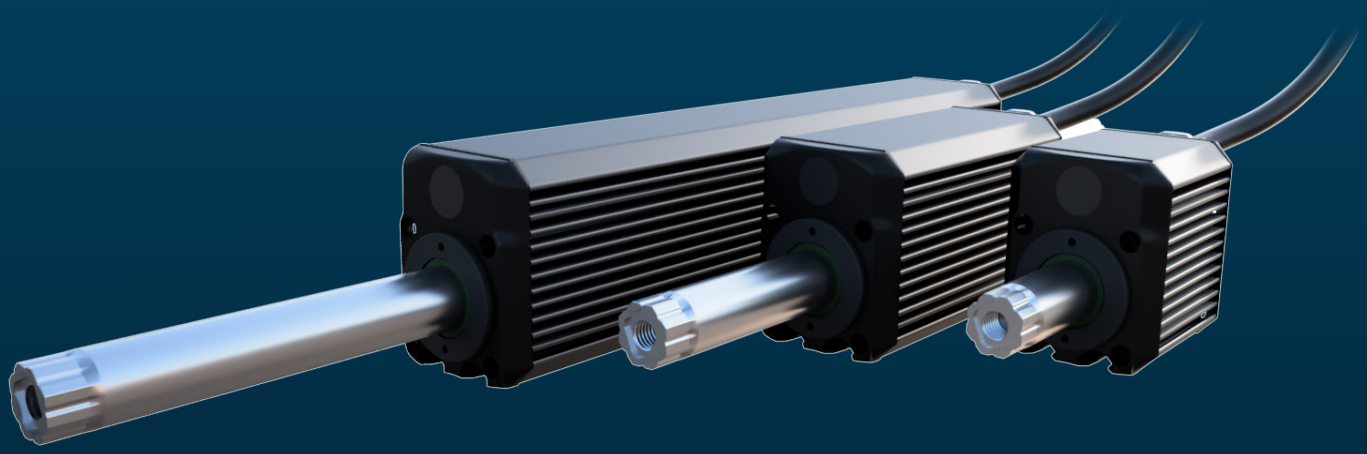
Iris Dynamics Ltd.

# ORCA™ SERIES SMART LINEAR MOTORS

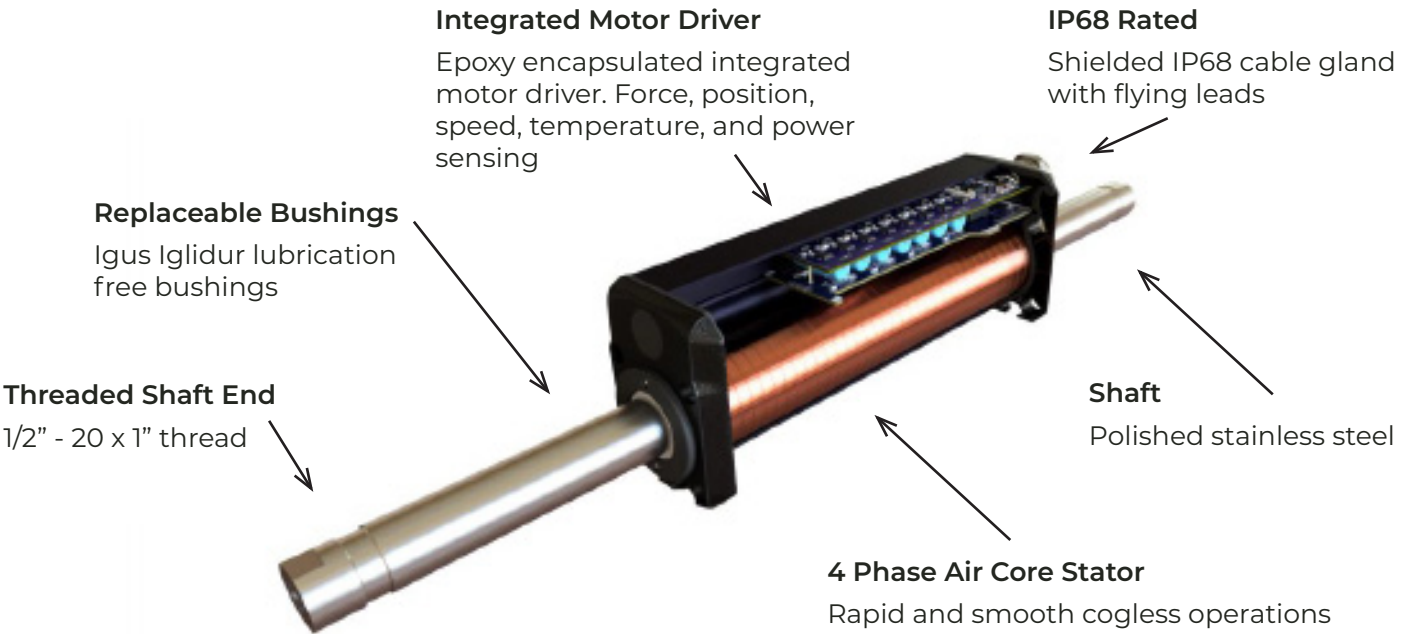
## DATASHEET

ORCA-6-LITE
ORCA-3-12V, ORCA-3-36V
ORCA-6-24V, ORCA-6-48V
ORCA-15-48V



# Table of Contents

# ORCA Motors Overview




ORCA Series Fully Integrated Smart Linear Motor

ORCA Series Smart Linear Motors feature high performance, ultra-low latency, low total costs of ownership, and silent operation. These motors are force controlled making them ideal for applications with human-machine interaction. An all-in-one approach means every motor includes integrated drivers, power delivery, logic, and sensing. There are no requirements to buy a separate controller.

## Product Highlights

- Integrated Waterproof IP68 Motor Driver
- Integrated Position and Force Sensing
- Highspeed Force and Position Control
- Very Quiet
- Powered by Low Voltage DC
- One Single Moving Part
- Hardened RS485 Communications
- Backdrivable with Low Force Ripple
- Low Maintenance
- Simple to Use

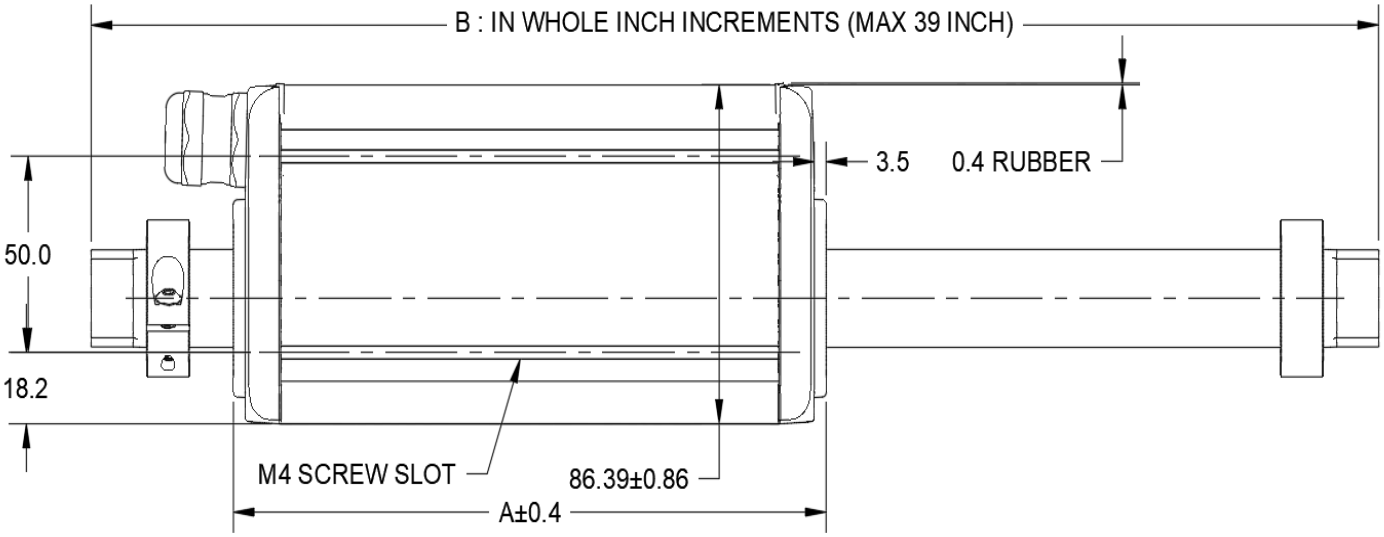
### ORCA Series Smart Linear Motors Overview

| Part Number | Max Voltage Supply | Max Force | Max Speed | Force Accuracy *without external calibration* | Position Sensor Accuracy |
|---|---|---|---|---|---|
| ORCA-6-LITE | 30 V | 247 N *55.5 lbf* | 1.8 m/s *72 in/s* | 0.74 N *0.166 lbf* | ±150 um *±0.0059 in* |
| ORCA-3-12V | 60 V | 182 N *40.8 lbf* | 8.1 m/s *320 in/s* | 1 N *0.225 lbf* | ±250 um *±0.0098 in* |
| ORCA-3-36V | | 281 N *63.1 lbf* | 5.3 m/s *207 in/s* | 1 N *0.225 lbf* | |
| ORCA-6-24V | 60 V | 426 N *95.7 lbf* | 5.3 m/s *210 in/s* | 0.57 N *0.128 lbf* | ±150 um *±0.0059 in* |
| ORCA-6-48V | | 638 N *143.5 lbf* | 3.6 m/s *140 in/s* | 0.64 N *0.144 lbf* | |
| ORCA-15-48V | | 1061 N *238.5 lbf* | 2.1 m/s *84 in/s* | 0.97 N *0.218 lbf* | |

# Mechanical Drawings

ORCA series motors come in standard sizes as shown in the table below. Usable stroke is calculated based on stator and shaft length.

The ORCA series is built to standard mechanical specifications, see below. Please contact us at *sales@irisdynamics.com* if your application requires modifications from this standard. Common modifications include shaft length, rear tube length, and stator color.



