



# **T400E**

# **MANUAL**

**Models**  
**T4004V46CAI**  
**T4004V4CAI**

**Important: This document should be read carefully before commencing  
installation**

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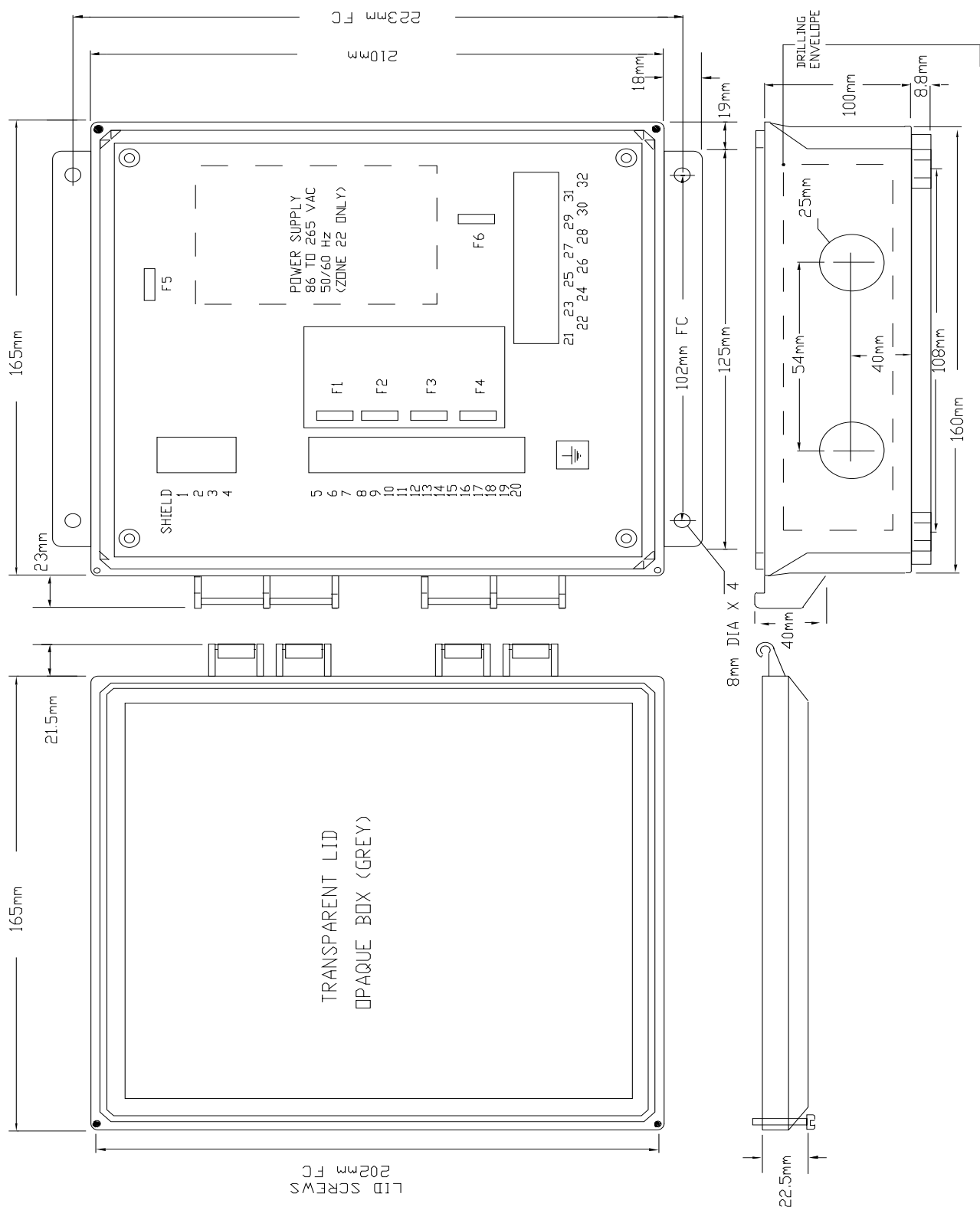
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# Approvals

