

USER MANUAL

Air Cooled Spindles

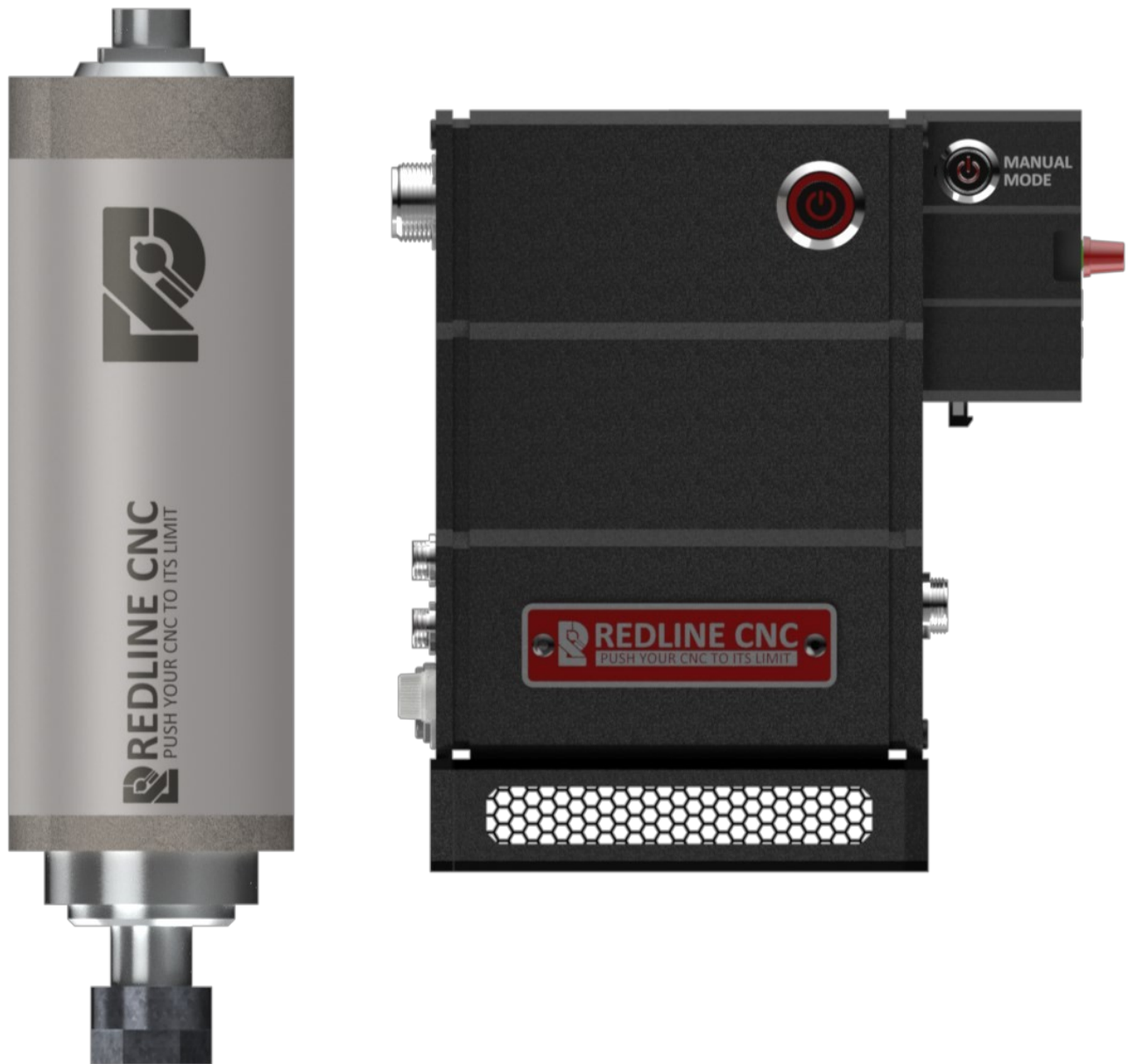


Table of Contents

INTRODUCTION.....	3
SAFETY RULES.....	3
Electrical Safety:.....	4
Personal Safety:.....	4
Use of the Power Tool:.....	5
Care of the Power Tool:.....	7
Additional Safety Instructions.....	7
Personal Protective Equipment:.....	8
SPECIFICATIONS.....	9
FEATURES AND BENEFITS.....	11
COMPONENTS.....	13
Buttons and Connections.....	15
DIGITAL READOUT AND MANUAL SPEED OVER-RIDE.....	18
Spindle Motor and Connections.....	19
INSTALLATION.....	21
Mounting the VFD.....	21
Wiring Instructions.....	26
VFD SETUP.....	36
Digital Readout (DRO) Controls.....	36
Programming Codes (MASSO).....	37
Programming Codes (Buildbotics).....	38
Spindle Break-In Procedure.....	39
Spindle Warm-Up Procedure.....	40
START-UP.....	41
Normal Operation.....	41
START-UP.....	43
Normal Operation.....	43
ADDITIONAL RESOURCES.....	44

INTRODUCTION

REDLINE CNC Spindles are the most advanced Plug and Play Spindle Kits on the market today. Featuring a sleek and stylish patent pending design, compact all metal enclosure, a high quality custom made Spindle with four ceramic bearings standard. In addition, it's the only safety approved Plug and Play Spindle kit on the market today. No other Spindle Kit on the market has the quality, reliability and safety that the REDLINE CNC offers !


SAFETY RULES

These operating instructions explain the Redline CNC Spindle and the correct handling of the CNC system. Please read these operating instructions and accompanying documents in their entirety before commissioning of the system in order to become familiar with the characteristics and the operation of the product. The improper operation of the Redline CNC Spindle system can lead to damage to the product and property and can cause serious injuries, electric shock and / or fire. It is imperative to adhere to the safety instructions listed in these operating instructions at all times. Should you have any questions or concerns prior to initial use of the Redline CNC Spindle or the need for further information, do not hesitate to contact us prior to the commissioning of the Redline CNC Spindle system.


**Safety Instructions and Protective Measures:
(General Safety Warnings for the Use of Power Tools)**

Work Area Safety


NOTICE: Keep work area clean and well lit. Cluttered or dark areas invite accidents.


 **Caution:** Do not operate the power tool in explosive atmospheres, such as in the presence of flammable liquids, gases or dust. Power tools create sparks which may ignite the dust or fumes.

NOTICE: Keep children and bystanders at a distance while operating a power tool. Distractions can cause you to lose control and can result in accidents.


 **Caution:** Operate the spindle only in interior spaces on a solid, horizontal table or workbench.


Electrical Safety:


 **Warning:** Power tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs with grounded power tools. Unmodified plugs and matching outlets will reduce the risk of electric defects and malfunctions.


 **Warning:** Do not expose power tools to moisture. The power tool is only suitable for indoor use. Water entering a laser tool will increase the risk of electric shocks.


Personal Safety:

 **Caution:** Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use a power tool while you are tired and/or under the influence of drugs, alcohol or medication. A moment of inattention while operating a power tool may result in serious personal injury.

 **Caution:** Use personal protective equipment. Always wear eye protection. Protective equipment, such as a suitable dust mask or ear protection, reduces the risk of injuries.

 **Caution:** This tool is controlled by a computer. During operation, it should not be controlled directly. Lack of caution or expertise as well as program errors can lead to unexpected movements.


 **Caution:** Do not touch the insertion tools or motors as they can heat up significantly during operation.


 **Caution:** Never place any parts of the tool or accessories in the mouth as this can lead to serious injuries.


NOTICE: All persons who operate the power tool must have read and fully understood all relevant safety and operating instructions. Misunderstanding may result in personal injury.


