect the power once the receiver LED starts flashing again.

5.6 Updating the receiver firmware

The firmware of the onboard receiver is updated with ExpressLRS Configurator using the **HappyModel EP1/2 2400 RX** target, in one of the following ways:

- **Wi-Fi** – receiver in Wi-Fi mode (chapter 5.5), upload the firmware file via the web interface at 10.0.0.1,
- **Betaflight passthrough** – via USB and the flight controller,
- **USB-UART adapter (FTDI)** – adapter TX to the **ET** pad, adapter RX to the **ER** pad. Before that, the **+5V** and **E5** pads must be bridged; remove the bridge again after the update.

Detailed procedures can be found in the documentation listed in chapter 5.10.

5.7 Electronic speed controllers (ESC)

- The ESCs come with **Bluejay** firmware from the factory. Settings (direction of rotation, startup tones etc.) can be changed via Betaflight passthrough using ESC Configurator or BLHeliSuite.
- In Betaflight, select the **DShot** protocol on the *Configuration* tab (DShot150, DShot300 and DShot600 are supported).
- On the *Motors* tab, **without propellers** and with a battery connected, briefly spin each motor in turn and check its position and direction of rotation against the diagram.

5.8 Arm, Disarm and failsafe

- On the *Modes* tab, assign the **ARM** function to a switch on the radio. Always control *Arm* (motors on) and *Disarm* (motors off) with a switch, not with the throttle stick.
- On the *Failsafe* tab, check that the motors are stopped when the signal is lost. Test the function without propellers by switching off the radio.
- Betaflight will not allow Arm if the throttle is above minimum, the drone is tilted, or the board is connected to a computer via USB with Configurator open.

5.9 Freeing the UART2 port (board modification)

In the factory state, the onboard receiver is permanently connected to TX2 and RX2. According to the manufacturer, UART2 can be freed for another device by bridging the **+5V** and **E5** pads with solder.

※ UART2 is not freely available. After bridging the +5V and E5 pads, the onboard receiver stops working and the drone must be controlled by a different receiver. A modification of the board is not a product defect.

5.10 Further documentation

Official documentation for the systems used: www.expresslrs.org (ExpressLRS), www.edgetx.org (EdgeTX, the operating system of many radios) and betaflight.com.

Firmware and backup configuration for the board are published by the manufacturer at www.happymodel.cn.

6. Flying

6.1 Pre-flight check

- A **fully charged** battery is inserted, properly secured and with an undamaged cable.
- Propellers are undamaged, mounted correctly according to the motor direction of rotation and firmly tightened.
- The receiver antenna is connected and out of reach of the propellers.
- The link to the radio is established (green LED solid) and failsafe has been tested.
- The OSD shows the correct battery voltage.
- The flying area is safe and complies with the rules in chapter 3.

6.2 Voltage monitoring and ending the flight

Monitor the battery voltage on the OSD. End the flight at the latest at **3.5 V per cell** (2S: 7.0 V, 3S: 10.5 V, 4S: 14.0 V). Deeper discharge damages the battery. We recommend setting a low-voltage warning in Betaflight.

7. Maintenance and troubleshooting

7.1 Maintenance and storage

- After a crash, check the board, solder joints, antenna connector and motor wires.
- Remove dirt with a dry brush. Do not power a wet board; let it dry thoroughly.
- Store batteries disconnected, at 3.8 V per cell (2S: 7.6 V, 3S: 11.4 V, 4S: 15.2 V).

7.2 Troubleshooting

Problem	Possible cause and solution
Receiver will not enter bind mode	Repeat the triple power-up exactly as described in chapter 5.4, or use binding via Wi-Fi (5.5).
LED keeps double flashing after binding	Change the Model Match setting in the ExpressLRS Lua script (Off/On).
LED flashes slowly, no signal	Radio switched off, different ExpressLRS major version in the transmitter and receiver, or a different binding phrase.
Receiver switches to Wi-Fi by itself	Without a link to the radio, the receiver enters Wi-Fi mode after 60 seconds. Switch on the radio and bind the receiver if necessary (5.4 or 5.5).
Nothing moves on the Receiver tab	UART2 does not have Serial Rx enabled or the CRSF protocol is not set (5.4).

Problem	Possible cause and solution
Arm is not possible	Throttle not at minimum, drone not level, no signal or Configurator open. The cause is shown on the *Setup* tab and in the OSD.
Motor spins the wrong way	Swap two motor phase wires or change the direction in the ESC (5.7).
Incorrect voltage or current in the OSD	Check scale 110 (voltage) and 470 (current) on the Power & Battery tab.
Gyroscope not detected after flashing	On boards with LSM6DSV16X, the custom define ACCGYRO_LSM6DSV16X is missing (5.2).

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 (CrazyF411 ELRS) is printed on the circuit board.

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.