



Parachute Manual DRS-M210-V2

Version 1.1-EN

Drone Rescue Systems GmbH
Austria – Stremayrgasse 16/4
8010 Graz

www.dronerescue.com
office@dronerescue.com



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2 DISCLAIMER

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Your safety is your own responsibility, including proper use of equipment and safety gear, and determining whether you have adequate skill and experience. Our products may be dangerous, unless used properly and with adequate precautions, including safety gear. Our products are not intended for use by hobbyists or non-professional users.

Warranty will be terminated if parachute is re-packed by yourself.



3 Introduction








The DRS-M210-V2 is an autonomous parachute solution for the DJI M210-V2 (UAV), providing the following advantages

- **Completely autonomous** due to own developed electronics independent of the flight controller
- **Very light-weighted**, because we are not using a pyrotechnical, spring or servo-approach to eject the parachute, but a very light-weighted internationally patented catapult mechanism
- **Easy to reuse** within minutes
- **LED + acoustical indication signal** before take-off and when the parachute gets deployed
- **No explosive component** to deploy the parachute
- **Bayonet mechanism** to simply attach and detach the whole system.

This document will guide you through the system components, installation, configuration and pre-flight checks as well as possible firmware updates, storage and maintenance recommendations.

4 Components

Table 1 lists all systems components. Within the document parts are linked by their short ID e.g. [Container](#) for the carbon container.

Short ID	Picture*	Quantity	Description
Container		1	Carbon container of the DRS System
Container Lid		1	Lid of the Container .
Parachute		1	Parachute (wrapped in a plastic cover secured by some rubber bands)
Parachute cord		2	Parachute cord of the Container .
Hook and loop fastener		3	Hook and loop fastener
Container cord		1	Container safety cord (with buckle).
Hook		1	Brummel hook








Short ID	Picture*	Quantity	Description
Hook protection sleeve		1	Protection sleeve for the brummel hook
Cord box		1	Cord box
Cord box lid		1	Lid of the cord box, including a small rubber stopper in the center
Mounting plate		1	DRS Mounting plate
DRS M210 Connector		1	DRS M210 Connector
Screw		4	M2.5x16mm DIN 912 (cylinder head screw, hexagon socket)
Spacer		4	Spacer

Table 1 System components

*Depending on the actual DRS configuration the component pictures in Table 1 may slightly differ from your system.

5 Installation

Unmount all propellers and detach all batteries and other power supplies before starting the installation!



Mounted propellers may cause any injuries or damages.

It is mandatory to verify the correct operation with an assembly test right after the installation! See chapter 5.6 Assembly test for details.

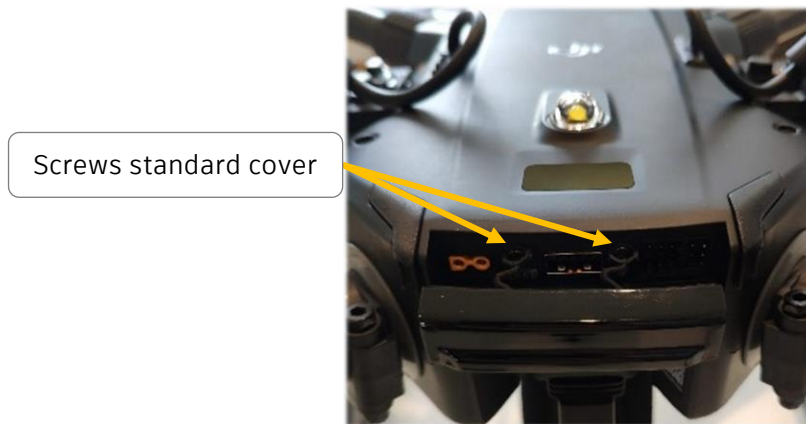
5.1 Install the mounting plate

The [Mounting plate](#) will be mounted on the top of the UAV. Therefore, take four [Spacers](#) and place each one on one upward Gimbal mounting position. Put the [Mounting plate](#) on the [Spacers](#) and fixate it with the [Screws](#) as shown in pictures below.



