

## Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.



The speed control for fans provides a closed loop variable frequency drive (VFD) control based on a sensor input. The VFD is preprogrammed for the motor, incoming power and available with various sensors. Customer supplied sensors may be used. The speed control is ideal for locations where a simple closed-loop control is required.

VFD and Control Packages Availability				
Fan Model	Remote Dial	Constant Airflow	Constant Pressure	By Others
AX	■		■	■
FJC	■		■	■
FJI	■	■	■	■
QEI	■	■	■	■
QEID	■	■	■	■
TAUB	■		■	■
TAUD	■		■	■
TBI	■		■	■
TCB	■		■	■
TDI	■		■	■
VAB/S	■		■	■
VAD/S	■		■	■

### DANGER

Always disconnect, lock and tag power source before installing or servicing. Failure to disconnect power source can result in fire, shock or serious injury.

### CAUTION

When servicing the fan, motor may be hot enough to cause pain or injury. Allow motor to cool before servicing.

### CAUTION

Precaution should be taken in explosive atmospheres.

### DANGER

Pour écarter les risques d'incendie, de choc électrique ou de blessure grave, veiller à toujours débrancher, verrouiller et étiqueter la source de courant avant l'installation ou l'entretien.

### ATTENTION

Lors de toute intervention sur la soufflante, le moteur peut être suffisamment chaud pour provoquer une douleur voire une blessure. Laisser le moteur refroidir avant toute maintenance.

### ATTENTION

Faire preuve de précaution dans les atmosphères explosives.

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## General Safety Information

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Only qualified personnel should install this unit. Personnel should have a clear understanding of these instructions, the VFD manufacturer instructions, and be aware of general safety precautions. Improper installation can result in electric shock, possible injury from contact with moving parts, as well as other potential hazards. Other considerations may be required if high winds or seismic activity is present. If more information is needed, contact a licensed professional engineer before moving forward.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electric Code (CEC) in Canada.
2. Do not allow the power cable to kink or come in contact with oil, grease, hot surfaces or chemicals. Replace cord immediately if damaged.
3. Verify that the power source is compatible with the equipment.
4. For liquid tight applications, use appropriate sized liquid tight conduit.

### Receiving

Upon receiving the product, check to ensure all items are accounted for by referencing the delivery receipt or packing list. Inspect each crate or carton for shipping damage before accepting delivery. Alert the carrier of any damage detected. The customer will make a notation of damage (or shortage of items) on the delivery receipt and all copies of the bill of lading which is countersigned by the delivering carrier. If damaged, immediately contact your local representative. Any physical damage to the unit after acceptance is not the responsibility of manufacturer.

### Unpacking

Verify that all required parts and the correct quantity of each item have been received. If any items are missing, report shortages to your local representative to arrange for obtaining missing parts. Sometimes it is not possible that all items for the unit be shipped together due to availability of transportation and truck space. Confirmation of shipment(s) must be limited to only items on the bill of lading.

### Handling

Handle in such a manner as to keep from scratching or chipping the coating. Damaged finish may reduce the ability of the fan to resist corrosion.

### Storage

Units are protected against damage during shipment. If the unit cannot be installed and operated immediately, precautions need to be taken to prevent deterioration of the unit during storage. The user assumes responsibility of the fan and accessories while in storage. The manufacturer will not be responsible for damage during storage. These suggestions are provided solely as a convenience to the user.

The ideal environment for the storage of units and accessories is indoors, above grade, in a low humidity atmosphere which is sealed to prevent the entry of blowing dust, rain or snow. Temperatures should be evenly maintained between 30° to 110°F (-1° to 43°C), as wide temperature swings may cause condensation and “sweating” of metal parts. All accessories must be stored indoors in a clean, dry atmosphere.

Remove any accumulations of dirt, water, ice, or snow and wipe dry before moving to indoor storage. To avoid “sweating” of metal parts, allow cold parts to reach room temperature. Use a portable electric heater to dry parts and remove moisture build up. Leave coverings loose to permit air circulation and to allow for periodic inspection.

