



## Digital Tension Meter Instruction Manual

All of the information herein is the exclusive proprietary property of Maxcess International and is disclosed with the understanding that it will be retained in confidence and will neither be duplicated nor copied in whole or in part nor be used for any purpose other than for which disclosed.

Copyright 2008, all rights reserved. Periodically there will be updates to this manual. The latest version is available

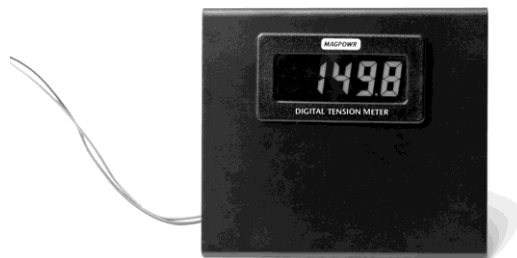
on our website or by calling your regional office listed on the back page of this publication.



**CAUTION:** Read complete instructions prior to installation and operation of the unit.



**CAUTION:** Risk of electric shock.



UL Recognized Component  
File #E308360



- LCD WITH RED BACKLIGHTING
- 0 to 1 mADC Input
- 0.6 INCH (15.2 mm) HIGH LCD DIGITS
- BUILT-IN SCALING PROVIDED
- AUTO ZEROING CIRCUIT
- SELECTABLE DECIMAL POINTS
- WIRE CONNECTIONS MADE VIA SCREW CLAMP TYPE TERMINALS
- FITS DIN STANDARD CUT-OUT 2.68" (68 mm) x 1.30" (33 mm)
- NEMA 4X/IP65 SEALED FRONT PANEL BEZEL
- 9 TO 28 VDC POWERED

### 1.0 DESCRIPTION

The DTM Digital Tension Meter is designed and manufactured using the latest technology for a high quality, compact, affordable instrument for use in industrial environments. Each unit has a 3-1/2-digit LCD display with 0.6 inch (15.2 mm) high digits and a DIP switch selectable decimal point.

The units are constructed of a lightweight, high impact plastic case with a clear viewing window. The sealed front panel meets NEMA 4X/IP65 specifications for wash-down and/or dusty environments, when properly installed.

### 2.0 SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

### 3.0 SPECIFICATIONS

1. **DISPLAY:** 3-1/2-digit (-1999 to 1999), 0.6" (15.2 mm) high digits. Minus (-) sign is displayed when current is negative.
2. **DECIMAL POINTS:** DIP switch selectable decimal points allow the display to be read in tenths, hundredths or thousandths.
3. **POWER REQUIREMENTS:** 9 to 28 VDC @ 35 Ma typ., 50 mA max. Above 26 VDC, derate operating temperature to 50°C.

4. **INPUT RANGES:**  $\pm 1.000$  mADC
5. **ACCURACY:** (@ 23°C, less than 85% RH)  $\pm(0.1\% + 1 \text{ digit})$
6. **OVERRANGE RATINGS, PROTECTION & INDICATION:** 9 to 28 VDC power circuit is not isolated from the signal circuit.  
**Max Input Current:** 10mA  
**Overrange Indication:** Overrange is indicated by a "1" displayed in the most significant digit and the blanking of the three least significant digits.
7. **READING RATE:** 2.5 readings per second
8. **RESPONSE TIME:** 1.5 seconds to settle for a step change
9. **NORMAL MODE REJECTION:** 60 dB 50/60 Hz
10. **INPUT IMPEDANCE:** 200  $\Omega$
11. **CERTIFICATIONS AND COMPLIANCES:**

#### SAFETY

UL Recognized Component, File # E308360, UL61010A-1, CSA C22.2 No. 61010-1

Recognized to U.S. and Canadian requirements under the Component

Recognition Program of Underwriters Laboratories, Inc.

Type 4X Enclosure rating (Face only), UL50

Issued by Underwriters Laboratories, Inc.

IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1. IP65 Enclosure rating (Face only), IEC 529

### 3.0 SPECIFICATIONS (cont)

#### 12. ENVIRONMENTAL CONDITIONS:

**Operating Temperature:** 0° to 60°C (above 50°C, derate backlight operating voltage to 26 VDC maximum).

**Storage Temperature:** -40° to 80°C

**Operating and Storage Humidity:** 85% max relative humidity (non-condensing) from 0 to 60°C.

**Temperature Coefficient:** 100 PPM/°C

**Altitude:** Up to 2000 meters.

**13. CONSTRUCTION:** High impact plastic case with clear viewing window. (Panel gasket and mounting clip included.) This unit is rated for NEMA 4X/IP65 indoor use. Installation Category I, Pollution Degree 2

**14. WEIGHT:** 3.3 oz. (93.5 g)

**15. REQUIRED CONDITIONS TO MEET UL RECOGNIZED COMPONENT LISTING:** The equipment is considered: Panel-mountable, Installation Category I, Pollution Degree 2, permanently connected (field wiring)

- The device should be used within its Recognized ratings as specified above.  
Input - 9 to 28 VDC  
Signal - 1.000 mA DC  
Ambient - 0°C to 60°C (above 50°C, derate backlight operating voltage to 26 VDC maximum)
- The device should be mounted in the intended manner in an enclosure having adequate strength and thickness with acceptable spacings being provided.
- The spacings from the exposed live-metal parts to the enclosure wall should be in accordance with the requirements for the overall equipment.
- The terminals are suitable for factory wiring only.
- These devices have been tested with an elevated ambient of 50°C to 75°C.
- The device has been evaluated for Nema Type 4X/IP65 enclosure rating for the face, mounted in a tightly fitting cutout.
- These devices have been evaluated for double insulation between the terminals and the face plate.

### 16. ELECTROMAGNETIC COMPATIBILITY

#### Immunity to EN 50082-2

Electrostatic discharge	EN 61000-4-2	Level 2; 4 Kv contact Level 3; 8 Kv air
Electromagnetic RF fields	EN 61000-4-3	Level 3; 10 V/m <sup>1</sup> 80 MHz - 1 GHz
Fast transients (bursts)	EN 61000-4-4	Level 4; 2 Kv I/O Level 3; 2 Kv power
RF conducted Interference	EN 61000-4-6	Level 3; 10 V/rms <sup>2</sup> 150 KHz - 80 MHz
Power frequency magnetic fields	EN 61000-4-8	Level 4; 30 A/m
Simulation of cordless telephone	ENV50204	Level 3; 10 V/m 900 MHz ± 5 MHz 200 Hz, 50% duty cycle

#### Emissions to EN 50081-2

RF interference	EN 55011	Enclosure class A Power mains class A
-----------------	----------	--

#### Notes:

- Self-recoverable loss of performance during EMI disturbance at 10 V/m. Process signal may deviate during EMI disturbance.**  
For operation without loss of performance:  
Unit is mounted in a metal enclosure (Buckeye SM7013-0 or equivalent)  
I/O and power cables are routed in metal conduit connected to earth ground.
- Self-recoverable loss of performance during EMI disturbance at 10Vrms. Process signal may deviate during EMI disturbance.**  
For operation without loss of performance:  
Install power line filter RLC#LFIL0000 or equivalent at the unit.  
Refer to the EMC Installation Guidelines section of this bulletin for additional information.

### 4.0 INSTALLATION ENVIRONMENT

The unit should be installed in a location that does not exceed the maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided. The bezel should be cleaned only with a soft cloth and neutral soap product. **Do NOT use solvents.** Continuous exposure to direct sunlight may accelerate the aging process of the bezel.