5.2 Install the M210 – Connector

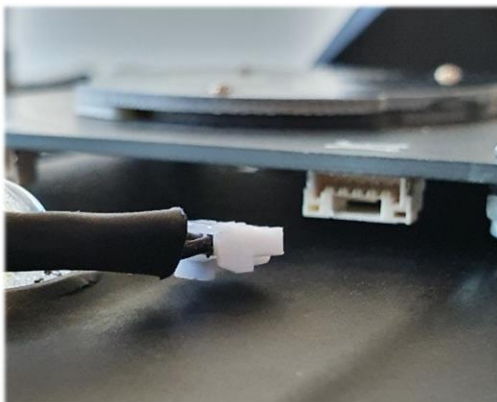
Remove the two screws and the standard cover in the rear of the UAV.



Plug in the [DRS M210 Connector](#) instead.



Connect the other side of the [DRS M210 Connector](#) to the white socket on the bottom side of the [Mounting plate](#) as shown below.



Original IP rating of the UAV is no longer valid!

5.3 Mount the cords



Make sure the drone is in a stable upside position. Select one of the front arms of the UAV. Mount one [Parachute cord](#) to the arm and pull it around close to the hinge. Thread one end of the cord through the other end's loop. Repeat the steps on the other front arm and tighten the [Parachute cords](#) well.



Mount the [Container cord](#) similar to the [Parachute cords](#) on to the left arm of the UAV rear side and tighten it well.



Put the [Hook and loop fastener](#) over each [Parachute cord](#) and the [Container cord](#).



Now fasten the [Hook and loop fastener](#).



Take both [Parachute cords](#) and thread the ends through the central hole in the [Cord box lid](#). Then push the lid downwards.



Thread the open ends of both [Parachute cords](#) through the [Hook's](#) small hole without opening.

Push the [Parachute cords](#) far enough through the hole to wrap the loops over the [Hook](#). Push the [Cord box lid](#) up till the end.





Remove the protection film from the adhesive tape on the bottom side of the [Cord box](#) and press the box on the center of the UAV with the slots pointing to the arms with the [Parachute cords](#). There should be a minimum distance of 2mm between [Cord box](#) and [Mounting plate](#). Tighten each Parachute cord and put it through the slots of the [Cord box](#). Stuff the remaining cords inside, then clip the [Cord box lid](#) onto the [Cord box](#).

**Caution:**

If the Container cords are not tightened well, the cords might get into the UAV propeller and cause a crash!