The unit should be stored at least 3-1/2 inches (89 mm) off the floor on wooden blocks covered with moisture proof paper or polyethylene sheathing. Aisles between parts and along all walls should be provided to permit air circulation and space for inspection.

### Inspection and Maintenance During Storage

While in storage, inspect equipment once per month. Keep record of inspection and maintenance performed.

Clean if moisture or dirt accumulations are found on parts; then source should be located and eliminated.

### Removing from Storage

As units are removed from storage to be installed in the final location, the units should be protected and maintained in a similar fashion until the equipment goes into operation.

Prior to assembly and installation of the unit and system components, inspect the assembly to make sure it is in working order. Check all fasteners and accessories for tightness.

## Variable Frequency Drive (VFD)

The VFD supplied is preprogrammed based on the optional sensor input, motor supplied on the fan and incoming power. The VFD supplies power to and accepts the control signal from the optional sensor to control fan speed. The VFD is housed in a NEMA-3R rated enclosure suitable to be mounted indoors or outdoors.

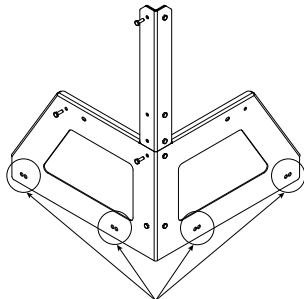
The VFD is not supplied with communication outputs to building management or other control systems.

### VFD Mounting Using Optional Corner Brackets (FumeJet Only)

#### NOTE

The optional VFD roof curb corner mounting bracket can be mounted on any corner of the roof curb and VFD can be mounted on side B or C of the bracket.

1. Using holes A (See Figure 1) mount the VFD roof curb corner mounting bracket on the appropriate corner of the roof curb with field supplied fasteners.



Roof curb mounting holes (A)

Figure 1

2. The VFD mounting bracket has a telescoping corner support that may need to be adjusted to fit the VFD being used. Measure the distance between the top and bottom mounting holes of the VFD being mounted and adjust the support accordingly.
3. Using the supplied hardware, mount the VFD to the three point mounting bracket using holes B or C (See Figure 2).

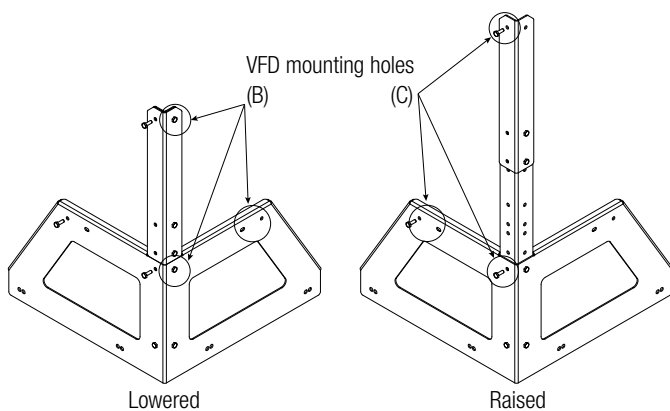


Figure 2

4. Install weathershield if mounted outdoors.

### Field Mounting

- The mounting hole pattern can be found in the Danfoss manual supplied with the VFD.
- Place the VFD as near to the motor as possible, keeping the motor cables as short as possible. Maximum motor cable length to be less than 100 ft. (30.5 m).
- Mount the VFD vertically to a solid structure; always use the provided sheet metal backing plate.
- A minimum clearance of 9 in. (228.6 mm) above and below, 3 in. (76.2 mm) on each side is required.
- If mounted outdoors, installation of the weathershield is required.

Mounting VFD weathershield:

- Weathershield attaches to the top of the VFD using M6x1 fasteners (supplied).

### VFD Weathershield Mounting

The weathershield is only required if the VFD is mounted outdoors.

1. Slide the bracket between the VFD mounting surface and the back of the VFD (See Figure 3).
2. Tighten the upper mounting bolts to secure the bracket and VFD.