NOTICE: Dress properly. Do not wear loose clothing or jewellery. Pin your hair above your shoulders so that it cannot get caught in the Ball Screws and linear guides or moving parts.


Use of the Power Tool:

 **Caution:** Do not alter or misuse the tool. Any alteration or modification is a misuse and may result in serious personal injury.

 **Caution:** Disconnect the plug from the power source before you make any adjustments, change accessories, or store the tool. Such preventative safety measures reduce the risk of starting the power tool accidentally.

 **Caution:** Store idle power tools out of the reach of children and do not allow persons unfamiliar with the tool or these instructions to operate the power tool. Power tools are dangerous in the hands of untrained users.

 **Caution:** Do not touch the bit or collet after use. After usage bit and collet are too hot to be touched with bare hands.

 **Caution:** When using the end mills, V-bits or cutters, always have the workpiece securely clamped. Never attempt to hold the work piece with your hands while using any accessories. These tools can jam easily in the material, and can kickback, causing loss of control resulting in serious injury.



Caution: If the work piece or bit becomes jammed or bogged down, turn the power tool "OFF" by the switch. Wait for all moving parts to stop and unplug the tool, then free the jammed material. If the switch to the tool is left "ON", the tool could restart unexpectedly causing serious personal injury.

NOTICE: Do not allow familiarity gained from frequent use become commonplace. Always remember that a careless fraction of a second is sufficient to inflict severe injury.

NOTICE: Never use dull or damaged insertion tools. Sharp bits must be handled with care. Damaged bits can snap during use. Dull bits require more force to cut the tool, possibly causing the bit to break.

NOTICE: The speed and feed of the bit when carving, routing or cutting is very important. Always observe the recommended speed and feed for the particular bit.

NOTICE: Do not leave a running tool unattended, turn power off. Only when tool comes to a complete stop and is disconnected from the mains it is safe.

NOTICE: Use the power tools, accessories etc. in accordance with these instructions, taking into account the working conditions and the work to be performed. Use of the power tool for operations different from those intended could result in a hazardous situation with high probability of superficial injury.

NOTICE: Do not reach into the area of the rotating insertion tools. The proximity of the rotating tools to your hand may not always be obvious.

Care of the Power Tool:

NOTICE: Maintain the tools. Check for misalignment or binding of moving parts, breakage of parts and any other conditions that may affect the power tool's operation. If damaged, have the power tool repaired before use. Many accidents are caused by poorly maintained power tools.

Additional Safety Instructions



Caution: Depending on the application field of the machine (private or commercial), observe the applicable occupational safety and health, safety and accident prevention and environmental regulations.



Caution: Some dust created by cutting, milling or other construction activities contains chemicals known to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are known to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are: Lead from nonferrous metals with lead content, carbonate from carbon fibre, arsenic and chromium from chemically treated lumber. Your risk from exposures to these varies, depending on how often you perform this type of work. To reduce your exposure to these chemicals, work in a well ventilated area, and work with approved safety equipment, such as dust masks that are specially designed to filter out microscopic particles.

Safely dispose of milling debris — recycle or safely dispose of milling debris and dust, keeping in mind flammability, (potential) spontaneous combustion, and chemical considerations. Even natural materials can have surprising implications for disposing of them, *e.g.*, walnut wood dust is allelopathic (inhibits plant growth) and an irritant to the skin and breathing tract and potentially poisonous to some animals in addition to the typical spontaneous combustion hazard which sawdust poses.

Personal Protective Equipment:

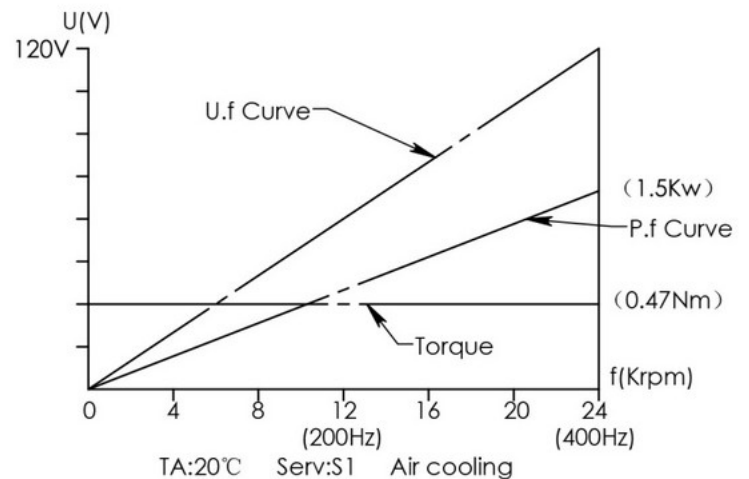
When working with the CNC gantry system, the operator has to wear at least the following personal protective equipment and has to be compliant with the below-mentioned safety aspects:

- **Safety goggles** for protecting the eyes against flying chips etc.
- **Ear protection** for protecting the ears against sound and noise.
- No wearing of **clothes which can get caught in the machine**, such as ties, scarves, wide sleeves etc. Additionally, jewelry and especially long necklaces and rings are to be dispensed with.
- Shoulder length or longer hair is to be secured with a **hairnet or a hat** to prevent it from getting caught in the linear guides and / or rotating tools.
- Prior to all adjustments to the machine, its control or system guided tools, such as the Milling Motor, the plug is to be disconnected from the power source.
- Never hold the workpiece to be processed with your hands. It is mandatory that the work piece is securely fixed on the machine table. Other-wise there exists a high risk of injuries!

SPECIFICATIONS

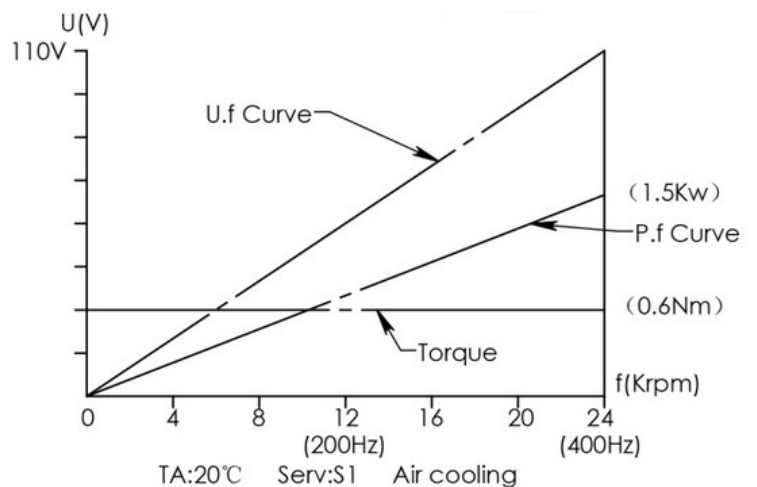
65mm, 1.5kw, Air-Cooled

- Part Number: RL-VFD-1K5-65-Air
- Material: Stainless steel
- Size: $\Phi 65\text{mm} \times 270\text{mm}$
- Power: 1.5KW
- Horsepower: 2hp
- Voltage: 110VAC
- Current: 10A
- Frequency: 0 ~ 400Hz
- Speed: 0 ~ 24000RPM
- Cooling: Air cooled
- Bearing Lubrication: Grease
- Collet size: ER11 Collet
- Shank Sizes: 1/8", 1/4"
- Bearings: Ceramic 2 x 7005, 2 x 7002
- Weight: 2.92kg / 6lbs 7oz



