



## DTM20 Seismic Vibration Distributed Transmitter-Monitor

(Acceleration, Velocity, Displacement)

The DTM20 distributed Seismic vibration transmitter-monitor provides a simple and cost-effective solution for monitoring “balance-of-plant” equipment. The DTM’s smart design is extremely reliable with redundancy in power supply inputs, 4-20mA outputs and relay outputs, as well as, a Modbus communication port. The DTM20 monitor can interface with almost any vibration sensor (accelerometer or velocity transducer). The DTM is fully digital and may be configured in the field or come pre-configured from the factory.



### DTM20 Features

#### **Designed with reliability**

- Redundant power supplies
- Redundant 4-20mA outputs
- Dual dry-contact relay outputs
- Trip multiply and Bypass

#### **Galvanic isolation for solid signal processing**

- Power input isolation
- Sensor signal conditioning isolation
- Transmission 4-20mA output isolation
- Relay output isolation

#### **Band-pass filter to further isolate unwanted noise**

Programmable sharp 8th-pole low-pass filter further eliminate high frequency band noise, thus obtains reliable vibration signal.

#### **Fully field programmable by CFG software**

- DTM20-CFG can easily change any configuration of the monitor.
- Calibration of the system is available with CFG software

#### **Condition Monitoring by digital link**

- Static (trend, overall, alarms, GAP, system OK)
- Dynamic (waveform, spectrum, phase reference, waterfall)
- Data will be directly transferred into server with no needs of additional interface hardware

#### **MODBUS digital communication**

- Build-in Modbus RTU digital communication
- More information from Modbus line

#### **Work with variety of vibration sensors**

- Accelerometer
- Velocity sensor
- Low frequency sensor
- Electro-magnetic velocity sensor

#### **Backward compatible with TM101**

- Field adjustment with on-monitor push button (without software)
- ZERO calibration
- Alert set point
- Danger set point



## Specifications

### Electrical

#### Power:

Redundant. Accept dual power input  
20-30VDC @150mA  
Isolation: 1000VDC power to signal conditioner circuit

#### Frequency Response (-3dB):

##### Nominal Frequency:

2 - 3KHz

##### Low Frequency:

0.5 - 100Hz

##### High Frequency:

10 – 20KHz (peak)

#### Filters:

Low-pass filter (field programmable):  
8-pole (160 dB per decade, 48 dB per octave)  
100Hz to 10kHz, field programmed by CFG  
High-pass filter (factory setting):  
2-pole (40 dB per decade, 12 dB per octave)  
4 options (0.5Hz,2Hz,10Hz,100Hz) or custom

#### Piezo Sensor Interface:

##### Sensitivity:

100mV/g  
100mV/in/sec  
4mV/um  
or any sensitivity specified

##### Current Source

Nominal 4mA@24VDC

#### Seismic Velocity Sensor Interface:

##### Sensitivity:

User specified for any vibration sensor  
Software programmable

#### Accuracy:

Typical +/-1% FS  
Maximum +/-2% FS

#### Buffered Output:

Original vibration, un-filtered  
Impedance: 150Ω  
Maximum cable distance: 300m (1000ft)  
Sensitivity: same as the sensor  
Local BNC connector  
On line CM terminals

#### Overall Vibration output:

Up to two 4-20mA output  
4-20mA(1):  
Source. Output to controller.  
Sharing signal ground  
Maximum load resistance 500Ω  
4-20mA(2):  
Loop. Loop powered by controller.  
Galvanic isolation, 1000VDC  
Power supply range: 16-30VDC  
Maximum load resistance: 50\*(Vs-16)  
Where Vs is the loop power supply

#### Alarm Set point:

5 - 100% FS  
Accuracy:  
±0.1%

#### Relays:

Seal: Epoxy  
Capacity: 0.2A/240VAC,  
0.4A/110VAC  
2.0A/24VDC, resistive load  
Relay type: SPTD  
Isolation: 1000VDC

#### Push Buttons:

SET: System on-site calibration and alarm setting  
+ : Adjustment increment  
- : Adjustment decrement

#### LED Machine Condition Indicator:

OK: System OK indication  
ALT: Vibration over Alert level  
DNG: Vibration over Danger level  
BYP: System in BYPASS  
TRX: Digital transmission active



# DTM Distributed Transmitter Monitor

## RESET/BYPASS:

- Front panel push-button
- Remote RESET/BYPASS terminals

## Trip-Multiply

Double or Triple Multiply set by DTM-CFG. This feature is not available with (M2, M4 and M6 option)

## Modbus RTU

RS485 Modbus RTU (Non-isolated. Use DTM96 for isolation)

## Software programming (DTM-CFG):

- Measurement Units A, V, D
- Alert and danger set-point, time delay
- ZERO and Full-Scale calibration
- Low-pass filter corner frequency setup
- Alarm latching/ non-latching, energized/ de-energized
- Relay programmable with alert, danger or system OK
- Sensor selection, sensitivity setup
- System calibration
- Digital communication setup
- Trip-multiply setup
- Real-time bar-graph and alarms
- 3 layers of password protection

## Digital Condition Monitoring

- Terminals
  - RS485 for both Modbus RTU and condition monitoring
- Software PCM360-LT
  - Work with PCM360-LT plant condition management software
- Dynamic waveform:
  - Real-time vibration data, 2000 sets per data acquisition.
- Alarms:
  - Up to 100 alarms can be stored in DTM20.
- Trend:
  - Up to 1000 trend data can be stored in DTM20.
- Spectrum:
  - Up to 800 lines of resolution.