#### NOTE

If the optional three-point mounting bracket is being used, a nut and bolt will be required to secure the weathershield bracket to the VFD on the unsupported corner.

3. Slide the shield onto the bracket (See Figure 4).
4. Fasten the shield to the bracket with supplied screws.

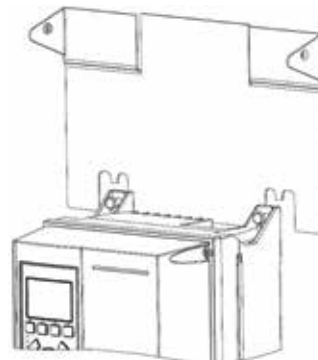


Figure 3



Figure 4

## Electrical Installation

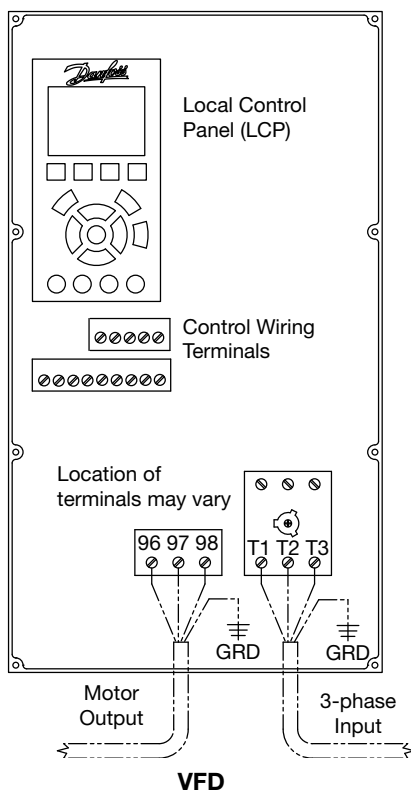
- All wiring is by others.
- Use a dedicated ground wire for input power, motor power and control wiring. Do not ground one VFD to another in a “daisy chain” fashion.
- Keep the grounding wire connections as short as possible.
- Improper grounding may cause premature motor failure.
- The VFD has an integrated fuse and disconnect.
- For liquid tight applications, use appropriate size liquid tight conduit.
- For replacement fuses, refer to included Danfoss Installation and Operation Manual (IOM).
- This manual focuses on the control setup from Greenheck. For more information on the VFD, programming options, or BACnet integration please refer to the Danfoss website for current FC-102 manuals.

### IMPORTANT

Always disconnect power before working on or near a unit. Lock and tag the disconnect switch and/or breaker to prevent accidental power up.

## Power Wiring Procedure

1. Remove the eight fasteners on the cover of the VFD using T20 Torx® or flat head screwdriver. An extension may be needed to reach the fasteners. Remove the cover.
2. Connect incoming 3-phase AC input power to terminals T1, T2 and T3 on the master disconnect.
3. Connect ground cable to the nearest grounding terminal located on the body of the enclosure.



4. Connect the 3-phase motor wiring to terminals 96 (U), 97 (V) and 98 (W).
5. Connect ground wire to the nearest grounding terminal located on the body of the enclosure.
6. Use a cable clamp to relieve pressure from connections.
7. Sensor wires will connect on terminal blocks below control pad. Control wires may need to be connected before reinstalling cover.
8. Replace VFD cover reusing fasteners.

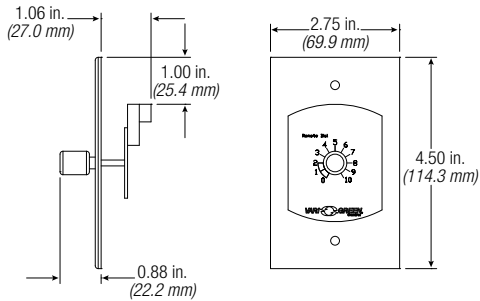
## Remote Dial Control

The VFD supplied is preprogrammed based on the optional sensor input, motor supplied on the fan, and incoming power. The VFD supplies power to and accepts the control signal from the optional sensor to control fan speed. The VFD is housed in a NEMA-3R rated enclosure suitable to be mounted indoors or outdoors.