**NOTE: Do NOT use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.**

#### Installation

The DTM Digital Tension Meter meets NEMA 4X/IP65 requirements for indoor use, when properly installed. The units are intended to be mounted into an enclosed panel. A sponge rubber gasket, mounting clip, two screws, and nut fasteners are provided to install and seal the unit in the panel cutout. The following procedure assures proper installation:

- Cut panel opening to specified dimensions. Remove burrs and clean panel opening.
- Carefully remove center section of the panel gasket and discard. Slide gasket over rear of the unit to the back of the bezel.
- Slide nut fastener into slot on mounting clip and then insert mounting screw through nut on both sides of mounting clip. **Tip of mounting screw should NOT project through hole on clip.**
- Install DTM unit through panel cutout.
- Slide mounting clip over rear of unit until clip is against back of panel. The mounting clip and DTM housing have a latching feature to hold the unit in place until tightened.

**NOTE: Hold the DTM front bezel in place when sliding the mounting clip into position.**

- Alternately tighten each mounting screw to ensure uniform gasket

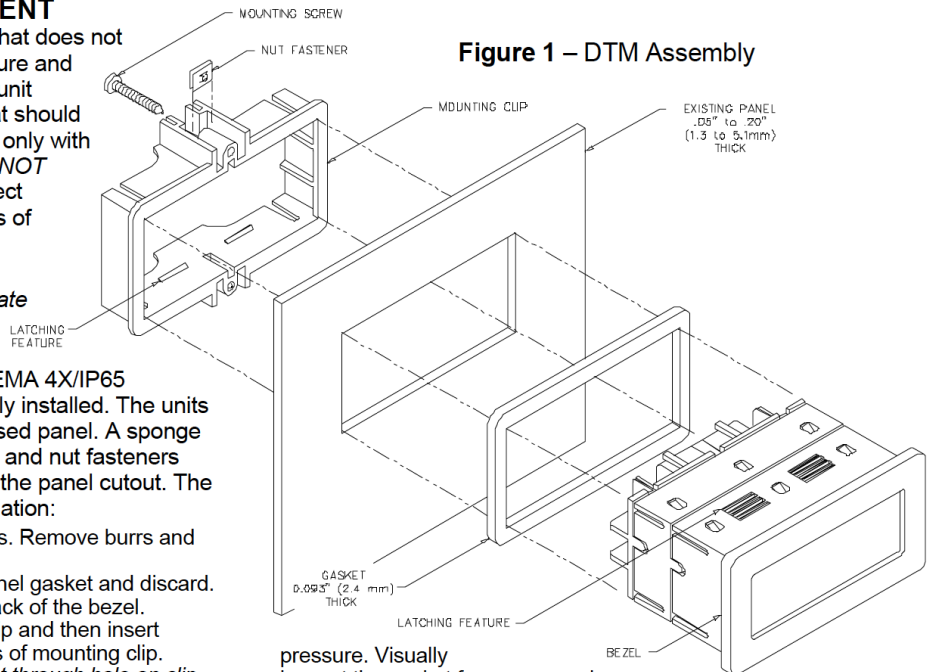


Figure 1 – DTM Assembly

pressure. Visually inspect the gasket for proper seal.

- The gasket should be compressed approximately 75 to 80% of its original thickness. (Recommended torque is 28 to 36 in-oz.)
- If the gasket is not adequately compressed and the mounting screws cannot be tightened any further, loosen mounting screws and insure that the clip is latched as close as possible to the panel.
- Repeat step #6 for tightening the mounting screws.

## EMC Installation Guidelines

Although this unit is designed with a high degree of immunity to ElectroMagnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of electrical noise, source or coupling method into the unit may be different for various installations. Cable length, routing and shield termination are very important and can mean the difference between a successful or a troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The unit should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
  - a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
  - b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
  - c. Connect the shield to earth ground of the unit and leave the other end of the shield unconnected and insulated from earth ground.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
4. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure.

The following EMI suppression devices (or equivalent) are recommended:

Ferrite Suppression Cores for signal and control cables:

Fair-Rite # 0443167251 (RLC #FCOR0000)

TDK # ZCAT3035-1330A

Steward #28B2029-0A0

Line Filters for input power cables:

Schaffner # FN610-1/07 (RLC #LFIL0000)

Schaffner # FN670-1.8/07

Corcom #1VR3

**Note:** Reference manufacturer's instructions when installing a line filter.

6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.