CORRECT



INCORRECT



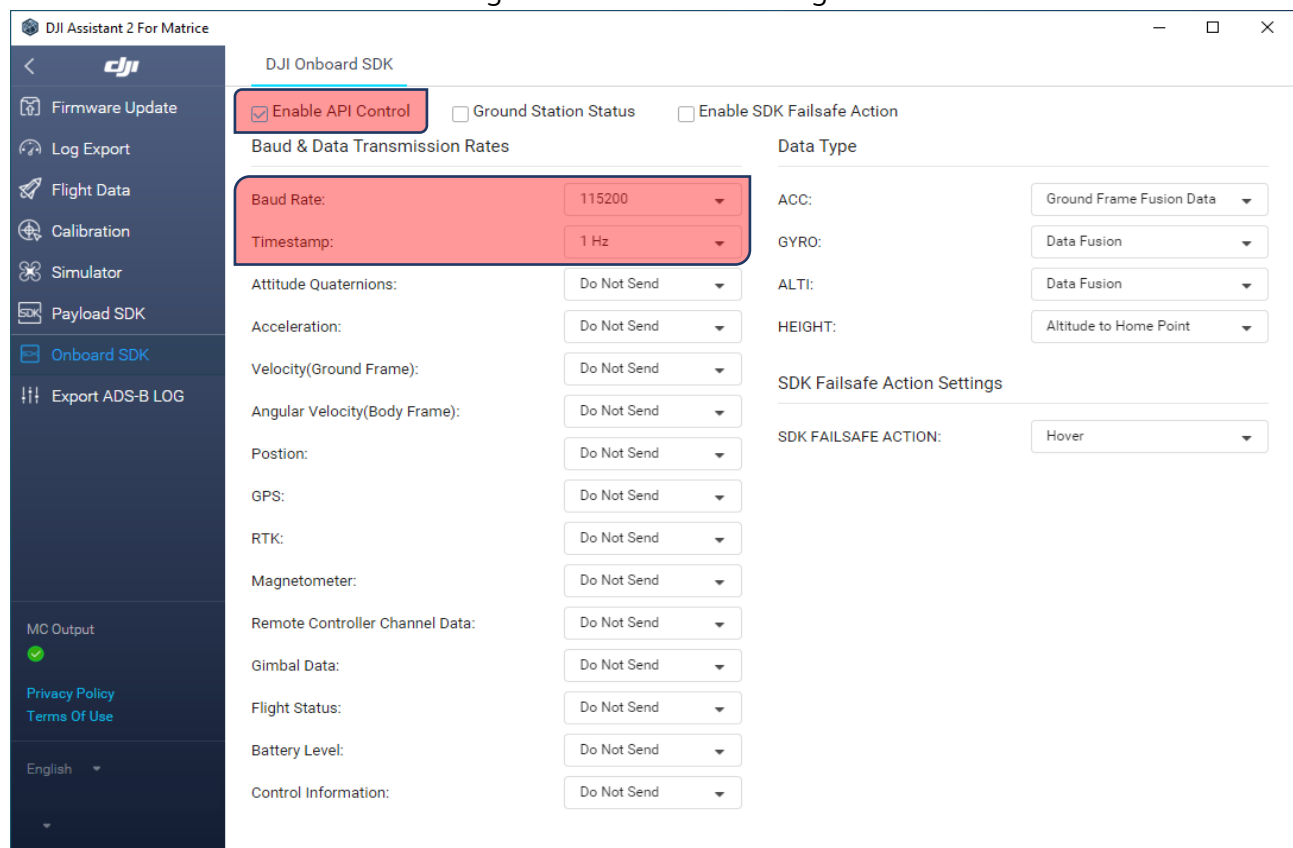
5.4 Configure the M210-V2

5.4.1 Configure Onboard SDK in DJI Assistant Application

Onboard SDK is used to switch off the UAV motors before the parachute is deployed.

- Connect the UAV with a PC and use DJI Assistant 2 to configure the output (see DJI M210 user manual for details).
- Select “Onboard SDK” on the left.
- “**Enable API Control**” via checkbox on the top left.
- Set “**Baudrate**” to **115200** via dropdown list.
- Set “**Timestamp**” to **1 Hz** via dropdown list.

Correct DJI Onboard SDK settings are shown in the figure below.



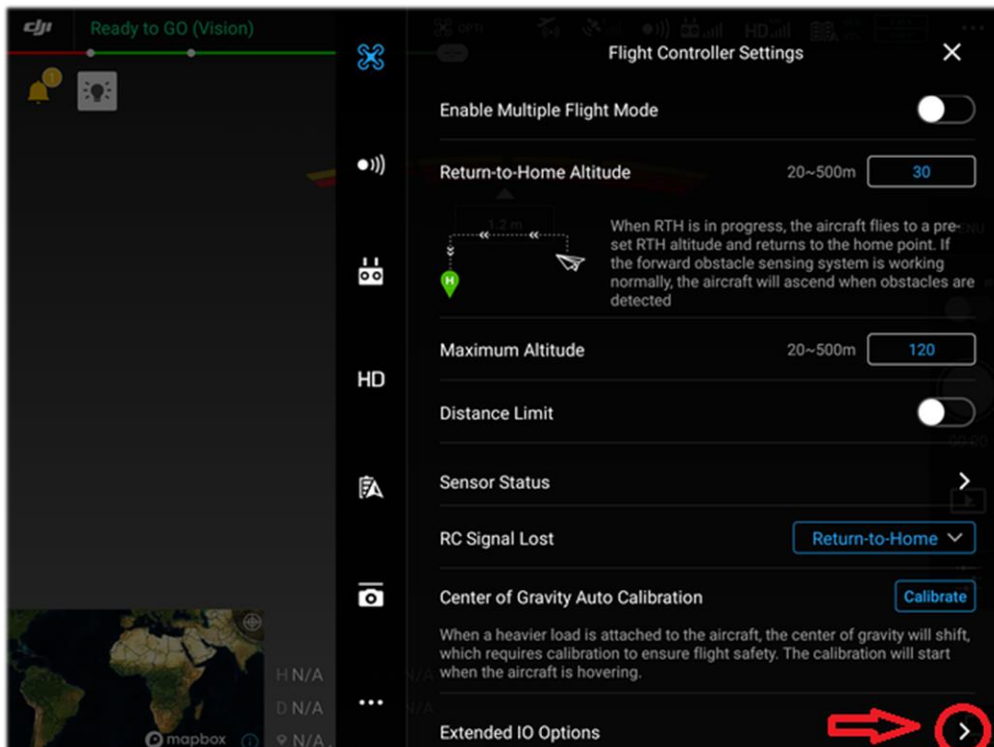
5.4.2 Configure PWM signal in DJI Pilot App