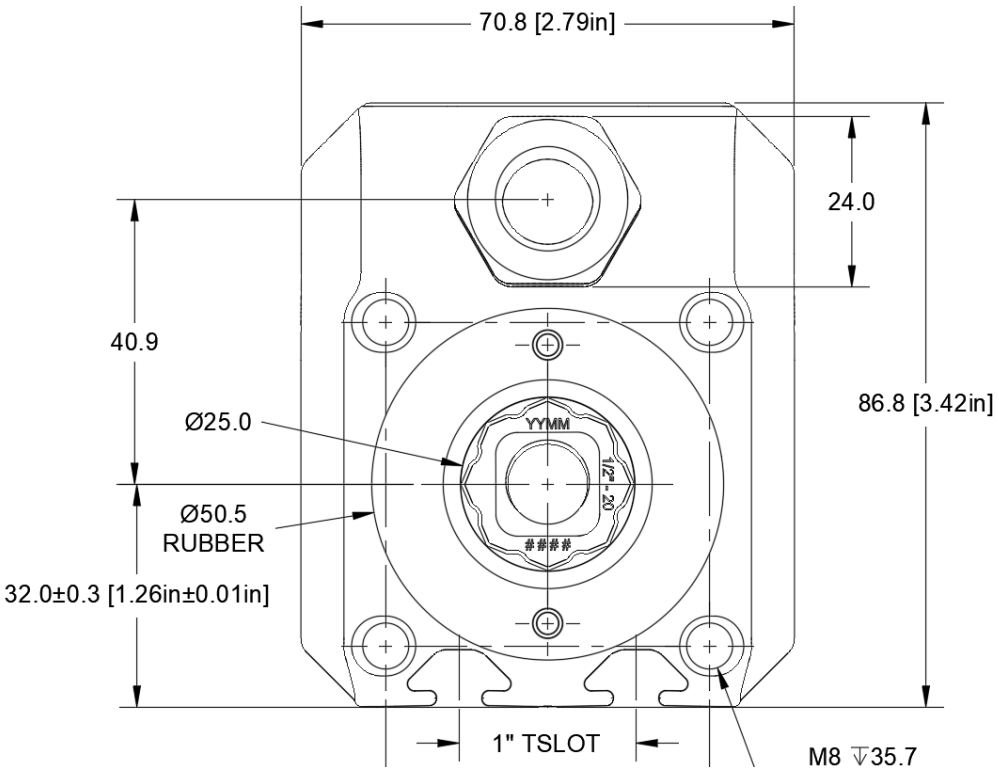

## Motor Body Mechanical Specifications

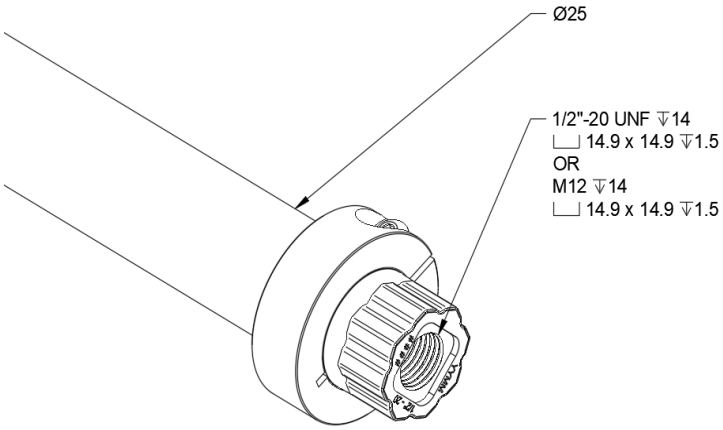
| | | ORCA-3-XXX | ORCA-6-XXX | ORCA-15-48V |
|---|---|---|---|---|
| Length | A | 99.2 mm *3.9 in* | 175.4 mm *6.9 in* | 404 mm *15.9 in* |
| Weight | | 1.224 kg *2.7 lbs* | 2.4 kg *5.29 lbs* | 5.3 kg *11.7 lbs* |
| Chassis Material | | Anodized Aluminum | | |
| Bushing Material | | Igus GFM-2526-25 | | |

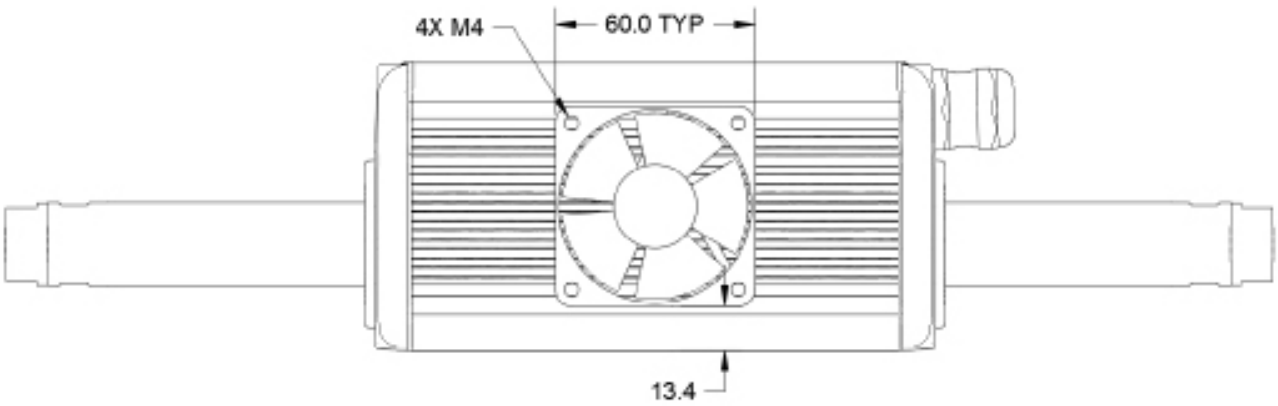
## Standard Shaft Mechanical Specifications

| | | ORCA-3-XXX | ORCA-6-XXX | ORCA-15-48V |
|---|---|---|---|---|
| Length | B | 228.6 mm *9 in* | 381 mm *15 in* | 762 mm *30 in* |
| Usable Stroke | | 101.6 mm *4 in* | 177.8 mm *7 in* | 330.2 mm *13 in* |
| Weight | | 0.8 kg *1.76 lbs* | 1.36 kg *2.99 lbs* | 2.74 kg *6.03 lbs* |
| Diameter | | 25mm *0.98 in* | 25 mm *0.98 in* | 25 mm *0.98 in* |
| Material | | Stainless Steel (304 SS) | | |
| Coupling | | 1/2-20 Threaded Hole (M12 Option Available) ↧14 mm | | |

# Mechanical Drawings



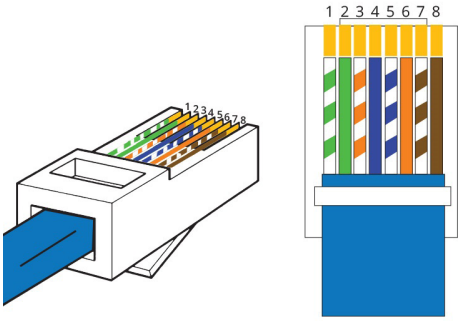
# Electrical & Software Interfacing

## Interface Options and Application Compatibility

There are several ways to integrate ORCA motors in applications. Below is a list of commonly supported applications, but any application that can support serial messages or analog/digital inputs and outputs can control one or more motors.

| Quick Application Information | | | | | |
|---|---|---|---|---|---|
| **Supported Application** *irisdynamics.com/articles* | **Compatible Interfaces** USB | RS485/ RS422 | Analog / Digital | **Supporting Tools** *irisdynamics.com/downloads* | **Required Accessory** *See page 16/17 for details* |
| MATLAB, Labview | x | | | OrcaSDK for MATLAB/Labview | USB-to-RS422 Cable + RJ45 Splitter |
| Unity, Unreal, General C++ | x | | | OrcaSDK for Windows | USB-to-RS422 Cable + RJ45 Splitter |
| Windows Plug-and-Play | x | | | IrisControls Software* | USB-to-RS485 Cable + RJ45 Splitter |
| PLC or Microcontroller | | x | | ORCA Series MODBUS User Guide | None |
| PLC or Microcontroller | | | x | ORCA IO SmartHub User Guide | ORCA IO Smart Hub |
| Pneumatic Retrofit | | | x | ORCA IO SmartHub User Guide | ORCA IO Smart Hub |

**IrisControls Software can be used in combination with any other interface to aid development and provide comprehensive real-time feedback*




## Data Cable

ORCA series motors include a shielded communication cable of twisted pairs carrying the differential signals used to transmit and receive characters on two separate interfaces, as well as 5V lines which can power small external loads, or be used to power the integrated logic and sensors when no main power is provided to the motor.

| Data Cable Specifications | | | | |
|---|---|---|---|---|
| Pos | Use | Notes | Electrical Standard | ESD Rating |
| 1 | MODBUS RX+ | 120 ohm termination | Exceeds TIA-485-A | IEC 61000-4-2 Level 4 |
| 2 | MODBUS RX- | | | |
| 3 | MODBUS TX+ | 120 ohm termination | | |
| 4 | IrisControls TX/RX+ | | | |
| 5 | IrisControls TX/RX- | | | |
| 6 | MODBUS TX- | | | |
| 7 | +5V | Can be used to power logic in absence of main supply. Use 4.5 to 5.5 VDC | 500 mA max output | |
| 8 | GND | | | |

# Electrical & Software Interfacing

## Modbus RTU Serial Interface

ORCA series motors feature a 'field-bus' serial communication interface which allows configuration, control, and monitoring. Features of the motors are offered by exposing data fields (registers) which can be written to and read from by sending and receiving characters over the serial interface.

Serial communications are implemented using a subset of the Modbus RTU specification, with additional functionality to support a high-speed stream of commands and feedback. The Modbus RTU User Manual is available for download below.

*Download Here - irisdynamics.com/downloads*

## IrisControls™

ORCA motors feature an optional graphical user interface called IrisControls which can be used to monitor details and configure settings. This interface provides an easy way to visually tune the internal PID position controller, set up motion profiles, add performance restrictions, and capture information while connected. IrisControls is available for download below.

*Download Here - irisdynamics.com/downloads*

## IO SmartHub

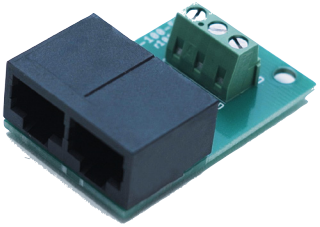
OPTIONAL AND SOLD SEPARATELY


The IO SmartHub provides control of ORCA Series motors in Force, Position, and Kinematic Modes through simple digital and analog inputs. Real-time force and position data are fed from the motor and provided as analog outputs. The IO SmartHub attaches to the motor's data cable (RJ45) and allows for easier integration with existing industrial control methods such as PLCs with 4-20 mA current loop outputs. Find more information in the ORCA IO SmartHub User Guide below.

*Learn More - irisdynamics.com/downloads*

## PWM Module

OPTIONAL AND SOLD SEPARATELY



An interface chip is used to enable PWM control of ORCA motor positions, while also providing the option to connect the motor simultaneously to IrisControls to facilitate motor configuration.

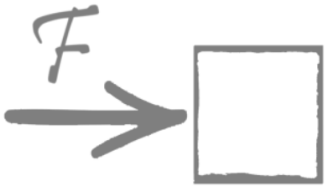
*Learn More - irisdynamics.com/news/pwm-interface-for-orca-motors*

## Operating Modes

ORCA motors can operate in one of four modes of operation, enabling countless applications. Each of these modes is described in detail in the *ORCA Series Reference Manual (RM220115)*

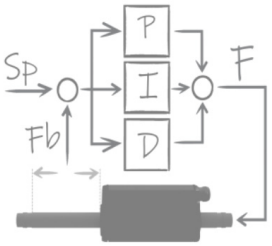
### Force Mode

The motor receives a stream of user forces, and dynamically controls the amount of force produced between the shaft and stator. This allows for smooth and consistent force output. This is a great mode for polishing and grinding applications, depth control for floats, or for robotic controllers that transcend kinematics with force-aware models.



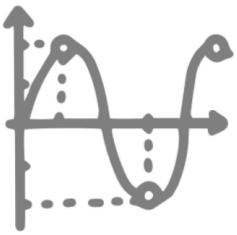

### Position Mode

A classic mode of operation where a stream of position setpoints (Sp) are provided. The motor will run an internal PID controller to track the position targets, overcoming external disturbances like mass, friction, springs, gravity, etc. The internal controller's feedback loop is very fast and is stable even with high gains.




### Kinematic Mode

The motor receives a trigger signal and then follows one or more configurable paths. Smooth, efficient, and repeatable motions can be achieved with all the calculation and compensation performed by the motor. This mode makes replacing pneumatic systems very easy. It simplifies system architecture, improves system performance, and reduces engineering efforts.



### Haptic Mode

A unique linear motor mode that replicates springs, dampers, mass, and/or vibrations simultaneously. The on-board controller performs latency-sensitive effects like virtual hard-stops and high frequency vibrations which reduces development effort and increases haptic effect capability. This mode is perfect for force-feedback control applications and instances where the motor is manipulated by a person.