## 5.0 WIRING CONNECTIONS

The electrical connections are made via screw-clamp terminals located on the back of the unit. When wiring the unit, use the label to identify the wire position with the proper function. All

conductors should meet voltage and current ratings for each terminal. Also cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the unit be protected by a fuse or circuit breaker. Strip the wire, leaving approximately 1/4" bare wire exposed (stranded wires should be tinned with solder). Insert the wire into the screw-clamp terminal and tighten the screw until the wire is clamped tightly. Each terminal can accept up to two #14 AWG wires.

## 6.0 DECIMAL POINT SELECTION

The DTM Digital Tension Meter can be set-up to read in 10ths, 100ths, or 1000ths. The decimal point position is DIP switch selectable for one of three locations. If all the DIP switches are set to the "OFF" position, then NO decimal point will appear in the display. The DIP switches are located at the rear of the unit.

## 7.0 DTM SIGNAL INPUT

The SCALE DIP switch (S1) and the Scaling Potentiometer are used to scale the display to the desired maximum tension indication. The Scale switch should be left in the "ON" position for use as a tension meter.

When the power supply is floating (unreferenced) to the desired measurement points, the (-) signal input and the power supply common should be connected. If the power supply is not floating (referenced), the common mode voltage between the (-) signal input and power supply common terminal must not be greater than 1.0 V peak. A common mode voltage higher than 1.0 V peak will result in a measurement error.

The Calibration Potentiometer has been set at the factory and should not be adjusted unless the unit is being re-calibrated with an accurate current source.



**CAUTION:** The Maximum Current of 10 mA must not be exceeded or the unit may be damaged. (See Specifications).

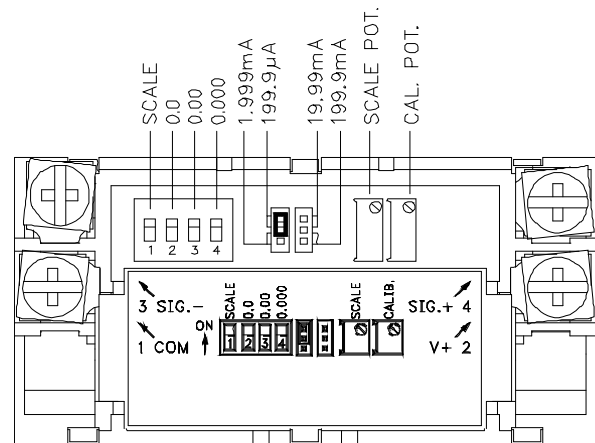


Figure 3 – DTM Signal Input

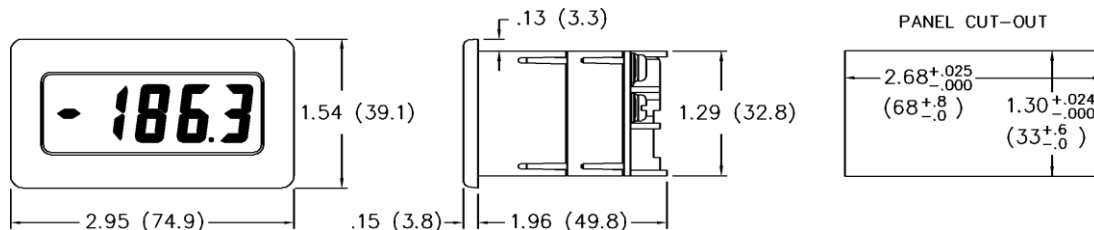


Figure 2 – DTM Installation Dimensions and Panel Cutout

## 8.0 METER SCALING

The Digital Tension Meter display can be scaled to almost any lower numerical value. Setting the Scale switch to the "ON" position enables the Scale Potentiometer, which is used to scale the unit. The Scale potentiometer can be set to divide the reading by a division factor between 1 and 13.