## Zones of use of T400 Elite:

CAT II 3D for use in Zone 22. Areas as defined in BS EN 50281-1-2

## Certification Markings:

CE 1180  II 2D T125° -20°C to +50°C IP66 Baseefa04ATEX0131X



Class II Division 1 Groups E, F & G (Canada Only)



Class II Division 2 Groups F & G (USA Only)

Power dissipation in Watts

ATEX category 2D : 12 Watts

## To Open the Lid:

1. Disconnect power (isolate ALL circuits)
2. Untighten the lid securing screws
3. Carefully open the lid ensuring that the gasket is not damaged and remains in place

## To Close the Lid:

1. Check that the gasket is correctly fitted into the box groove and is undamaged.
2. Tighten the lid screws.
3. Check that the lid and box are correctly mated.

## Special conditions for safe use:

**WARNING: Static Hazard - Clean only with a damp cloth.**

# **T400 ELITE HOT BEARING MONITOR**

## **INTRODUCTION**

The T400 ELITE is a microprocessor controlled unit which is able to accept signals of hot bearings in 8 zones and is able to cause alarm and shutdown of the machine when hot bearings are detected. The control unit is housed in a self-contained wall-mounting enclosure, and the sensors are separate items for mounting on the bearings. The T400 ELITE will operate from 100 to 240 VAC  $\pm 10\%$  or from 24VDC.

## **1. SPECIFICATIONS**

### **1.1 The Control Unit**

A plastic enclosure houses the electronics and terminal connectors. The unit contains a printed circuit board to accommodate power supply circuitry, output relays, microprocessor and terminals. A short ribbon cable is connected to the lid of the enclosure where the indicator lamps are mounted. Two 'touch buttons' are mounted on the lid to allow the unit to be tested during operation, and to mute the alarm relay.

Electrical Supply (T4004V46CAI) - (T4004V4CAI)	-	24VDC or 100 to 240 VAC $\pm 10\%$ 50/60Hz (Zone 22 only) 24Vdc (Zone 21 only)
Power Consumption	-	12VA/12 WATTS
Alarm Relay Contacts	-	1 Pole normally open 8A@ 250VAC
Stop Relay Contacts	-	1 Pole normally open 8A@ 250VAC
Sensor Inputs	-	PTC thermistor
Sensor Supply	-	24VDC Current 100 ma maximum
Terminals	-	Power 4mm <sup>2</sup> 14 AWG max Signals 2.5mm <sup>2</sup> 16 AWG max Plug In
Protection	-	ATEX CE Ex II 2D T125°C, II 3D T125°C Class II Division 1 Groups E, F & G (Canada Only) Class II Division 2 Groups F & G (USA Only)
Height	-	9.7", 246mm
Width	-	7.4", 188mm
Depth	-	4", 102mm
Fixing Centres	-	8.75" high x 4" wide, 222mm x 102mm
Cable Entry	-	2 Holes 1 1/8" DIA, 28mm, 3/4" CONDUIT
Weight	-	3lbs, 1.3Kg

Status Indicator Lamps	-	Viewed through front panel
	-	POWER
	-	HOT BEARING 1
	-	HOT BEARING 2
	-	HOT BEARING 3
	-	HOT BEARING 4
	-	HOT BEARING 5
	-	HOT BEARING 6
	-	HOT BEARING 7
	-	HOT BEARING 8
	-	ALARM
Touch Switches	-	MUTE
	-	TEST

## 1.2 Bearing Temperature Sensors

### 1.2.1 Bearing Temperature Sensor – a range are available.

The temperature Sensor is designed to screw into the bearing housing in a grease nipple hole or other tapped hole and will detect excessive temperature of the bearing housing. The body of the sensor contains a positive temperature coefficient (PTC) thermistor which has a fixed switching temperature. Below this temperature, the thermistor has a low resistance and above this temperature it has a very high resistance. All of the sensors in each zone on the bearings are connected electrically in series so that if any one of them exceeds its switching temperature the total resistance exceeds the trip resistance of the control unit. The system fails to safe, as if the wire is broken at one of the sensors, an alarm signal is generated. A two core plus shield cable is permanently attached to the sensor body. A grease nipple is provided in the body of the sensor to allow greasing of the bearing in the normal manner.