The VFD is not supplied with communication outputs to building management or other control systems.

### Kit Includes:

- NEMA-3R VFD including integral fuse and disconnect, with weathershield
- Remote dial with wall plate



Remote Dial Control

### Remote Dial Mounting

- Remote dial control is for indoor use only.
- Locate the remote dial control within 100 ft. (30.5 m) of the VFD.
- The remote dial control may be mounted in a standard 2x4 in. electrical junction box.

### Control Wire Installation

#### IMPORTANT

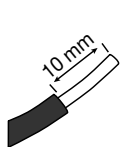
Always disconnect power before working on or near a unit. Lock and tag the disconnect switch and/or breaker to prevent accidental power up.

#### NOTE

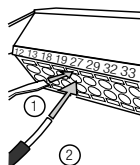
When servicing the unit, VFD may be hot enough to cause pain or injury. Allow VFD to cool before servicing.

Keep control wires as short as possible [100 ft. (30.5 m) or less] and separate from high power cables to minimize interference.

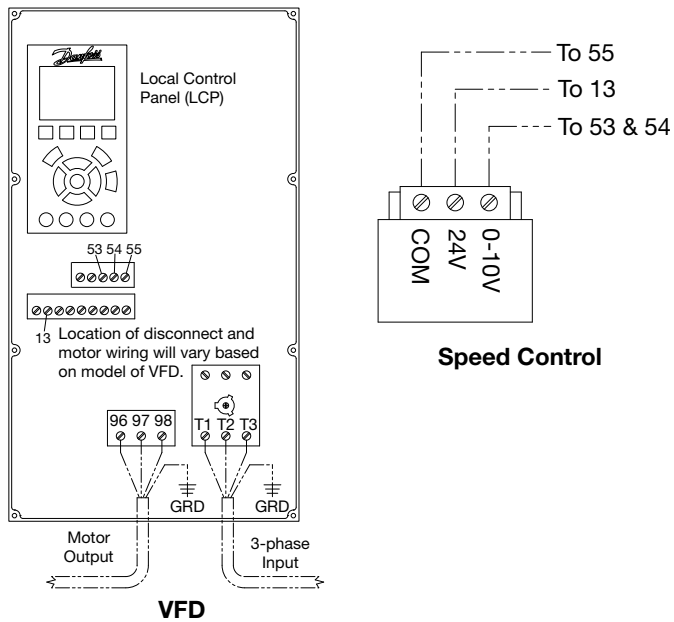
1. Remove the eight fasteners on the VFD cover using T20 Torx® or flat head screwdriver. An extension may be needed to reach the fasteners. Remove the cover to access wiring terminals.
2. When installing the control wires on the VFD, open the contact by inserting a small screwdriver into the slot between the contact holes and push the screwdriver slightly upwards.
3. Connect the COM terminal from the remote dial control to terminal 55 on the VFD.
4. Connect the 24V terminal from the remote dial control to terminal 13 on the VFD.
5. Connect the 0-10V terminal from the remote dial control to terminals 53 and 54 on the VFD.
6. Reinstall the cover on the VFD.



Wire Insulation Removal



Insert Wire in Terminal



## Setpoint Adjustment Procedure

No adjustment within the VFD is needed.

1. To increase the fan speed, rotate the dial clockwise.
2. To decrease the fan speed, rotate the dial counterclockwise.
3. To turn the fan off, rotate the dial counterclockwise until the dial indicator points to zero.

# Constant Airflow Control

## NOTE

Fan must be equipped with Sure-Aire™ to utilize constant airflow control package.

The VFD supplied is preprogrammed based on the optional sensor input, motor supplied on the fan and incoming power. The VFD supplies power to and accepts the control signal from the optional sensor to control fan speed. The VFD is housed in a NEMA-3R rated enclosure suitable to be mounted indoors or outdoors.

