

AoFrio

USER MANUAL

ECR2 Installation & operation

Document no: WT8632_i12

Issue date: August 2024

Copyright © 2024 – AoFrio Ltd. All rights reserved

AoFrio Ltd

P: +64 9 477 4500 **E:** sales@aofrio.com

www.aofrio.com





Table of contents

| | |
|--------------------------|-----|
| Warnings | 3-4 |
| Introduction | 5 |
| Motor mounting | 5-6 |
| Fan installation | 7 |
| Electrical connections | 8 |
| Firmware operation | 8 |
| Operation examples | 9 |
| Troubleshooting | 10 |
| Maintenance and cleaning | 11 |

Warnings

Please read the following warnings to maintain the safe function and continued performance of your Wellington ECR2 motor:

Accuracy of information and disclaimer of warranties

All technical advice furnished, or recommendations made in this document are provided in good faith and are believed to be accurate as at the date of publication. However, your use of this document is at your sole risk.

Neither AoFrio nor its related bodies corporate nor its or their directors officers and employees (together "AoFrio") make any warranty, expressed or implied, in relation to the reliability, accuracy or completeness of any information in this document or as to any results to be obtained. The buyer assumes all responsibility for loss or damage resulting from the use this document or the handling or use of any of the products.

AoFrio's products are supplied under the terms and conditions contained in the General Conditions of Sale which can be viewed at www.aofrio.com.

General Safety

- Only install or maintain electric motors and fans if you are suitably qualified and trained.
- Wear suitable safety clothing and use appropriate equipment to avoid injury.
- Inspect the motor, housing, and other mechanical parts such as cables and connections for damage and defects before installing. Do not install the motor if it is damaged or if it has been dropped.
- Check electrical cables and connections for damage at regular intervals. Remove defective motors.
- Do not install cables in a way that will allow them to come into contact with a fan.
- As the motor does not contain any serviceable parts, please return, or responsibly dispose of, damaged or malfunctioning motors.
- After a fan has been attached to the motor, take care to avoid injury from spinning fan blades. Avoid wearing loose clothing and jewellery and use a hair net.
- Do not work on the machine while the fan is still spinning.
- Install a suitable guard over the fan to avoid accidental contact with spinning fan blades.
- As the motor can start automatically and unexpectedly when power is applied, do not assume that a non-rotating motor is not powered. Always check that power is disconnected before you work on the motor or fan.
- After a period of operation, some motor surfaces may be hot. Ensure there is protection from accidental contact to avoid burn injuries.

Wires and cords

Ensure all wires and cords are routed and supported to reduce the risk of damage from:


- Sharp edges
- Surfaces and parts that operate at temperatures higher than the wire insulation's specified range
- Moving parts
- Motors, motor compressors, refrigerant lines, and similar parts that are likely to vibrate
- Clamps without smooth, rounded surfaces
- Metal parts contacting single insulated wiring

Transport and Handling

- Storage – Store motors in clean, dry conditions.
- Motor handling – Take care to protect motors from damage caused by impact or dropping during transport.
- Disposal – Follow the regulations for disposal of electrical equipment in the country of use.

Warnings – continued

Zone 2 Flammable Gas Environments

- If you are installing a motor in a Zone 2 Flammable Gas Environment, check that it is suitably certified. Only motors carrying the  mark are certified for use in zone 2 flammable gas environments.
- Check that all electrical connections to the motor and electrical cable conform to the ATEX Directive 2014/34/EU and IEC 60079-0.
- Enclose any fan attached to the motor with fan hood, or enclosure, to provide IP20 on the air inlet side and IP10 at the air outlet side.
- Check the clearances between the fan and its hood or walls of the enclosure are at least 1/100 of the maximum diameter of the fan, or 2mm (whichever is greater). Clearances must not exceed 5 mm.
- If the installed fan is made of light alloy, the content of Mg and Ti must be less than 7.5%.
- Check that the fan complies with EN 14986, EN 13463-1, EN 13463-5 (or EN 80079-36, EN 80079-37) for the EU market. Installation must comply with IEC 60079-0 and IEC 60079-15.