#### SWITCHING TEMPERATURE RANGE

- depending on sensor chosen: 50°C to 90°C + 5°C

#### **SEE INDIVIDUAL BEARING SENSOR MANUALS**

RESISTANCE AT 60°C	-	250 Ohms max
RESISTANCE AT 100°C	-	2000 Ohms Min
SENSING VOLTAGE	-	30V DC maximum
SENSING CURRENT	-	5ma maximum
FIXING THREAD	-	1/8" NPT
CABLE	-	2 Core + shield 0.75mm <sup>2</sup> 10ft (3Mtr.) Long
WEIGHT	-	7 oz. (0.2Kg)

#### **Protection.**

Ex II 1 D Txx°C BAS01 ATEX 1191X

CSA Class II Division 1 (**WDB2's ONLY**)

Txx°C is replaced by the actual maximum temperature of the chosen sensor.

## 2 INSTALLATION INSTRUCTIONS

**Warning:** Always lock-out and tag-out the machine prior to installation and set-up.

**Wiring:** All Wiring Must Be In Accordance With Local and National Electrical Codes and Should Be Undertaken By an Experienced and Professional, Qualified Electrician.

### 2.1 The Control Unit

The Control Unit box should be installed in a suitable control or starter switch room and mounted at an eye level position so that the warning lights can be readily seen. The box should have sufficient space to open the lid for wiring and adjustment. An audible alarm, hooter or visual indicator lamp can be installed in or outside of the control room.



**The Control Unit is susceptible to static voltage. Connection of a clean ground to terminal 31 is essential for optimum performance. Prior to this connection, static handling precautions should be taken.**

#### **Enclosure Installation:**

- a. The IP66 rating of the enclosure must be maintained when used in a Zone 21 dust environment. You must use the correct cable, glands and sealing arrangement and in accordance with the installation codes detailed in BS EN 60079 and EN 50281
- b. Where other certified components are used as part of the assembly or installation procedure, the user must take in to account any limitations which might be listed on the relevant certificates.
- c. The box is supplied with 2 x 27.5mm (1<sup>1</sup>/<sub>8</sub>"") pre drilled holes in the bottom face. The user may add **only** 2 x 27.5mm (1<sup>1</sup>/<sub>8</sub>"") clearance holes per face. The holes may be placed anywhere on the box face but the centre line between adjacent holes must be no less than 54mm (2<sup>1</sup>/<sub>4</sub>"). There must be at least 12.7mm (1/2") of material from the inside edge of the box. All unused entry apertures must be sealed using component certified stopping plugs Hawke International type 375 or 387. The end user must install component or apparatus certified stopping plugs and cable glands in strict accordance with the manufacturer's instructions.
- d. The enclosure must not be modified in any way without reference to don Electronics, as this will invalidate the certification, except where used in certain Zone 22 applications.
- e. All wiring must be carried out in accordance with relevant codes of practice and / or instructions (BS EN 600079-14, EN50281).
- f. The voltage and current and maximum power dissipation shown on the box label must not be exceeded.
- g. The wiring installation must extend to within 1 mm of the metal face of the terminal.
- h. All leads must be insulated for the appropriate voltage.

- i. Not more than 1 single or multiple strand cable is to be connected to any terminal unless multiple conductors have previously been joined in a suitable manner (e.g. boot lace ferrule) such that they present a single connection point to the terminal.
- j. A parallel shaft screwdriver of the correct size should always be used when tightening terminals.

## 2.2 Bearing Temperature Sensors (Grease through type)

The standard temperature sensors, which are pre-set at 80°C are screwed into the grease holes of the bearings for the elevator leg head pulley, boot pulley and jockey pulley, where fitted. If any of the sensors exceeds its switching temperature, a signal is sent to the control unit and will cause an alarm signal, eventually resulting in shutdown. Each sensor has a greasing by-pass and is installed in the bearing as Drawing 'C'.