The VFD is not supplied with communication outputs to building management or other control systems. The airflow setpoint is field adjustable using the local control panel (LCP).

The Dwyer Magnesense MSII has a digital display and is housed in a NEMA-4X enclosure suitable to be mounted indoors or outdoors. The system calculates volume based on differential static pressures measured with Sure-Aire.

### Kit Includes:

- NEMA-3R VFD including integral fuse and disconnect, with weathershield
- Dwyer Magnesense MSII pressure transducer
- 25 ft. (7.6 m) of 1/4 in. (6.4 mm) nylon tubing

### Pressure Transducer Mounting

- The pressure transducer is housed in a NEMA-4X rated enclosure suitable to be mounted indoors or outdoors.
- Locate the pressure transducer as close to the Sure-Aire ports as possible.
- The pressure transducer should be mounted on a vertical surface with the connections directed down to prevent moisture from entering either the pressure ports or the electrical cable entry. The diaphragm must be vertical to minimize gravity effects.
- Attach the mounting flange to a flat surface. Do not overtighten.
- Mount the pressure transducer higher than the Sure-Aire termination plate to ensure that any moisture or condensation drains back into the fan.

### Pressure Transducer Plumbing

1. Use the supplied 1/4 in. (6.4 mm) nylon tubing to connect the high port on the Sure-Aire termination plate located on the fan to the (+) port on the pressure transducer.
2. Use the supplied 1/4 in. (6.4 mm) nylon tubing to connect the low port on the Sure-Aire termination plate located on the fan to the (-) port on the pressure transducer.

## Control Wire Installation

### IMPORTANT

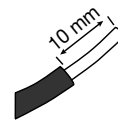
Always disconnect power before working on or near a unit. Lock and tag the disconnect switch and/or breaker to prevent accidental power up.

### NOTE

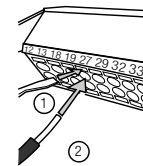
When servicing the unit, VFD may be hot enough to cause pain or injury. Allow VFD to cool before servicing.

Keep control wires as short as possible [100 ft. (30.5 m) or less] and separate from high power cables to minimize interference.

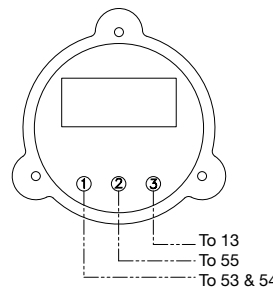
1. Remove the eight fasteners on the VFD cover using T20 ® or flat head screwdriver. An extension may be needed to reach the fasteners. Remove the cover to access wiring terminals.
2. Remove the face cover of the pressure transducer by rotating the face cover counterclockwise and pulling outward.
3. When installing the control wires on the VFD, open the contact by inserting a small screwdriver into the slot between the contact holes and push the screwdriver slightly upwards.
4. Connect terminal 1 from the pressure transducer to terminal 53 and 54 on the VFD.
5. Connect terminal 2 from the pressure transducer to terminal 55 on the VFD.
6. Connect terminal 3 from the pressure transducer to terminals 13 on the VFD.
7. Reinstall the cover on the VFD and the pressure transducer.



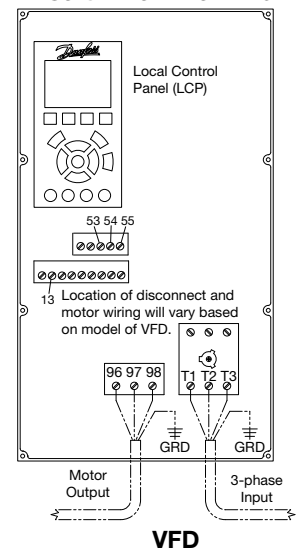
Wire Insulation Removal



Insert Wire in Terminal



Pressure Transducer



VFD





## Setpoint Adjustment Procedure

The kit will arrive with the setpoint preprogrammed based on the fan order. Adjustment should only be made by qualified personnel.