Proper use

The ECR motor range is designed to be used exclusively as fan motors in commercial refrigeration applications. This means:

- Motors must be properly matched to the required fan load. See AoFrio's product range for performance data.
- The rated load of the motor shall not be exceeded.
- Motors must only be used in environments that are within the specified permitted temperature limits.
- Motors must only be used within the limits of their respective IP ratings.
- Motors shall not be used in situations where they will be partially or wholly submerged in water.
- In order to maintain the motor IP rating (IP67) the motor connectors should be IP67 rated or the connectors appropriately located or protected so that they are not subject to moisture or humidity.
- ECR2 should not be used in conjunction with transformer type voltage stabilizers with maximum boost ratio of 1.4 or higher in 230 Volt applications.

Cleaning

- **WARNING** – Electrical shock or burn hazard. Unplug the unit or turn off the power supply before proceeding.
- **DO NOT** clean motor with a pressure washer or hose.

Installation

The following general requirements must be met for any installation of the motor:

- Install the motor in such a way as to protect it from any impact sources.
- Do not remove or loosen the nuts for the 'through bolts' as this can damage the seal between the motor housings. Use additional spring washers and nuts to fasten the motor to its mounting.
- Secure cables and wiring to avoid contact with moving parts and fan blades.
- Install cables in a way that does not put excessive strain on the cable gland.
- Mount motors in an orientation that allows cable entry from underneath or below the motor. If cable orientation is from the side of the motor, you should apply a downward bend to the cable as close to the cable gland as possible to avoid water tracking into the motor. Cable entry from above is not recommended.

Introduction

AoFrio's Wellington ECR2 motor is a drop-in replacement for shaded pole Q-frame and unit bearing motors used in commercial refrigeration.

Motor mounting

Motors can be mounted either as Basket or ring, Bracket, or Rear.

Basket or Ring Mounting

Secure the motor to the fan basket with four flanged nuts, or nuts and spring washers, with a required torque setting of 1.0 - 1.5Nm.

Figure 1 (below) shows the correct installation of the motor into a fan basket or ring mount.

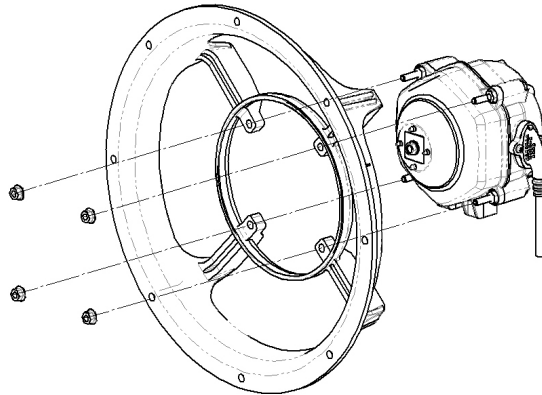


Figure 1

Bracket Mount

Secure the motor to the bracket with two screws which are part of the Foot Mount Kit. Then insert the rectangular washers and screws into the foot mount feature on the housing (see Figure 2) making sure that you push the screws all the way to the end of the groove.

Figure 3 shows the correct assembly of the motor to a foot mount bracket. The required torque setting for the two hex nuts is 2.0 – 2.2Nm.

