

SYSTEM OVERVIEW

The Telesis® TMM5100/470 PINSTAMP® marking system permanently prints messages into a variety of materials such as steel, aluminum, and plastic. Hardened pins are pneumatically accelerated to indent dot matrix characters into the item being marked. The shape, size, density, and location of characters are determined by the user through the system software. The marking head moves the pin cartridge through X- and Y-axis motions to reach the correct position for each dot of the characters to be marked. The system software automatically controls pin extension and retraction to mark the message.

The system is compliant with UL, CSA, CE, and RoHS specifications.

TMM5100 Marking Head includes the mechanical motion components to position the marking pin at precise X/Y positions and the pneumatic components to drive the marking pins from, and return the pins to, the pin cartridge.

The TMM5100 marking head is an X/Y-traversing mechanism. Using two stepper motor drives, it accurately and rapidly positions the pin cartridge at coordinate-defined locations in marking window within .002" (.050 mm). The TMM5100 accommodates the rigorous dynamics of impacting, rebounding, and rapid positioning of the cartridge using a system of belt-driven leadscrews and guide rods.

The floating pin design permits high quality, consistent marks on irregular, slightly curved surfaces. It also accommodates applications where marking surfaces cannot be positioned at a consistent distance from the marker.

Pin Cartridges. Aluminum cartridges are used for 25L-series pins; steel cartridges for 101-series pins. Non-lubricated, lightweight plastic pin cartridges are used for 150S-series pins

and optionally, as custom cartridges, for 25L- and 101-series pins. Metal cartridges require lubrication via the filter/regulator/lubricator unit. Pin cartridges are available in many configurations based on the number of pins and the pin spacing (.25 to .75 inches) [6 to 19 mm]. Cartridges for 25L-series and 101-series pins typically hold 6 pins. Cartridges for 150S-series pins may contain from 2 to 6 pins. The cartridge configuration dictates the size of the marking window along the X-axis. Refer to the marking head installation drawing for details.

Marking Pins for the TMM5100 include the 25L, 25XL, 101, and 150S-series. Refer to the marking head installation drawing for pin stroke (pin extension) dimensions. Refer to the marking depth tables for pin cone angles and depths.

Marker Cable connects the marker to the controller. The highly flexible, removable cable is 8m (26 ft.) long. Optional extension cables are available for greater distances.

Filter/Regulator/Lubricator Unit includes two regulators with pressure gauges to control the drive air and return air, and an oil reservoir with delivery control. The regulator contains a coarse filter and a coalescing filter to remove finer particles. Two air lines connect the regulated air to the marking head. Drive air fires the impact pin; return air pushes it back into the cartridge and delivers lubricant to the cartridge. Systems with plastic pin cartridges use filter/regulator units without lubricators since oil is not required and will damage the cartridges. Standard air lines are 25 ft. (7.5 m) long made of 3/8" tubing.

TMC470 Controller provides the electrical interface and software control of the TMM5100 marking head. (Refer to *TMC470 Controller Specifications* for details.)

TMM5100/470 Marking System

SYSTEM OPTIONS

- Mounting Post with Hand Crank; 19.3" (492 mm) Travel
- Pistol Grip Handle with Pushbutton Controls
- Gimbal Assemblies and Cable Balancers

- Foot Switch (Start Print)
- Pushbutton Station (Start/Abort)

- Cartridge Standoffs (for precise marker positioning)
- Custom Cartridges (pin quantity and spacing)
- Marking Head Extension Cables

- TMC470 Controller Panel-mounting Bezel/Bracket Kit
- TMC470 Controller Wall-mounting Bracket Kit
- TMC470N NEMA[®] Enclosure

- Bar Code Scanner
- Bar Code Wand

- Backup Utility Software
- Logo/Font Generator Software
- Upgrade Utility Software

SYSTEM SETUP

Complete installation procedures are provided in the *TMM5100* and the *TMC470 Installation/Maintenance Manuals*. The following procedures are listed for reference only to provide a general overview of the installation process.

NOTE

The TMM5100 may be mounted using either the bottom plate or the top plate of the marking head assembly. Refer to the appropriate mounting drawing for dimensions and details.

