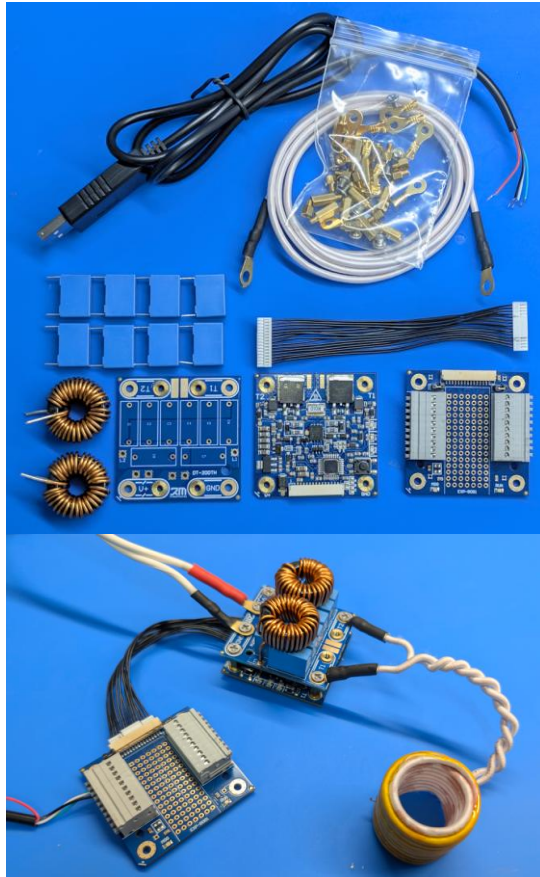


Developer Kit for CRO-SM3

CRO-SM3-PRO-DEV

Starter kit for rapid prototyping and development of SM3 based induction heating systems



The CRO-SM3-PRO-DEV developer kit provides a practical starting point for evaluating the CRO-SM3-PRO and developing custom induction heating systems. It brings together the controller and supporting components for building a working prototype, exploring its capabilities and testing suitability for a particular application.

The configurable tank capacitor and supplied litz wire allow developers to experiment with different coil geometries and resonant frequencies to suit their workpieces. A USB-to-serial adaptor enables computer-based configuration and monitoring, while the EXP-BOB1 breakout board provides convenient access to the controller's connections for external controls and integration into a larger system.

The kit requires assembly and a suitable external DC power supply, with cooling selected to suit the intended operating conditions.

You will also need to read the datasheet for the CRO-SM3 before using this kit. Other parts of this kit also have their own datasheets which should be read before use.

Kit Contents

- Induction heater driver
- Tank capacitor kit
- Connector breakout board
- 10 cm 15-way JST cable
- Mounting hardware
- 2 x 100 µH, 15 A Chokes
- USB-Serial adaptor
- 1.5 m of terminated 18 A litz wire

[CRO-SM3-PRO](#)

[DT-200-TH-KIT](#)

[EXP-BOB1](#)

[CAB-JSTGH-15-10](#)

[NMMK-M3](#)

[CHK-15A](#)

[USB-UART1](#)

[LITZ-18A-1500](#)

Assembly

This kit can be assembled in numerous ways to suit the intended system design. The instructions below focus on a general demo setup which can be used to help gain an understanding of the system and how to use it.

Tank capacitor & chokes

The tank capacitor is made up of a number of smaller capacitors wired in parallel on a PCB. The total capacitance can be selected from 330 nF to 2,640 nF in 330 nF increments simply by choosing the number of capacitors soldered.

Note that it is much easier to start with fewer capacitors and add more if needed than it is to try to remove them once they have been soldered in place.

The capacitance will have several effects on the system overall, which are notably the resonant frequency of the system, and the system impedance. Generally speaking, a larger capacitance will lower both the system impedance and the resonant frequency.

Once you have chosen the total capacitance you want, the individual 330 nF capacitors can be soldered to the PCB. You can also fix the chokes to the same PCB as shown as this can make the overall assembly neater. Make sure to include a link wire if using a single PSU. More detail for wiring the chokes and capacitors can be found in the DT-200 datasheet.

