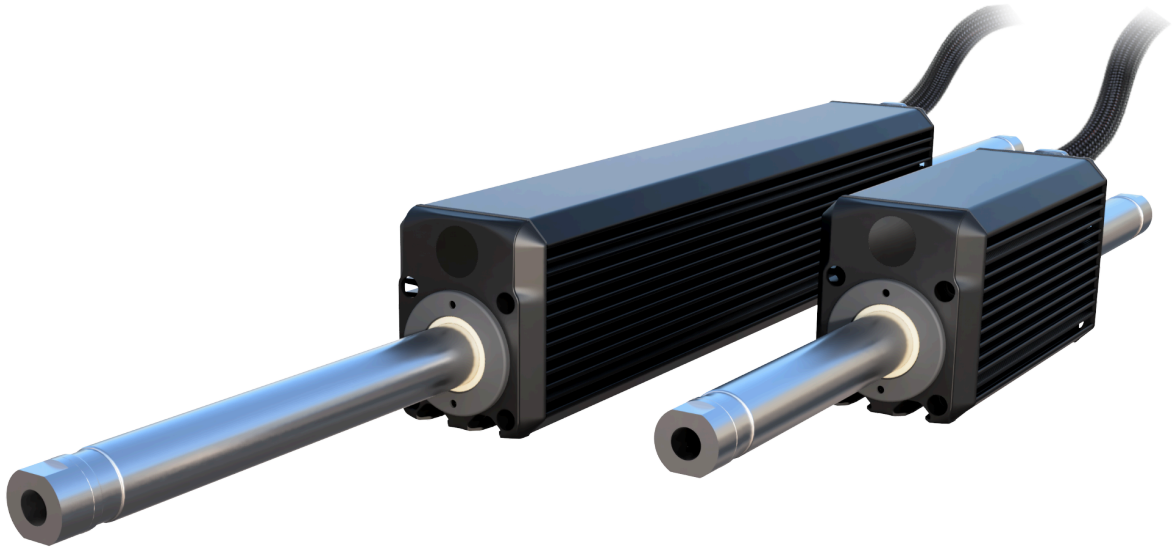
ORCA™ Series Motor

QuickStart Guide

This document applies to ORCA Series Motor firmware:

- > 6.2.8



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Revision History

Version	Date	Author	Reason
1.0	February, 2022	kh	Initial Draft
1.1	June, 2022	sw	Add links and diagrams
1.2	June, 2022	rm	Figure Labels, intro description, table of contents, format fix
1.3	January, 2023	rm	Clearer set up, remove detailed data pinout
1.4	June, 2023	rm	Restructuring, update to Orcabrains 6.1.7
1.5	January, 2024	rm	Update to Orcabrains 6.2.8
1.6	April, 2025	sj	Update with grounding information.
1.7	May 2025	jg	Update with Modbus over half-duplex link

How do I set up my motor?