## Physical

### Dimension:

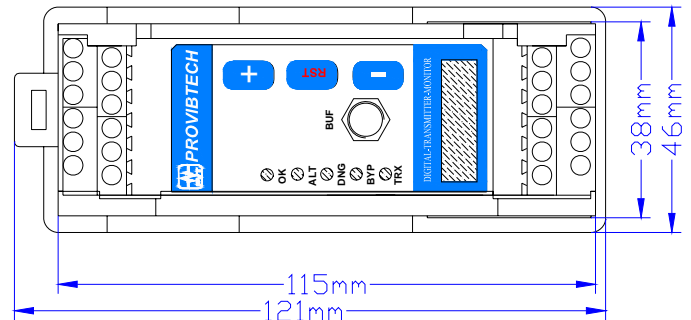
- Height: 75mm (2.95")  
see figure below
- Weight: 2.0lbs (1.0kg)

## Environmental

- Temperature:
  - Operation: -40°C to +85°C
  - Storage: -50°C to +100°C
- Humidity: 90% non-condensing
- Case: Aluminum cast (copper free)

## Certification

- CE certified with EMI compliance
- CSA: Class I, Div. 2, Grps A,B,C&D,T4
- ATEX: II 3G ExnA II T4
- GOST R: 2ExnAII T4X



Rail Mounting

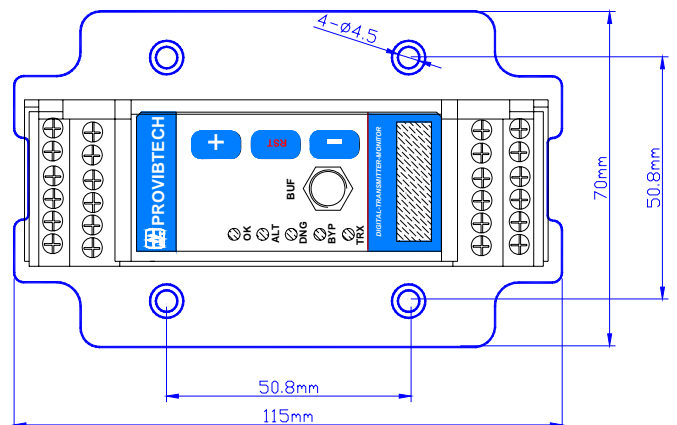


Plate Mounting



# DTM Distributed Transmitter Monitor

## Hazardous area

Marking:

ATEX Standards:

EN 60079-0

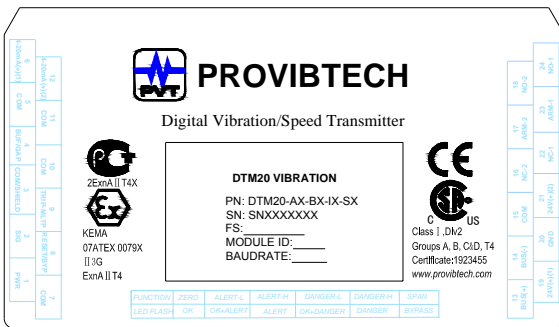
EN 60079-15

Special condition in hazardous area:

The ambient temperature range is:  $-40^{\circ}\text{C} \leq T_a \leq 70^{\circ}\text{C}$

DTMs must be placed inside an enclosure that is in accordance with EN 60079-15:2005.

Provisions must be made externally to prevent the rated voltage from being exceeded by transient disturbances of more than 40 %.



## Ordering Information

**DTM20-101-AXX-CX-GX-HX-IX-JX-MX-SX**

**Factory pre-configured seismic monitor**

**AXX: Full Scale**

- A00: 0 - 200µm pk-pk
- A01: 0 - 500µm pk-pk
- A02: 0 - 100µm pk-pk
- A03: 0 - 250µm pk-pk
- A05: 0 - 125µm pk-pk
- A06\*: 0 - 50mm/s pk
- A07: 0 - 100mm/s pk
- A08: 0 - 20mm/s pk
- A11: 0 - 25mm/s pk
- A12: 0 - 5.0g pk
- A13: 0 - 10g pk
- A14: 0 - 8mil pk-pk
- A15: 0 - 20mil pk-pk
- A16: 0 - 4mil pk-pk
- A17: 0 - 10mil pk-pk
- A18: 0 - 5mil pk-pk
- A19: 0 - 2.0 ips pk

- A20: 0 - 4.0 ips pk
- A21: 0 - 0.8 ips pk
- A22: 0 - 1.0 ips pk
- A26: 0 - 50mm/s rms
- A27: 0 - 100mm/s rms
- A28: 0 - 20mm/s rms
- A31: 0 - 25 mm/s rms
- A32: 0 - 2.0 ips rms
- A33: 0 - 4.0 ips rms
- A34: 0 - 0.8 ips rms
- A35: 0 - 1.0 ips rms
- A36: 0 - 20g pk
- A37: 0 - 50g pk

## CX: Alarms

- C0\*: Dual alarms with epoxy sealed relays
- C1: No Alarm

## GX: Mounting

- G0\*: DIN rail mounting
- G1: Plate mounting

## HX: Sensor (not include)

- H0\*: TM0782A or any ICP accelerometer with 100mV/g (A00-A05 not available)
- H1: TM0793V or any ICP velocity sensor with 4mV/mm/s (A12, 13, 36, 37 not applicable)
- H2: TM079VD (A12, 13, 36, 37 not available)
- HXXX: Seismic velocity sensor, Sensitivity = XXX mV/in/sec (A12, 13, 36, 37 not available)

## IX: Frequency Response

- I0\*: Normal Frequency (2 - 3KHz, H2 not available)
- I1: Low Frequency (0.5-100Hz)
- I2: High frequency (10 - 20KHz, A12, 13, 36, 37 only with accelerometer)
- IXXX-YYYY\*\*:
  - XXX: Hi-pass filter;
  - YYYY: low pass filter

## MX: Condition Monitoring,

**4-20mA with Galvanic Isolation\*\*\***

- M1\*: 4-20mA without isolation. No CM
- M2: 4-20mA without isolation . With CM
- M3: 4-20mA with isolation. No CM
- M4: 4-20mA with isolation. With CM
- M5: Dual 4-20mA, Modbus enabled
- M6: Dual 4-20mA, Modbus with PCM360 condition monitoring capability



## SX: Approvals

S0\*: CE  
 S1: CE  
 CSA: Class I, Div. 2, Grps A,B,C&D,T4  
 ATEX: II 3G ExnA II T4  
 TR CU: 2Ex nA II T4 X  
 № TC RU C- US.ГБ05.B.00476  
 NANIO CCVE

\* Denotes factory default.  
 \*\* Low pass has to be 4X more than hi pass filter.  
 \*\* Galvanic isolation requires loop powered configuration.