# ORCA-3-12V Specifications

## ORCA-3-12V

### General Specifications

| | | | |
|---|---|---|---|
| Supply Voltage | min | 12 V | *Undervoltage lockout prevents operation below 10 V.* |
| | max | 60 V | *Exposure to supply voltages greater than max can cause permanent damage.* |
| Max Supply Current | max | 21.5 A | |
| ESD Protection | IEC 61000-4-2 Level 4 | | |
| IP Rating | IP68 | | |
| Min Chassis Temperature | min | -20 °C | |
| | max | 70 °C | |
| Serial Protocol | RS485 / RS422 | | *Full Duplex or Half Duplex; 120 Ω termination.* |
| Message Protocol | Modbus RTU | | *High throughput functions codes available.* |
| Maximum Baudrate | 1.2 Mbps | | |
| Internal Control Rate | 3.0 kHz | | |
| Motor Phases | 3 | | |
| Position Sensor | Integrated Hall Array | | *Will report absolute position, but requires home on power-up to establish zero position.* |
| Position Accuracy | ±250 um | ±0.0098 in | |
| Position Repeatability | ±25 um | ±0.001 in | |
| Thermal Sensors | Driver and Stator | | *Auto shut-off, adjustable limits.* |

### Force and Power and Speed

| | *Motor Temp* | *12 Vdd* | *24 Vdd* | *48 Vdd* | *60 Vdd* |
|---|---|---|---|---|---|
| *See the Typical Characteristics section below for detailed information on performance versus speed* | | | | | |
| Max Force | 20°C | 138 N *30.9 lbf* | 182 N *40.8 lbf* | 182 N *40.8 lbf* | 182 N *40.8 lbf* |
| Max Power | | 258 W | 450 W | 450 W | 450 W |
| Max Force Duration | | 35 s | 17 s | 17 s | 17 s |
| Force Constant (Kf) | | 8.6 N/√W | | | |
| Max Force | 70°C | 116 N *26 lbf* | 180 N *40.4 lbf* | 180 N *40.4 lbf* | 180 N *40.4 lbf* |
| Max Power | | 219 W | 529 W | 529 W | 529 W |
| Max Force Duration | | <1 s | | | |
| Force Constant (Kf) | | 7.8 N/√W | | | |
| Max Speed | full range | 1.6 m/s *64 in/s* | 3.2 m/s *128 in/s* | 6.5 m/s *256 in/s* | 8.1 m/s *320 in/s* |
| Force Accuracy* | full range | 1 N *0.225 lbf* | | | |
| Force Repeatability | | 0.1 N *0.022 lbf* | | | |

**Motors are Internally calibrated. External calibration using known external loads will improve accuracy .*

### Cooling

| | *Condition* | *Power* | *Force* |
|---|---|---|---|
| Continuous Power/Force | 20°C ambient, still air | 18 W | 33 N *7 lbf* |
| | 20°C ambient, single fan @ 10 CFM | 57 W | 59 N *13 lbf* |
| | 20°C ambient, 2x 60 mm fans @ 39 CFM each | 64 W | 63 N *14 lbf* |

*For information on a specific application's thermal feasibility reach out to sales@irisdynamics.com*

# ORCA-3-36V Specifications

## ORCA-3-36V

### General Specifications

| | | | |
|---|---|---|---|
| Supply Voltage | min | 12 V | *Undervoltage lockout prevents operation below 10 V.* |
| | max | 60 V | *Exposure to supply voltages greater than max can cause permanent damage.* |
| Max Supply Current | max | 21.1 A | |
| ESD Protection | IEC 61000-4-2 Level 4 | | |
| IP Rating | IP68 | | |
| Min Chassis Temperature | min | -20 °C | |
| | max | 70 °C | |
| Serial Protocol | RS485 / RS422 | | *Full Duplex or Half Duplex; 120 Ω termination.* |
| Message Protocol | Modbus RTU | | *High throughput functions codes available.* |
| Maximum Baudrate | 1.2 Mbps | | |
| Internal Control Rate | 3.0 kHz | | |
| Motor Phases | 3 | | |
| Position Sensor | Integrated Hall Array | | *Will report absolute position, but requires home on power-up to establish zero position* |
| Position Accuracy | ±250 um | ±0.0098 in | |
| Position Repeatability | ±25 um | ±0.001 in | |
| Thermal Sensors | Driver and Stator | | *Auto shut-off, adjustable limits.* |

### Force and Power and Speed

| | *Motor Temp* | *12 Vdd* | *24 Vdd* | *48 Vdd* | *60 Vdd* |
|---|---|---|---|---|---|
| *See the Typical Characteristics section below for detailed information on performance versus speed* | | | | | |
| Max Force | 20°C | 95 N *21.3 lbf* | 189 N *42.5 lbf* | 281 N *63.1 lbf* | 281 N *63.1 lbf* |
| Max Power | | 115 W | 459 W | 1012 W | 1012 W |
| Max Force Duration | | 78 s | 19 s | 7 s | 7 s |
| Force Constant (Kf) | | 8.8 N/√W | | | |
| Max Force | 70°C | 79 N *17.9 lbf* | 159 N *35.7 lbf* | 278 N *62.5 lbf* | 278 N *62.5 lbf* |
| Max Power | | 97 W | 390 W | 1190 W | 1190 W |
| Max Force Duration | | <1 s | | | |
| Force Constant (Kf) | | 8.1 N/√W | | | |
| Max Speed | full range | 1.1 m/s *41 in/s* | 2.1 m/s *83 in/s* | 4.2 m/s *166 in/s* | 5.3 m/s *207 in/s* |
| Force Accuracy* | full range | 1 N *0.225 lbf* | | | |
| Force Repeatability | | 0.1 N *0.022 lbf* | | | |

**Motors are Internally calibrated. External calibration using known external loads will improve accuracy*

### Cooling

| | *Condition* | *Power* | *Force* |
|---|---|---|---|
| Continuous Power/Force | 20°C ambient, still air | 18 W | 34 N *8 lbf* |
| | 20°C ambient, single fan @ 10 CFM | 57 W | 61 N *14 lbf* |
| | 20°C ambient, 2x 60 mm fans @ 39 CFM each | 64 W | 64 N *14 lbf* |

*For information on a specific application's thermal feasibility reach out to sales@irisdynamics.com*

# ORCA-6-LITE Specifications

## ORCA-6-LITE

### General Specifications

| | | | |
|---|---|---|---|
| Supply Voltage | min | 12 V | *Undervoltage lockout prevents operation below 10 V.* |
| | max | 30 V | *Exposure to supply voltages greater than max can cause permanent damage.* |
| Max Supply Current | max | 13.5 A | |
| ESD Protection | IEC 61000-4-2 Level 4 | | |
| IP Rating | IP68 | | |
| Min Chassis Temperature | min | -20 °C | |
| | max | 70 °C | |
| Serial Protocol | RS485 / RS422 | | *Full Duplex or Half Duplex; 120 Ω termination.* |
| Message Protocol | Modbus RTU | | *High throughput functions codes available.* |
| Maximum Baudrate | 1.2 Mbps | | |
| Internal Control Rate | 3.0 kHz | | |
| Motor Phases | 4 | | |
| Position Sensor | Integrated Hall Array | | *Will report absolute position, but requires home on power-up to establish zero position* |
| Position Accuracy | ±150 um | ±0.0059 in | |
| Position Repeatability | ±15 um | ±0.0006 in | |
| Thermal Sensors | Driver and Stator | | *Auto shut-off, adjustable limits.* |

### Force and Power and Speed

*See the Typical Characteristics section below for detailed information on performance versus speed*

| | *Motor Temp* | *12 Vdd* | *18 Vdd* | *24 Vdd* | |
|---|---|---|---|---|---|
| Max Force | 20°C | 139 N *31.1 lbf* | 208 N *46.7 lbf* | 247 N *55.5 lbf* | 247 N *55.5 lbf* |
| Max Power | | 102 W | 229 W | 324 W | 324 W |
| Max Force Duration | | 175 s | 78 s | 49 s | 47 s |
| Force Constant (Kf) | | 13.7 N/√W | | | |
| Max Force | 70°C | 116 N *26.2 lbf* | 175 N *39.3 lbf* | 233 N *52.4 lbf* | 244 N *54.9 lbf* |
| Max Power | | 87 W | 195 W | 346 W | 381 W |
| Max Force Duration | | <1 s | | | |
| Force Constant (Kf) | | 12.5 N/√W | | | |
| Max Speed | full range | 0.7 m/s *29 in/s* | 1.1 m/s *43 in/s* | 1.5 m/s *58 in/s* | 1.8 m/s *72 in/s* |
| Force Accuracy* | full range | 0.74 N *0.166 lbf* | | | |
| Force Repeatability | | 0.1 N *0.022 lbf* | | | |

**Motors are Internally calibrated. External calibration using known external loads will improve accuracy*

### Cooling

| | *Condition* | *Power* | *Force* |
|---|---|---|---|
| Continuous Power/Force | 20°C ambient, still air | 34 W | 73 N *16 lbf* |
| | 20°C ambient, single fan @ 10 CFM | 106 W | 129 N *29 lbf* |
| | 20°C ambient, 2x 60 mm fans @ 39 CFM each | 139 W | 148 N *33 lbf* |

*For information on a specific application's thermal feasibility reach out to sales@irisdynamics.com*

# ORCA-6-24V Specifications

## ORCA-6-24V

### General Specifications

| | | | |
|---|---|---|---|
| Supply Voltage | min | 12 V | *Undervoltage lockout prevents operation below 10 V.* |
| | max | 60 V | *Exposure to supply voltages greater than max can cause permanent damage.* |
| Max Supply Current | max | 37.5 A | |
| ESD Protection | IEC 61000-4-2 Level 4 | | |
| IP Rating | IP68 | | |
| Min Chassis Temperature | min | -20 °C | |
| | max | 70 °C | |
| Serial Protocol | RS485 / RS422 | | *Full Duplex or Half Duplex; 120 Ω termination.* |
| Message Protocol | Modbus RTU | | *High throughput functions codes available.* |
| Maximum Baudrate | 1.2 Mbps | | |
| Internal Control Rate | 3.0 kHz | | |
| Motor Phases | 4 | | |
| Position Sensor | Integrated Hall Array | | *Will report absolute position, but requires home on power-up to establish zero position* |
| Position Accuracy | ±150 um | ±0.0059 in | |
| Position Repeatability | ±15 um | ±0.0006 in | |
| Thermal Sensors | Driver and Stator | | *Auto shut-off, adjustable limits.* |

### Force and Power and Speed

| | *Motor Temp* | 12 Vdd | *24 Vdd* | *48 Vdd* | *60 Vdd* |
|---|---|---|---|---|---|
| *See the Typical Characteristics section below for detailed information on performance versus speed* | | | | | |
| Max Force | 20°C | 215 N *48.3 lbf* | 426 N *95.7 lbf* | 426 N *95.7 lbf* | 426 N *95.7 lbf* |
| Max Power | | 229 W | 899 W | 899 W | 899 W |
| Max Force Duration | | 78 s | 20 s | 17 s | 17 s |
| Force Constant (Kf) | | 14.2 N/√W | | | |
| Max Force | 70°C | 181 N *40.6 lbf* | 361 N *81.3 lbf* | 421 N *94.7 lbf* | 421 N *94.7 lbf* |
| Max Power | | 195 W | 779 W | 1058 W | 1058 W |
| Max Force Duration | | <1 s | | | |
| Force Constant (Kf) | | 12.9 N/√W | | | |
| Max Speed | full range | 1.1 m/s *42 in/s* | 2.1 m/s *84 in/s* | 4.3 m/s *168 in/s* | 5.3 m/s *210 in/s* |
| Force Accuracy* | full range | 0.57 N *0.128 lbf* | | | |
| Force Repeatability | | 0.1 N *0.022 lbf* | | | |

**Motors are Internally calibrated. External calibration using known external loads will improve accuracy*

### Cooling

| | *Condition* | *Power* | *Force* |
|---|---|---|---|
| Continuous Power/Force | 20°C ambient, still air | 34 W | 75 N *17 lbf* |
| | 20°C ambient, single fan @ 10 CFM | 106 W | 133 N *30 lbf* |
| | 20°C ambient, 2x 60 mm fans @ 39 CFM each | 139 W | 153 N *34 lbf* |

*For information on a specific application's thermal feasibility reach out to sales@irisdynamics.com*