1. When designing a fixture, allow for 3-axis adjustment to aid in horizontal, vertical, and lateral alignment of the marking head.
 - ▶ Mount marking head to a suitable fixture using two M6-1.00 bolts. **Mounting bolts must not extend into marking head more than more 1/4" (6.3 mm).**
2. Mount filter/regulator assembly, using brackets provided, within 25 ft. (7.5 m) of marking head; within 15 ft. (4.5 m) if lubricator is used.
3. Connect drive air and return air lines to the connectors on back of marking head.
4. Connect supply air to input port on filter/regulator assembly.

CAUTION

The TMC470 is not a sealed unit. Protect it from potentially damaging conditions and contaminants. Do not block vents in bottom of case. Ensure the marking system is electrically isolated from any devices that may generate extreme electromagnetic interference (EMI).

5. Locate controller as close as practical to marking head. Standard marker cable length is 8 m (26 ft.).
6. Install the controller as a table-top, wall-mounted, panel-mounted, or enclosure-mounted unit, as applicable.
7. Ensure controller power switch is OFF.
8. Connect marker cable to marking head and to controller.
9. Connect power cable to controller.
10. Position controller power switch to ON.
11. Start marking system software.
12. Adjust pin stroke, drive air, and return air for impact depth.

TMM5100/470 Marking System

HEAD CART./PIN	NOM.	MAX.	NOMINAL STROKE "R"	MAXIMUM STROKE "S"
25	5.00 [127]	5.10 [130]	.52 [13]	.62 [16]
25XL	5.30 [135]	5.40 [137]	.83 [21]	.93 [24]
101	5.37 [136]	5.47 [139]	.96 [24]	1.06 [27]
150S	3.72 [94]	3.84 [98]	.25 [6]	.38 [10]

PIN TYPE	CONFIGURATION NO. OF PINS X SPACING	A	B	C	D	E	F	G	H	J
25L	6 X .25	2 [51]	1.50 [38]	.27 [7]	1.50 [38]	1.29 [33]	3.73 [95]	.22 [6]	4.62 [117]	5 [127]
	6 X .38	2.63 [67]	1.19 [30]	.27 [7]	1.50 [38]	1.22 [31]	4.41 [112]	.22 [6]	4.62 [117]	5 [127]
	6 X .50	3.25 [83]	.88 [22]	.27 [7]	1.50 [38]	.67 [17]	4.36 [111]	.22 [6]	4.62 [117]	5 [127]
	6 X .75	4.50 [114]	.25 [6]	.27 [7]	1.50 [38]	.05 [1]	4.99 [127]	.22 [6]	4.62 [117]	5 [127]
25XL	6 X .25	2 [51]	1.50 [38]	.27 [7]	1.50 [38]	1.29 [33]	3.73 [95]	.22 [6]	4.62 [117]	5.31 [135]
	6 X .38	2.63 [67]	1.19 [30]	.27 [7]	1.50 [38]	1.22 [31]	4.41 [112]	.22 [6]	4.62 [117]	5.31 [135]
	6 X .50	3.25 [83]	.88 [22]	.27 [7]	1.50 [38]	.67 [17]	4.36 [111]	.22 [6]	4.62 [117]	5.31 [135]
	6 X .75	4.50 [114]	.25 [6]	.27 [7]	1.50 [38]	.05 [1]	4.99 [127]	.22 [6]	4.62 [117]	5.31 [135]
101	6 X .25	2 [51]	1.50 [38]	.27 [7]	1.50 [38]	1.29 [33]	3.73 [95]	.22 [6]	4.62 [117]	5.31 [135]
	6 X .38	2.63 [67]	1.19 [30]	.27 [7]	1.50 [38]	.92 [23]	4.11 [104]	.28 [7]	4.62 [117]	5.37 [136]
	6 X .50	3.25 [83]	.88 [22]	.27 [7]	1.50 [38]	.61 [15]	4.42 [112]	.28 [7]	4.62 [117]	5.37 [136]
	6 X .75	4.50 [114]	.25 [6]	.42 [11]	1.50 [38]	-.02 [-5]	5.04 [128]	.28 [7]	4.62 [117]	5.37 [136]
150S	2 X .75	1.50 [38]	1.81 [46]	.27 [7]	1.72 [44]	1.20 [30]	3.82 [97]	.56 [14]	3.16 [80]	3.63 [92]
	3 X .75	2.25 [57]	1.44 [37]	.27 [7]	1.72 [44]	.94 [24]	4.09 [104]	.44 [11]	3.16 [80]	3.63 [92]
	5 X .75	3.75 [95]	.63 [16]	.27 [7]	1.72 [44]	.16 [4]	4.88 [124]	.48 [12]	3.16 [80]	3.63 [92]
	6 X .75	4.50 [114]	.25 [6]	.61 [16]	1.72 [44]	-19 [5]	5.22 [133]	.45 [11]	3.16 [80]	3.63 [92]