## DTM20-AX-BX-IX-MX-SX

### Field programmable seismic monitor

#### AX: Sensor and Alarm

A0: ICP sensor, Dual alarms  
 A1: ICP sensor, No alarm  
 A2: Seismic velocity, Dual alarms  
 A3: Seismic velocity, No alarm  
 A4: Looseness monitoring, Dual alarms

#### BX: Mounting

B0: DIN rail mounting  
 B1: Plate mounting

#### IX: Frequency Response

I0\*: Normal Frequency (2 - 3KHz, H2 not available)  
 I1: Low Frequency (0.5-100Hz)  
 I2: High frequency (10 – 20KHz,  
 A12, 13, 36, 37 only with accelerometer)

IXXX-YYYY\*\*:

XXX: Hi-pass filter;  
 YYYY: low pass filter

#### MX: Condition Monitoring

##### 4-20mA with Galvanic Isolation\*\*\*

M1\*: 4-20mA without isolation. No CM  
 M2: 4-20mA without isolation . With CM  
 M3: 4-20mA with isolation. No CM  
 M4: 4-20mA with isolation. With CM  
 M5: Dual 4-20mA, Modbus enabled  
 M6: Dual 4-20mA, Modbus with PCM360 condition  
 Monitoring capability

## SX: Approvals

S0\*: CE  
 S1: CE  
 CSA: Class I, Div. 2, Grps A,B,C&D,T4

ATEX: II 3G ExnA II T4  
 TR CU: 2Ex nA II T4 X

№ TC RU C- US.ГБ05.B.00476  
 NANIO CCVE

\*\* Low pass has to be 4X more than hi-pass filter.  
 \*\* Galvanic isolation requires loop powered configuration.

## Optional Accessories

### DTM-CFG-K

The DTM configuration and calibration software kit includes:

- ✓ DTM-CFG configuration and calibration software CD
- ✓ RS485-USB converter with cable

### PCM-TCP

Modbus RTU-TCP Converter

### TM900

Power converter with isolation. Converts 95-250 VAC into 24VDC and is capable of powering up to five DTM modules.

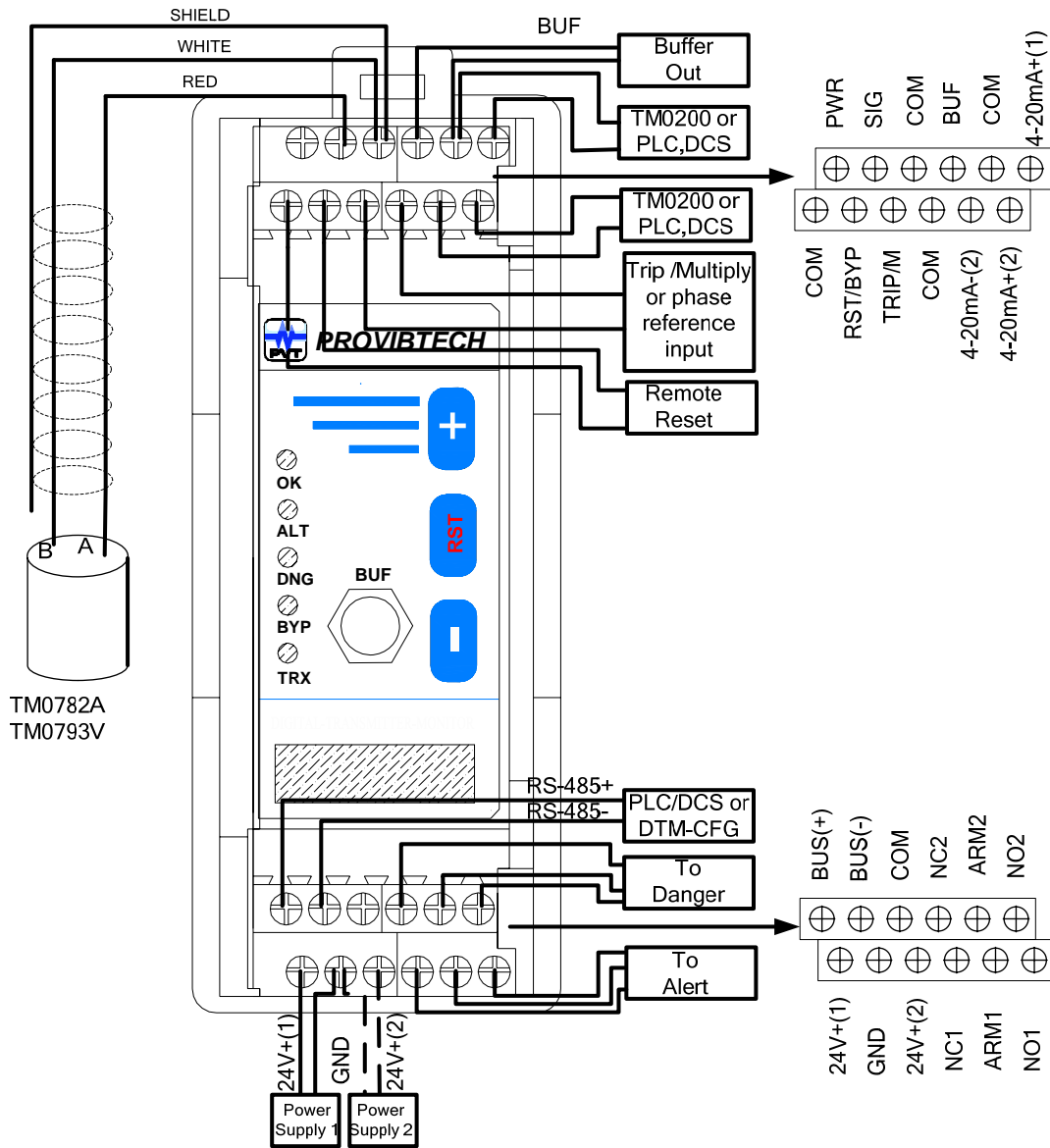
### Seismic Sensor Systems

- ✓ **TM0782A-K-M:** Accelerometer kit
- ✓ **TM0783A-K-M:** Accelerometer with cable
- ✓ **TM0793V-K-M:** Velocity sensor kit
- ✓ **TM079VD-V/H-K:** Low frequency sensor