# ORCA-6-48V Specifications

## ORCA-6-48V

### General Specifications

| | | | |
|---|---|---|---|
| Supply Voltage | min | 12 V | *Undervoltage lockout prevents operation below 10 V.* |
| | max | 60 V | *Exposure to supply voltages greater than max can cause permanent damage.* |
| Max Supply Current | max | 34 A | |
| ESD Protection | IEC 61000-4-2 Level 4 | | |
| IP Rating | IP68 | | |
| Min Chassis Temperature | min | -20 °C | |
| | max | 70 °C | |
| Serial Protocol | RS485 / RS422 | | *Full Duplex or Half Duplex; 120 Ω termination.* |
| Message Protocol | Modbus RTU | | *High throughput functions codes available.* |
| Maximum Baudrate | 1.2 Mbps | | |
| Internal Control Rate | 3.0 kHz | | |
| Motor Phases | 4 | | |
| Position Sensor | Integrated Hall Array | | *Will report absolute position, but requires home on power-up to establish zero position* |
| Position Accuracy | ±150 um | *±0.0059 in* | |
| Position Repeatability | ±15 um | *±0.0006 in* | |
| Thermal Sensors | Driver and Stator | | *Auto shut-off, adjustable limits.* |

### Force and Power and Speed

*See the Typical Characteristics section below for detailed information on performance versus speed*

| | *Motor Temp* | *12 Vdd* | *24 Vdd* | *48 Vdd* | *60 Vdd* |
|---|---|---|---|---|---|
| Max Force | 20°C | 143 N *32.2 lbf* | 287 N *64.4 lbf* | 573 N *128.9 lbf* | 638 N *143.5 lbf* |
| Max Power | | 102 W | 408 W | 1631 W | 2023 W |
| Max Force Duration | | 175 s | 44 s | 11 s | 8 s |
| Force Constant (Kf) | | 12.9 N/√W | | | |
| Max Force | 70°C | 120 N *27.1 lbf* | 241 N *54.2 lbf* | 482 N *108.3 lbf* | 602 N *135.4 lbf* |
| Max Power | | 87 W | 346 W | 1386 W | 2165 W |
| Max Force Duration | | <1 s | | | |
| Force Constant (Kf) | | 12.9 N/√W | | | |
| Max Speed | full range | 0.7 m/s *28 in/s* | 1.4 m/s *56 in/s* | 2.8 m/s *112 in/s* | 3.6 m/s *140 in/s* |
| Force Accuracy* | full range | 0.64 N *0.144 lbf* | | | |
| Force Repeatability | | 0.1 N *0.022 lbf* | | | |

**Motors are Internally calibrated. External calibration using known external loads will improve accuracy*

### Cooling

| | *Condition* | *Power* | *Force* |
|---|---|---|---|
| Continuous Power/Force | 20°C ambient, still air | 34 W | 75 N *17 lbf* |
| | 20°C ambient, single fan @ 10 CFM | 106 W | 133 N *30 lbf* |
| | 20°C ambient, 2x 60 mm fans @ 39 CFM each | 139 W | 153 N *34 lbf* |

*For information on a specific application's thermal feasibility reach out to sales@irisdynamics.com*

# ORCA-15-48V Specifications

## ORCA-15-48V

### General Specifications

| | | | |
|---|---|---|---|
| Supply Voltage | min | 12 V | *Undervoltage lockout prevents operation below 10 V.* |
| | max | 60 V | *Exposure to supply voltages greater than max can cause permanent damage.* |
| Max Supply Current | max | 37.5 A | |
| ESD Protection | IEC 61000-4-2 Level 4 | | |
| IP Rating | IP68 | | |
| Min Chassis Temperature | min | -20 °C | |
| | max | 70 °C | |
| Serial Protocol | RS485 / RS422 | | *Full Duplex or Half Duplex; 120 Ω termination.* |
| Message Protocol | Modbus RTU | | *High throughput functions codes available.* |
| Maximum Baudrate | 1.2 Mbps | | |
| Internal Control Rate | 3.0 kHz | | |
| Motor Phases | 4 | | |
| Position Sensor | Integrated Hall Array | | *Will report absolute position, but requires home on power-up to establish zero position.* |
| Position Accuracy | ±150 um | ±0.0059 in | |
| Position Repeatability | ±15 um | ±0.006 in | |
| Thermal Sensors | Driver and Stator | | *Auto shut-off, adjustable limits.* |

### Force and Power and Speed

*See the Typical Characteristics section below for detailed information on performance versus speed*

| | *Motor Temp* | *12 Vdd* | *24 Vdd* | *48 Vdd* | *60 Vdd* |
|---|---|---|---|---|---|
| Max Force | 20°C | 214 N *48.2 lbf* | 429 N *96.3 lbf* | 857 N *192.7 lbf* | 1061 N *238.5 lbf* |
| Max Power | | 92 W | 367 W | 1468 W | 2248 W |
| Max Force Duration | | 462 s | 115 s | 29 s | 19 s |
| Force Constant (Kf) | | 22.4 N/√W | | | |
| Max Force | 70°C | 180 N *40.5 lbf* | 360 N *81 lbf* | 721 N *162 lbf* | 901 N *202.5 lbf* |
| Max Power | | 78 W | 312 W | 1247 W | 1948 W |
| Max Force Duration | | <1 s | | | |
| Force Constant (Kf) | | 20.4 N/√W | | | |
| Max Speed | full range | 0.4 m/s *17 in/s* | 0.9 m/s *34 in/s* | 1.7 m/s *67 in/s* | 2.1 m/s *84 in/s* |
| Force Accuracy* | full range | 0.97 N *0.218 lbf* | | | |
| Force Repeatability | | 0.15 N *0.0.34 lbf* | | | |

**Motors are Internally calibrated. External calibration using known external loads will improve accuracy .*

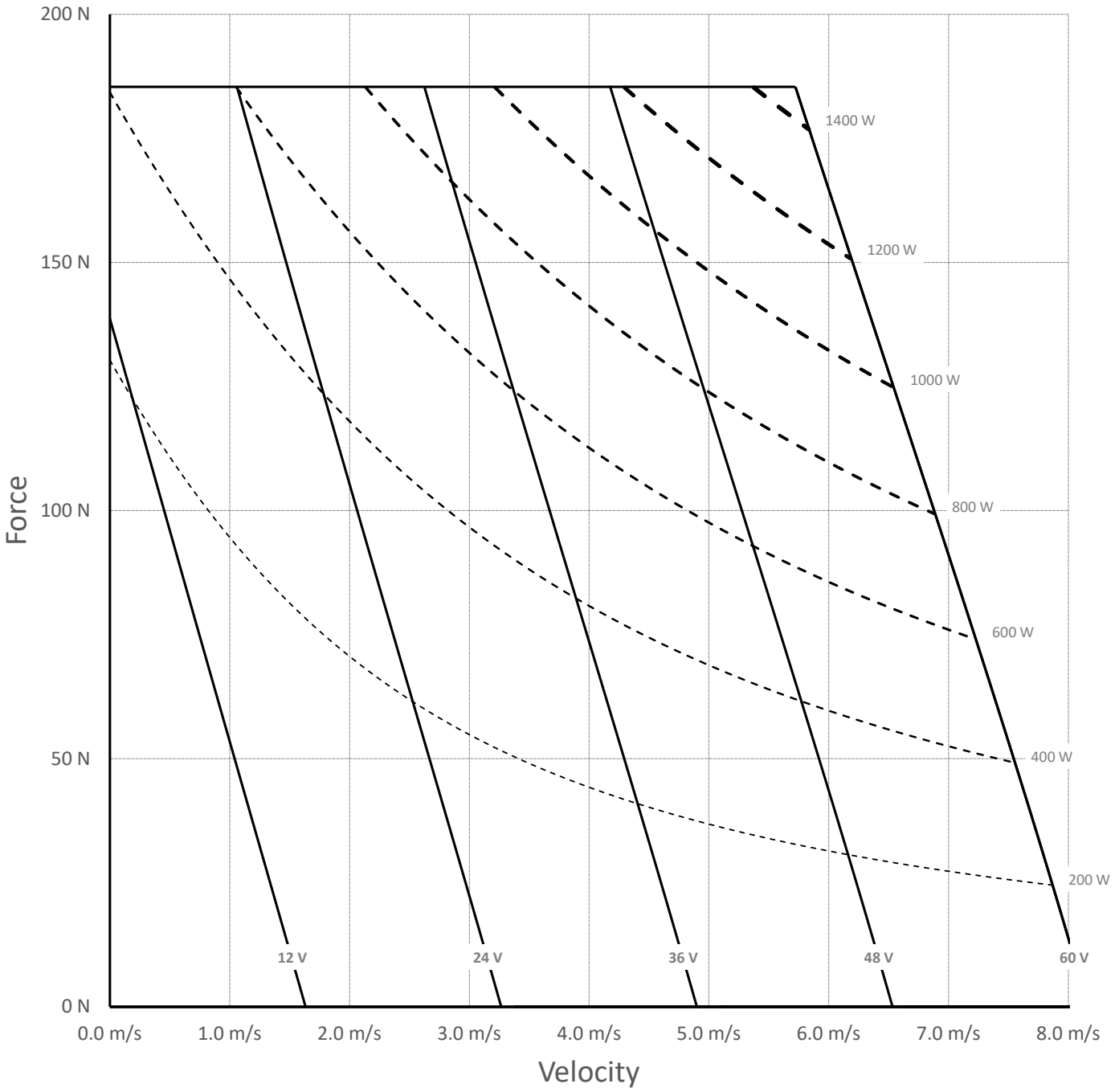
### Cooling

| | *Condition* | *Power* | *Force* |
|---|---|---|---|
| Continuous Power/Force | 20°C ambient, still air | 73 W | 174 N *39 lbf* |
| | 20°C ambient, single fan @ 10 CFM | 346 W | 380 N *85 lbf* |
| | 20°C ambient, 2x 60 mm fans @ 39 CFM each | 358 W | 386 N *87 lbf* |

*For information on a specific application's thermal feasibility reach out to sales@irisdynamics.com*

# ORCA-3-12V Force and Speed

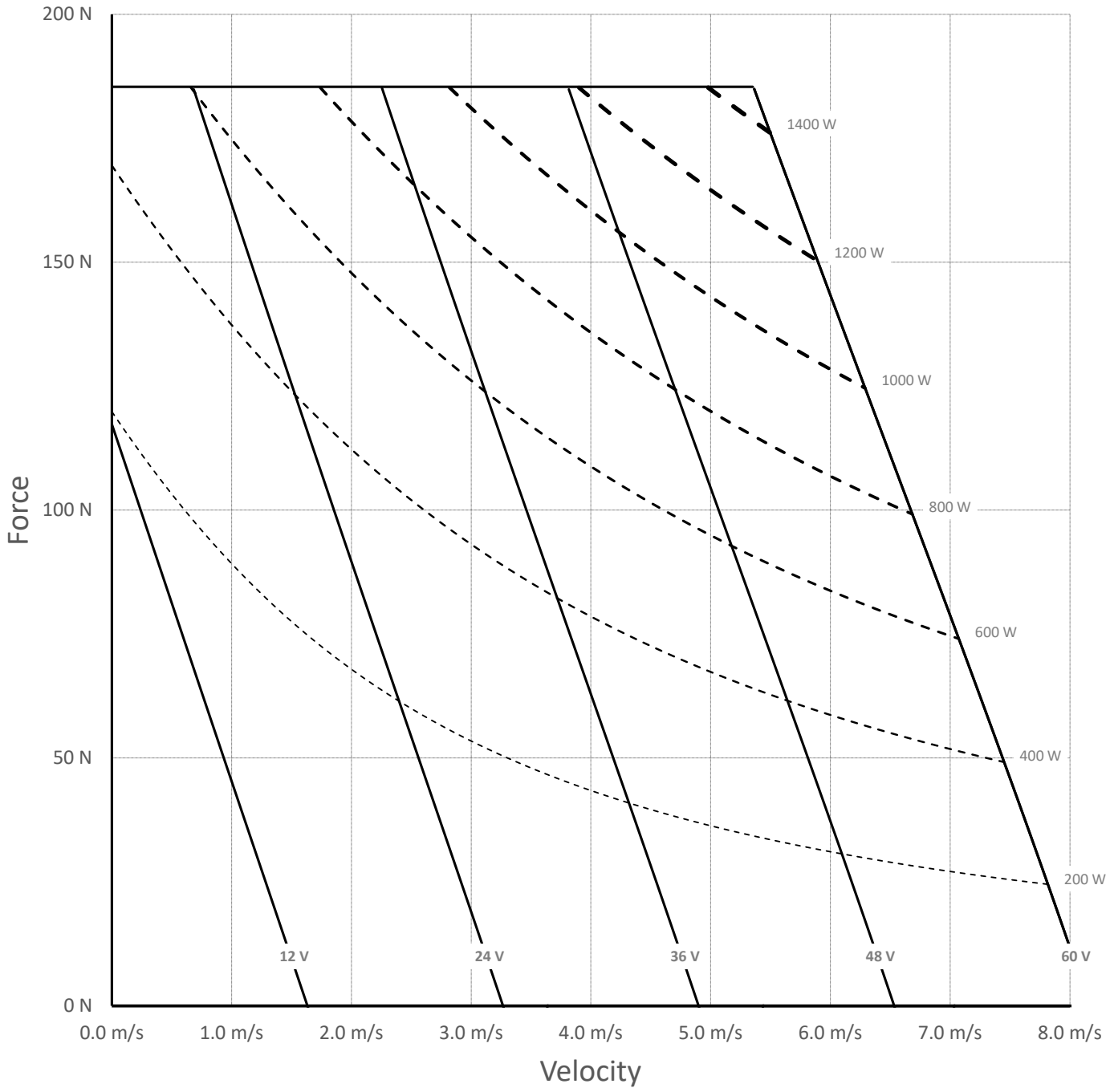
## ORCA-3-12V Force Limits (25 C)