Plugging It In

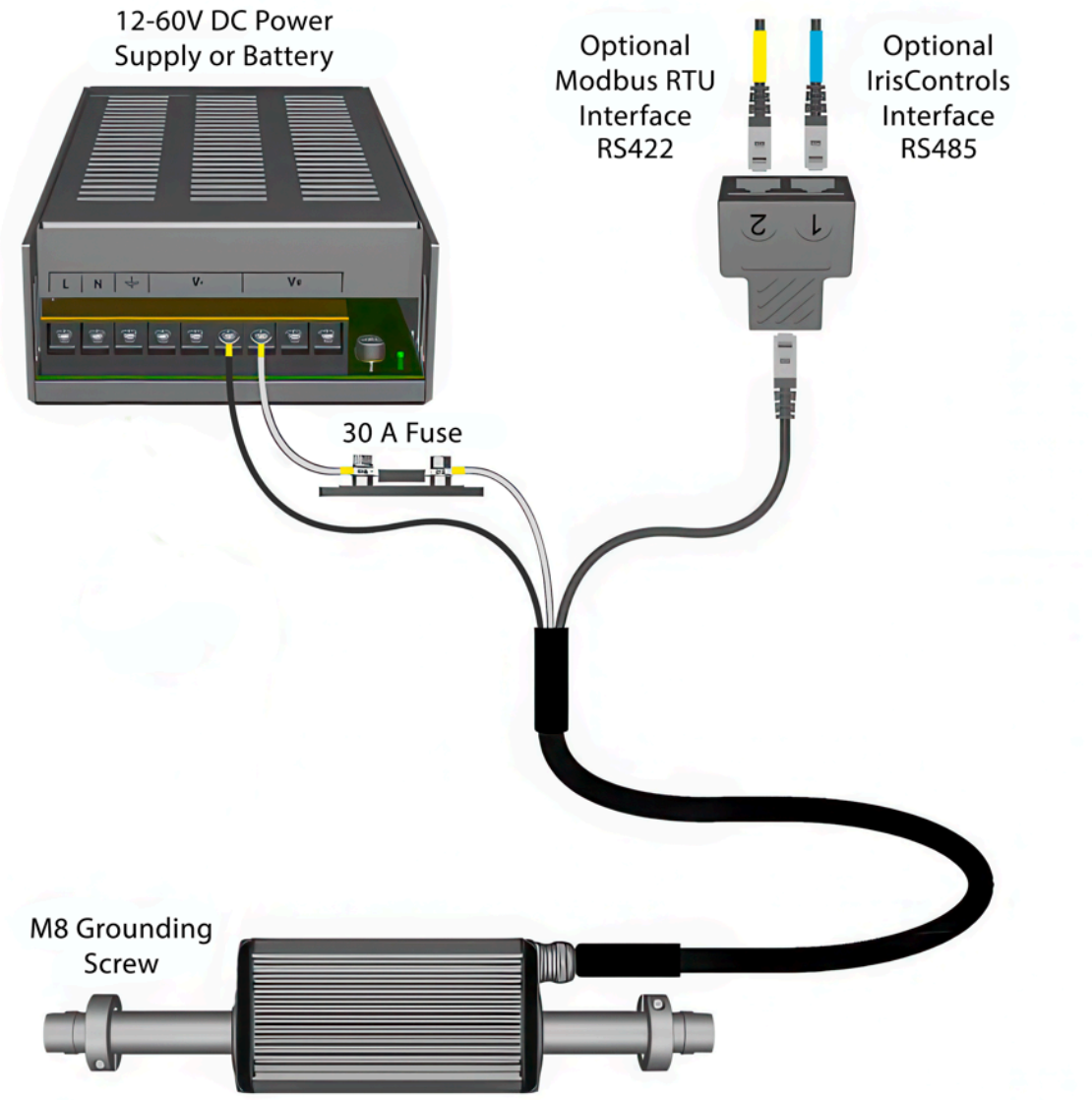

Figure 1: Orca Series Motor Setup Diagram

*Note: Ensure the Power supply and Data Interface share a ground

Mounting to a Secure Surface

⚠WARNING⚠ The motor's shaft contains STRONG magnets. Keep away from ferrous metals and sensitive electronics.

Mount the motor to a secure surface. The motor comes with T-Slots on the bottom face for easy and secure mounting, or it can be clamped to a surface for initial evaluation. If clamped instead of fastened to a surface, exercise caution when operating the motor.

Downloading IrisControls Software

The IrisControls Windows application is used by Iris Dynamics devices to generate a graphical user interface (GUI). The GUI generated by the Orca Series motor can be used to view motor details and configure settings. This is the best place to start to configure and get familiar with the motor's capabilities.

The latest version is always available for download at irisdynamics.com/downloads

Communication Cables

Orca Series motors support two communication interfaces: a Modbus RTU serial connection capable of carrying out high throughput command and feedback, and an IrisControls graphical interface. Further information regarding Modbus Over Half-Duplex, using RS485 is available here: Modbus Over Half-Duplex

Figure 2: RS485 - USB for Orca GUI and firmware upgrades. This cable can also provide logic power

Figure 3: RS422 - USB for Modbus RTU communication

Figure 4: RJ45 Splitter for splitting data cable into two communication interfaces

Providing Power to the Motor

All Orca Series motors can be powered with a 12 – 58 VDC power source. The Orca Series variant name specifies the voltage at which the motor is most efficient.

A 30-amp fast-blow fuse must be installed between the power supply and the motor. This fuse will be destroyed if negative voltage is applied to the motor.

In all cases, the black power lead is “Ground” and should be connected to the negative terminal of the power supply or battery.
As an important safety measure, the chassis of the motor must be securely connected to Earth.
The 5V and GND lines on the data cable can be used to power the motor’s logic so that communications and diagnosis can continue when the motor’s power source is switched off or disconnected.

Special Notes

The position of the motor’s shaft on power up will be the zero position and will re-zero as retracted. The absolute position will be lost if the motor loses 5V. Moving the shaft through its full stroke will reset the zero to the fully retracted position.
A beta feature is available that will have the motor auto zero itself on power up, see reference manual for configuration details.