80mm, 1.5kw, Air-Cooled

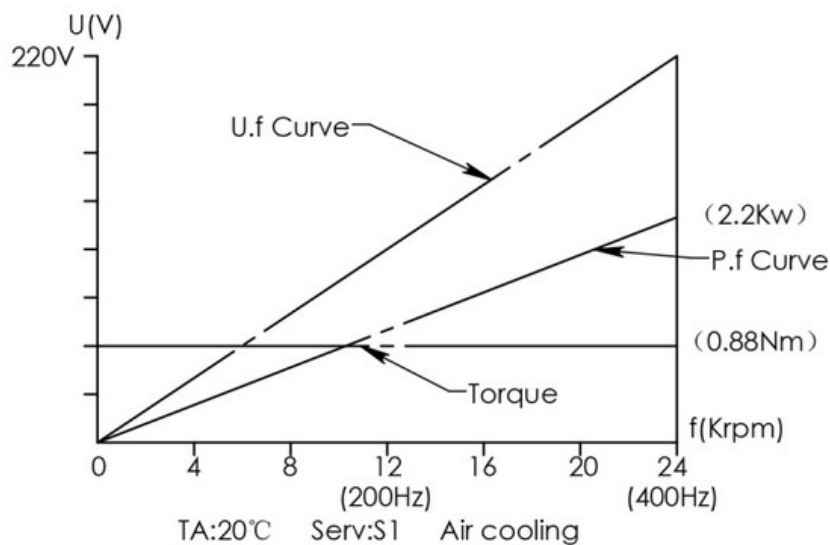
- Part Number: RL-VFD-1K5-80-Air
- Material: Stainless steel
- Size: $\Phi 80 \text{ mm} \times 195 \text{ mm}$
- Power: 1.5KW
- Horsepower: 2hp
- Voltage: 110VAC
- Current: 10A
- Frequency: 0 ~ 400Hz
- Speed: 0 ~ 24000RPM
- Cooling: Air cooled
- Bearing Lubrication: Grease
- Collet size: ER20 Collet
- Shank Sizes: 1/8", 1/4", 3/8", 1/2"
- Bearings: Ceramic 2 x 7005, 2 x 7002



- Weight: 4.05kg / 8lbs 15oz

80mm, 2.2kw, Air-Cooled

- Manufacturer Part Number: RL-VFD-2K2-80-Air
- Material: Stainless steel
- Size: Ø80x195(Middle body diameter: 80mm, Length:195mm)
- Power: 2.2KW
- Horsepower: 3hp
- Voltage: 220 VAC
- Current: 10A
- Frequency: 0 ~ 400Hz
- Speed: 0 ~ 24000RPM
- Cooling: Air cooled
- Runout off: Less than 0.005mm
- Bearing Lubrication: Grease
- Collet size: ER20 (6mm)
- Shank Sizes: 1/8", 1/4", 3/8", 1/2"
- Bearings: Ceramic 2 x 7005, 2 x 7002
- Weight: 4.05kg / 8lbs 15oz



FEATURES AND BENEFITS

EMI Shielding:

- All Metal Aluminum Enclosure preventing Electro Magnetic Interference (EMI) traps electrical noise inside of the enclosure.
- All inputs Control signals use shielded cables and input filters for noise free control.
- Shielded Spindle cable with High Frequency noise filter keeps the VFD noise inside the enclosure.
- AC Line filter to keep noise off the power lines.
- Fully wired and programmed VFD with PWM and RS-485 controls
- Some models wired for coolant / vacuum relay
- Remote or Manual speed setting switch to adjust speed.
- Convenient Remote that attaches to your Control monitor.
- Spindle is full grounded for safety back to the chassis.
- Optional Wall mount or Desktop stand with input dust filter to keep the dust out of you VFD.
- Safe inspected by third party with valid inspection decal.

Ceramic Bearings:

Manufacturers prize ceramic bearings because of their speed advantage over their steel counterparts. This benefit stems from their four main characteristics:

- Reduced rolling resistance
- Reduced weight
- Increased durability
- Increased stiffness
- Reduced rolling resistance mainly results from the ceramic balls' increased smoothness, dimensional stability, and increased uniformity over steel ball bearings.

These properties ensure that applied loads are uni-formly distributed over all rolling elements. Additionally, ceramic materials have a significantly lower coefficient of friction (~20–30 times less) than steel ball bearings with standard seals and lubrication. This reduced friction results in reduced rolling resistance and faster rotational speeds.

The reduced weight of ceramic bearings also contributes to their overall enhanced performance over steel bearings. Ceramic materials can weigh up to 40% less than comparable steel bearings. This reduced weight translates to decreased centrifugal loads exerted on the outer race as the bearing spins.

This reduction of forces allows ceramic bearings to operate up to 20–40% faster than conventional steel bearings while using considerably less energy to maintain their speed. Ceramic bearings are also harder than steel bearings and therefore are more durable. Studies show that ceramic bearings can last anywhere between 5 and 20 times longer. The smoother surface of the ceramics also significantly reduces the risk of bearing seizure with little to no lubrication. Furthermore, ceramic bearings can operate in harsh environments due to their resistance to corrosion and degradation. Finally, their electrical insulation properties eliminate the risk of electrical erosion and pitting of the rolling elements .

PLUG AND PLAY

Say goodbye to time consuming and complex Spindle Kit set-ups. REDLINE CNC Spindle Kits are plug and play with your CNC. We do the work of ensuring all the wiring is done properly and goes through a thorough inspection process, so you don't have to.

THREE MOUNTING OPTIONS

REDLINE CNC Spindle Kits were design with convenience in mind, that's why we offer three (3) different VDF mounting options.

- Wall Mount
- Desk Top
- Under Table Mount

COMPONENTS

Redline CNC Spindle Kit by Redline CNC—65mm, 1.5 kW Air Cooled 110V



- 1x 65mm 1.5kw Air Cooled Spindle
- 1x All Metal 1.5kw 110v VFD with removable display
- 1x power cord
- 1x PWM Data Cable or RS-485 control cable
- 2x remote cable short
- 2x Optional remote cable long
- 1x Spindle to VFD cable 14 gauge flexible shielded 600v wire (8mm)
- 1x ER 11 collet nut
- 1x 1/4" collet
- 1x 1/8" collet
- 2x spindle wrenches
- 1x (choice of mount)

Redline CNC Spindle Kit by Redline CNC—80mm, 1.5 kW Air Cooled 110V

- 1x 80mm 1.5kw Air Cooled Spindle
- 1x All Metal 1.5kw 110v VFD with removable display
- 1x power cord
- 1x PWM Data Cable or RS-485 control cable
- 2x remote cable short
- 2x Optional remote cable long
- 1x Spindle to VFD cable 18 gauge flexible shielded 600v wire (8mm)
- 1x ER 20 collet nut
- 1x 1/2 collet
- 1x 3/8 collet
- 1x 1/4 collet
- 1x 1/8 collet 1x (choice of mount)