**EXAMPLE:** The DTM Tension Meter has been connected to a Spyder meter output to measure tension. The Spyder has been calibrated to 100 pounds maximum tension. Apply 100 pounds to the load cells. Set the DTM Scale switch, S1, to "ON". Use the scale potentiometer to adjust the display reading until the DTM display shows "1000". Set decimal point switches, S3 and S4, to "OFF" and switch S2 to "ON". The display will now show "100.0".

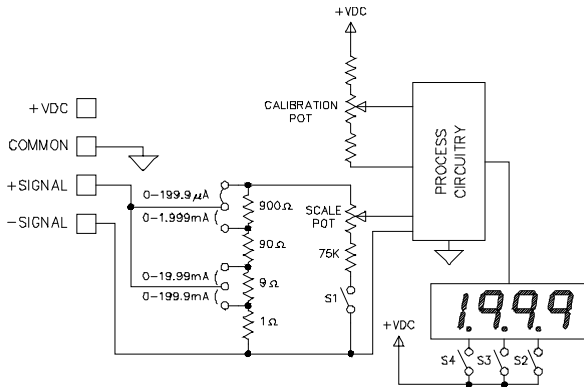


Figure 4 – DTM Meter Scaling

## 9.0 TYPICAL MEASUREMENT APPLICATIONS

The DTM meter can be used to display the value of the meter output, 0 to 1mA, signal from MAGPOWR tension controls and amplifiers. The following table provides the terminal numbers of all the MAGPOWR controls which provide a 0 to 1 mA meter output.

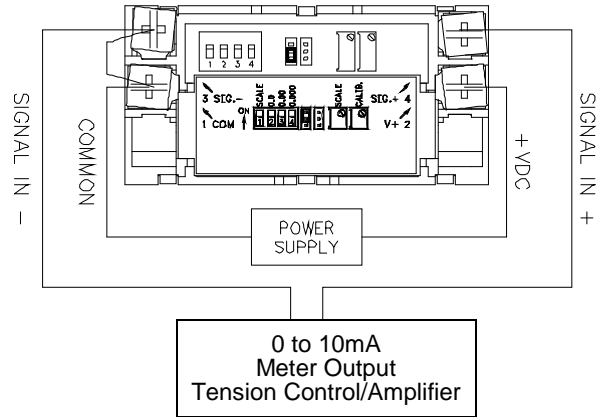


Figure 5 – DTM Measurement Application

MAGPOWR PRODUCTS WITH 0-1 mA METER OUTPUTS			
Product	TERMINALS		Usage
	Negative	Positive	
Cygnus®	TB4.6	TB4.5	Tension
Spyder Plus	34	33	Tension
VERSATEC®	TB3.4	TB3.2	Output Percent
DLCA	22	21	Tension
DTR65	3	4	Tension
TSA	8	9	Tension
PS90	7	6	Output Percent
PS24	7	6	Output Percent
DFC90	7	6	Output Percent
DFCA	6	5	Output Percent

Table 1 – DTM Product Compatibility



AMERICAS  
Tel +1.405.755.1600  
Fax +1.405.755.8425  
sales@maxcessintl.com  
www.maxcessintl.com

EUROPE, MIDDLE EAST  
AND AFRICA  
Tel +49.6195.7002.0  
Fax +49.6195.7002.933  
sales@maxcess.eu  
www.maxcess.eu

CHINA  
Tel +86.756.881.9398  
Fax +86.756.881.9393  
info@maxcessintl.com.cn  
www.maxcessintl.com.cn

INDIA  
Tel +91.22.27602633  
Fax +91.22.27602634  
india@maxcessintl.com  
www.maxcess.in

JAPAN  
Tel +81.43.421.1622  
Fax +81.43.421.2895  
japan@maxcessintl.com  
www.maxcess.jp

KOREA, TAIWAN,  
AND SE ASIA  
asia@maxcessintl.com  
www.maxcess.asia