## 3 ELECTRICAL WIRING

Refer to Drawings A & B

Mount a conduit junction box within 10ft (3 metres) of each sensor – generally one junction box can be used for a pair of sensors. Connect the sensor cable to the junction box using sealing glands and protect the cable from damage. If flexible conduit is to be used, a conduit adaptor is available to attach to the sensor. Connect the junction box back to the control unit. We strongly recommend the use of shielded wires when wiring the sensors to the control unit. When terminating conduits at the control unit, ensure ground continuity by using a suitable bushing.

**Any Bearing Sensor inputs which are unused must be connected to +volts at the control unit.**

When installing the equipment in an area which is likely to be hazardous from Ignitable Dusts, use liquid tight conduit and fittings and follow all local codes.

Terminal (Shield) is used to provide a continuous shield connection for the communications cable and is not grounded in the T400

**WARNING: under no circumstances must the power supply connection be allowed to come into contact with these terminals; to do so would result in the failure of the communications interface.**

Terminal 5 is provides for an 0 volt connection

Terminal 6 is used for temperature sensor 1 input

Terminal 7 is used for temperature sensor 2 input

Terminal 8 is used for temperature sensor 3 input

Terminal 9 is used for temperature sensor 4 input

Terminal 10 is used to provide +24 VDC power to the temperature sensors

Terminal 11 is used to provide +24 VDC power to the temperature sensors

Terminal 12 is used for temperature sensor 5 input

Terminal 13 is used for temperature sensor 6 input

Terminal 14 is used for temperature sensor 7 input

Terminal 15 is used for temperature sensor 8 input  
Terminal 16 is provides for an 0 volt connection

Terminal 17 no connection  
Terminal 18 no connection  
Terminal 19 is used for remote MUTE+ connection  
Terminal 20 is used for remote MUTE- connection

Terminals 21 and 22 are no connection

Terminals 23 and 24 are a volt free Alarm contact for Alarm relay A rated 250 VAC @ 8 Amp non inductive.

Terminals 25 and 26 are no connection

Terminals 27 and 28 are a volt free Stop contact for Stop relay A rated 250 VAC @ 8 Amp non inductive.

Terminals 29 and 30 are for the AC power supply. This is only fitted when the T400 is to be used in a Zone 22 application. The AC supply can be between 100 and 250 Volts 50/60 HZ.

Terminal 31 is used for a ground (earth) terminal when using a mains power supply or an 0 VDC terminal when using a separate DC power supply.

Terminal 32 is used when powering the T400 from a separate 24 VDC power supply.

**Fuses:**

**It is very important to observe the fuse ratings used on the T400 elite.** The following fuse ratings MUST apply.

F5 has a recommended maximum rating of 200ma when used in a CAT 3D (Zone 22) installation.

F5 is used to limit the current available to the internal electronics and terminals 3 and 4.

F6 is used to protect the AC power supply and should have a 1.0 Amp rating. In order to maintain the product certification, these fuses MUST be replaced with equivalent fuses at the same rating. Failure to do so will invalidate the certification and any warranties which may exist. The sensor supply (terminals 10 and 11) is limited by F5.

## **4 OPERATING INSTRUCTIONS**

### **4.1 The TEST function**

#### **4.1.1 Normal Test**

The T400 ELITE is equipped with a self test function, initiated by the test touch button on the lid of the control unit. When the button is touched sensor 7 lamp flashes and then the following automatic test is initiated as the touch is released.

1. All lamps illuminate – sensor 7 lamp continues to flash
2. After 5 seconds all lamps return to their pre-test conditions

This test can be performed when the system is running or stopped and tests the correct function of the microprocessor and of all lamps.