Redline CNC Spindle Kit by Redline CNC—80mm 2.2 kW Air Cooled 220V

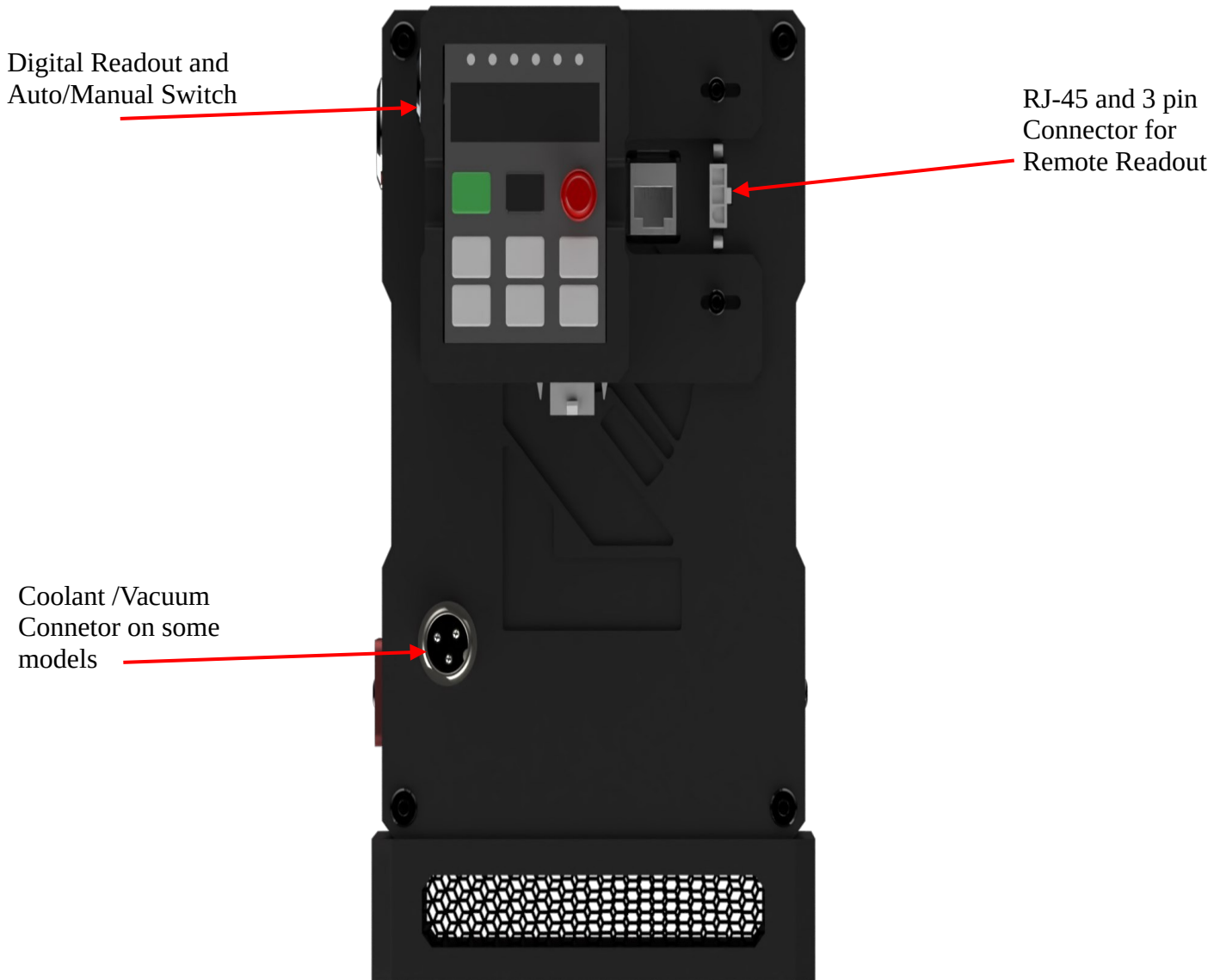
- 1x 80mm 2.2kw Air Cooled Spindle
- 1x All Metal 2.2kw 220v VFD with removable display
- 1x power cord with Nema 6/15-p plug for 220v. The VFD requires a 15amp fuse breaker. It's a 3 wire configuration. Single Phase 220.
- 1x PWM Data Cable or RS-485 control cable
- 2x remote cable short
- 2x Optional remote cable long
- 1x Spindle to VFD cable 18 gauge flexible shielded 600v wire (8mm)
- 1x ER 20 collet nut
- 1x 1/2 collet
- 1x 3/8 collet
- 1x 1/4 collet
- 1x 1/8 collet
- 1x (choice of mount)

Buttons and Connections.