The deployment can be triggered manually with a PWM signal which is generated by the UAV. Therefore, you must configure the PWM output before use.

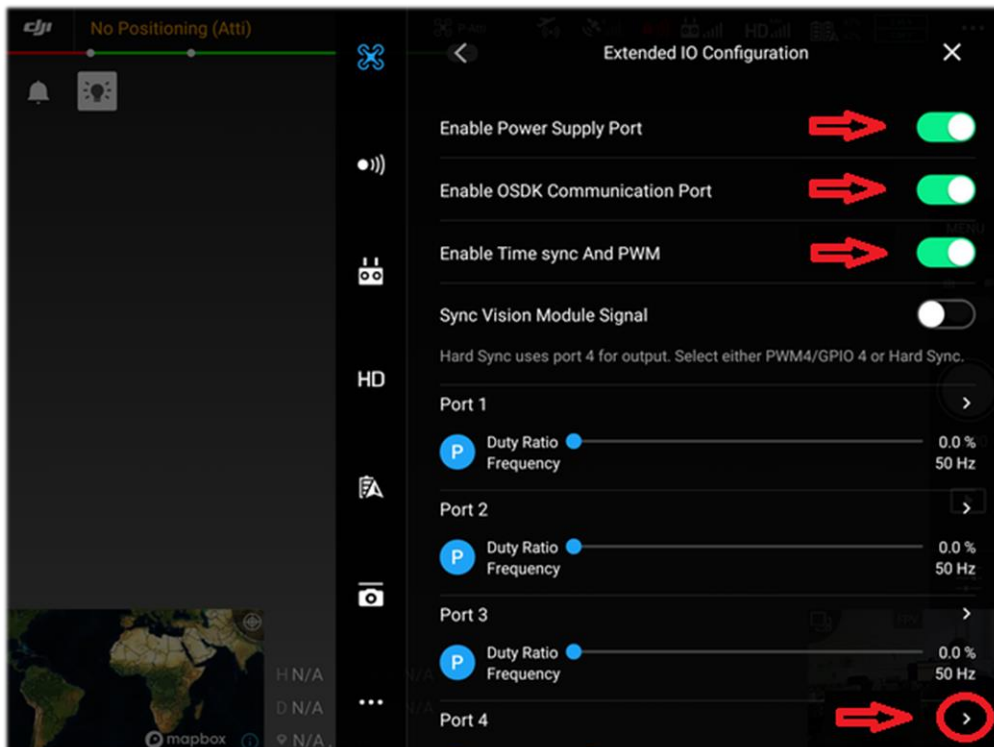
- Enter the settings in the DJI Pilot app
(top right corner; see red arrow in the picture)