*Characteristics are identical for forward (shaft extension), and reverse motions.*
*Dashed lines indicate force maximus due to power supply limits.*
*Solid lines indicate force maximums due to power supply voltage.*
*Valid forces must meet both voltage and power requirements.*

# ORCA-3-12V Force and Speed

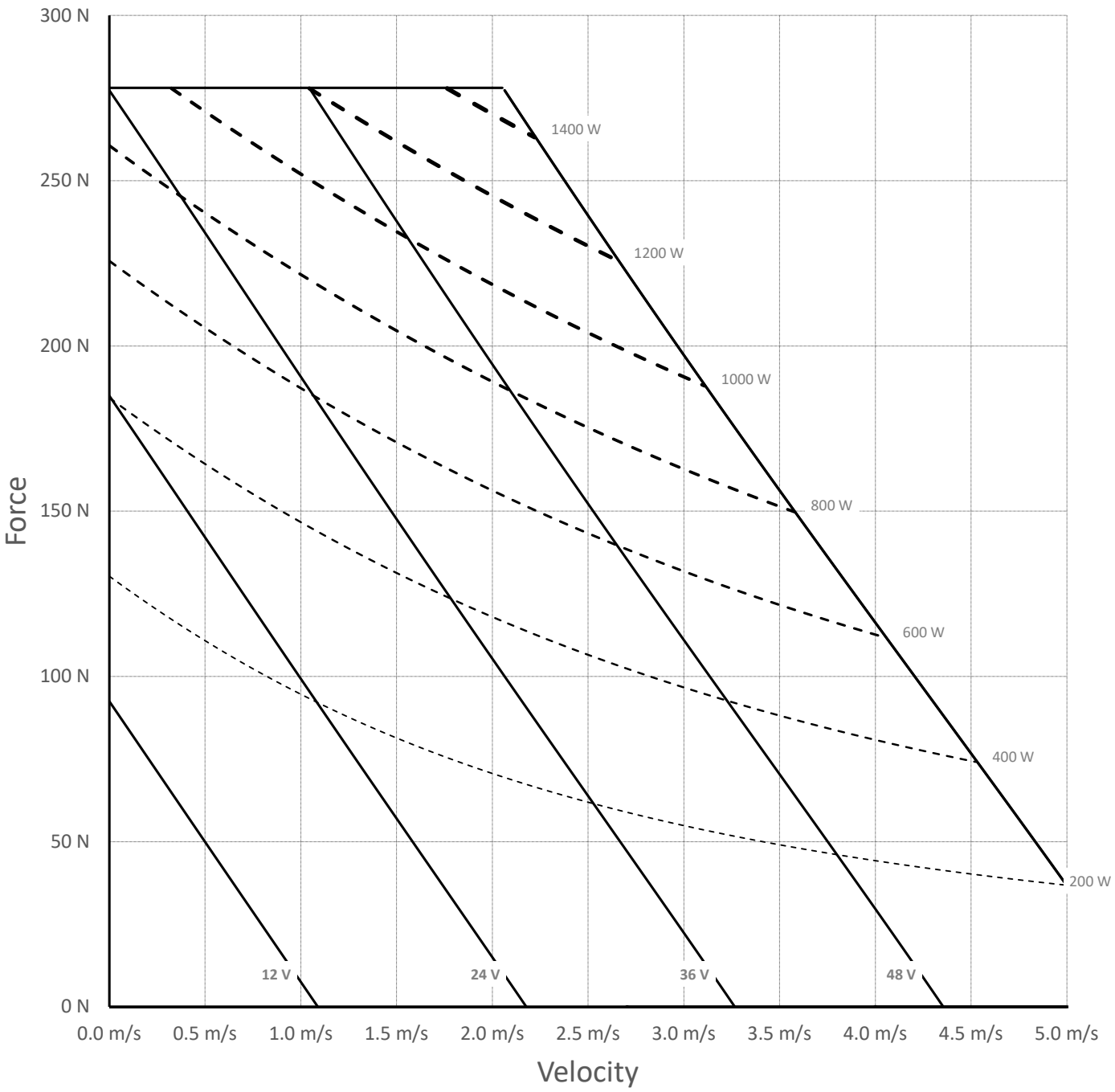
## ORCA-3-12V Force Limits (70 C)




*Characteristics are identical for forward (shaft extension), and reverse motions.*
*Dashed lines indicate force maximus due to power supply limits.*
*Solid lines indicate force maximums due to power supply voltage.*
*Valid forces must meet both voltage and power requirements.*

# ORCA-3-36V Force and Speed

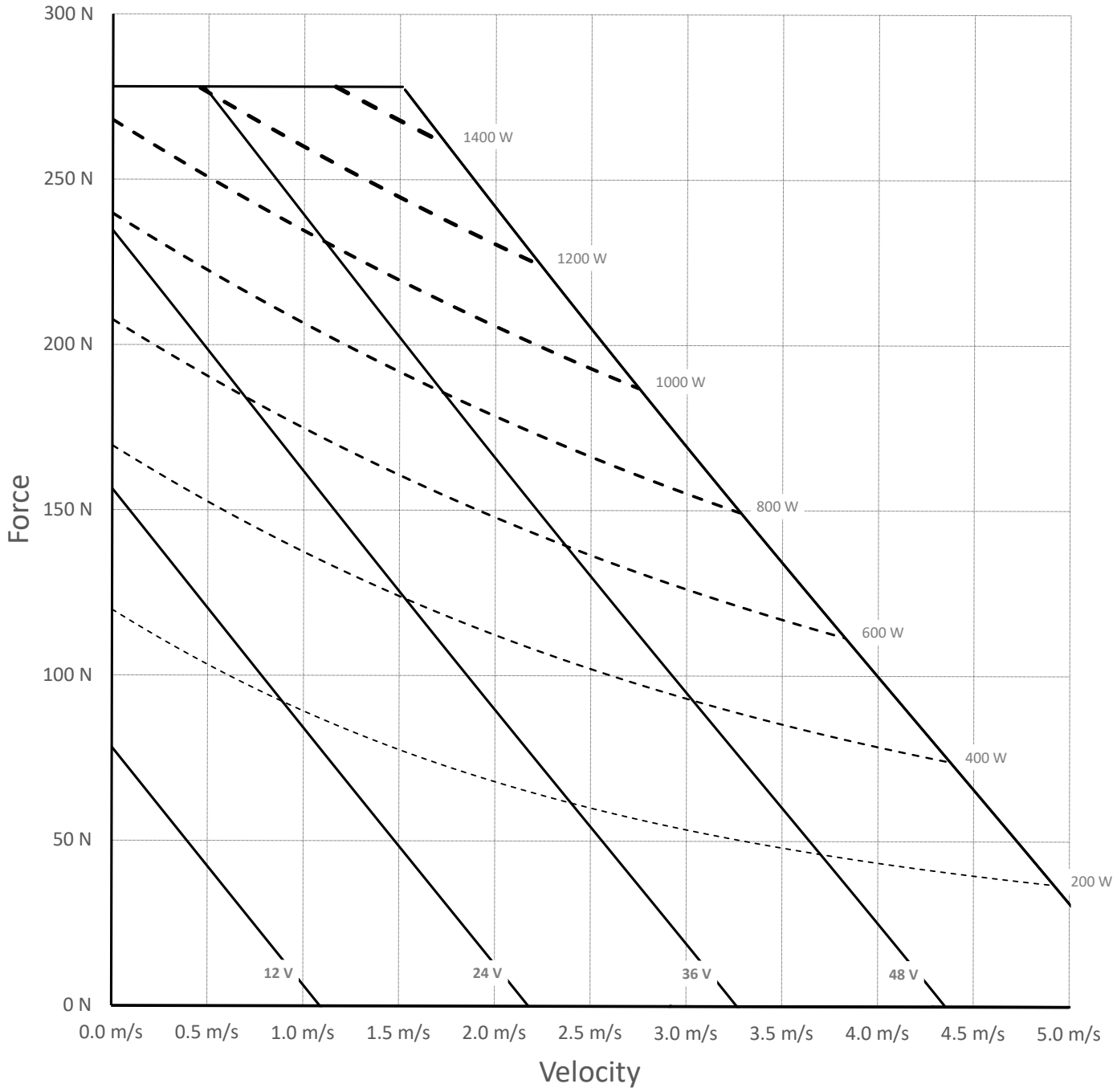
## ORCA-336 Force Limits (25 C)




*Characteristics are identical for forward (shaft extension), and reverse motions.*
*Dashed lines indicate force maximus due to power supply limits.*
*Solid lines indicate force maximums due to power supply voltage.*
*Valid forces must meet both voltage and power requirements.*