FRONT OF VFD



RIGHT SIDE OF VFD

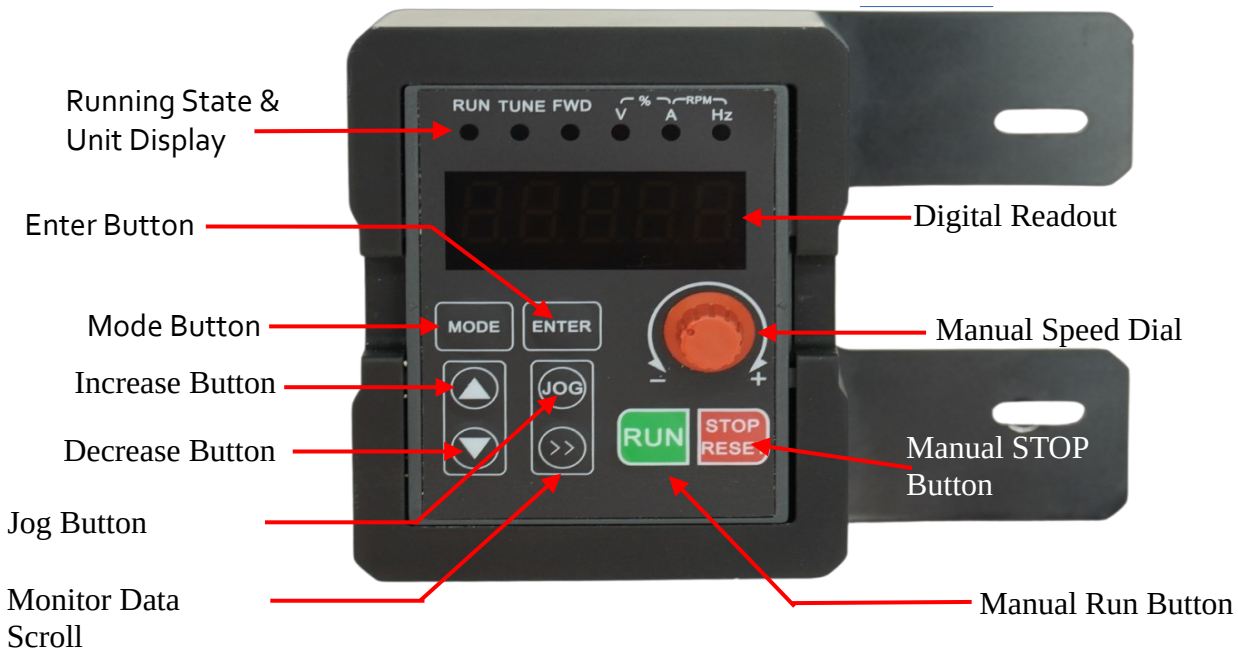


LEFT SIDE OF VFD

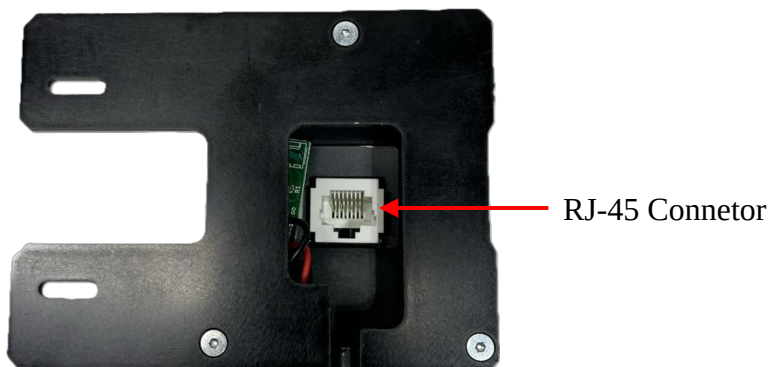


DIGITAL READOUT AND MANUAL SPEED OVER-RIDE

FRONT OF THE DIGITAL READOUT

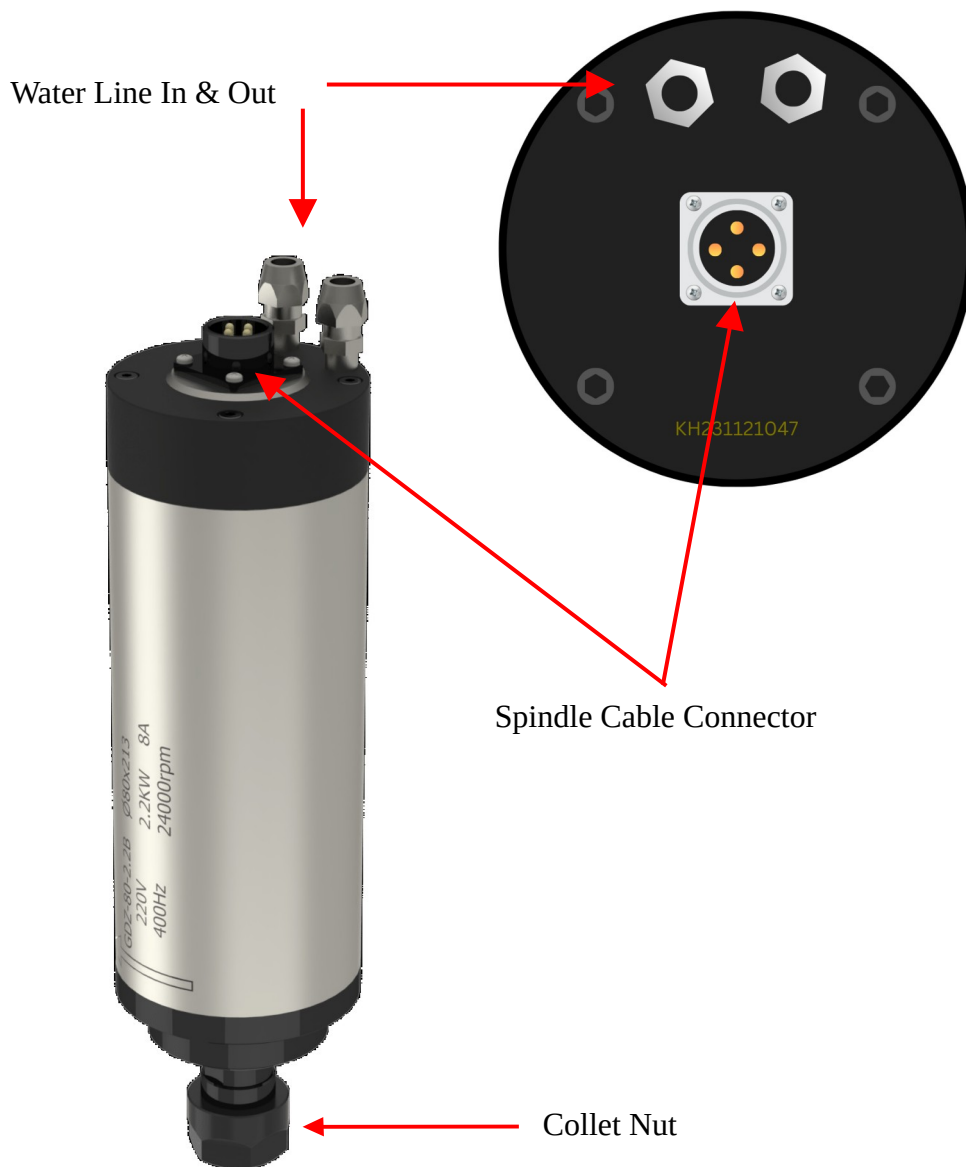


BACK OF THE DIGITAL READOUT



COMPONENTS

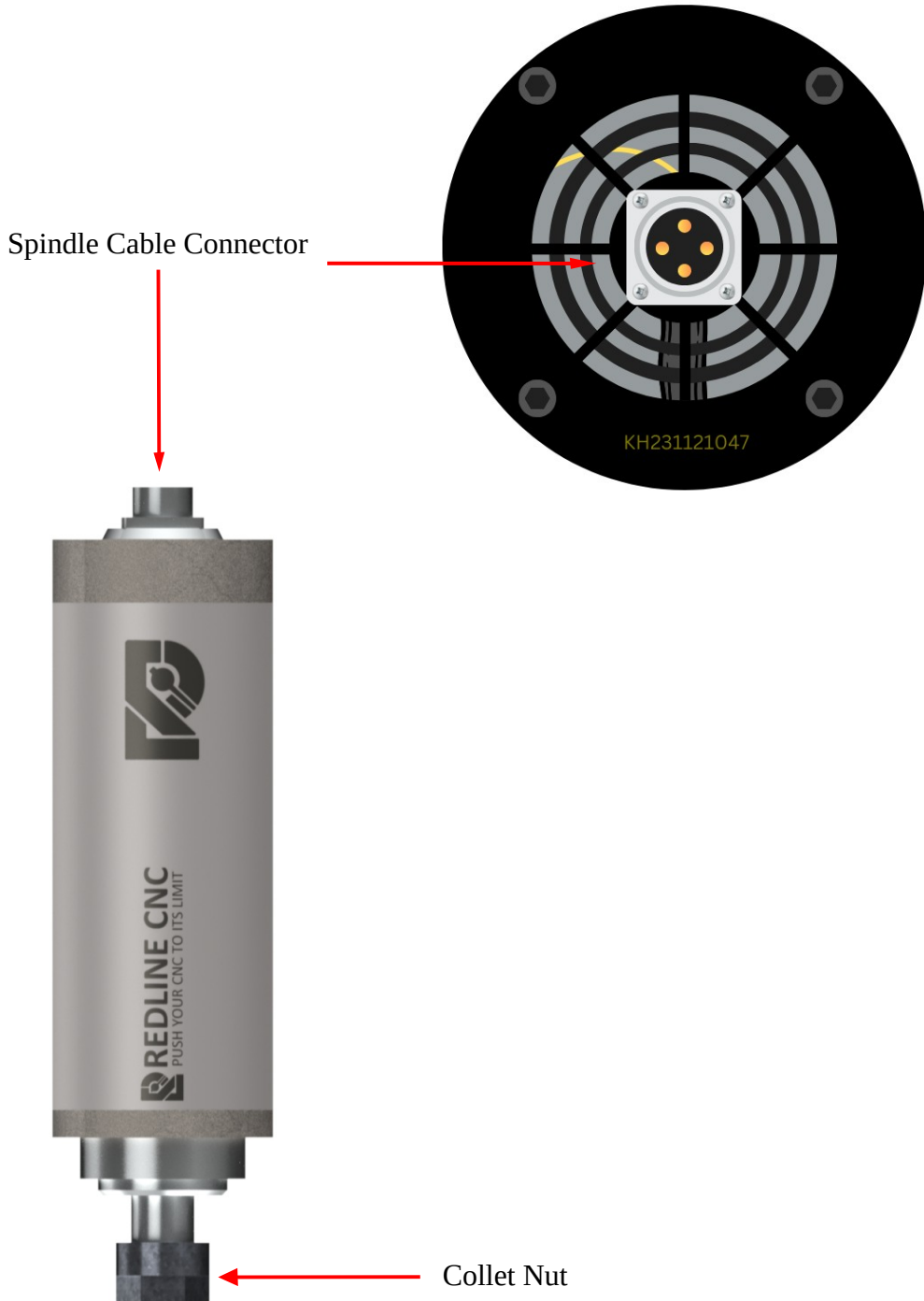
Spindle Motor and Connections Water-Cooled



COMPONENTS

Spindle Motor and Connections

Air-Cooled



INSTALLATION

Mounting the VFD

- Wall Mounting
- Desktop Mounting
- Under Table Mounting

WALL MOUNTING

- Screw VFD Mounting Bracket – Wall French Cleat to the wall in the location you want the VFD. (Screws not provided)
 - Ensure the mount is level
 - Use wall anchors if there is no stud
 - Attach to wall with countersink holes facing away from the wall