How do I connect the motor to the IrisControls software?

IrisControls can be downloaded from the Iris Dynamics website: irisdynamics.com/downloads. Unzip the folder in the desired location and follow the installation instructions in the readme file.
With the IrisControls application open and the motor set up as in Figure 1, connect the RS485 USB cable (blue) to the PC. Select the COM port associated with the motor in the COM port dropdown.

Figure 5: Connecting to the Orca Series

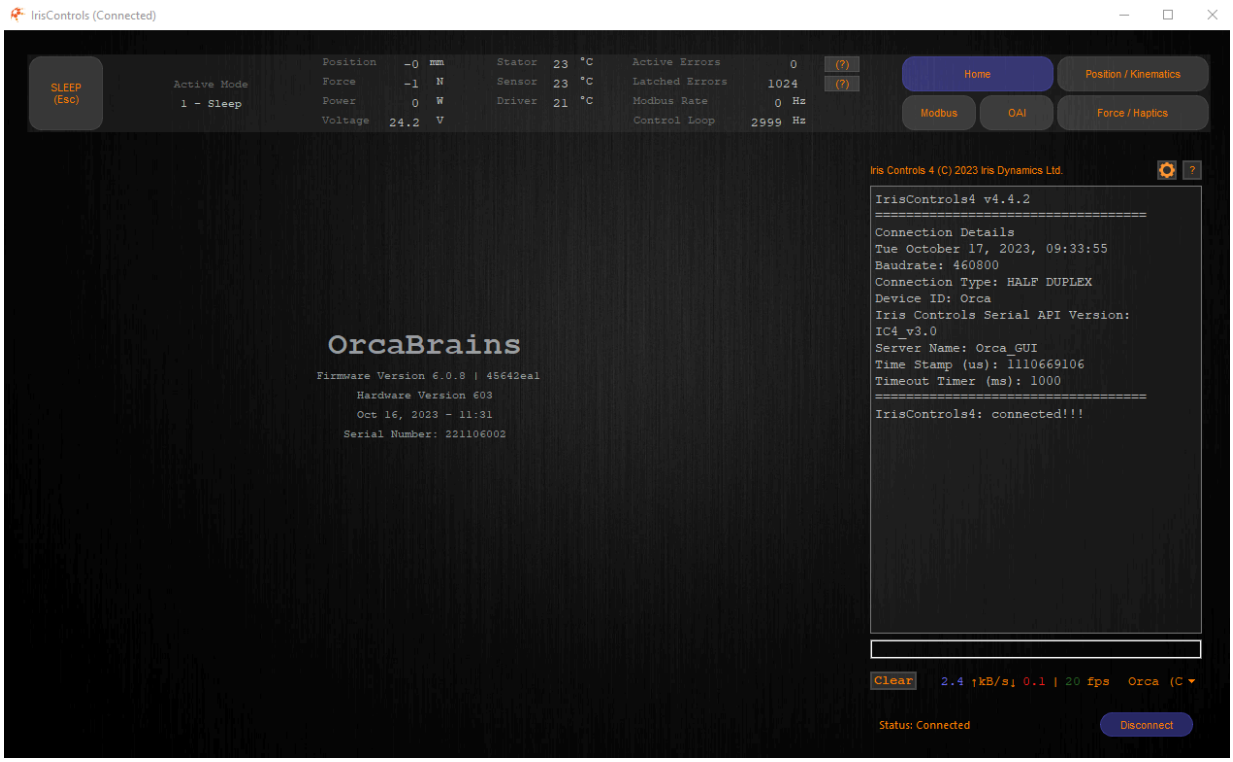

Figure 6: The IrisControls Home Screen

How can I test the motor's Force Control functionality?

From the menu panel, press the button labeled "Force / Haptics". This will open a GUI page that allows for testing and configuring various motor force effects.

The motor comes loaded with default parameters for each of the eight configurable haptic effects.

⚠**WARNING**⚠ **Be aware the following step will cause the motor to move, please ensure the motor is mounted in a safe location to avoid danger to people or property.** The motor can be put back into "Sleep" mode at any time by pressing the large "Sleep Motor" button in the menu panel, or by clicking on the "Enable Haptics" button if it is blue.

With the motor securely mounted and powered, press the large "Enable Haptics" button. This will engage the motor's force controller to reach target forces as calculated by the combination of enabled effects.