1. Using the LCP keypad, depress the Quick Menu key.
2. Using the up and down arrows, select Q1 My Personal Menu. Depress the OK button to select.
3. Using the up and down arrows, select 20-21 Setpoint 1. Depress the OK button to select.
4. The display will flash *Access Denied* and *Please Enter a Password*. Using the up, down, right and left arrows, adjust the password to 00000200. Depress the OK button.
5. The display will flash *Password Accepted*.
6. Depress the OK button. Using the up, down, right and left arrows, adjust the Setpoint 1 to the new desired setpoint. Depress the OK button.
7. Depress Status button to return to the system Status menu.

## Constant Pressure Control

The VFD supplied is preprogrammed based on the optional sensor input, motor supplied on the fan, and incoming power. The VFD supplies power to and accepts the control signal from the optional sensor to control fan speed. The VFD is housed in a NEMA-3R rated enclosure suitable to be mounted indoors or outdoors.

The VFD is not supplied with communication outputs to building management or other control systems.

The pressure setpoint is field adjustable using the local control panel (LCP).

The pressure transducer, a Dwyer Magnesense MSII, has a range of  $\pm 28$  in. water column (WC). The digital display is housed in a NEMA-4X enclosure suitable to be mounted indoors or outdoors.

### Kit Includes:

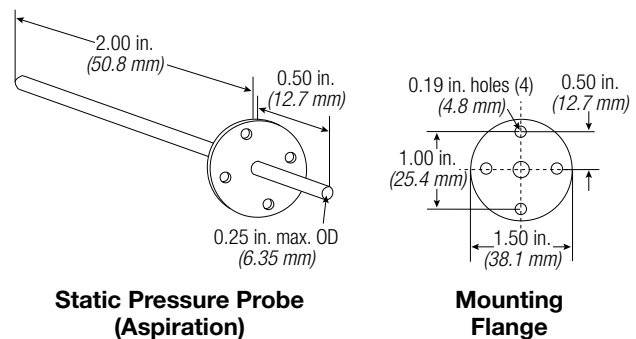
- NEMA-3R VFD including integral fuse and disconnect, with weathershield
- Dwyer Magnesense MSII pressure transducer
- 25 ft. (7.6 m) of 1/4 in. (6.4 mm) nylon tubing
- One duct static pressure probe

### Pressure Probe Mounting

The position of the static pressure probe to get the best results depends on the layout of the system. Select a location on the duct that is a minimum of 1-1/2 duct diameters upstream or downstream from any dimensional change, elbow, damper, or other obstruction.

The pressure probe mounting location should be centrally located in the duct to prevent condensation from entering the tube. Avoid mounting the pressure probe at the bottom of the duct.

1. Drill a 3/8 in. (9.5 mm) diameter hole at the location where pressure measurement is desired.
2. Insert the pressure probe into hole.
3. Secure probe using the mounting holes in the mounting flange of the pressure probe. Tighten screws until the mounting flange is flush with mounting location and gasket is compressed.



### Pressure Transducer Mounting

- The pressure transducer is housed in a NEMA-4X rated enclosure suitable to be mounted indoors or outdoors.
- Locate the pressure transducer within 100 ft. (30.5 m) of the VFD. One hundred feet is the maximum control wire length for this pressure transducer.
- The pressure transducer should be mounted on a flat vertical surface with the connections directed down to prevent moisture from entering either the pressure ports or the electrical cable entry. The diaphragm must be vertical to minimize gravity effects on the diaphragm.
- The pressure transducer should be mounted higher than the static pressure probe to ensure that any moisture or condensation drains back into the duct.
- Pressure transducer plumbing options:
  - Negative static pressure measurement. Connect the pressure probe to the negative (-) port, as indicated on the transmitter. Leave positive (+) port open to atmosphere.
  - Positive static pressure measurement. Connect the pressure probe to the positive (+) port, as indicated on the transmitter. Leave negative (-) port open to atmosphere.

## Control Wire Installation

### IMPORTANT

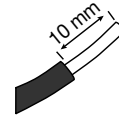
Always disconnect power before working on or near a unit. Lock and tag the disconnect switch and/or breaker to prevent accidental power up.