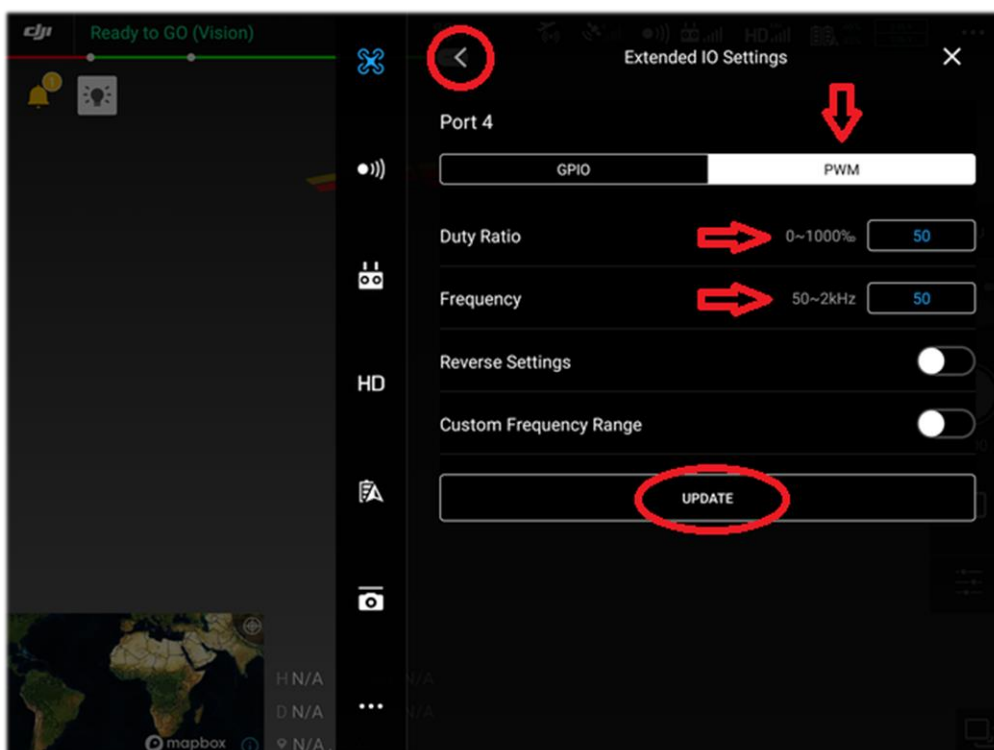
- Enter the “Extended IO Options”
(the UAV has to be switched on for this option to be visible)



- Enable “Power Supply Port”, “OSDK Communication Port”, and “Time Sync and PWM” settings. Then enter the settings for “Port 4”



- Switch to PWM mode, set the duty ratio to 50‰ (= 5%) and the frequency to 50 Hz. Click “UPDATE” to apply the changes, then navigate back with the left arrow “<”.



- Close the flight controller settings window.

The PWM signal is now configured to a 1 ms on-time and a period of 20 ms. If you want to manually trigger the deployment, set the “Duty Ratio” to 100‰ (=10%) which will generate a 2 ms on-time PWM signal. Don’t forget to set it back to 50‰ (1 ms) afterwards. You can use the manual deployment to test the system (see chapter 5.6 Assembly test).

5.4.3 Onboard SDK activation

The UAV requires an activation of the DRS-app before it can be used. This must be done only once, and it happens automatically during startup when the UAV and the DRS are turned on. However, the UAV needs internet access for this procedure. If the UAV has no direct link to the internet (WLAN), you can connect it to a PC with internet access via USB and start “DJI Assistant 2 for Matrice” as an alternative. DJI Assistant 2 detects the activation request and prompts the user for confirmation. Once activated, the UAV does not need internet access at future flights for the DRS to work.



Caution:

If the activation is skipped or if it fails, then the DRS cannot turn off the motors and the parachute or the cords can get tangled up in the propellers when the parachute is deployed. It is therefore absolutely inevitable to verify that the motors stop at the assembly test.

5.5 DRS Configuration

The DRS System is pre-configured for DJI M210 standard use case application. Fit the configuration to your specific usage. Configuration is described in chapter 7.2.

5.6 Assembly test

Perform this assembly test right after the installation (before the first flight) and after every 50th flight to verify the proper operation of the parachute system. The intention is to test the engine shutdown and the deployment mechanism without a [Parachute](#) actually being loaded in the [Container](#). It is necessary to switch on the motors but keep the UAV on the ground during this test.

Follow the checklist on the next page.