# ORCA-3-36V Force and Speed

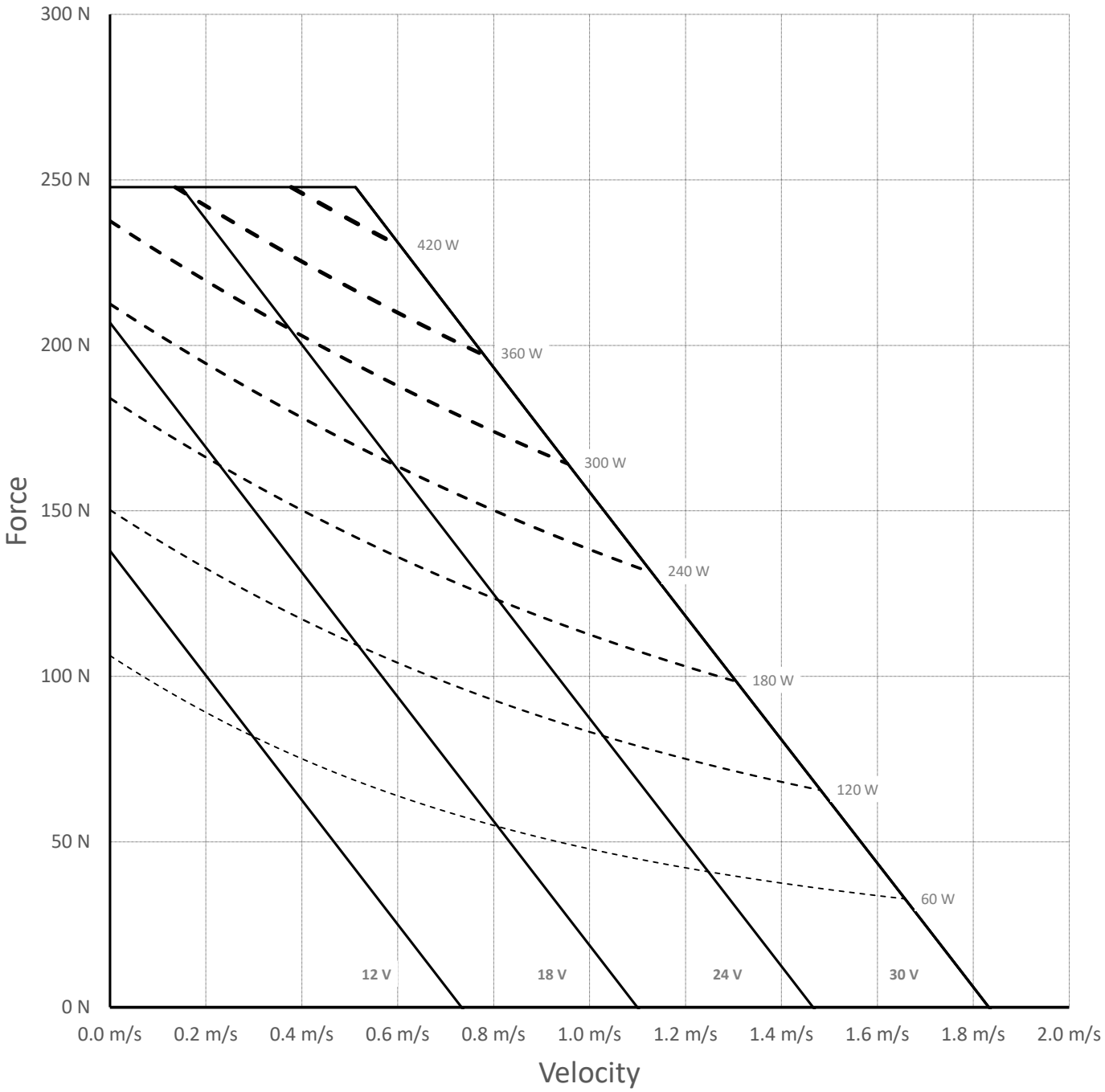
## ORCA-336 Force Limits (70 C)




*Characteristics are identical for forward (shaft extension), and reverse motions.*
*Dashed lines indicate force maximus due to power supply limits.*
*Solid lines indicate force maximums due to power supply voltage.*
*Valid forces must meet both voltage and power requirements.*

# ORCA-6-LITE Force and Speed

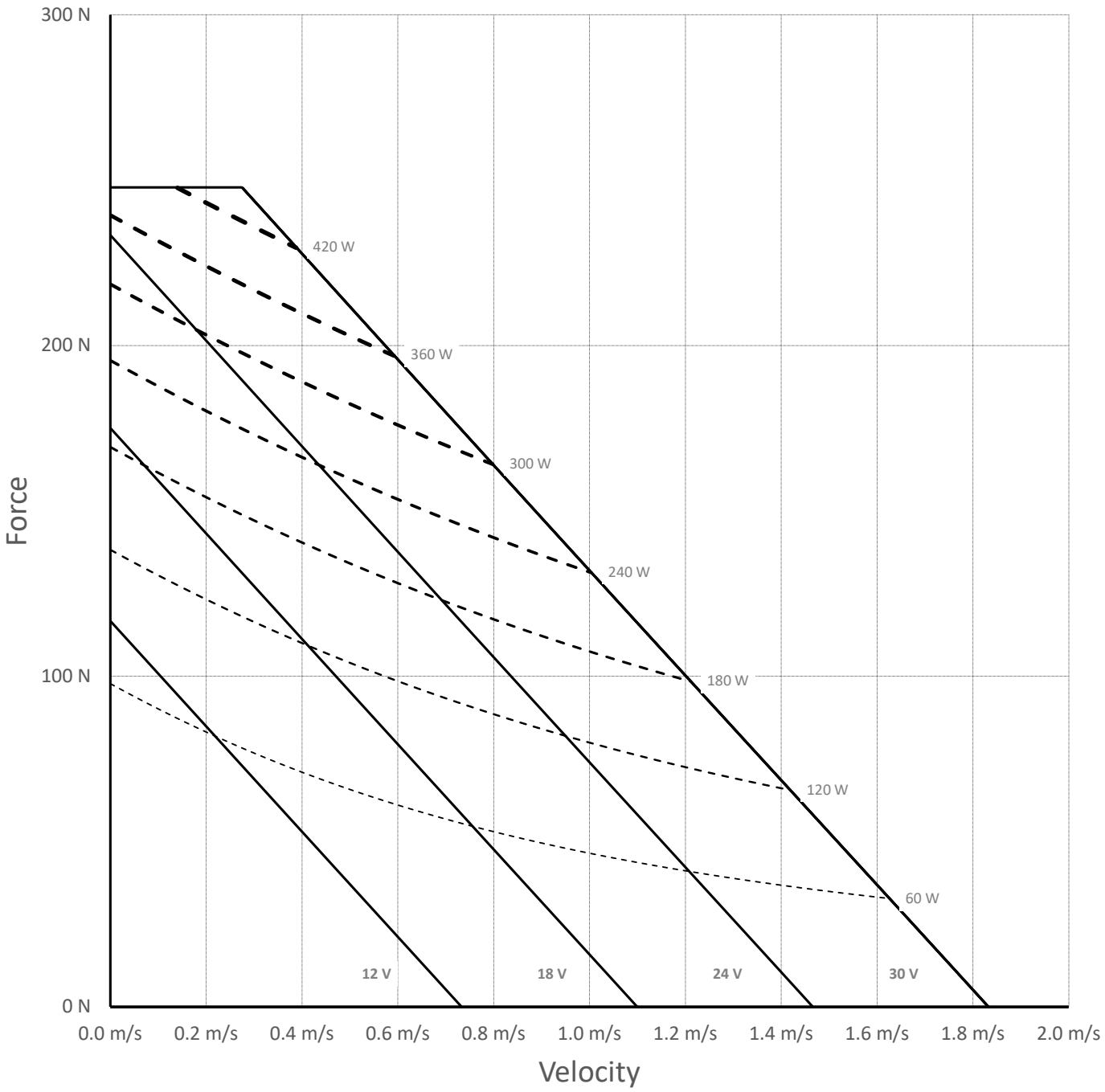
## ORCA-6-LITE Force Limits (25 C)




*Characteristics are identical for forward (shaft extension), and reverse motions.*
*Dashed lines indicate force maximus due to power supply limits.*
*Solid lines indicate force maximums due to power supply voltage.*
*Valid forces must meet both voltage and power requirements.*

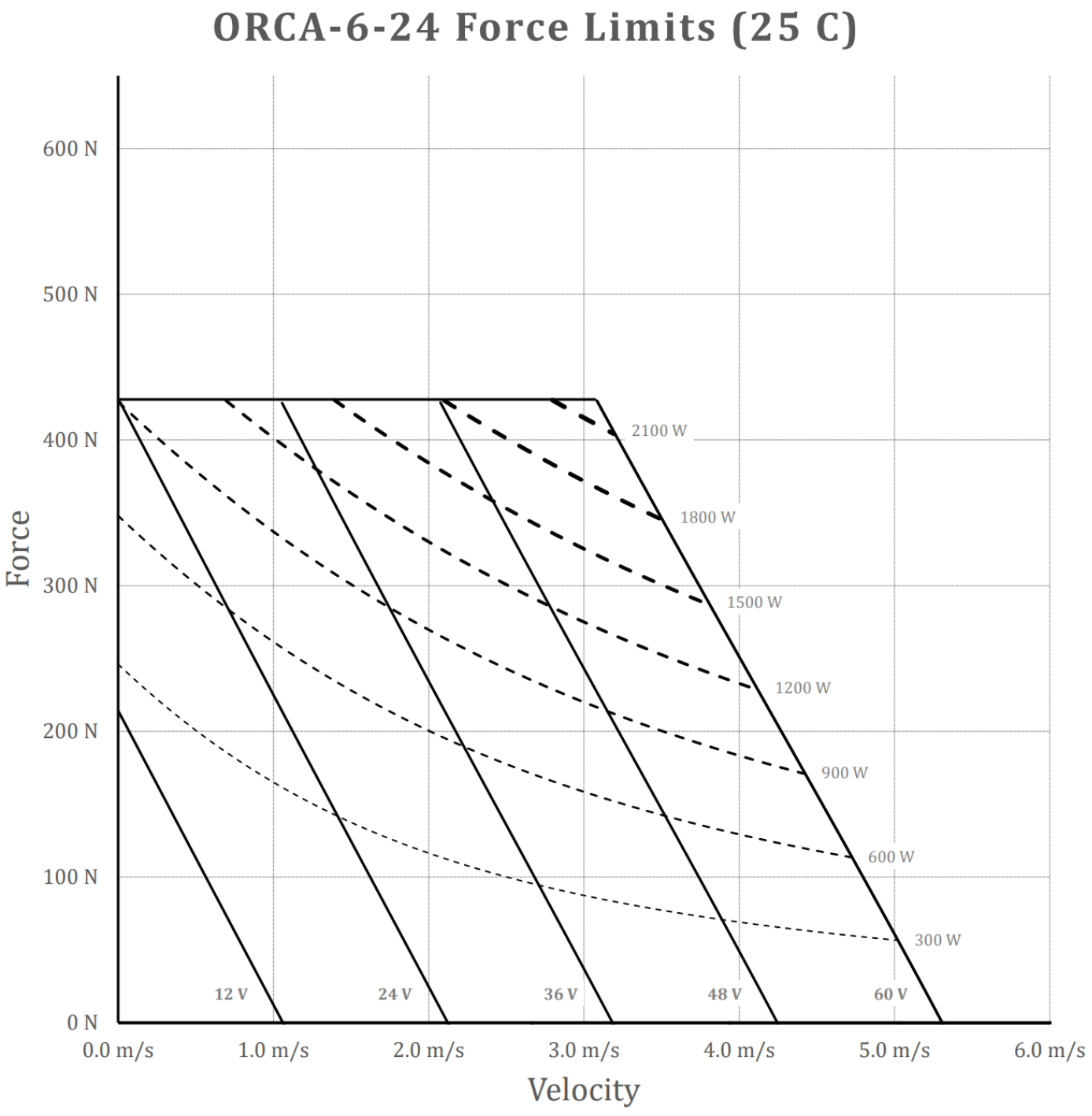
# ORCA-6-LITE Force and Speed

## ORCA-6-LITE Force Limits (70 C)




*Characteristics are identical for forward (shaft extension), and reverse motions.*
*Dashed lines indicate force maximus due to power supply limits.*
*Solid lines indicate force maximums due to power supply voltage.*
*Valid forces must meet both voltage and power requirements.*