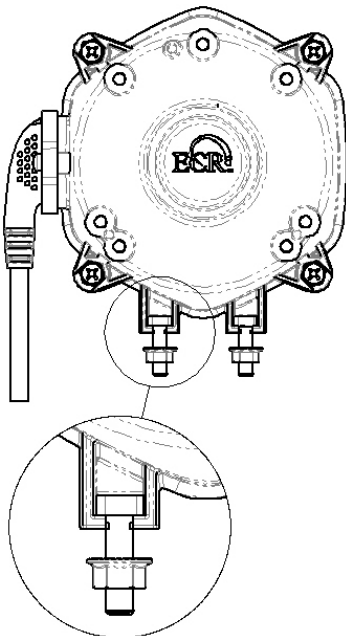


Figure 2. – Foot Mount Kit Insertion

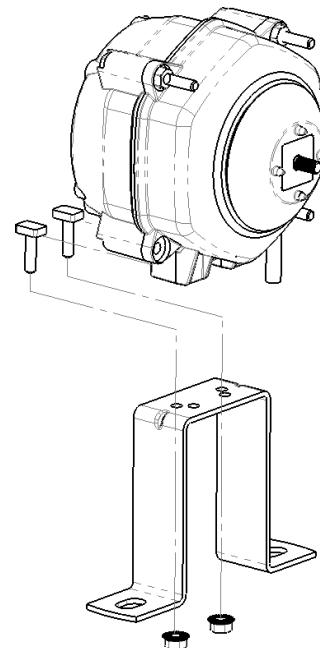


Figure 3. – Bracket assembly

Motor mounting - continued

Rear Mount

NOTE: You should only use AoFrio supplied screws for this mounting option.

To rear mount a motor to a bulkhead or a sheet metal bracket, secure them with either 3 or 4 Plastite screws.

As shown in Figure 4, below, screws may not have a penetration of more than 12mm. The required torque setting for the rear mount screws is 2.5-3.0Nm.

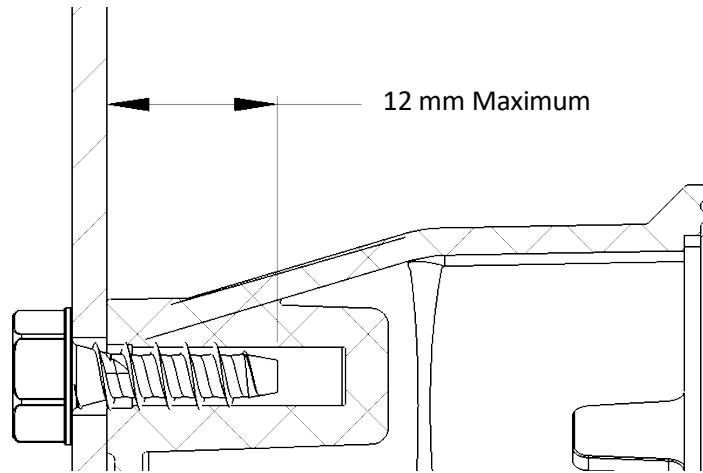


Figure 4. – Rear Mounting Screw

Fan installation

NOTE: You should only use AoFrio supplied washers, screws and nuts for installation of the axial impeller.

Use a flat washer, or conical washer, between the fan and the serrated flange screw when assembling to an internal thread shaft.

In the same way, use a flat or conical washer between the impeller and nut when assembling to the external thread shaft.

Figures 5a and 5b show the correct assembly of a fan to the motor.