## DTM20 System Installation

### DTM20 Field-Wiring Diagram



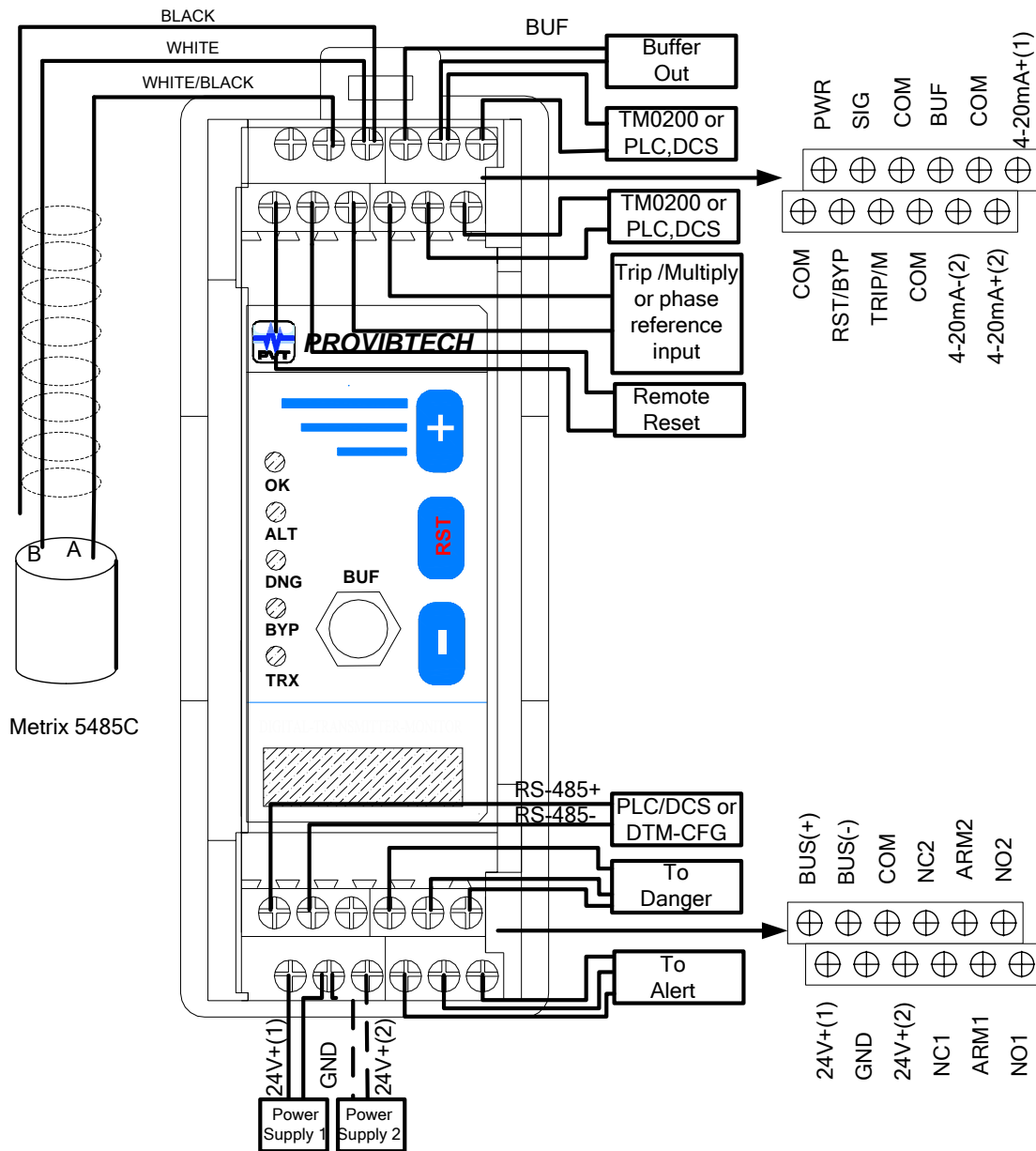
#### Note:

- ✓ Power supply 2 and 4-20mA(2) are optional connections used for redundancy.
- ✓ Alert and Danger relays are shown connected as normally open. Connect ARM and NC for normally closed.
- ✓ Connecting COM and RST/BYP with an external continuous or momentary closed switch will initiate a remote reset. Temporarily closing the switch will result in a system reset, continuous close will result in a system bypass.
- ✓ If DTM20 has the digital condition monitoring function, the Trip/Multi and COM pins are used for phase reference input. Thus, the DTM20 won't provide the Trip Multiply and the Trip Multiply property should be set to "None" in the DTM-CFG software.
- ✓ When using the signal condition monitoring function the DTM20 works with DTM10-501/502 to provide a phase reference output. In this case connect Trip/Multi of DTM20 with Trip/Multi of DTM10-501/502 and connect COM of DTM20 with COM of DTM10-501/502.