- Unmount the propellers



Mounted propellers may cause any injuries or damages.

- Verify that all cables are connected tightly.
- Verify that all screws that fix the mounting plate are pulled tight.
- Attach the [Container](#) and put it under tension as explained in chapter 6.2 Loading and unloading the parachute. The system should be strained but not loaded with a parachute after this step.
- Insert a dummy load into the [Container](#) (e.g. an appropriate bottle filled with water).



Trigger (Deploy) an empty Container will cause damage to the device!

- Turn on the UAV and perform the usual takeoff procedure until the motors are spinning but without taking off.
- Verify the correct status of the DRS by observing the LED and the buzzer signals. The DRS should be in the [ARMED MANUAL](#) state.
- Prepare to catch (or at least dodge) the dummy. The dummy load can be shot out to some degree depending on its mass. Take precautions to prevent it from causing any harm or damage.

Trigger the manual deployment by setting the PWM port 4 Duty Rate to 100‰ (=10%) at 50 Hz (see chapter 5.4.2).

Verify that

- the motors have been switched off,
- the dummy load has been deployed,
- the DRS's buzzer and LED indicate the [DEPLOYED](#) state.

All these conditions must be met for a positive test result.

Afterwards

- Reset the PWM to 50‰ (=5%) after the test.
- Turn off the UAV.

6 Flight

6.1 Pre-Flight Inspection

To ensure a safe and reliable operation visually check the following components before each flight:

- No visual damage to the elastic rubber springs of the [Container](#) or any other component.
- The [Parachute](#) is packed in the plastic protection foil
- The [Parachute](#) is fully loaded inside of the [Container](#) and no parachute fabric is protruding
- The [Container](#) is rotated to its locked position
- The [Parachute](#) is properly linked to the drone with the cords and the [Hook](#)
The link is covered with the [Hook protection sleeve](#)
- The [Container](#) is fully under tension and the deployment base is at the bottom
- The [Container cord](#) is linked to the UAV
- The [Container Lid](#) is tightly clipped on the top of the [Container](#)

6.2 Loading and unloading the parachute



First open the release mechanism of the [Container](#), which is the small shutter at the bottom. The easiest way to do so is to get underneath the shutter using your fingernail and lift it to the stop. When lifted, place the [Container](#) on a flat surface and keep the shutter in this position.



Use a solid object which fits the inner diameter of the [Container](#) and is longer than the whole unit. A plastic pipe is very convenient, but a small bottle of water works as well. Use it to gently push down the deployment mechanism until it reaches the bottom position. While holding this position, release the shutter. Now slightly decrease the pressure on the deployment mechanism until the shutter snaps into place.



Gently push the shutter back in place until it does not stick out of the container tube.

Caution:

In case the shutter is not fully back in place or is manually pulled out, the parachute will get deployed and might cause injuries or damages!



Remove the bottom rubber band (the one at the jagged edge) from the [Parachute](#) but keep the plastic cover shut or the parachute will unfurl.



Insert the [Parachute](#) halfway into the [Container](#) with the jagged edge first.

Remove the top rubber band and slide the [Parachute](#) in completely.



Check if the parachute fabric is fully covered by the plastic cover. Pay special attention to the bottom side.



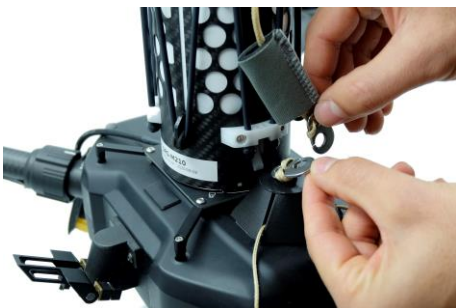
Protruding parachute fabric at any side might impede a proper parachute deployment!



Clip on the [Container Lid](#) to protect the parachute from sunlight and other environmental influences. The cord of the [Parachute](#) should lead out underneath the [Container Lid](#) at its designated position pointing to the center of the UAV.



Place the [Container](#) onto the [Mounting plate](#) with the small pike (arrow) at the bottom pointing towards the open padlock symbol. After pushing it down a bit, rotate it clock-wise until the arrow points towards the closed padlock symbol.