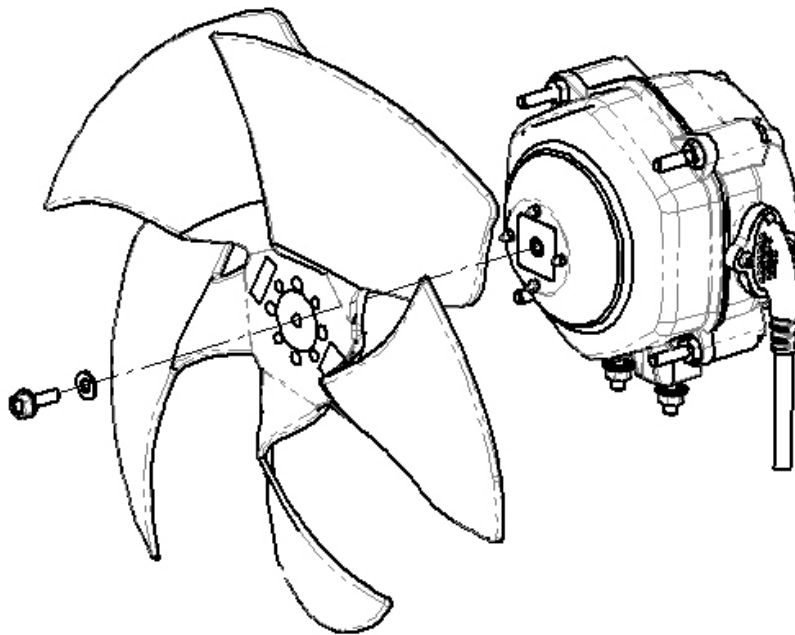


Figure 5a. – Fan Assembly (Internal thread shaft) Torque Setting: 1.5 – 1.7N.m

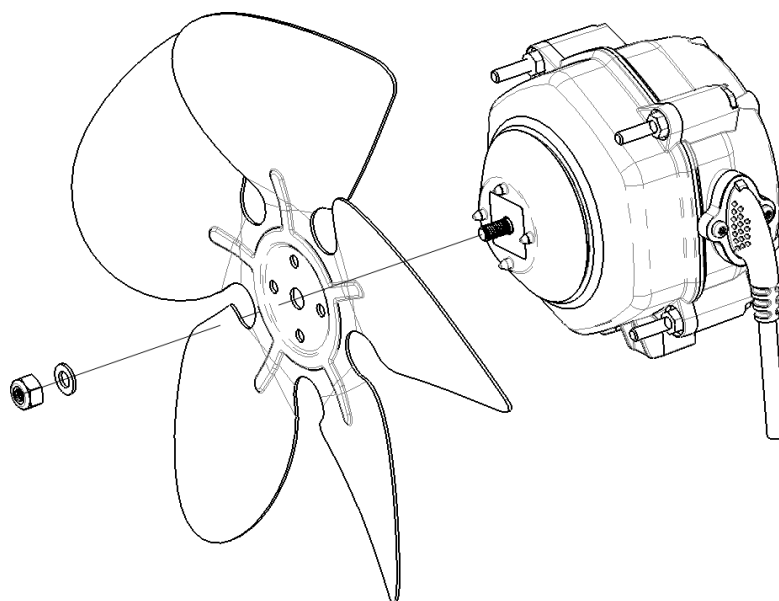


Figure 5b – Fan Assembly (external thread shaft) Torque Setting: 3.0 – 3.2N.m

Electrical connections

Check that the motor forms a safe and complete electrical circuit.

- **Conductors** - Connect as follows:
 - **Brown** - Phase (Live)
 - **Blue** - Neutral
 - **Black** – (Optional) Used for speed and direction control
- In order to maintain the motor IP rating (IP67) the motor connectors should be IP67 rated or the connectors appropriately located or protected so that they are not subject to moisture or humidity.
- The supply cord and its connector are specific to the end product installation and needs to be reviewed and addressed as part of the end product assessment.
- If the motor is being used in a potentially explosive environment, electrical connections must be made and protected in accordance with relevant ATEX/IECEX standards (see section 1.2 Safety in Zone 2 Flammable Gas Environments)
- The black wire should be treated as a Live part. Ensure that appropriate electrical separation is maintained.

Firmware operation

NOTE: Refer to respective connection diagram and product labels on motors for Direction of Rotation and Mode of Operation.

You can control speed and direction for motors with three core cables while they are running. The direction of rotation, clockwise (CW) or counterclockwise (CCW) relates to the shaft end of the motor. Set up three-wire connections as follows:

- **Black control wire connected to neutral or left unconnected** to operate as pre-configured Speed 1
- **Black control wire connected to phase (live)** to operate as per pre-configured Speed 2
- **Motor connection to a switched output using AoFrio's custom communications protocol** to vary the speed in real-time.