# DTM Distributed Transmitter Monitor

**DTM20 Field-Wiring Diagram (Interfacing with 5485C)**



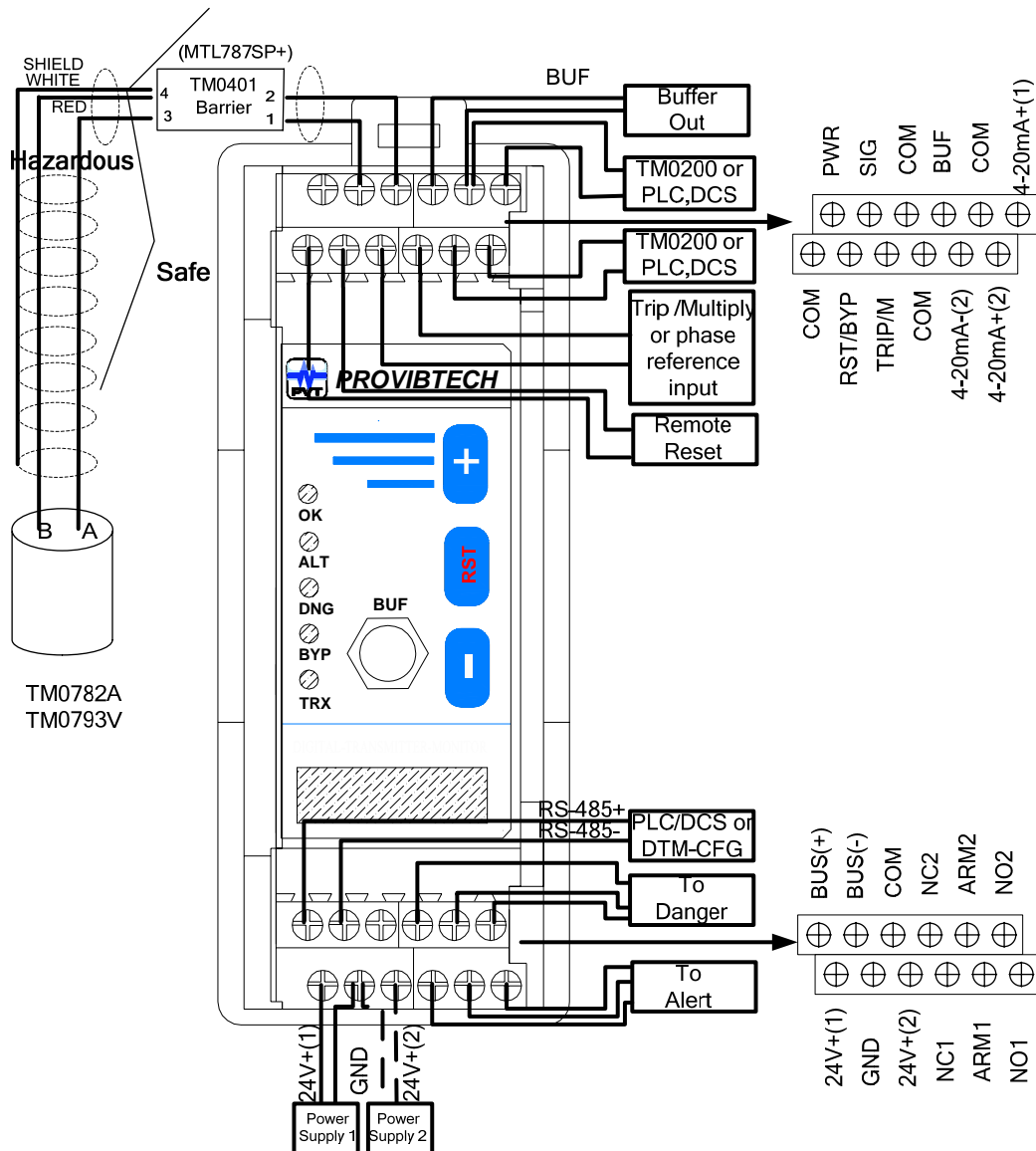
**Note:**

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- ✓ When using the signal condition monitoring function the DTM20 works with DTM10-501/502 to provide a phase reference output. In this case connect Trip/Multi of DTM20 with Trip/Multi of DTM10-501/502 and connect COM of DTM20 with COM of DTM10-501/502.



# DTM Distributed Transmitter Monitor

## DTM20 Hazardous Area Field-Wiring Diagram



### Note:

- ✓ Power supply 2 and 4-20mA(2) are optional connections used for redundancy.
- ✓ Alert and Danger relays are shown connected as normally open. Connect ARM and NC for normally closed.
- ✓ Connecting COM and RST/BYP with an external continuous or momentary closed switch will initiate a remote reset. Temporarily closing the switch will result in a system reset, continuous close will result in a system bypass.
- ✓ If DTM20 has the digital condition monitoring function, the Trip/Multi and COM pins are used for phase reference input. Thus, the DTM20 won't provide the Trip Multiply and the Trip Multiply property should be set to "None" in the DTM-CFG software.
- ✓ When using the signal condition monitoring function the DTM20 works with DTM10-501/502 to provide a phase reference output. In this case connect Trip/Multi of DTM20 with Trip/Multi of DTM10-501/502 and connect COM of DTM20 with COM of DTM10-501/502.
- ✓ Other barriers available:  
 TM0402: (STAHL 9001/51-280-091-141)  
 TM0407: (STAHL 9160/13-11-11)





# DTM Distributed Transmitter Monitor

## Looseness Monitor DTM20-A4

The DTM20-A4 is designed for monitoring reciprocating compressors & engines. It is a multiple parameter monitor with both impact monitoring and acceleration monitoring. Alarm can be the combination of these two parameters. You can conveniently decide the alarm level of each of the monitored parameters and setup accordingly. In addition to analog transmission, the monitor also supplies a digital output, dual alarms, and a condition monitoring. Thus greatly enhanced the analysis and monitoring capabilities of the system. The looseness monitor conforms to ISO10816-6.



### Looseness Monitor Unique Features

#### Precision Looseness Monitor

Programmable impact trigger level and time base.  
Impact is set in acceleration (g's) with DTM-Config software.  
Highly repeatable with quantitative measurement

#### Multiple parameters monitoring

Not only monitoring looseness impact but also overall acceleration  
Both parameters can be monitored and alarmed

#### Multiple outputs

Analog transmission via dual 4-20mA  
Digital Modbus RTU output  
Dual programmable alarms  
Waveform and spectrum (with software)

#### More accurate impact response

Industrial, light weight accelerometer (100mv/g - pk constant current) makes the measurement more responsive to high frequency and repeatable

#### Live waveform helps trigger level setting

Within the configuration process, the live waveform can be analyzed to decide the looseness trigger level thus minimize the "estimated" uncertainty

#### Designed with reliability

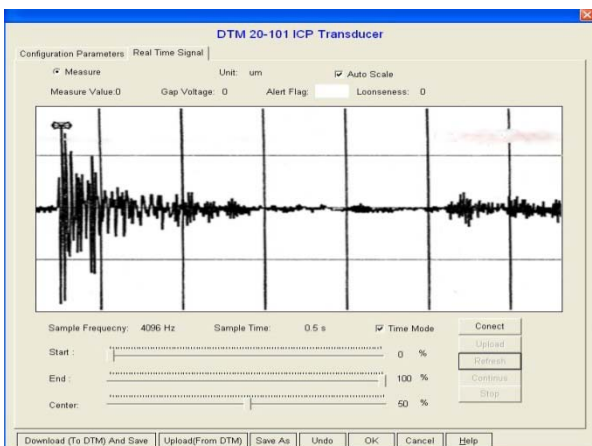
Redundant power supplies  
Redundant 4-20mA outputs  
Dual dry-contact relay outputs  
Trip multiply and Bypass

#### Galvanic/optical isolation for solid signal processing

Power input isolation  
Sensor signal conditioning isolation  
Transmission 4-20mA output isolation  
Relay output isolation  
Digital output isolation with DTM96