#### **4.1.2 Extended Test**

If the Normal Test is initiated as in 4.1.1 and if the test touch button is touched again, while sensor 7 lamp is flashing, the extended test operates as follows:

1. All lamps illuminate – sensor 7 lamp continues to flash
2. Touching the test sensor again
3. Sensor 7 and 8 lamps flash together for a further 5 seconds (8 seconds total time)
4. The ALARM RELAY and STOP RELAY are inverted (off becomes on and on becomes off) and sensor 7, sensor 8 and the alarm led flash together.
5. After 3 seconds all lamps and relays return to their pre test conditions

If this test is performed when the system is not running, the Alarm will sound but the STOP RELAY will have no effect on the equipment. If this test is performed when the equipment is running, the Alarm will sound and the STOP RELAY will stop the equipment! This test should be performed on a regular basis to check the safety of the installation.

The touch button has been designed to ignore the first 0.5 seconds of touch; this is to reduce the possibility of accidental activation. Once activated as indicated by the led adjacent to the touch pad, removing the finger deactivates the button, if you leave your finger in place, the touch button will only remain active for approximately 2 seconds before automatically de-activating again. The touch button continuously recalibrates in order to eliminate the effects of static, dust or moisture build up on the surface.

### **4.2 Normal Operation**

If all Hot Bearing Sensors are ‘cold’, all eight HOT BEARING indicator lamps will be off. The ALARM indicator lamp and ALARM relay will be off. The STOP relay will be energised.

### 4.3 Hot Bearing Alarm

If a Hot Bearing Sensor becomes 'hot', the associated HOT BEARING indicator lamp and ALARM lamp will illuminate. After approx 2 seconds, the ALARM relay will energise. If the Hot Bearing Sensor then becomes 'cold', the HOT BEARING indicator lamp, ALARM lamp and ALARM relay will de-energise.

If more than one Hot Bearing Sensor becomes 'hot', all associated HOT BEARING indicator lamps will illuminate. Only when all Hot Bearing Sensors become 'cold' will the ALARM lamp and ALARM relay de-energise.

### 4.4 Alarm Mute

If the ALARM lamp and ALARM relay are energised because of a Hot Bearing, the ALARM may be muted (turned off) by the following methods. If a finger is placed on the MUTE target, the ALARM lamp begins to flash, the ALARM relay de-energises and all HOT BEARING indicator lamps which were illuminated will flash. Alternatively, if a voltage is applied to the MUTE input terminals, the same MUTE action will occur. If the Hot Bearing Sensors become 'cold', the flashing indicator lamps will de-energise.

If, during a MUTE condition, a further bearing sensor becomes 'hot', the associated HOT BEARING indicator lamp will illuminate, the ALARM lamp and relay will energise leaving the original muted HOT BEARING indicator lamps flashing. A further MUTE operation would flash all associated HOT BEARING indicator lamps.

### 4.5 Hot Bearing Stop (Shut Down)

If a HOT BEARING condition is detected, and if the ALARM indicator lamp is on (whether muted or not) for more than 3 minutes, the STOP relay will de-energise. If the ALARM condition is cleared in less than 3 minutes, the STOP relay will not de-energise but the amount of alarm time will be 'remembered'. If the ALARM condition occurs again immediately, the 'shut down timer' will continue from where it last stopped until the 3 minutes is completed. If the ALARM condition does not occur again immediately, the 'shut down timer' will time backwards, reducing the amount of time 'remembered' until the timer reaches zero. Consequently, if the alarm condition is intermittent, but no single interval of alarm exceeds 3 minutes, the persistence of alarms can eventually result in a STOP condition.

### 4.6 Restarting

If the machine has stopped because of a hot bearing condition as in 4.5 the lamps described above will remain flashing indefinitely. As soon as the hot bearings have cooled the flashing lamps will be cancelled, and the ALARM and STOP relays will be reset.

**CHECKLIST**  
**For problems after initial start-up**

1. Is there excessive interference on the electrical power supply? Power conditioners and surge (spike) suppressor may have to be fitted.
2. Has the wiring for the Sensors been routed away from power cables? See paragraph 3.
3. Is the T400 Elite circuit properly grounded?
4. Is the Micro-processor control unit overheating, if so mount in temperature-controlled environment of maximum temperature 40°C.
5. Check that high powered 'Walkie Talkie' radios are not operated immediately near the T400 Elite control unit or Sensors as this will affect the performance.