Alternative configurations are also possible with different, pre-programmed firmware, the most common being:

- Continuous CCW and CW operation
- Timed Speed 1
- Continuous Speed 2

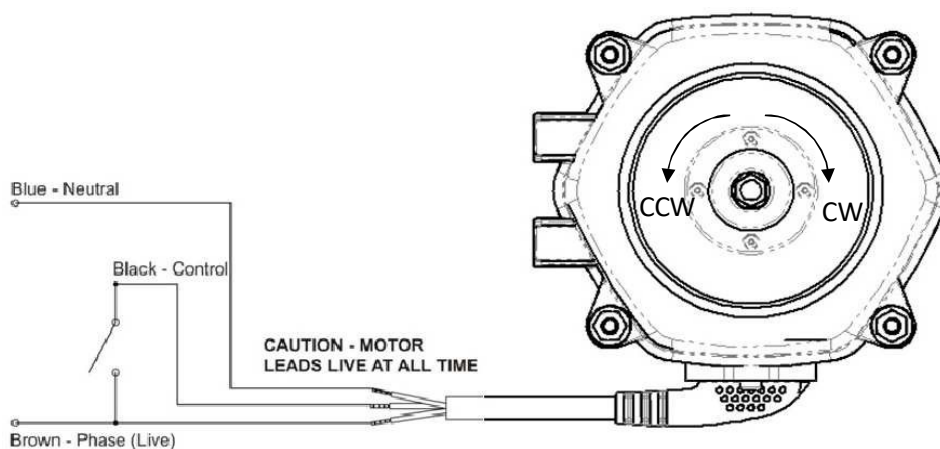


Figure 6. – Electrical Connection for Direction Control

Motors with only two core cables can be configured to run a second speed and direction for a pre-determined time on power-up, before reverting to their primary speed and direction. This is referred to as “Timed Speed 2 on Start”.

Operation examples

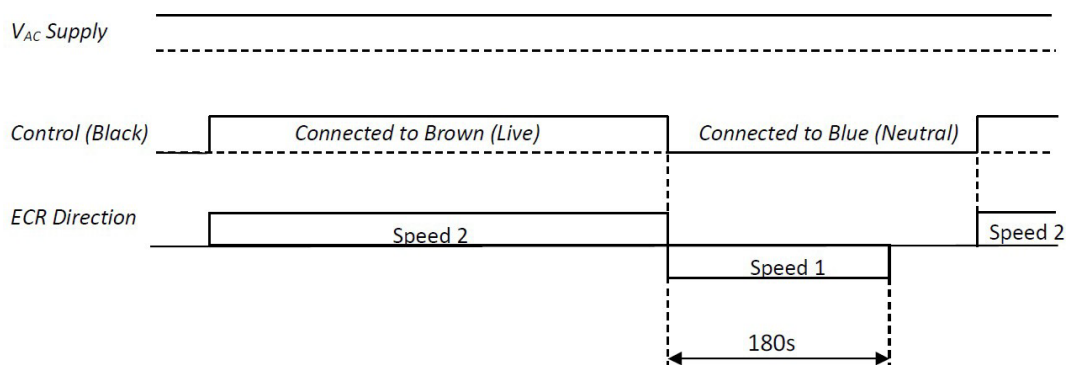
Timed Speed 1

If the motor is configured with “Timed Speed 1”, the motor will behave in the following way when powered:

- **Black connected to Phase (Live)** – The motor spins continuously as per Speed 2 setting
- **Black connected to Neutral** – The motor spins as per Speed 1 for 180 seconds, then stops

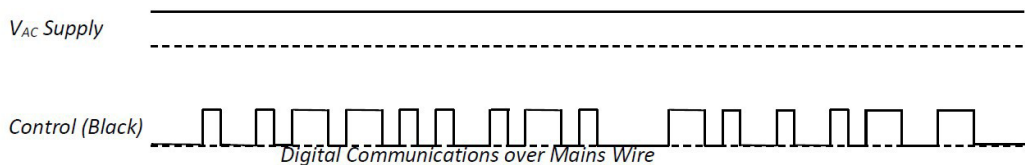
If the power is turned off and on again, the timer is restarted, and the motor will operate in the Speed 1 direction for 180 seconds before stopping. The motor will spin continuously in the Speed 2 direction, if the black wire is reconnected to Phase (Live).