#### Fully field programmable by CFG software

DTM20-CFG can easily change any configuration of the monitor.  
Calibration of the system is available with CFG software





## Reciprocating condition monitoring by direct digital connection

Static registers (trend, overall, alarms, GAP, system OK)  
Dynamic signal (waveform, spectrum, phase reference, waterfall)  
Data will be directly transferred into server with no needs of additional interface hardware

## MODBUS digital communication

Build-in Modbus RTU digital communication  
More register information from Modbus

## Specifications

### Electrical

#### Power:

Redundant. Accept dual power input  
20-30VDC @150mA  
Galvanic isolation: 1000VDC

#### Frequency Response:

100-1200rpm

#### Piezo Sensor Interface:

##### Sensitivity:

100mV/g -pk

##### Current Source

Nominal : 4mA@24VDC

#### Monitor Accuracy:

Typical +/-2% FS  
Maximum +/-5% FS

#### Buffered Output:

Original vibration, un-filtered  
Impedance: 150Ω  
Maximum cable distance: 300m (1000ft)  
Sensitivity: same as the sensor  
Local BNC connector  
On line CM terminals

#### Overall Vibration output:

Up to two 4-20mA outputs  
4-20mA(1):  
Source  
Sharing sensor ground  
Maximum load resistance 500Ω

4-20mA(2):

Loop. Loop powered by controller.  
Optical isolation, 1000VDC  
Power supply range: 16-30VDC  
Maximum load resistance: 50\*(Vs-16)  
Where Vs is the loop power supply

#### Alarm Set Point:

5 - 100% FS

Accuracy:

±0.1%

#### Relays:

Seal: Epoxy  
Capacity: 0.2A/240VAC,  
0.4A/110VAC  
2.0A/24VDC, resistive load  
Relay type: SPTD  
Isolation: 1000VDC

#### Push Buttons:

SET: System on-site calibration and alarm setting  
+ : Adjustment increment  
- : Adjustment decrement

#### LED Machine Condition Indicator:

OK: System OK indication  
ALT: Vibration over Alert level  
DNG: Vibration over Danger level  
BYP: System in BYPASS  
TRX: Digital transmission active

#### RESET/BYPASS:

Front panel push-button  
Remote RESET/BYPASS terminals

#### Trip-Multiply

Double or Triple Multiply set by DTM-CFG. This feature is not available with (M2, M4 and M6)

#### Software programming (DTM-CFG):

Alert and danger set-point, time delay  
ZERO and Full-Scall calibration  
Alarm latching/ non-latching, energized/ de-energized  
Relay programmable with alert, danger or system OK  
Sensor selection, sensitivity setup  
System calibration  
Digital communication setup



# DTM Distributed Transmitter Monitor

- Trip-multiply setup
- Real-time bar-graph and alarms
- 3 layers of password protection

## Digital Condition Monitoring

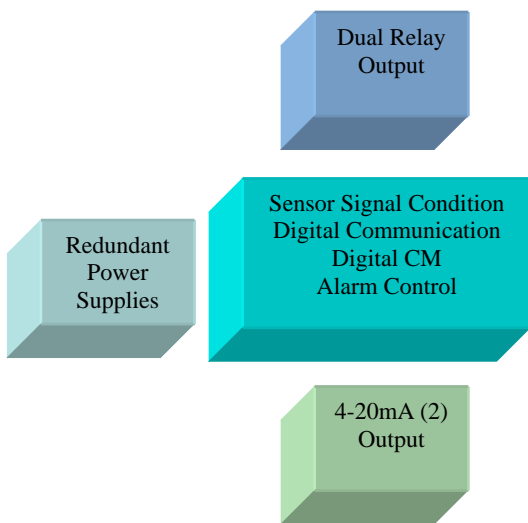
- Terminals
  - RS485 for both Modbus RTU and condition monitoring
- Software PCM360-LT
  - Work with PCM360-LT plant condition management software
  - Dynamic waveform:
    - Real-time vibration data, 2000 sets per data acquisition.

- Alarms:
  - Up to 100 alarms can be stored in DTM20
- Trend:
  - Up to 1000 trend data can be stored in DTM20
- Spectrum:
  - Up to 800 lines of resolution

## Physical

### Dimension:

- Height: 75mm (2.95")  
see figure below
- Weight: 2.0lbs (1.0kg)



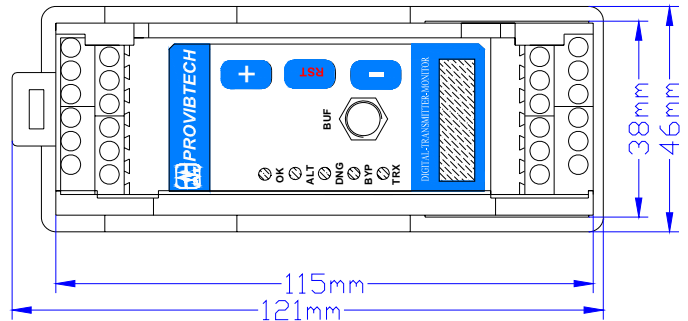
*Building Block of DTM20  
All modules are isolated  
Digital output isolation via DTM96*

## Environmental

- Temperature:
  - Operation: -40°C to +85°C
  - Storage: -50°C to +100°C
- Humidity: 90% non-condensing
- Case: Aluminum cast (copper free)

## Certification

- CE certified with EMI compliance
- CSA: Class I, Div. 2, Grps A,B,C&D,T4
- ATEX: II 3G ExnA II T4
- TR CU: 2Ex nA II T4 X
- № TC RU C- US.ГБ05.B.00476
- NANIO CCVE