### NOTE

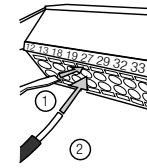
When servicing the unit, VFD may be hot enough to cause pain or injury. Allow VFD to cool before servicing.

Keep control wires as short as possible [100 ft. (30.5 m) or less] and separate from high power cables to minimize interference.

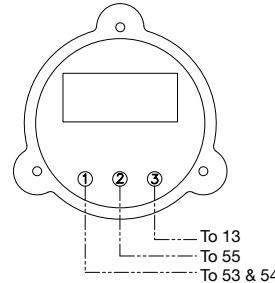
1. Remove the eight fasteners on the VFD cover using T20 Torx® or flat head screwdriver. An extension may be needed to reach the fasteners. Remove the cover to access wiring terminals.
2. Remove the face cover of the pressure transducer by rotating the face cover counterclockwise and pulling outward to access the wiring terminals.
3. When installing the control wires on the VFD, open the contact by inserting a small screwdriver into the slot between the contact holes and push the screwdriver slightly upwards.
4. Connect terminal 1 from the pressure transducer to terminal 53 and 54 on the VFD.
5. Connect terminal 2 from the pressure transducer to terminal 55 on the VFD.
6. Connect terminal 3 from the pressure transducer to terminals 13 on the VFD.
7. Reinstall the cover on the VFD and the pressure transducer.



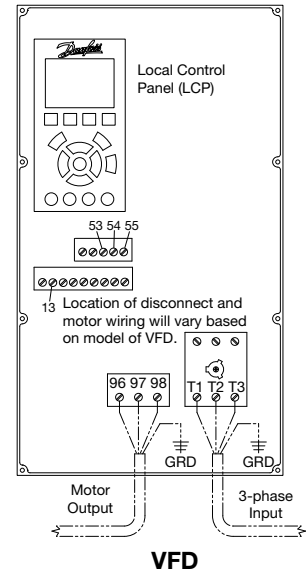
Wire Insulation Removal



Insert Wire in Terminal



Pressure Transducer



VFD

## Setpoint Adjustment Procedure

The kit will arrive with the setpoint preprogrammed based on the fan order. Adjustment should only be made by qualified personnel.

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7. Depress Status button to return to the system Status menu.

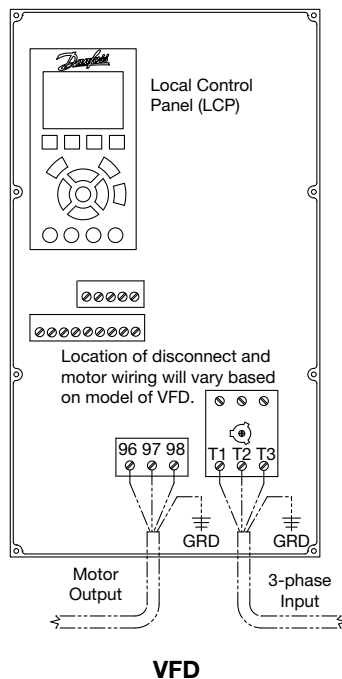
## Customer Supplied Sensor/VFD Only

The VFD supplied is preprogrammed based on the motor supplied on the fan and incoming power. The VFD can be run in hand mode or field programmed using the local control panel (LCP). For details on programming the VFD, refer to the Danfoss Programming Guide for VLT HVAC Drive FC 102 located at <http://drives.danfoss.com/products/vlt/>.

The VFD has a 10 VDC (15 mA) and a 24 VDC (130 mA) power supply to power auxiliary devices.

### Kit Includes:

- NEMA-3R VFD including integral fuse and disconnect, with weathershield



## Our Commitment

*As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.*

Product warranties can be found online at [Greenheck.com](http://Greenheck.com), either on the specific product page or in the literature section of the website at [Greenheck.com/Resources/Library/Literature](http://Greenheck.com/Resources/Library/Literature).