Pull the [Hook Protection sleeve](#) over the [Hook](#) of the [Parachute](#).



Fit the metal hook of the [Parachute](#) and the hook of the [Parachute cords](#) connected to the UAV arms into each other. Afterward slide the [Protection sleeve](#) over both hooks.



Caution:

The protection sleeve prevents an unintentional detachment of the hooks, thus always has to be in place!



Connect the safety cord of the DRS-M210-V2 to the [Container cord](#) mounted to the rear arm of to the UAV.



6.3 Takeoff

Observe the LED and the buzzer during takeoff and thus verify that the DRS is in the correct system state (see chapter 7.1 Device states and signals).

After initializing and while still on ground, the system switches to [ON](#) state where it listens for the manual deployment PWM signal. If you chose to waive the manual deployment feature, you may take off in this state. Otherwise you must wait for the [ARMED MANUAL](#) state.

Right after the takeoff you must check if the DRS has correctly detected the takeoff in any case. Hover the UAV above approx. 3 m over the ground for a few seconds and wait until the status LED switches its mode according to [ARMED AUTOMATIC](#) state and the buzzer beeps once. Only then the automatic failure detection is active.



CAUTION:

If the DRS does not detect the takeoff, you must land the UAV because the automatic deployment function is inactive. Switch the power off, wait 10 seconds and repeat the start procedure.

If the failure persists, inform Drone Rescue Systems GmbH or it's reseller and provide the logfile for failure analysis.

6.4 After flight

After each flight it is recommended to do a short visual overall inspection to see if any part or component looks abnormal, worn out or broken. Replace damaged parts before using the DRS-M210-V2 the next time.

If you don't use the parachute rescue system for a longer period of time we recommend to take out the [Parachute](#) and remove the tension from the [Container](#) as described in chapter 9.

7 Device

The DRS-M210-V2 is equipped with a micro SD memory card slot. The SD card is FAT32 formatted and used to store logfiles, perform firmware updates, and load configuration parameters.

7.1 Device states and signals

An indication light and a buzzer are used to inform the pilot about the DRS-M210-V2 internal system states as described in Table 2.

State	Visual Signal	Acoustic signal	Description
INITIALIZE	Breathing* Blue		System initializing.
ON	Solid Blue		System on, waiting for valid PWM input signal. Manual deployment not possible.
ARMED MANUAL	Blinking** Green		System armed - ready for take-off. Manual deployment possible.
ARMED AUTOMATIC	Solid Green	Short Beep	System armed - take-off detected. Automatic failure detection active.
ERROR	Blinking Red		System error.
DEPLOYED	Solid Red	Beeping till power off	Parachute deployed.
UPDATE	Blinking Purple		Firmware update in progress.

Table 2 Device states and indication signals

* Breathing smoothly fades the LED in and out in an interval of about 1 second

** Blinking immediately switches the LED from off to on and vice versa.

7.2 Device Configuration

The DRS-M210-V2 parachute system's behavior can be configured with the parameters described in Table 3. A configuration-file (ASCII text) named "config.txt" contains the parameter values. It must be placed in the root directory of the micro SD card. At boot time this file is processed and the values are stored for internal use. If the configuration-file cannot be processed for any reason, the LED flashes red for a short period of time after powering the DRS-M210-V2.

To set a parameter to a specific value the line has to start with the key-word "set" followed by the parameter's name and the value, all separated with a space. As an example, take a look at the following few lines which modify the values for the maximum banking-angle as well as the maximum sink-rate to values different from their defaults:

```
set MAX_BANK_ANGLE 45
set MAX_SINKRATE 800
```

Table 3 shows a list of available parameters.