VFD Mounting Bracket
Wall French Cleat



- Screw VFD Mounting Bracket – VFD French Cleat to the back of the VFD using the screws provided. (Screws Provided. 2.5mm Hex Head)
 - Attach to the VFD with countersink holes facing away from the VFD

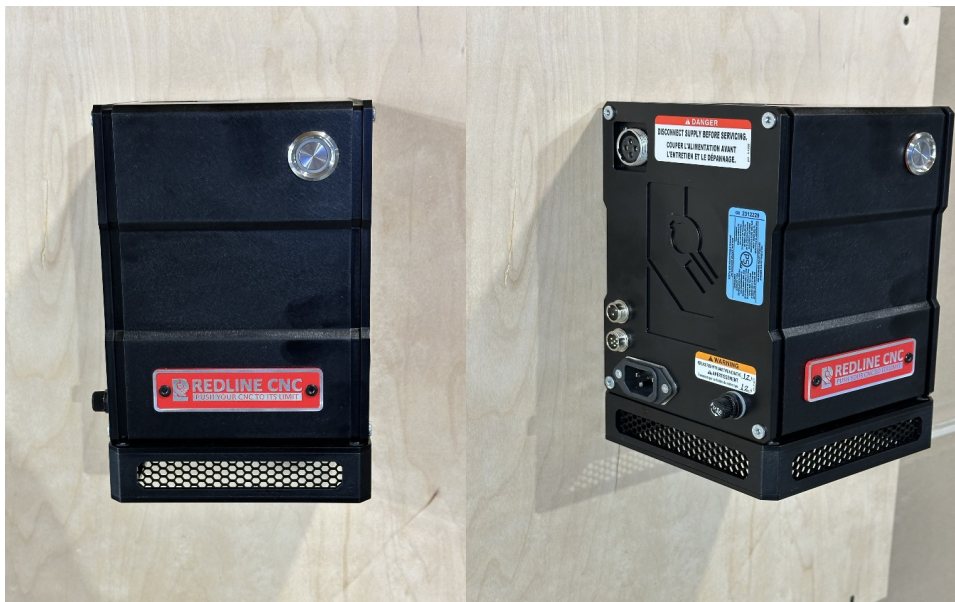
VFD Mounting Bracket
VFD French Cleat



INSTALLATION

Mounting the VFD

- Slide the VFD onto the Wall French Cleat



INSTALLATION

Mounting the VFD

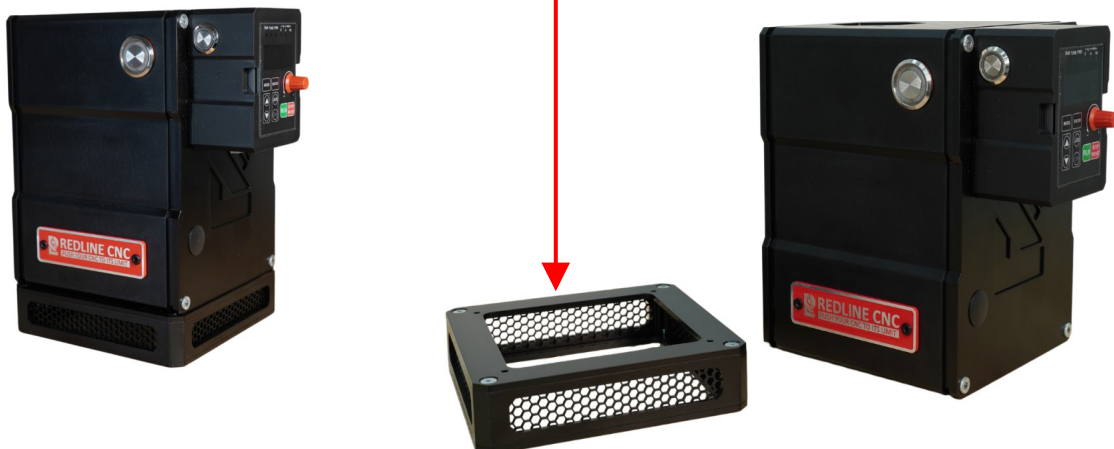
DESKTOP MOUNTING

- Place the VFD upside down
- Place the Desktop Stand centered on top of the upside down VFD lining up the 4 corner screw holes.
- Insert and tighten 4 mounting screws from underneath. (Screws Provided. 2.5mm Hex Head)

Note: If using the Desktop Mounting method, the Desktop Mount **MUST** be used to allow air flow through the bottom of the VFD.



Desktop Mount



INSTALLATION

Mounting the VFD

UNDER TABLE MOUNTING

- Select a location for the VFD under your table.
- Screw the Under Table Mount to the bottom of your table or QCW. (Screws not provided)
- Remove the 2x top corner screws on both sides of the VFD. (3mm Hex Head)



- Attach the 2x VFD Table Mounts to the Left and Right of the VFD with the studs facing inward using the replacement long screws provided. (3mm Hex Head)



INSTALLATION

Mounting the VFD



VFD Table Mounting Brackets

Under Table Mount



INSTALLATION

Wiring Instructions

Wiring The VFD and Spindle to your Machine Spindle Cable Connection



Spindle Cable Connection Points



INSTALLATION

Wiring Instructions

Wiring The VFD and Spindle to your Machine

Spindle Cable Connection



Air-Cooled



Water-Cooled

INSTALLATION

Wiring Instructions

Wiring The VFD and Spindle to your Machine Controller Communications Cable (MASSO/PWM)

MASSO/PWM – CNC Controller End



MASSO/PWM – VFD End



INSTALLATION

Wiring Instructions

Wiring The VFD and Spindle to your Machine Controller Communications Cable (BuildBotics/RS-485)



Buildbotics 25 pin Connector

RJ-485 Connection – VFD End



INSTALLATION

Wiring Instructions

VFD AC Power Connection (110V)



INSTALLATION

Wiring Instructions

VFD AC Power Connection (220V)



NEMA 6-15P

NEMA 6-15R

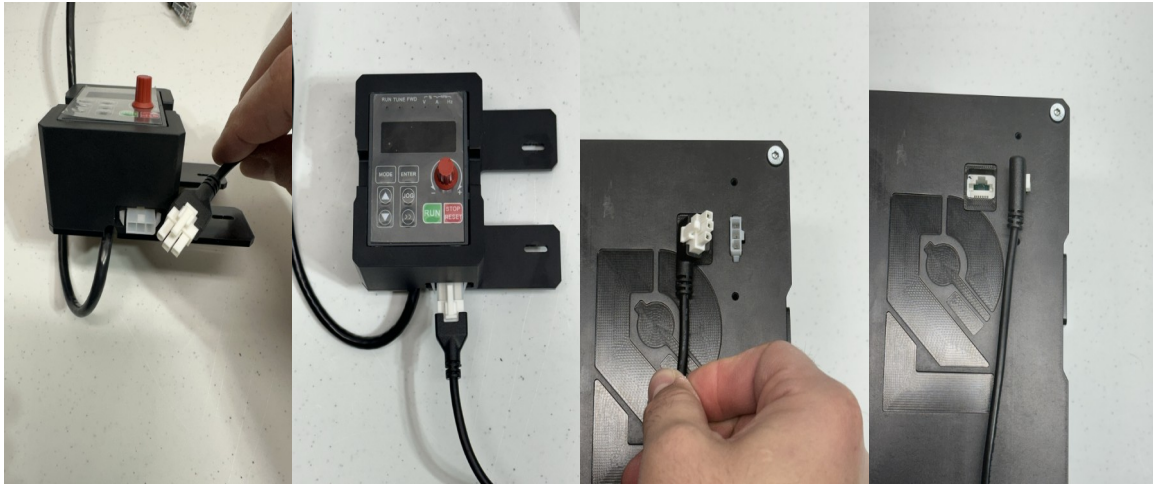
NEMA 6-15R



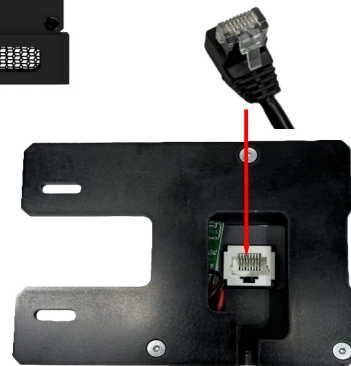
INSTALLATION

Wiring Instructions

Digital Readout (DRO) Connection / Installation (Connected to VFD)