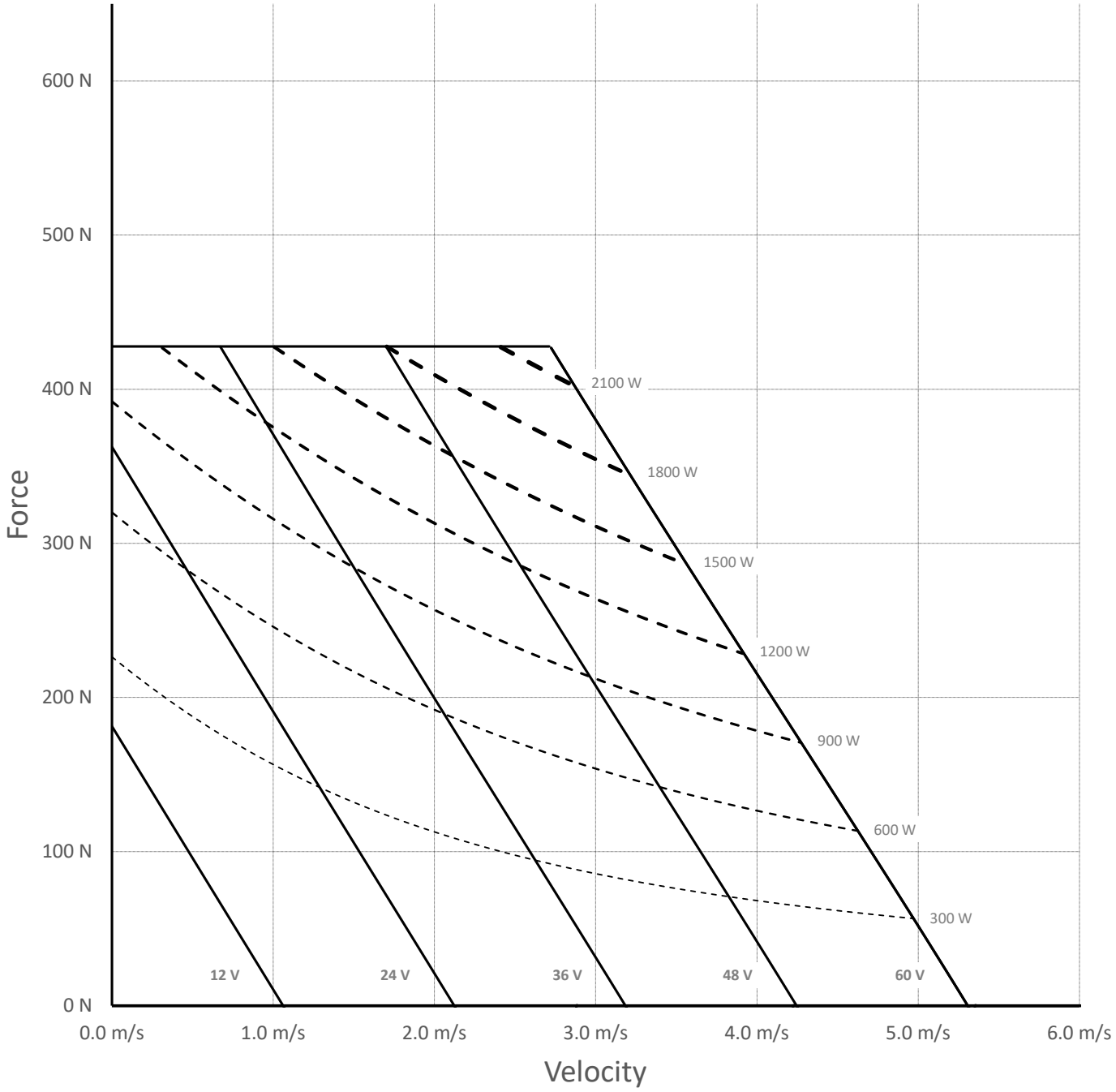
# ORCA-6-24V Force and Speed




*Characteristics are identical for forward (shaft extension), and reverse motions.*
*Dashed lines indicate force maximus due to power supply limits.*
*Solid lines indicate force maximums due to power supply voltage.*
*Valid forces must meet both voltage and power requirements.*

# ORCA-6-24V Force and Speed

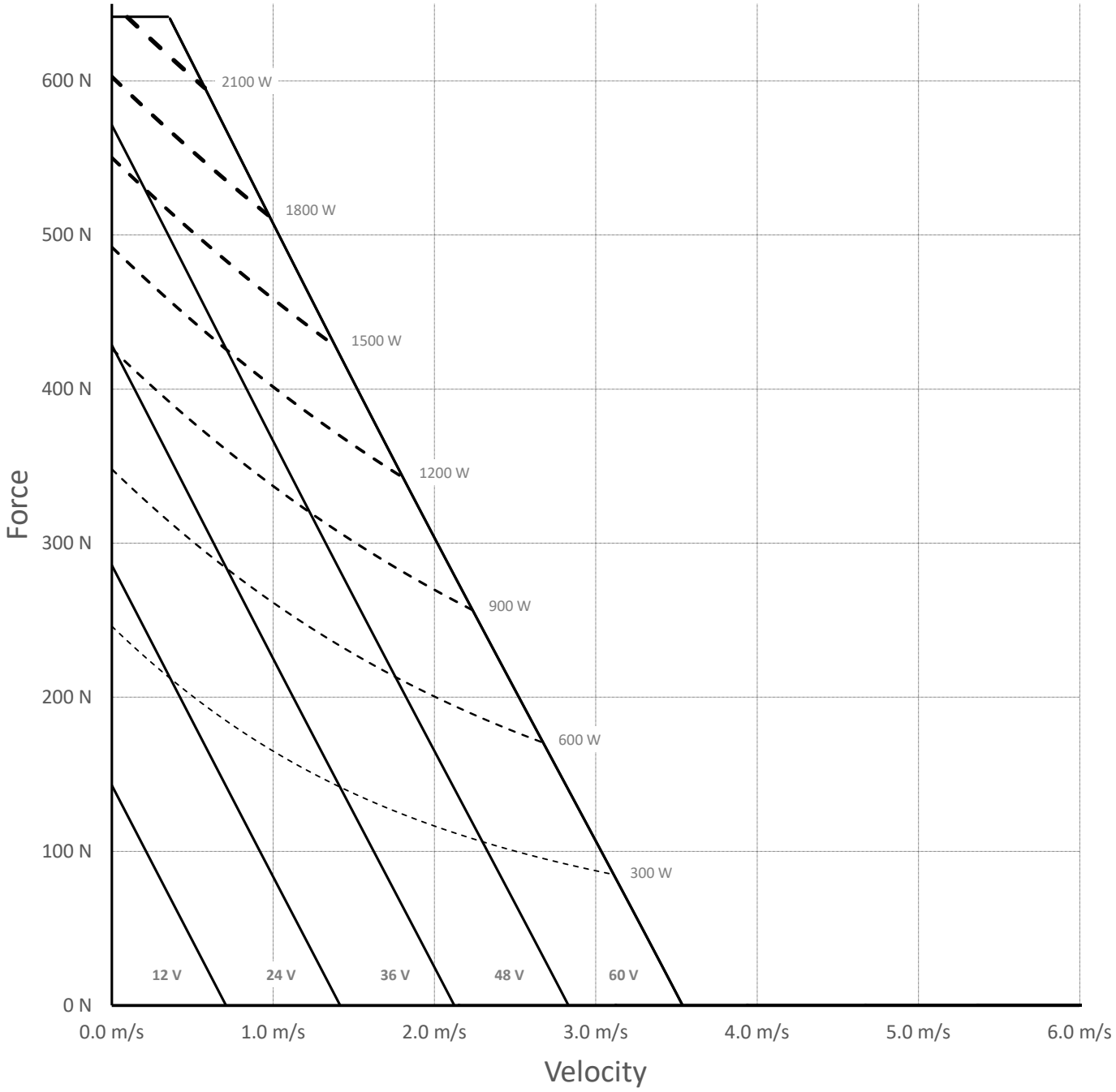
## ORCA-6-24 Force Limits (70 C)




*Characteristics are identical for forward (shaft extension), and reverse motions.*
*Dashed lines indicate force maximus due to power supply limits.*
*Solid lines indicate force maximums due to power supply voltage.*
*Valid forces must meet both voltage and power requirements.*

# ORCA-6-48V Force and Speed

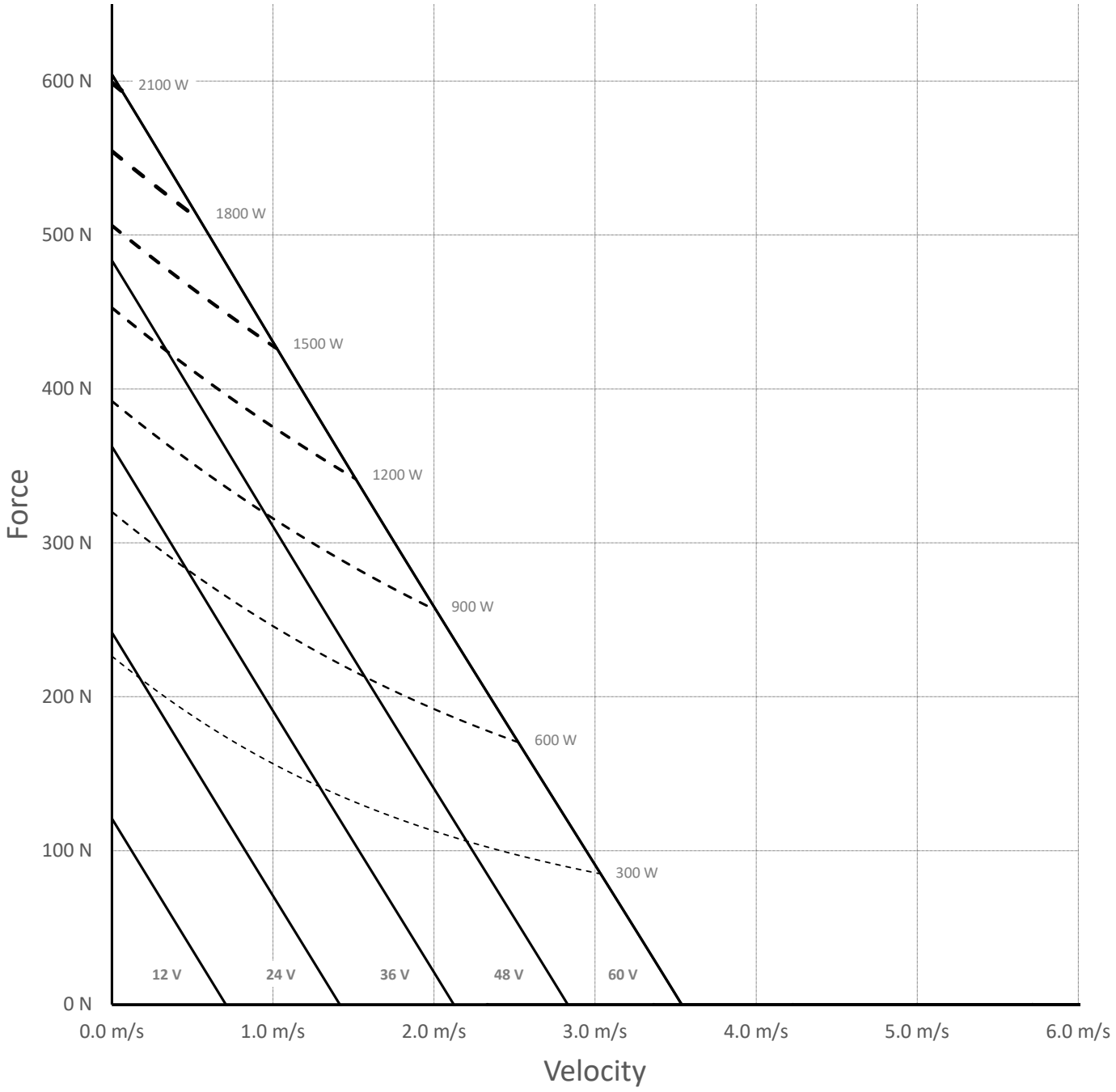
## ORCA-6-48 Force Limits (25 C)




*Characteristics are identical for forward (shaft extension), and reverse motions.*
*Dashed lines indicate force maximus due to power supply limits.*
*Solid lines indicate force maximums due to power supply voltage.*
*Valid forces must meet both voltage and power requirements.*