Parameter	Def.	Range	Unit	Description
MAX_BANK_ANGLE	55	20 - 90	deg	Deploy when roll or pitch angle exceeds set value. Set to zero to disable this feature.
MAX_SINKRATE	700	500 - 2550	$\frac{cm}{s}$	Deploy when vertical velocity exceeds set value. Set to zero to disable this feature.
MAX_YAWRATE	300	100 - 490	$\frac{deg}{s}$	Deploy when yaw rate exceeds set value. Set to zero to disable this feature.
MIN_FREEFALL_ACC	300	5 - 500	$\frac{cm}{s * s}$	Deploys when the norm of the acceleration vector drops below this value. Set to zero to disable this feature.
DISABLE_POWER_BAD	0	0 / 1	-	0: deploy when a power loss is detected 1: Power loss detection is disabled
AUTOMATIC_DISABLE	0	0 / 1	-	0: Deploy when enabled parameters exceed their set value. 1: System will NOT deploy when enabled parameters exceed set value. Only manual deploy works.

Parameter	Def.	Range	Unit	Description
LOGGING_FROM_POWER_ON	1	0 / 1	-	0: Logging from takeoff until power off. 1: Logging from power on until power off.
MOTOR_OFF_DELAY	0	0 – 10000	ms	Delay parachute deployment for configured time. This refers to manual and automatic deployment.
SERIAL_INTERFACE	0	0 - 3	-	Must be set to 2 for DRS-M210-V2.

Table 3 Available parameters to customize configuration



CAUTION:

Be careful when choosing the values. Use proper values for your UAV and application. Using improper parameter values may cause the parachute to fail from deploying as well as unwanted deployments.

7.3 System Time

The DRS-M210-V2 is capable of naming the log-files based on the current date and timestamp. Therefore, the system's time has to be set in advance. This is done once after fabrication but might be repeated if the system was not supplied with power for a very long time or you want to change it to your time zone.

To set the system time, place a file named "set_time.txt" in the root directory of the micro SD memory card. As an example, see the following content which can be used as a template:

```
#YY-MM-DD, hh:mm:ss  
19-12-02,11:36:00
```

The firmware will find and parse this file at startup, and if a valid entry is found, it sets the system time accordingly. The file will then be renamed to "set_time_ok.txt" on success or "set_time_fail.txt" if the entry cannot be parsed. This way, the user does not need to manually remove the file after setting the time.

7.4 Firmware Update

Store a file (.bin extension), provided by Drone Rescue Systems GmbH, in the root directory of the micro SD card to perform a firmware update. When the DRS powers up, the file will be found and the update process will start automatically. The status LED blinks violet during the update process which takes about 5 to 10 seconds (see 7.1 Device states and signals). After a successful update the LED blinks green for a few seconds. In case of any error the LED blinks red.

8 Specifications

8.1 Operational and environmental conditions

Service life (before repack required)	1 year
Maximum altitude above sea level	3000 m (9842 ft)
Maximum UAV speed	$23 \frac{m}{s}$ ($82.8 \frac{km}{h}$, 51.4 mph)
Maximum wind speed	$12 \frac{m}{s}$ ($43.2 \frac{km}{h}$, 26.8 mph)
Temperature range	-10 C° to +40 C°
Overall weight	430 g (0.95 lbs)
Maximum number of deployments*	10

*not including manual deployment within chapter 5.6 Assembly test

8.2 Approved payloads

The DRS-M210-V2 is approved for the DJI M210-V2 series with any additional payload as long as it is operated within the specifications provided by the manufacturer DJI.

9 Storage

If you don't use the parachute rescue system for a longer period of time, we recommend to take out the [Parachute](#) and remove the tension from the [Container](#). Be careful not to unfold the [Parachute](#) when you remove it from the [Container](#). Use the rubber bands to fix it. Use a solid object (e.g. pipe or water bottle), like the one you used within chapter 6.2 Loading and unloading the parachute to smoothly release the tension from the deployment mechanism.

Always store the system in a dry environment to prevent moisture accumulating inside of the parachute canopy increasing the inflation time in case of a deployment.

10 Maintenance

The DRS-M210-V2 parachute rescue system needs to be maintained once a year. The maintenance includes the following steps:

- Repacking the parachute
- Replacing the plastic protection foil
- Replacing the rubber bands
- Replacing the cords which connect the parachute with the drone

The maintenance needs to be done by Drone Rescue Systems GmbH or a certified partner of Drone Rescue Systems GmbH.