Rail Mounting

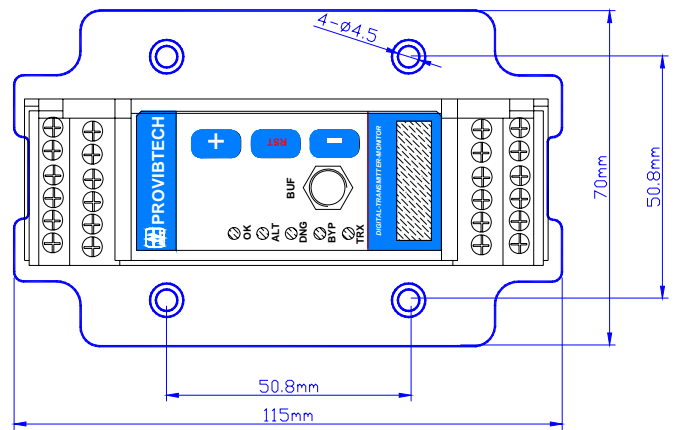


Plate Mounting

## Hazardous area

- Marking:
- ATEX Standards:
  - EN 60079-0
  - EN 60079-15
- Special condition in hazardous area:
  - The ambient temperature range is: -40°C ≤ Ta ≤ 70°C



# DTM Distributed Transmitter Monitor

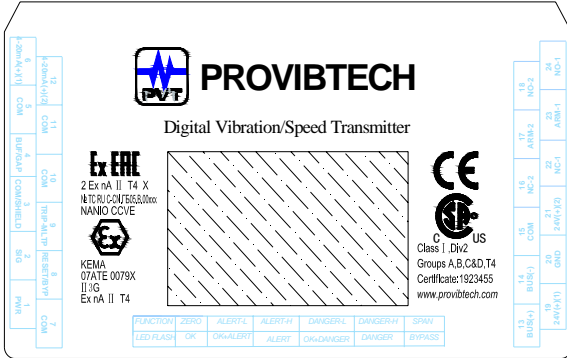
DTMs must be placed inside an enclosure that is in accordance with EN 60079-15:2005.

Provisions must be made externally to prevent the rated voltage from being exceeded by transient disturbances of more than 40 %.

ATEX: II 3G ExnA II T4  
TR CU: 2Ex nA II T4 X  
№ TC RU C- US.ГБ05.B.00476  
NANIO CCVE

**TXXX: Running Speed**  
XXX: Running at XXX rpm

\* Isolated 4-20mA requires external loop power.



## Optional Accessories

### DTM-CFG-K

The DTM configuration and calibration software kit includes:

- ✓ DTM-CFG configuration and calibration software CD
- ✓ RS485-USB converter with cable

## Ordering Information

### DTM20-A4-B0-I2-MX-SX-TXXX

Looseness monitor, fully field configurable, with Modbus RTU.

#### MX: Condition Monitoring,

##### 4-20mA with Optical Isolation\*

M5\*: Dual 4-20mA, Modbus enabled

M6: Dual 4-20mA, Modbus with PCM360 condition monitoring capability

#### SX: Approvals

S0\*: CE

S1: CE

CSA: Class I, Div. 2, Grps A,B,C&D,T4

### PCM-TCP

Modbus RTU-TCP Converter

### TM900

Power converter with isolation. Converts 95-250 VAC into 24VDC and is capable of powering up to five DTM modules.

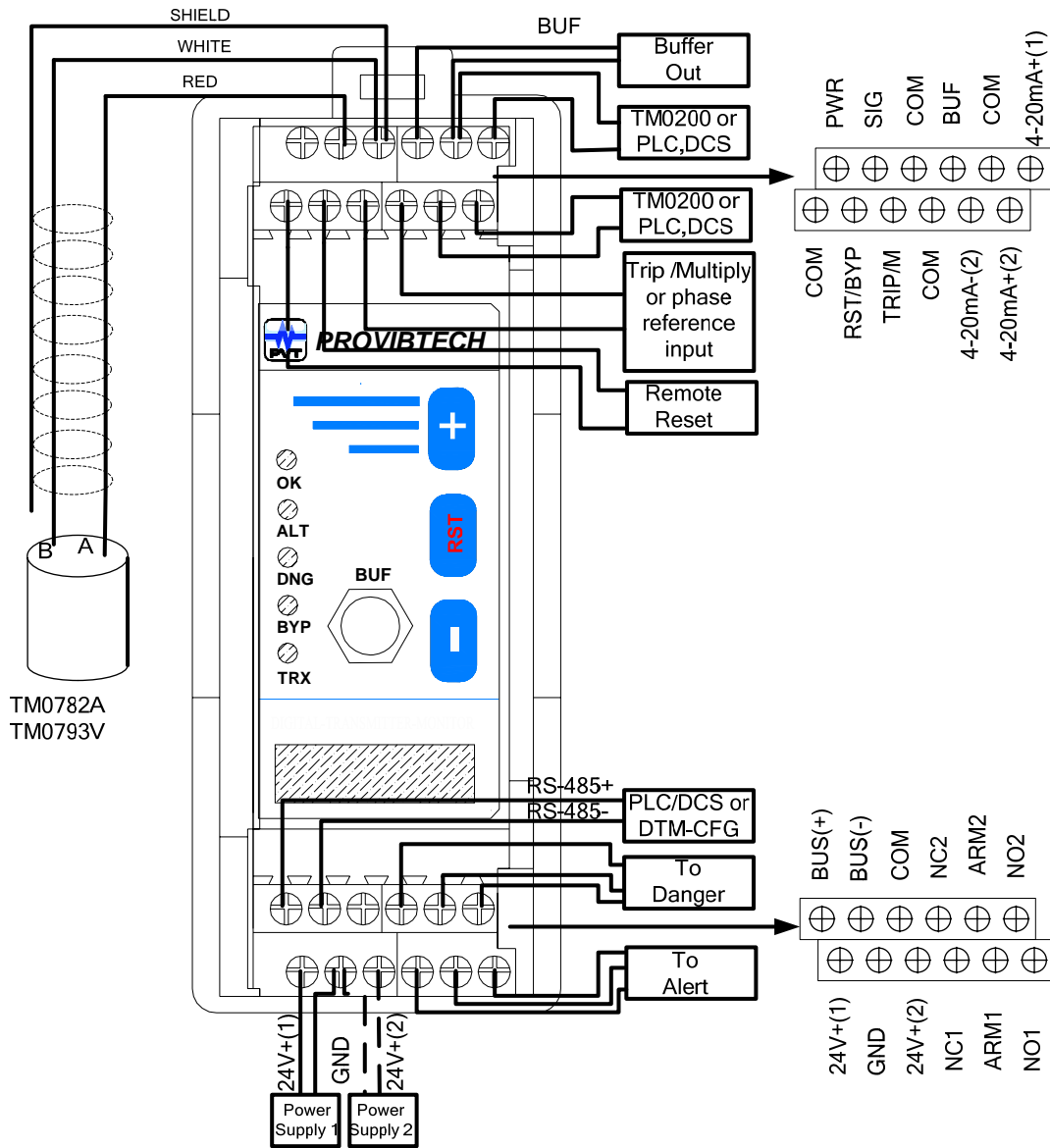
### Seismic Sensor Systems

- ✓ **TM0782A-K-M:** Accelerometer kit
- ✓ **TM0783A-K-M:** Accelerometer with cable