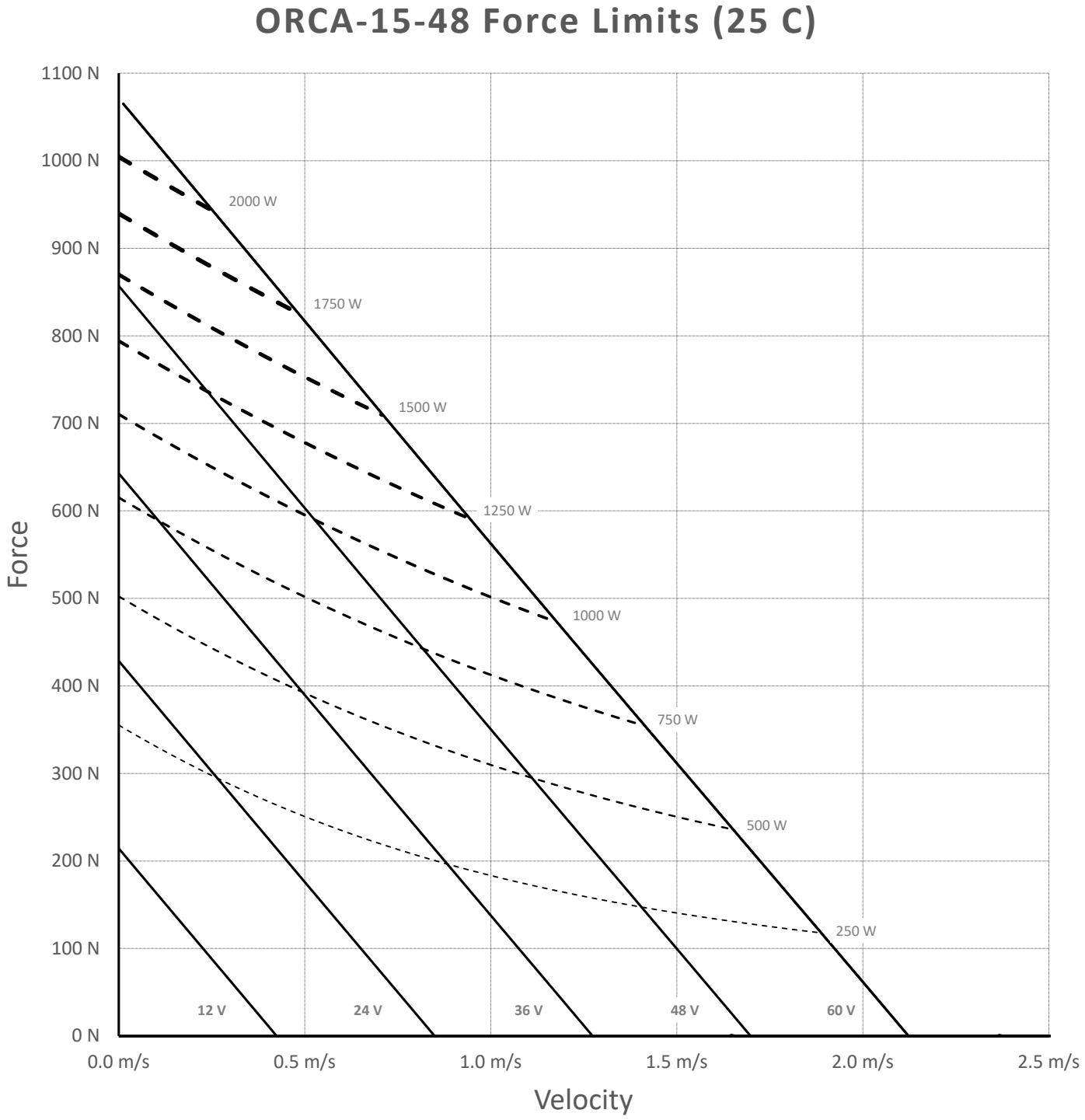
# ORCA-6-48V Force and Speed

## ORCA-6-48 Force Limits (70 C)




*Characteristics are identical for forward (shaft extension), and reverse motions.*
*Dashed lines indicate force maximus due to power supply limits.*
*Solid lines indicate force maximums due to power supply voltage.*
*Valid forces must meet both voltage and power requirements.*

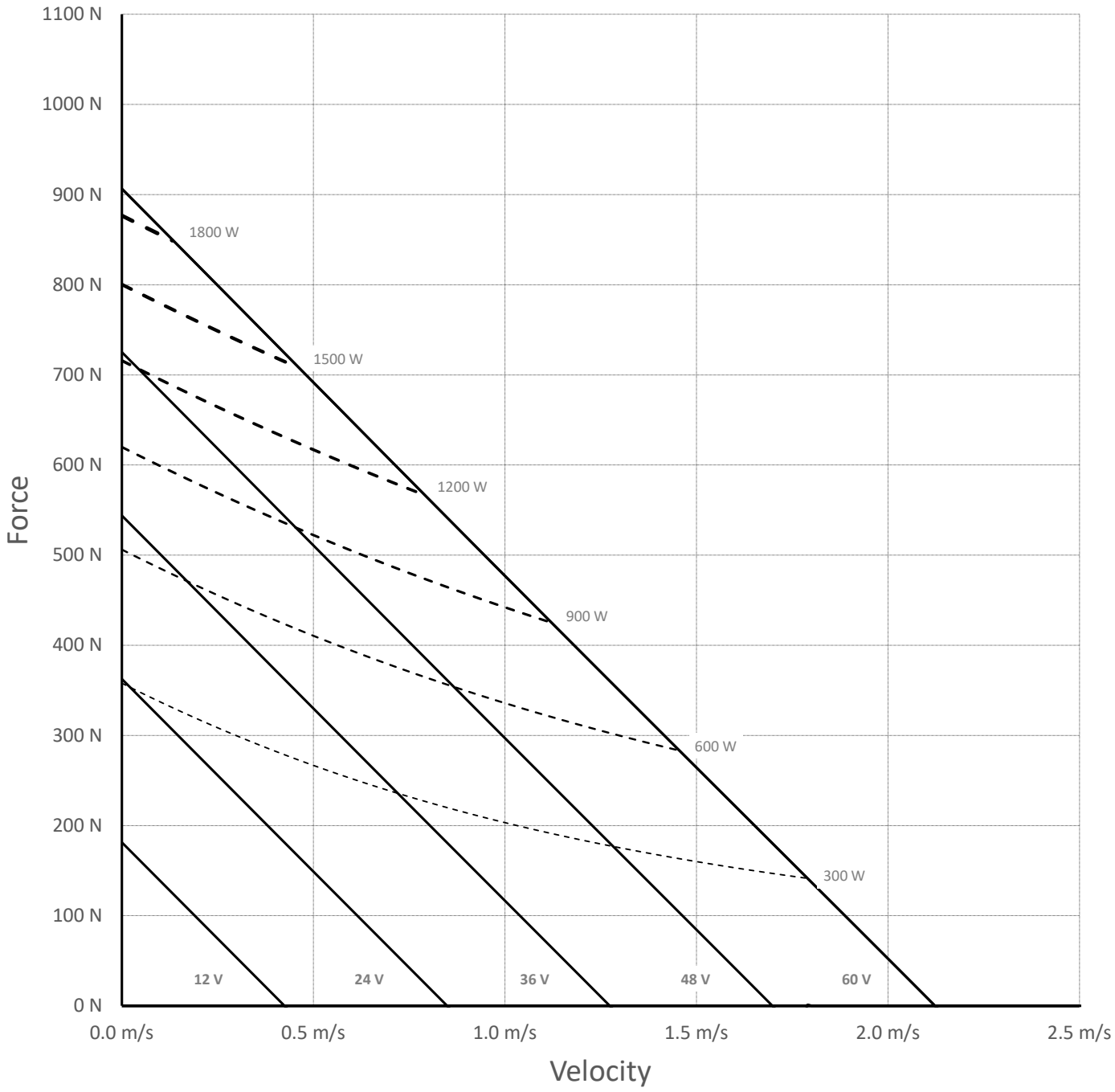
# ORCA-15-48V Force and Speed Plot




*Characteristics are identical for forward (shaft extension), and reverse motions.*
*Dashed lines indicate force maximus due to power supply limits.*
*Solid lines indicate force maximums due to power supply voltage.*
*Valid forces must meet both voltage and power requirements.*

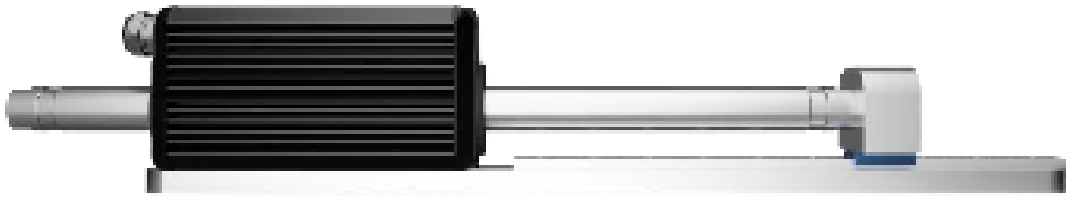
# ORCA-15-48V Force and Speed

## ORCA-15-48 Force Limits (70 C)




*Characteristics are identical for forward (shaft extension), and reverse motions.*
*Dashed lines indicate force maximus due to power supply limits.*
*Solid lines indicate force maximums due to power supply voltage.*
*Valid forces must meet both voltage and power requirements.*

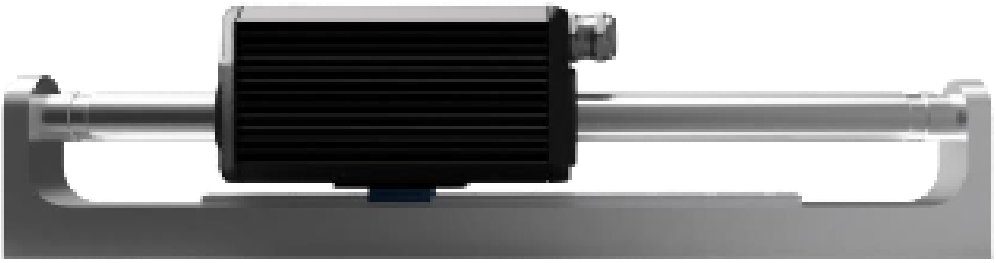
# Mounting Options



## Moving Shaft

In a moving shaft configuration, the stator is fixed, and the shaft actuates the load. Load support may be required to reduce bushing sideloading.

---



## Moving Stator

In moving stator configurations, the shaft is fixed on both ends and the stator moves. Multiple stators can be installed along a single shaft if the application requires it. Moving stators are advantageous for applications with length restrictions.

---

## Clevis/Universal Joint

An optional rear shaft cover allows mounting using ISO 1552 50 mm pneumatic tube attachments, enabling the line of action to move the load. Useful for replacing traditional lead screws or pneumatic actuators. Rear shaft cover is cut to match desired shaft length. Optional rear plates can be modified to facilitate chosen mounting hardware.

---

**Browse Accessories**
Offered by Iris Dynamics Ltd.

**VIEW HERE**

+1 888-995-7050

2-3948 Quadra Street
Victoria, BC Canada V8X 1J6

**Visit the Website:** www.irisdynamics.com
**Be in Touch:** sales@irisdynamics.com

*Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, Iris Dynamics Ltd. does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information Iris Dynamics Ltd. takes no responsibility for the content in this document if provided by an information source outside of Iris Dynamics Ltd. In no event shall Iris Dynamics Ltd. be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption,*
*costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory. Notwithstanding any damages that customer might incur for any reason whatsoever, Iris Dynamics Ltd. aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of Iris Dynamics Ltd.*
*Right to make changes — Iris Dynamics Ltd. reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof. Suitability for use — Iris Dynamics Ltd. products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an Iris Dynamics Ltd. product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Iris Dynamics Ltd. and its suppliers accept no liability for inclusion and/or use of Iris Dynamics Ltd. products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.*
*Applications — Applications that are described herein for any of these products are for illustrative purposes only Iris Dynamics Ltd. makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Customers are responsible for the design and operation of their applications and products using Iris Dynamics Ltd. products, and Iris Dynamics Ltd. accepts no liability for any assistance with applications or customer product design. It is the customer's sole responsibility to determine whether the Iris Dynamics Ltd. product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of the customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products. Iris Dynamics Ltd. does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by the customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Iris Dynamics Ltd. products in order to avoid a default of the applications and the products or of the application or use by the customer's third party customer(s). Iris Dynamics Ltd. does not accept any liability in this respect.*
*Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.*