## 5. FAULT FINDING CHART

SYMPTOM	CAUSE	REMEDIAL ACTION
Hot Bearing LED on Control Unit does not illuminate	Sensor not operating Wiring Fault Sensor connected to wrong terminals	Replace Sensor Check wiring
Hot Bearing LED on Control Unit on continuously	Wiring fault Sensor fault Unused input	Check wiring Check sensor Connect to +v
Wrong Hot Bearing LED on unit illuminates	Sensor connected to wrong input	See drawing 'A'
Alarm LED on	Bearing is HOT	Check Bearings
Relay off	Stop condition occurred	Alarm condition for more than 3 minutes
Machine fails to start	Wiring fault	Check wiring

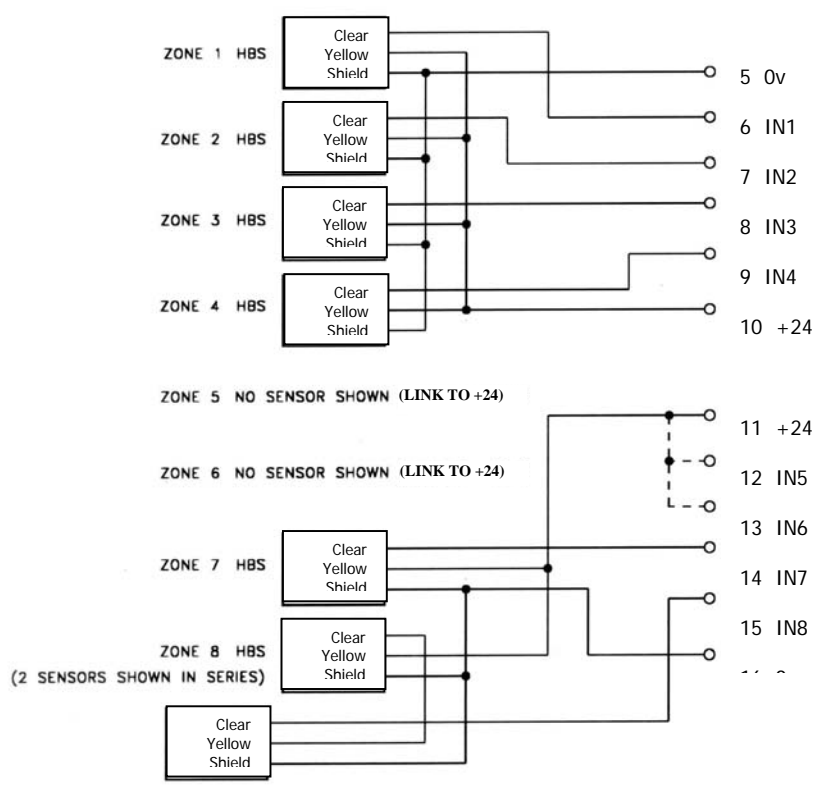
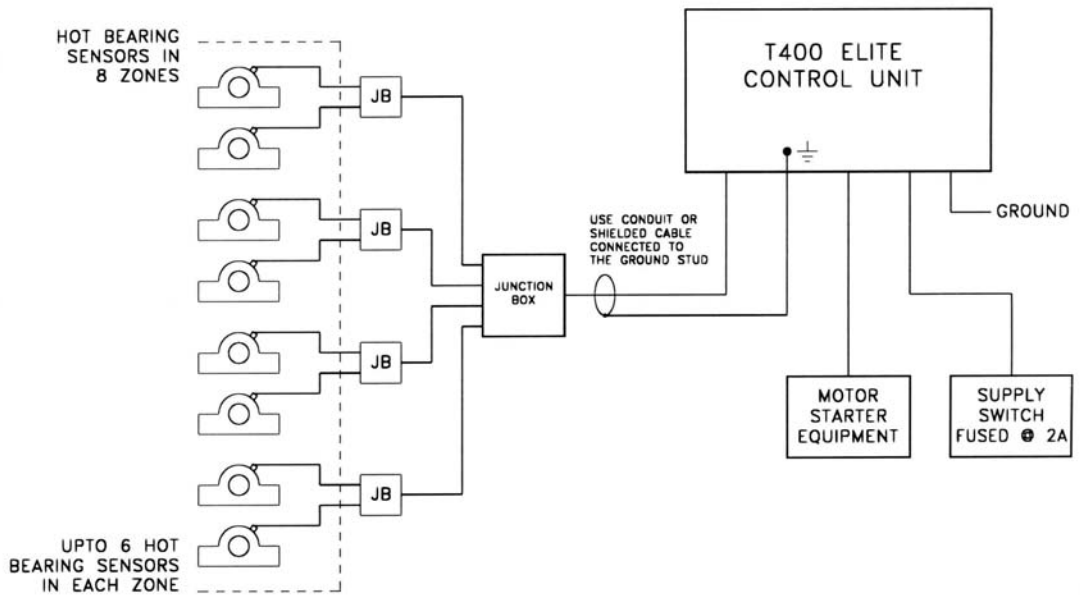
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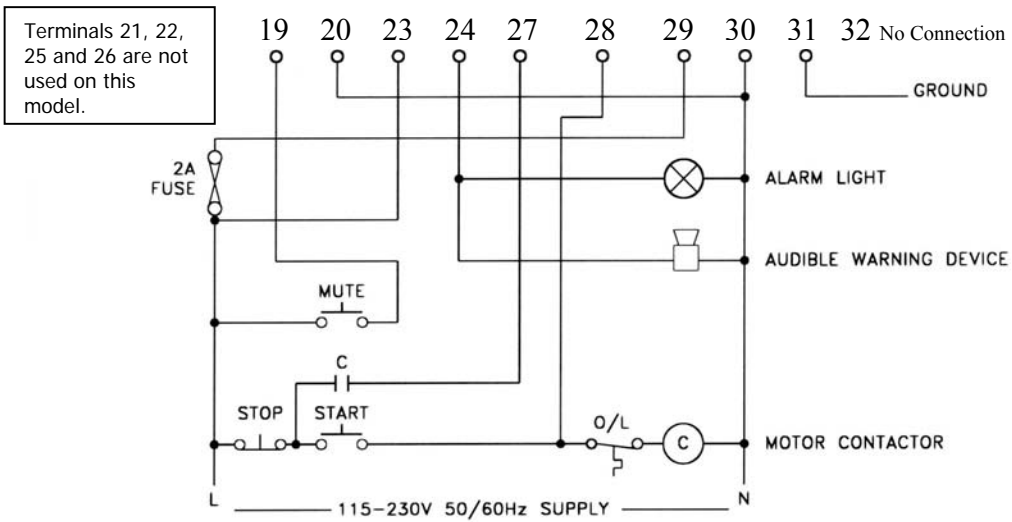
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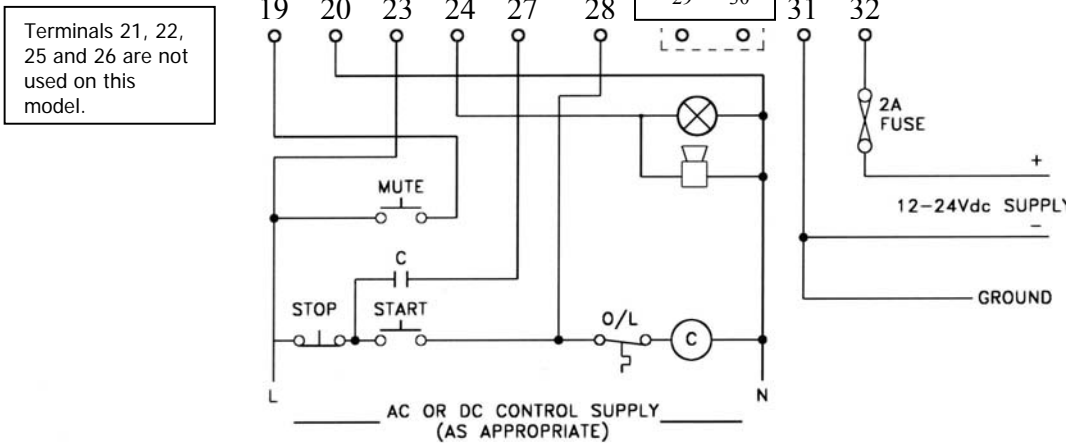
BLOCK DIAGRAM AND SENSOR WIRING

