



# TR1™ Series VFD

## Variable Frequency Drives



Trane TR1™ Series VFDs are specially designed for the unique requirements of HVAC applications. Standard features include PID control, DC link reactor for harmonics control, and energy optimizing capabilities. Low motor noise and high efficiency are also inherent in the TR1 Series VFD. Trane supplies pre-engineered bypass panels and other controls as required.

### Performance Ranges

- 208 V—1.5 to 60 HP
- 460 V—1.5 to 600 HP
- 600 V—1.5 to 600 HP

### Enclosures

- VFD Enclosures: NEMA 1 all VFD voltages, NEMA 12 all VFD voltages except 600 VAC
- VFD and Option Enclosures: NEMA 1, NEMA 3R, NEMA 12

### Features

#### Built-in Two Setpoint PID Controller

No need to supply a separate setpoint or PID controller.

#### Automatic Energy Optimization

There is no need to select a V/Hz curve because the VFD constantly adjusts the voltage applied to the motor to optimize energy savings even under changing speed and load conditions. Automatically compensates for oversized motors or systems that are not fully loaded.

#### Automatic Switching Frequency Modulation

Provides quiet motor operation at critical low flow conditions and full output without derate at high load.

#### Automatic Motor Adaptation

The VFD measures the motor's stator resistance and reactance, and uses this information to optimize performance and efficiency. The motor does not have to be run and the load does not have to be disconnected for Automatic Motor Adaptation test to be performed.

#### Customized Setup

All VFDs ship with customer's specific application pre-programmed. After input of motor nameplate data, the VFD is ready for startup.

#### Exclusive Digital Voltage Vector Control

Provides nearly perfect output current sine wave with full rated motor voltage at rated frequency, high efficiency for both drive and motor, and full motor performance at maximum speed without derate or additional motor heating.

### Monitoring Functions

- Missing motor phase
- Output ground fault
- Loss of control signal
- Loss of load or broken belt
- Output short circuit
- Low or missing input phase
- Motor overload using internal electronic I<sup>2</sup>t overload
- Line undervoltage and overvoltage, DC bus undervoltage and overvoltage, output overcurrent

### Trane TR1 Series VFD Keypad

All TR1 Series VFDs operate identically. All keypads are identical and interchangeable. Parameters from one VFD can be downloaded to others. Remote keypad mounting is also available.

- Displays four independent meters simultaneously. User can see at a glance VFD frequency, current, output kW, and output kW-h or any four of twenty-five possible displays.
- Display can show one of many process variables, including %, °F, °C, Pa, bar, RPM, in. wg., gal/s, gal/min, gal/hr, ft<sup>3</sup>/sec, ft<sup>3</sup>/min, ft<sup>3</sup>/hr, lb/in<sup>2</sup> and others.

### Communications

#### EIA-485 Interface

Fully equipped for serial communication—up to 31 VFDs can be connected to one serial bus up to 5,000 feet long.

#### Communication Integration to Building Management Systems

TR1 Series VFDs support open communication. BACnet, LonWorks and MODbus RTU are all supported. MODbus RTU is standard in every TR1 Series

VFD. An optional communication card that installs in the VFD can provide LonWorks communication. An optional BACnet portal can link up to ten TR1 Series VFDs to a BACnet network.

Johnson Controls Metasys® N2 and Siemens Apogee® FLN communication are also optionally available.

### PC Communication

Exclusive software allows direct communication with up to 99 VFDs. All parameters can be audited, set, saved to disk and printed out. Desired configurations can be uploaded from VFD to computer and downloaded to other VFDs. VFD performance can be logged for analysis.

### Options

All option panels are assembled in the factory's UL panel shop. All VFDs and panels are built in ISO 9001 certified facilities.

### Disconnects and Drive Fuses

Vertical configurations economize space in crowded installations.

### Bypasses

A side-by-side bypass package is offered for all voltages and sizes. A broad range of standard and engineered-to-order configurations are available.

### EMI, RFI Filters, Input AC Line Reactors

Built-In DC link reactors can be supplemented with optional harmonic protection.

### Cascade Controller Card

Allows staging of up to four additional motors or VFDs.

# TR1™ Series VFD Specifications

Input Voltages .....	200–240; 380–460; 550–600 VAC
Motor Voltages .....	200, 208, 220, 230, 240, 380, 400, 415, 440, 460, 550 or 575 VAC
Input Voltage Range for Full Output .....	Nominal $\pm 10\%$
Undervoltage Trip Point .....	164, 313 or 394 VAC
Overvoltage Trip Point .....	299, 538 or 690 VAC
Input Frequency .....	50 or 60 Hz, $\pm 2$ Hz
Output Frequency .....	Selectable 0 to 120 Hz
VFD Efficiency .....	97% or greater at full load and nominal motor speed
Input Displacement Power Factor .....	0.98 or greater at all speeds and loads
Follower Signal .....	0 to 5 VDC, 0 to 10 VDC, 0 to 20 mA, 4 to 20 mA fully selectable, direct and inverse acting
Lost Analog Reference Action .....	Selectable to go to a preset speed, go to maximum speed, stay at last speed, stop, turn off, or stop and trip
Time Delay for Lost Analog Reference Action .....	1 to 99 sec.
Output Current Limit Setting .....	Adjustable to 110% of drive rating
Current Limit Timer .....	0 to 60 sec. or infinite
Adjustable Maximum Speed .....	From minimum speed setting to 120 Hz
Adjustable Minimum Speed .....	From maximum speed setting to 0 Hz
Adjustable Acceleration Time .....	To 3,600 sec. to base speed
Adjustable Deceleration Time .....	To 3,600 sec. from base speed
Adjustable Auto Restart Time Delay .....	0 to 600 sec.
Breakaway Torque Time (1.6 times drive rated current) .....	0.0 to 0.5 sec.
Maximum Number of Preset Speeds .....	16
Maximum Number of Frequency Stepovers .....	4
Maximum Number of Accel/Decel Rates .....	4
Number of Programmable Digital Inputs .....	8
Number of Programmable Analog Inputs .....	Three: 2 voltage, 1 current
Number of Programmable Analog Outputs .....	Two
Number of Programmable Relay Outputs .....	Two: 1 standard Form A 30 VAC, 1A; 1 standard Form C 240 VAC, 2A (One or four additional optional)
Low Frequency and High Frequency Warnings .....	0 to 120 Hz
Low Current and High Current Warnings .....	0 to maximum current
Start Voltage .....	0 to 10%
Delayed Start .....	0 to 120 sec.
DC Braking Time .....	0 to 60 sec.
DC Braking Start .....	0 to maximum frequency
DC Braking Current .....	0 to 50% of rated motor current
Automatic Restart Attempts .....	0 to 20
Automatic Restart Time Delay .....	0 to 600 sec. between each attempt
Relay ON Delay and Relay OFF Delay (for the standard Form C relay and 4 relay option) .....	0 to 600 sec.
Display Languages .....	English, Spanish, French, German, Italian, Portuguese, Swedish, Dutch, Danish
Humidity .....	<95%, non-condensing
Maximum Elevation without Derate .....	3,300 ft. (1000 m)

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