NOTES:

- M6-1.00 MOUNTING SCREWS MUST NOT EXTEND INTO THE HEAD BY MORE THAN .25 [6] TO PREVENT INTERFERENCE WITH MOVING PARTS.
- 150S PINS PROTRUDE ABOUT .25 [6] FROM THE FRONT FACE OF THE CARTRIDGE IN THE NORMAL UNFIRE (RETURN AIR ON) POSITION.
- MAX. STROKE DOES NOT LEAVE MATERIAL FOR PIN RESHARPENING.
- "J" NOMINAL TARGET DISTANCE SET AT NOMINAL STROKE.
- IF VALUE OF COLUMN "E" IS NEGATIVE, SURFACE OF CARTRIDGE EXTENDS PAST EDGE OF MARKER BY THAT AMOUNT.

VERIFY THAT THIS DRAWING IS AT THE LATEST REVISION LEVEL WITH TELESIS CUSTOMER SERVICE PHONE: 1-800-867-8670

Ref. Dwg. 23389 F

TMM5100 Marking Head Mounting (Bottom-Plate Details)

HEAD CART./PIN	NOM.	MAX.	NOMINAL STROKE "R"	MAXIMUM STROKE "S"
25	5.00 [127]	5.10 [130]	.52 [13]	.62 [16]
25XL	5.30 [135]	5.40 [137]	.83 [21]	.93 [24]
101	5.37 [136]	5.47 [139]	.96 [24]	1.06 [27]
150S	3.72 [94]	3.84 [98]	.25 [6]	.38 [10]

PIN TYPE	CONFIGURATION NO. OF PINS X SPACING	A	B	C	D	E	F	G	H	J
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150S	2 X .75	1.50 [38]	1.81 [46]	.27 [7]	4.29 [109]	1.20 [30]	3.82 [97]	.56 [14]	3.16 [80]	3.63 [92]
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- IF VALUE OF COLUMN "E" IS NEGATIVE, SURFACE OF CARTRIDGE EXTENDS PAST EDGE OF MARKER BY THAT AMOUNT.

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Ref. Dwg. 23426 F

TMM5100 Marking Head Mounting (Top-Plate Details)

TMM5100/470 Marking System

TMM5100 MARKING HEAD

Specifications

The TMM5100 marking head specifications are subject to change without prior notice.

Dimensions	see <i>Mounting Detail drawings</i>
Weight	10.8 lb. (4.9 Kg) excluding support tooling
Operating Temp.....	32° to 122° F (0° to 50° C) non-condensing
Humidity	10% to 80%
Air Supply	Clean and dry, 60 to 120 psig (4.2 to 8.3 bar)
Air Consumption	1.8 SCFM (idle) 9.0 SCFM (marking)
X-axis Travel	0.75 in (19 mm) max.
Y-axis Travel	0.63 in (16 mm) max.
Marking Area.....	see <i>Mounting Detail drawings</i>
Pin Types	25L-, 25XL-, 101-, or 150S-series
Pin Material:	
25L and 25XL Pins.....	Powdered metal ,or carbide, or stainless steel with diamond tip
101 Pins.....	Carbide
150S Pins.....	Powdered metal or tool steel with carbide tip

Marking Characteristics

The TMM5100 can produce characters as small as .06" (1.5 mm). Characters can printed with resolutions from 10 dots per inch to 200 dots per inch for an engraved look. The depth of mark can be adjusted over a significant range by adjusting the pin stroke and, to a lesser extent, by adjusting the drive air pressure. .