Figure 7: Haptic effect configuration

Individual effects can be turned on and off by pressing the “Enable” button at the top of the effect configuration. The buttons will turn blue if an effect is enabled and gray it is disabled.
All parameters can be adjusted independently and any combination of effects can be valid.
A full description of all the effects and parameters is available in the Orca Series Motor Reference Manual.
To test large forces from the motor, a convenient way to do so is to enable the ‘Constant’ effect and a ‘Spring’ effect.

1. First, configure a spring effect to have a high gain parameter and a large dead zone. The spring will act as virtual hard stops preventing the motor from slamming into the shaft collars (the default values for Spring B are an example of this).
2. Next, set the Force of the ‘Constant’ effect to the desired value in millinewtons in either the positive (away from the cable end) or negative (towards the cable end) direction.

Pressing the “Saving Configuration” button will save the effect parameters to the motor’s permanent memory and will persist through motor power cycling.
Force Control and haptic effects can be enabled, disabled, and adjusted over the Modbus RTU interface from a PLC or PC based applications. See the Orca Series Modbus User Guide for complete details.

How can I test the motor's Position Control functionality?

From the menu panel, press the button labeled "Position / Kinematics". This will open a GUI page that allows for tuning of the PID position controller and setting up a Kinematic motion profile.

Figure 8: Menu panel

The motor comes with a default PID tuning for unloaded motor movement. These values can be adjusted to improve position tracking based on the load being applied to the motor and the position profile being used. Non standard shaft sizes can also impact required tuning.

To start position tracking press the "Set Kinematic Profile" button. This will reveal to a panel to configure a motion profile.

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The motor comes with an example position profile that chains a series of 3 motions together. Pressing the "Enable" button will have the motor use its position controller to track the configured motion profile. To have the motion run again press the "Trigger Next" button.

Figure 9: Kinematic motion profile configuration

Up to 32 motions can be configured, linked together, or looped. Configuration includes setting a target position, time to reach the position (this will govern the speed of the motor), delay between finishing the motion and starting the next (relevant when “Auto-Start Next” is enabled), and the id of the next motion in the sequence.

The “Home Motion ID” can be configured to set the motion that will be started when the controller is enabled.

Pressing the “Saving Configuration” button will save the motion profile to the motor’s permanent memory and will persist through motor power cycling.

Direct Position Control and kinematic motion profiles can be enabled, disabled, and adjusted over the Modbus RTU interface from a PLC or PC based applications. See the Orca Series Modbus User Guide for complete details.

Position Control can also be done with an analog current loop signal through the Orca IO SmartHub. Kinematic motions can also be triggered through a digital signal to the Orca IO SmartHub. See the Orca IO SmartHub User Guide for complete details.

Can I command the motor from an industrial control system?

The Orca IO SmartHub is an optional add-on which allows for control of Orca Series motors in Force, Position, and Kinematic Modes through simple digital and analog inputs. Real-time force and position data are also fed back from the motor to the Orca IO SmartHub and provided as analog outputs. The Orca IO SmartHub handles the high-speed digital communication with the motor, allowing easier integration with existing industrial control methods such as PLCs with 4-20 mA current loop outputs.

This is a great option for directly commanding force or position with a simple analog signal or triggering multiple configurable kinematic motion profiles with digital signals. In all modes of operation position and force feedback is returned as current loop signals. The Orca IO SmartHub User Guide explains how to use this device.

Figure 11: Orca IO SmartHub

How do I command the motor from a 3rd party application (MATLAB, LabVIEW, etc.)?

Any 3rd party application that has a Modbus RTU library available can be integrated with Orca Series motors. The RS422 USB cable can be plugged in to port 2 of the RJ45 splitter and the default Modbus RTU setting should be set as follow:

Serial Port: [The RS422 COM port]
Baud: 19200
Data Bits: 8
Stop Bits: 1
Parity: Even

See the Orca Series Reference Manual for list of available registers and the Orca Series Modbus User Guide for available standard and product specific function codes. As well, the motor's default baud rate can be increased using the IrisControls interface.

How do I interface my motor with custom developed software?

The IrisSDK for Windows is available that provides an API written in C++ that abstracts Modbus communications with Orca Series Motors. A set of libraries, tutorials and examples is available to get started either making a Windows application with the option of creating a custom GUI through the IrisControls software. Libraries can also be included in any custom developed C++ application to allow Orca Series motor integration with existing programs.
A GitHub repository with all source code and documentation can be found at: https://github.com/IrisDynamics/IrisSDK_for_Windows