## DTM20 System Installation

### DTM20 Field-Wiring Diagram



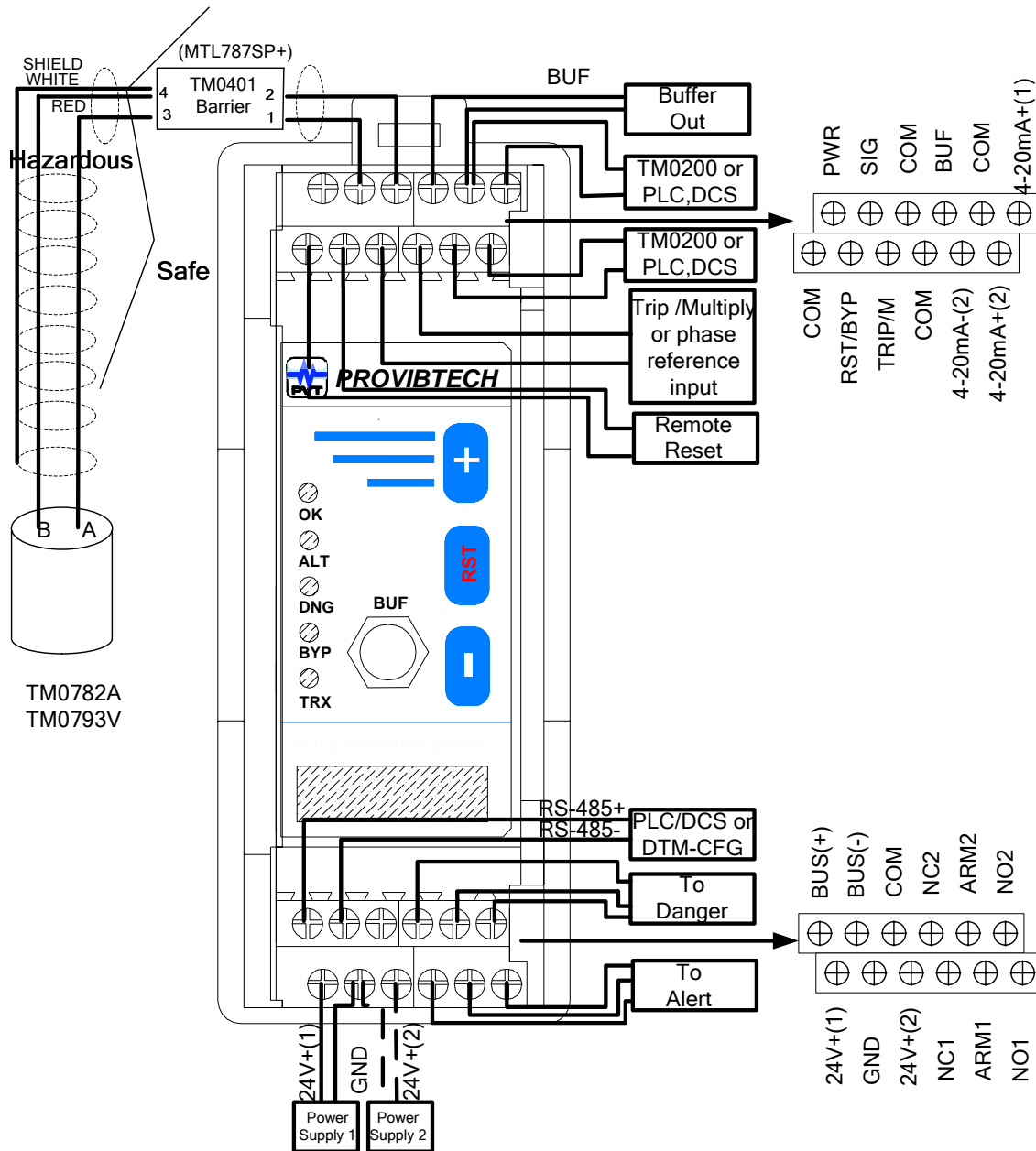
#### Note:

- ✓ Power supply 2 is optional connection used for redundancy.
- ✓ Alert and Danger relays are shown connected as normally open. Connect ARM and NC for normally closed.
- ✓ Connecting COM and RST/BYP with an external continuous or momentary closed switch will initiate a remote reset. Temporarily closing the switch will result in a system reset, continuous close will result in a system bypass.
- ✓ If DTM20 has the digital condition monitoring function, the Trip/Multi and COM pins are used for phase reference input. Thus, the DTM20 won't provide the Trip Multiply and the Trip Multiply property should be set to "None" in the DTM-CFG software.
- ✓ When using the signal condition monitoring function the DTM20 works with DTM10-501/502 to provide a phase reference output. In this case connect Trip/Multi of DTM20 with Trip/Multi of DTM10-501/502 and connect COM of DTM20 with COM of DTM10-501/502.



# DTM Distributed Transmitter Monitor

## DTM20 Hazardous Area Field-Wiring Diagram



### Note:

- ✓ Power supply 2 is optional connection used for redundancy.
- ✓ Alert and Danger relays are shown connected as normally open. Connect ARM and NC for normally closed.
- ✓ Connecting COM and RST/BYP with an external continuous or momentary closed switch will initiate a remote reset. Temporarily closing the switch will result in a system reset, continuous close will result in a system bypass.
- ✓ If DTM20 has the digital condition monitoring function, the Trip/Multi and COM pins are used for phase reference input. Thus, the DTM20 won't provide the Trip Multiply and the Trip Multiply property should be set to "None" in the DTM-CFG software.
- ✓ When using the signal condition monitoring function the DTM20 works with DTM10-501/502 to provide a phase reference output. In this case connect Trip/Multi of DTM20 with Trip/Multi of DTM10-501/502 and connect COM of DTM20 with COM of DTM10-501/502.