This is commonly used to reverse a condenser motor for 180 seconds when the compressor is turned off (motor permanently powered, with the black wire connected to the compressor supply for control).



Variable Speed

If a recognised digital communications signal is applied to the black wire, the motor will rotate at the speed and direction as defined by the digital signal. This includes the full range of speeds, both directions, and stationary.

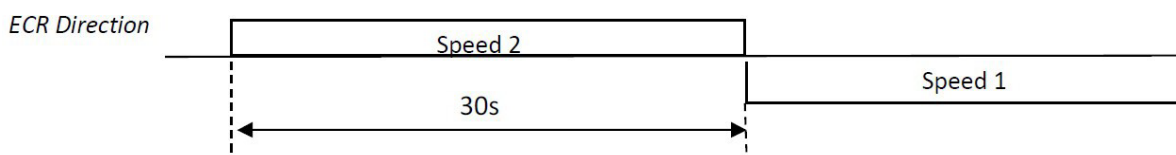


Timed Speed 2 on Start

Motors with only two wires can be configured with “Timed Speed 2 on Start”, the motor will behave in the following way when powered:

- **Power up** – The motor spins for 30secs as per Speed 2 setting
- **After time-out** - The motor runs continuously as per the Speed 1 setting

If at any point in the cycle the power is turned off and on again, it will restart as per the Power-up state. This can be used to reverse a condenser motor when the compressor is turned on.



Troubleshooting

| Issue | Possible Cause | Action |
|--|--|--|
| Motor pauses in the first few seconds of starting | <p>This is normal behaviour for this type of motor and is not a fault condition.</p> <p>Depending on load and desired speed, it may take up to 30secs for the motor to reach full speed.</p> | None. |
| Motor does not turn | No mains power. | Check the mains power supply is connected and switched on. |
| | Faulty connection. | Check power cable connection for damage and faults. |
| | Reverse function timed out. | Allow motor to reset to CCW mode. |
| | Thermal protection activated. | Allow motor to cool down and thermal protection to reset. |
| Motor fails to start after multiple attempts or stops and starts often. | Fan diameter or pitch too large. | Reduce load on motor. |
| Motor runs at slower speed than configured. | Fan diameter or pitch too large. Motor will exhibit torque limiting behaviour as an electrical and thermal protection measure if overloaded. | Reduce load on motor. |
| Motor runs in wrong or opposite direction | Black control wire not connected properly. | Check the connection of the black control wire connection. |

Maintenance and cleaning

We recommend that you set up a regular maintenance schedule for your cooler as follows. At least every six months, check that:

- Cables are not showing breakage or wear
- Fan is not loose or damaged
- Fan guard is still in place
- Motor is still securely mounted.

Motor Maintenance

- The motor does not contain any user serviceable parts and cannot be repaired.
- The motor bearings are selected for the rated duty of the motor and are expected to last for the life of the motor.
- If the motor no longer functions properly, follow the regulations for disposal of electrical equipment in the country where it is being used.

Cleaning

- When cleaning the motor and fan, we recommend using a soft cloth and non-abrasive cleaning fluid to remove dirt, dust, and other matter from the exterior. Avoid using sharp objects and alkali, acid, and solvent-based fluids that may damage the device.
- Never open the device to clean inside.
- Never clean using high-pressure water blasting or jetting as this can damage sensitive components.

Service / Technical Support

For servicing or technical support, please contact your local AoFrio Sales Office or find your nearest contact by visiting www.aofrio.com.

ECR2 user manual - Installation & operation

www.aofrio.com

WT8632_i12 Issue date: August 2024