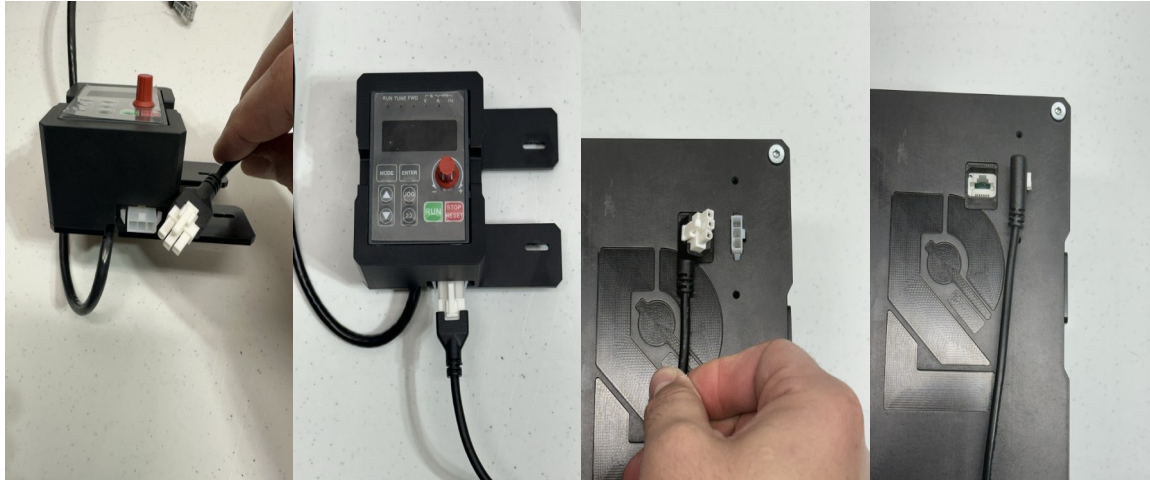
DRO Mounting Screws



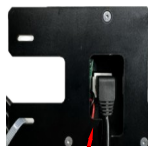
INSTALLATION

Wiring Instructions

Digital Readout (DRO) Connection / Installation (Removed from VFD) RJ-485 Connection



RJ-485 Connection – VFD End



RJ-485 Connection – DRO End



INSTALLATION

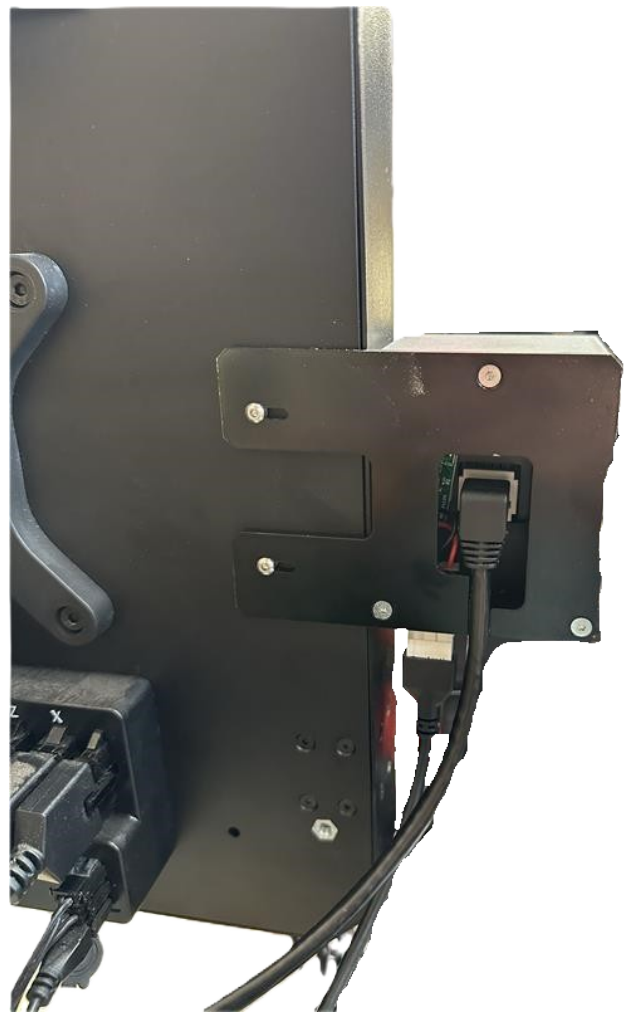
Wiring Instructions

Digital Readout (DRO) Connection / Installation (Removed from VFD) Wall and Table Mounted



INSTALLATION Wiring Instructions

Digital Readout (DRO) Connection / Installation (Removed from VFD)
MASSO Mounted



VFD SETUP

Digital Readout (DRO) Controls

Running State and Unit Display

RUN = When the frequency inverter is at run status, this lamp will be on.

FWD = The indicator lamp will be on at forward operation and will be off at reverse operation.

V = Indicate voltage

A = Indicate current








Hz = Indicate frequency




V-%-A = Indicate percentage

A-RPM-Hz = Indicate rotation speed

Programming Codes

Your VFD has already been programmed change the programming only if you have experience with programming VFDs.

- Press the  **Mode** button
- This brings you to the Function Code Menu
- The flashing number or letter indicates the field currently selected
- Press the  **Increase** or  **Decrease** buttons to scroll through numbers 0-9
- Press the  **Monitor Data Scroll** button to scroll through the different code locations
- Press the  **Enter** button when the correct function code you want to change is displayed
- The number currently showing/flashing is the current setting saved into the VFD
- To change the number press the  **Increase** or  **Decrease buttons** to scroll to the desired number

- If multiple numbers are required, use the  **Monitor Data Scroll** button to scroll through the different code locations
- Press the  **Enter** button when the correct function code you want to change is displayed
- At any time press the  **Mode** button to go back to the previous menu

VFD SETUP

Programming Codes (MASSO)

DEFAULT CODES:

P0.0.03 = 1	.....	ON/OFF AUTOMATIC COURSE
P0.0.04 = 3	.....	FREQUENCY AUTOMATIC SOURCE
P0.0.05 = 50.0	.....	KEYBOARD FREQUENCY REFERENCE
P0.0.06 = 1	.....	REVERSE MOTOR DIRECTION
P0.0.07 = 0320.0	.....	MAX MOTOR FREQUENCY, HZ
P0.0.08 = 0320.0	.....	UPPER MOTOR FREQUENCY, HZ
P0.0.11 = 0006.0	.....	ACCELERATION TIME
P0.0.12 = 0006.0	.....	DECELERATION TIME
P0.0.14 = 0001.5	.....	MOTOR RATED POWER, 1.5KW
P0.0.14 = 0002.2	.....	MOTOR RATED POWER, 2.2KW
P0.0.15 = 0320.0	.....	MOTOR RATED FREQUENCY, HZ
P0.0.17 = 012.00	.....	MOTOR RATED CURRENT, AMPS - 110v
P0.0.17 = 010.00	.....	MOTOR RATED CURRENT, AMPS - 220v
P0.0.18 = 24000	.....	MOTOR RATED ROTATING SPEED. RPM
P0.1.00 = 8	.....	TERMINAL CONTROLLED FREQUENCY SOURCE
P0.1.01 = 2	.....	KEYPAD FREQUENCY SOURCE
P1.0.23 = 2	.....	TEMP BASED FAN CONTROL
P2.0.00 = 1	.....	RUN FWD (DEFAULT)
P2.0.01 = 2	.....	REVERSE
P2.0.02 = 21	.....	ENABLE KEYPAD ON/OFF SOURCE
P2.0.03 = 18	.....	ENABLE KEYPAD FREQUENCY SOURCE
P5.0.02 = H.0801	.....	LED RUNNING DISPLAY
P5.0.15 = 5.9790	.....	DISPLAY COEFFICIENT
P5.0.16 = 0	.....	ADJUST RPM'S DECIMAL PLACE