Three marking modes are available to optimize quality and speed. Raster mode prints side-to-side, indexing downward one row at a time. Matrix mode prints up and down, indexing one column at a time. Continuous mode prints with only one pin at a time tracing the character shape.

Marking Speeds

Generally, the system will mark one character per second per pin (using 5x7 font, .125" [3 mm] high characters). Speeds will vary slightly depending on the selected character size, style, and dot density. Specific times can be verified by a Telesis representative.

Marking Noise

All TMM5100 markers are equipped with mufflers on the solenoid exhaust to reduce noise. Although every attempt is made to reduce noise, the material being marked significantly influences the noise level. For example, marking a solid lead block produces less noise than marking a thin-walled steel pipe.

Pin Life

Pin life depends largely on the type of material being marked, how hard or abrasive it is, and the required marking depth. On typical metals with a hardness of Rockwell Rb47, marking at a depth of .005" (.127 mm), powdered steel pins average about 3 million impressions before needing sharpened; carbide pins average approximately 9 million impressions. If carbide pins are used, marking times will increase by approximately 25% due to the increased weight of the pins.

Marking Depth

The following tables provide sample marking depths. Drive air was set at 80 psi (5.5 bars); return air was set at 20 psi (1.4 bars); pin stroke was set to the maximum allowable distance for each pin type to achieve the maximum depth of mark.

Max. Marking Depths – Type 25L Powdered-Metal Pins

MATERIAL (HARDNESS)	22° CONE	30° CONE	45° CONE	60° CONE
Aluminum (Rb2)	.0040 in .1016 mm	.0045 in .1143 mm	.0080 in .2032 mm	.0110 in .2794 mm
Brass (Rb22)	.0025 in .0635 mm	.0030 in .0762 mm	.0055 in .1397 mm	.0080 in .2032 mm
Cast Iron (Rb47)	.0025 in .0635 mm	.0030 in .0762 mm	.0055 in .1397 mm	.0080 in .2032 mm
Cold Rolled Steel (Rb53)	.0025 in .0635 mm	.0030 in .0762 mm	.0055 in .1397 mm	.0080 in .2032 mm