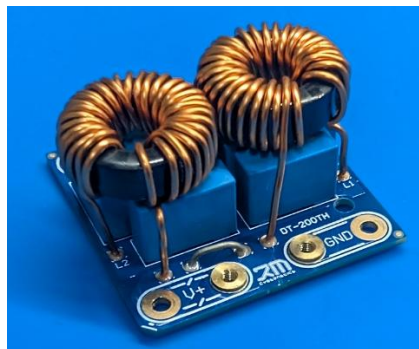


Figure 1: Example of assembled tank capacitor with mounted chokes and wire link

Stack assembly

The tank capacitor / choke assembly can be mounted to the SM3 using the standoffs provided. The longer (10 mm) ones are preferred as this allows for some clearance to keep the large high frequency currents in the tank from interfering with the controller below.

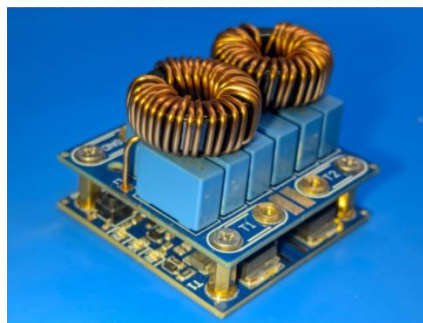


Figure 2: Tank capacitor module mounted on SM3

First screw the standoffs into the four threaded inserts on the SM3. Ensure the contacts are clean and fitted firmly as they may carry high currents at high frequency. Place the tank capacitor assembly onto the standoffs ensuring the correct alignment and matching connections for V+ / GND / T1 / T2. Screw this down with the supplied M3 screws to make a firm mount and electrical contact. These same contact points can be used for connecting the work coil and power cables, or they can be connected separately to the nearby M3 threaded inserts.

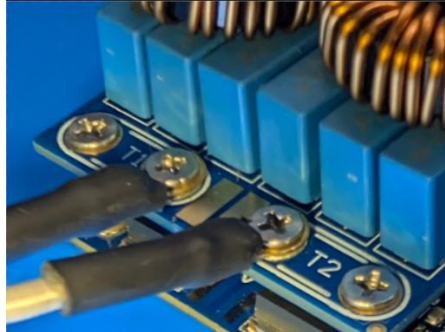


Figure 3: Electrical connection

Wiring from your PSU should be terminated with appropriate M3 ring terminals so that they can be attached with the M3 screws provided.

It is recommended to remove a workpiece from the coil before activating or deactivating the SM3. It is important to observe behaviour such as current draw, heating in cables and the components when experimenting with a new system.

Work Coil

A coil can be formed by wrapping the terminated litz wire around a suitable former. The windings can be in a single layer, or multilayered as long as the windings go in the same direction. The number of windings and the overall coil size will determine its inductance. With typical coil arrangements, the 1.5 m litz cable in this kit will allow for an unloaded coil inductance of approximately 0.5 μH to 5 μH , although this is a guide rather than a fixed limit. This inductance combined with the tank capacitance determines the resonant frequency of the system. This can be calculated using the formula:

$$f = \frac{1}{2\pi\sqrt{LC}}$$

where f is the resonant frequency in hertz, L is the total tank inductance in henries and C is the total tank capacitance in farads.

The dimensions of the work coil relative to those of the chosen workpiece (item to be heated) will have a significant effect on how efficiently power is transferred from the resonating system into heat in the workpiece.

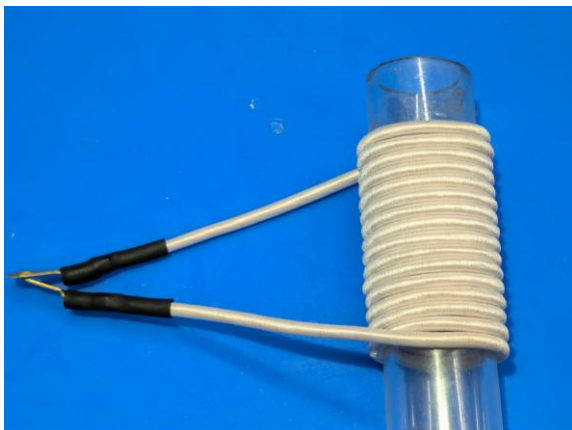


Figure 4: Example windings

High currents flowing in the work coil will cause it to heat up so care must be taken to limit the operating time accordingly. A hot workpiece will also radiate heat which can be absorbed by the coil, further heating it. Some of the effects of this can be mitigated by adding suitable heat-resistant insulation on the inside of the coil or by winding the coil in a larger diameter to provide a larger clearance.

Any remaining cable length that's not forming part of the work coil can be twisted together to minimise its inductance contribution to the system.