DRG.'A'

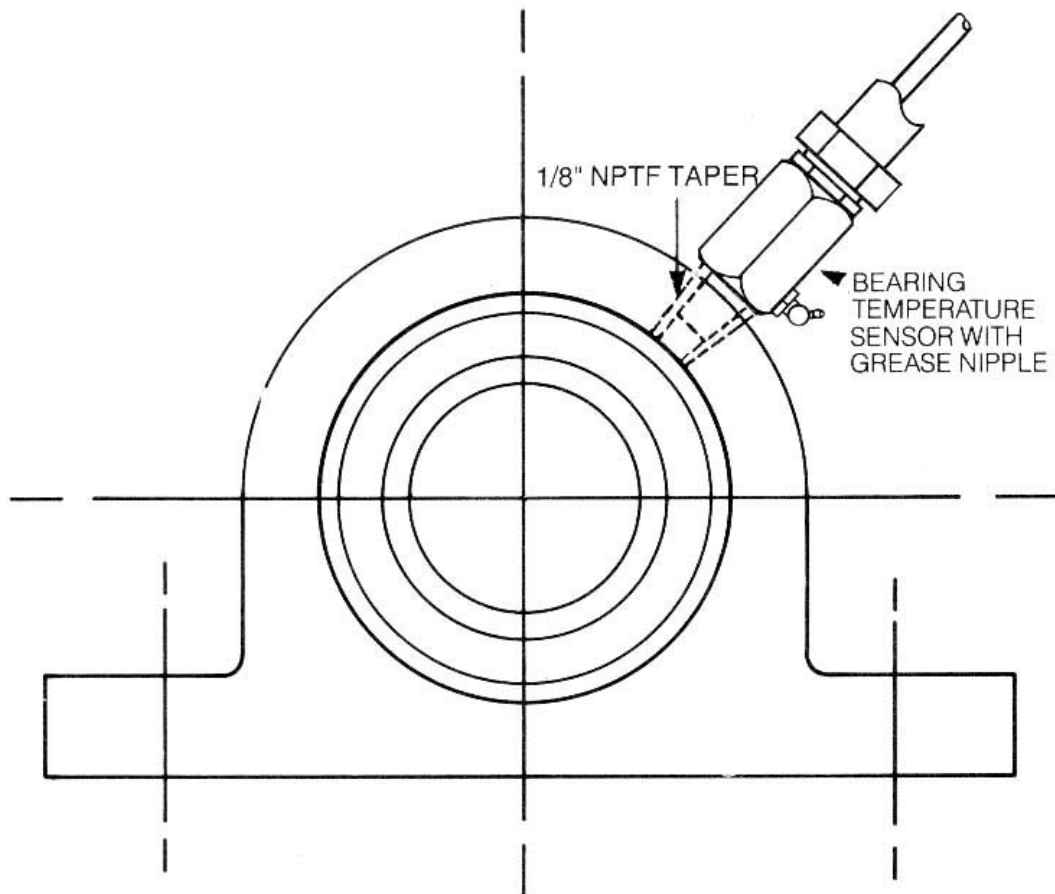
AC SUPPLY



DC SUPPLY



DRG. 'B'



### **FITMENT TO BEARING OF TEMPERATURE SENSOR**

**NOTE**

The special temperature sensor probe for use in a Class II Division 1 location has a connection for liquidtight flexible metal conduit.

DRG. 'C'