VFD SETUP

Programming Codes (Buildbotics)

DEFAULT CODES:

P0.0.03 = 2 ON/OFF AUTOMATIC COURSE
 P0.0.04 = 9 FREQUENCY AUTOMATIC SOURCE
 P0.0.05 = 50.0 KEYBOARD FREQUENCY REFERENCE
 P0.0.06 = 1 REVERSE MOTOR DIRECTION
 P0.0.07 = 0320.0 MAX MOTOR FREQUENCY, HZ
 P0.0.08 = 0320.0 UPPER MOTOR FREQUENCY, HZ
 P0.0.11 = 0006.0 ACCELERATION TIME
 P0.0.12 = 0006.0 DECELERATION TIME
 P0.0.14 = 0001.5 MOTOR RATED POWER, 1.5KW
 P0.0.14 = 0002.2 MOTOR RATED POWER, 2.2KW
 P0.0.15 = 0320.0 MOTOR RATED FREQUENCY, HZ
 P0.0.17 = 012.00 MOTOR RATED CURRENT, AMPS - 110v
 P0.0.17 = 010.00 MOTOR RATED CURRENT, AMPS - 220v
 P0.0.18 = 24000 MOTOR RATED ROTATING SPEED. RPM
 P0.1.00 = 8 TERMINAL CONTROLLED FREQUENCY SOURCE
 P0.1.01 = 2 KEYPAD FREQUENCY SOURCE
 P1.0.23 = 2 TEMP BASED FAN CONTROL
 P2.0.00 = 1 RUN FWD (DEFAULT)
 P2.0.01 = 2 REVERSE
 P2.0.02 = 21 ENABLE KEYPAD ON/OFF SOURCE
 P2.0.03 = 18 ENABLE KEYPAD FREQUENCY SOURCE
 P5.0.02 = H.0801 LED RUNNING DISPLAY
 P5.0.15 = 5.9790 DISPLAY COEFFICIENT
 P5.0.16 = 0 ADJUST RPM'S DECIMAL PLACE

START-UP

Spindle Break-In Procedure

The Spindle break-in procedure is pretty simple and straight forward and may need to be done if sitting stagnant for a period of time or if in a colder climate. The purpose of the break-in is to evenly distribute the lubricants and warm it up before being used.

6000 rpm for 20-30 min
9000 rpm for 20-30 min
12000 rpm for 20-30 min
18000 rpm for 20-30 min
24000 rpm for 20-30 min

First jog your spindle to a safe location, preferably without a bit installed before running.

Because we understand the risks of running g-code found on the internet, here it is in raw format with the meaning of each line. Here is the g-code in raw format, and copy this section to notepad, then save it, and change the extension to match that of your controller's format.

```
M3; spindle rotate CW
S6000; speed 6k rpm
g4 p1200000; pause 20 minutes (20x 60000 milliseconds)
S9000; speed 9k rpm
g4 p1200000
S12000; speed 12k rpm
g4 p1200000
S18000; speed 18k rpm
g4 p1200000
S24000; speed 24k rpm
g4 p1200000
M5; spindle stop
```

START-UP

Spindle Warm-Up Procedure

Before starting any carves, you might need to warm up your spindle, especially during cold months. You can adjust the warm-up routine to fit your needs. Similar to the spindle break-in procedure.

6000 rpm for 10 min

12000 rpm for 7 min

18000 rpm for 3 min

Here's the gcode in its raw format.

```
M3; spindle rotate CW
```

```
S6000; speed 6k rpm
```

```
g4 p600000; pause 10 minutes (10x 60,000 milliseconds)
```

```
S12000
```

```
g4 p420000; pause 7 minutes
```

```
S18000
```


```
g4 p180000; pause 3 minutes
```


```
M5; spindle stop
```


START-UP








Normal Operation


Automatic Mode

Power On the VFD by pressing the  **VFD Power** button


- Ensure the VFD is in automatic mode by ensuring the  **Manual Mode** button on the left side of the DRO is **NOT** lit up
- The spindle will now function automatically based on the g-code you set in your CAD (Computer Automated Design) software.

Manual Mode

- Power On the VFD by pressing the  **VFD Power** button
- Ensure the VFD is in manual mode by pressing the  **Manual Mode** button on the left side of the DRO and ensure the light around the Manual Mode button is **lit up Green**
- The spindle is now in Manual Mode.
- Ensure Stop/Reset Mode
 - The numbers should be blinking, indicating that the spindle is in Stop/Reset mode
- Adjust RPMs with Manual Speed Dial
 - Turn the  **Manual Speed Dial** located just below the numbers. This dial is used to control the RPMs.
 - Use the Green  **“Run”** button to start the spindle motor.
 - Use the Red  **“Stop/Reset”** button to stop the spindle motor.
- Conduct a Simple Test
 - Rotate the  **Manual Speed Dial** counterclockwise all the way.
 - Press the Green  **“Run”** button.

- Slowly rotate the  **Manual Speed Dial** clockwise until the dot indicator is pointing straight up (half way position). This position indicates approximately 12,000 RPMs.

Note:

If the displayed numbers do not show approximately 12,000 RPMs, press the  **Monitor Data Scroll** button to cycle through the display until it does.

The VFD operates by sending the frequency in Hz to your motor. Higher Hz results in a faster motor speed.

The motor is programmed to recognize that 200Hz equals 12,000 RPMs, which can be displayed by pressing the  **Monitor Data Scroll** button.

START-UP

Normal Operation

Stop Spindle Motor

- Press the red **“Stop/Reset”** button to stop your spindle motor
- Observe the digital display until it shows 0.0 and is flashing.
- Once the display reads 0.0 and is flashing, you can safely reach towards the bit area.

INSTALLING A CUTTING BIT

- Ensure the Spindle is OFF
- Use the included spindle wrench and collet nut wrench to loosen the collet nut from the spindle
- Ensure you have the correct collet installed for the diameter shank cutting bit you are using and it is pressed so it clicks in place on the collet nut.
- Insert the cutting bit shank end first to the indicator mark the manufacturer has placed on the shaft. If there is no indicator mark:
 - ◆ Insert the bit shank until it reaches the full depth of the collet's gripping area
 - ◆ After fully inserting the bit, pull it back a small amount (usually 1/8 to 1/4 inch) to prevent the bit from being fully seated
 - ◆ This small gap ensures the collet can securely clamp onto the shank without excessive pressure or potential damage
- Use the included spindle wrench and collet nut wrench to tighten the collet nut onto the spindle

Note: A collet nut should be tightened firmly, but not excessively so; good rule of thumb is to tighten if you feel a solid resistance, then add just a little more pressure with your hand, essentially a "firm hand squeeze" without over doing it; over tightening can damage the collet or bit shank.



ADDITIONAL RESOURCES

Delixi VFD Manual:

[Redline uses an EM60 VFD Engine the full Manual is located here](#)