Breakout board and serial connection

Connect the breakout board to the SM3 using the supplied JST cable. The connectors will lock in place when fitted correctly. They can be released by squeezing the connector before pulling it out.

The breakout board will give you easy access to the interface connections for the SM3 (see the SM3 datasheet for details).

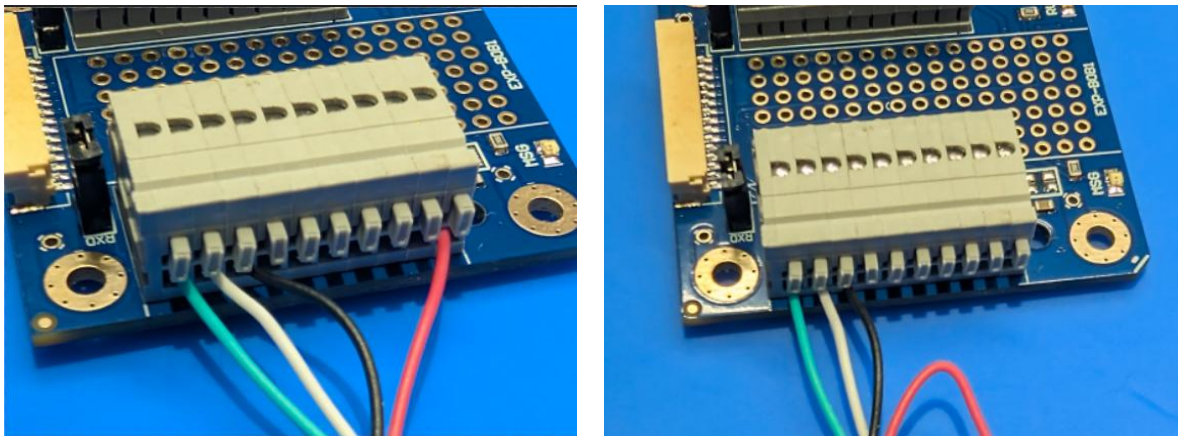


Figure 5: USB-Serial connection with and without the USB 5 V

The USB-to-serial adaptor has four wires: GND, 5 V, Rx and Tx. During normal operation with the external DC supply connected, leave the adaptor's red 5 V wire disconnected and insulate its exposed end. Serial communication requires only GND, Rx and Tx. For configuration with the external DC supply disconnected, the adaptor's 5 V wire can power the controller through the breakout board's 5 V connection (terminal L10). This powers the controller for communication only; it does not power the induction-heating output. Disconnect the red 5 V wire before reconnecting the external DC supply. The terminal block connections are opened by pushing the small button at the edge. Releasing it locks the wire in place.

Ensure the green, white and black wires are connected in the order shown: green to L1, white to L2 and black to L3 (GND). The connections are summarised in Table 1. L3 will form a common GND between the host computer and your electrical supply so make sure the PSU is suited for this.

Adaptor wire	Breakout board terminal	Function
Green (Tx)	L1	Rx
White (Rx)	L2	Tx
Black (GND)	L3	GND
Red (USB 5 V)	L10	5 V – configuration only, with the external DC supply disconnected

Table 1: USB-to-serial adaptor connections to the breakout board

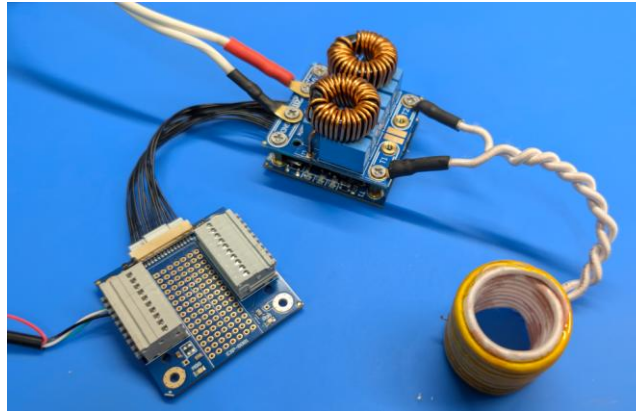


Figure 6: Example assembly

Usage

Before applying power, check the assembly carefully. Confirm that the tank capacitor module is correctly aligned on the SM3 with the V+ / GND / T1 / T2 connections matching, that the chokes and link wire are fitted as described in the DT-200 datasheet, and that all M3 connections are clean and tight. Check the PSU polarity, that no stray litz strands or ring terminals can short to neighbouring connections, and that the work coil is securely connected. If the USB-to-serial adaptor is fitted, confirm that its red 5 V wire is disconnected and insulated.

For first use, set the PSU to 15 V with a conservative current limit (the 5 A suggested for this kit is a sensible starting point) and ensure that its output voltage does not collapse when the resonator starts. The CRO-SM3 datasheet recommends a current-limited linear bench supply for experimental work, with initial tests carried out at 15 V before higher voltages (up to the recommended 24 V) are used.

To configure and monitor the controller from a computer, connect the USB-to-serial adaptor as described above and open the CRO-SM3-PRO web application from the Product Tools page at <https://www.rmcybernetics.com/product-tools>. You will need to be signed in with the registered account used to purchase the PRO controller or this kit. The application runs in Google Chrome or Microsoft Edge using the browser's Web Serial feature; when you connect, the browser asks you to select and approve the adaptor's serial port. The default serial settings are 57600 baud, 8 data bits, no parity and 1 stop bit. See the CRO-SM3 datasheet for details.

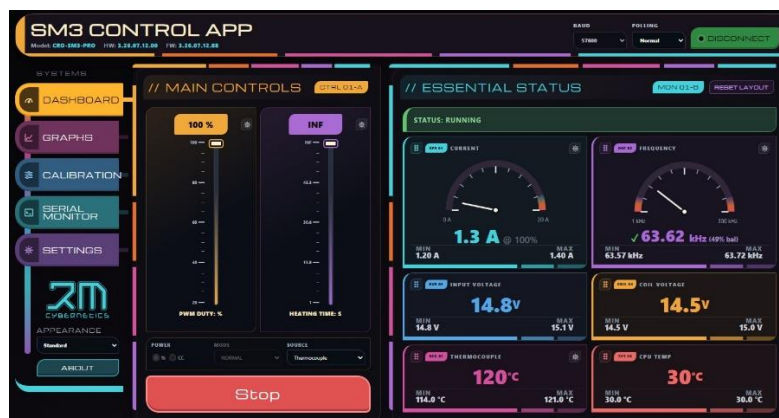


Figure 7: Browser based control software

A suggested test sequence for any coil and capacitor arrangement is as follows:

1. Start with the work coil empty. Apply power and start the SM3 using the onboard button or the web application. Note the unloaded PSU current and the resonant frequency reported by the controller. These depend on your coil and capacitor arrangement, but should be stable with no fault reported. Run the unloaded coil only briefly at first.

2. Stop the output and check for heating in the SM3, tank capacitor, chokes, work coil and wiring before continuing.
3. With the output running, slowly introduce a small piece of plain mild steel (such as an M3 bolt) that fits inside the coil without touching it, using non-metallic, heat-resistant handling or a fixture. Observe how the input current and the reported frequency change as the workpiece enters the coil and as it heats up. Withdraw the workpiece or stop the output if the current rises too rapidly, reaches the supply current limit or causes the supply voltage to fall.
4. Remove the workpiece from the coil before stopping the output, as recommended above. Allow the coil and workpiece to cool before repeating the test.

Monitor the temperature of the SM3, tank capacitor, chokes, work coil and cables during all tests and allow time for cooling between runs. Stop immediately and isolate the supply if you observe unexpectedly high current, a collapsing supply voltage, repeated faults or rapid heating of any component. Once a configuration behaves as expected at 15 V, the voltage and current limit can be increased gradually within the CRO-SM3 datasheet limits.

Document revision history

Revision	Date	Changes
1.0.0	30/09/2026	Initial Release

Table 2: Document revision history

Disclaimer

The information in this document is provided as-is and is not guaranteed to be free of errors.

The CRO-SM3-PRO-DEV is supplied as an evaluation kit for professional developers. RMCybernetics Ltd accepts no liability for damage, injury or loss arising from the design, construction, installation or use of any system built around it. Suitability for a particular application must be verified by the system designer.

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Compliance

The CRO-SM3-PRO-DEV is supplied as a development kit for evaluation, prototyping and incorporation into custom induction heating systems by professional developers. It requires assembly and integration with an external power supply and application-specific provisions for cooling and protection.

The system integrator is responsible for assessing the completed equipment against applicable requirements, including electromagnetic compatibility (EMC) and electrical safety, and for completing any required conformity assessment and marking before placing the finished equipment on the market or putting it into service.

Warranty, returns and contact

Warranty and returns are covered by the terms of sale published on our website. Damage caused by operation outside the specified electrical or thermal limits is not covered.

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