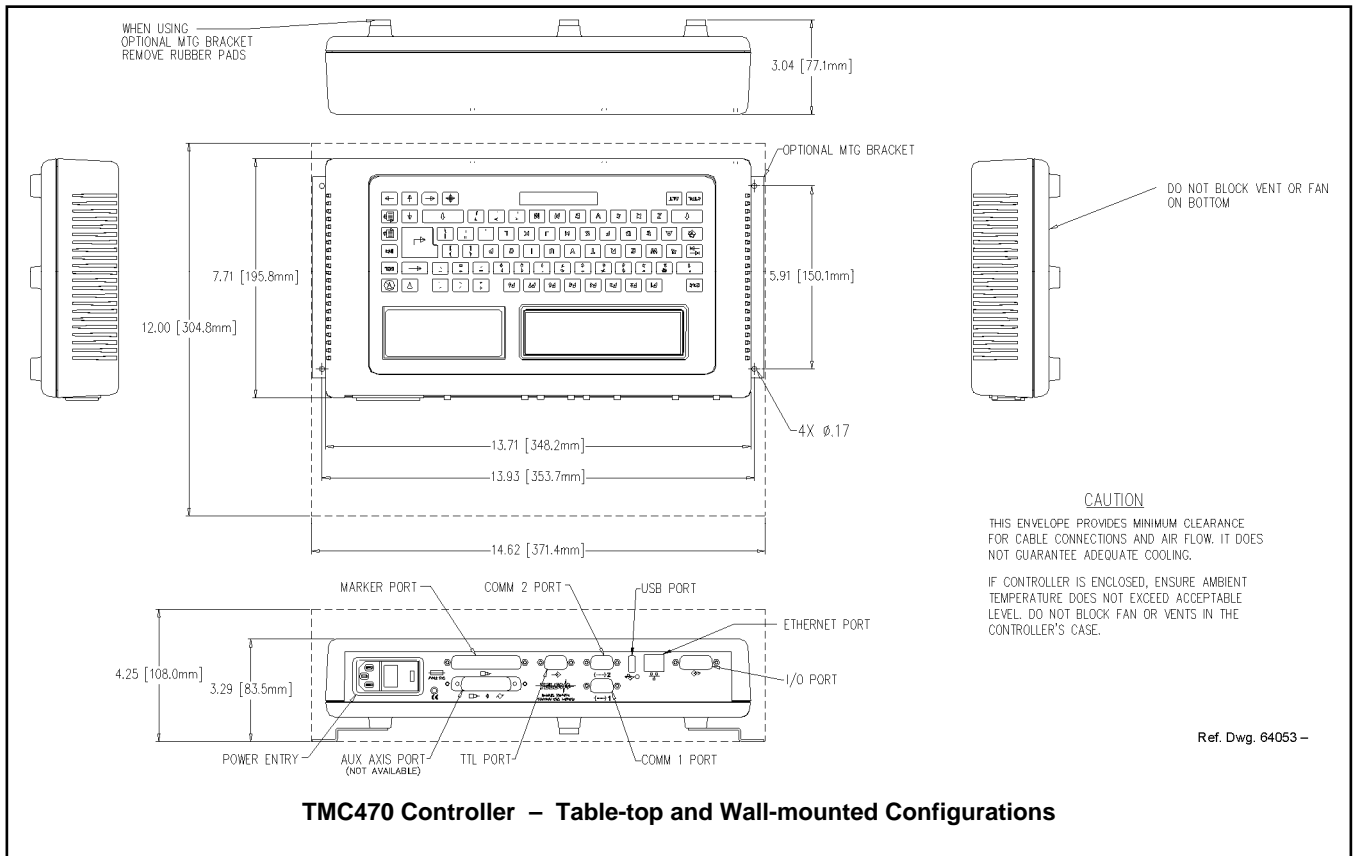
Max. Marking Depths – Type 25L Carbide Pins

MATERIAL (HARDNESS)	22° CONE	30° CONE	45° CONE	60° CONE
Aluminum (Rb2)	.0040 in .1016 mm	.0050 in .1270 mm	.0080 in .2032 mm	.0065 in .1651 mm
Brass (Rb22)	.0025 in .0635 mm	.0035 in .0889 mm	.0060 in .1524 mm	.0040 in .1016 mm
Cast Iron (Rb47)	.0025 in .0635 mm	.0035 in .0889 mm	.0060 in .1524 mm	.0040 in .1016 mm
Cold Rolled Steel (Rb53)	.0025 in .0635 mm	.0035 in .0889 mm	.0060 in .1524 mm	.0040 in .1016 mm

Max. Marking Depths – Type 101 and 150S Pins

MATERIAL (HARDNESS)	30° CONE	45° CONE	45° CONE *	60° CONE
Aluminum (Rb2)	.0110 in .2794 mm	.0150 in .3810 mm	.0170 in .4318 mm	.0220 in .5588 mm
Brass (Rb22)	.0080 in .2032 mm	.0120 in .3048 mm	.0135 in .3429 mm	.0160 in .4064 mm
Cast Iron (Rb47)	.0060 in .1524 mm	.0100 in .2540 mm	.0115 in .2921 mm	.0115 in .2937 mm
Cold Rolled Steel (Rb53)	.0060 in .1524 mm	.0100 in .2540 mm	.0110 in .2794 mm	.0150 in .3810 mm

* Denotes Carbide Pin (all others are powdered metal)



TMC470 CONTROLLER

The TMC470 controller may be installed as a table-top unit, a wall-mounted unit, a panel-mounted unit, or an enclosure-mounted unit. All configurations provide features and connectivity for external communications. Differences occur only in the mounting configuration.

TMC470 Specifications

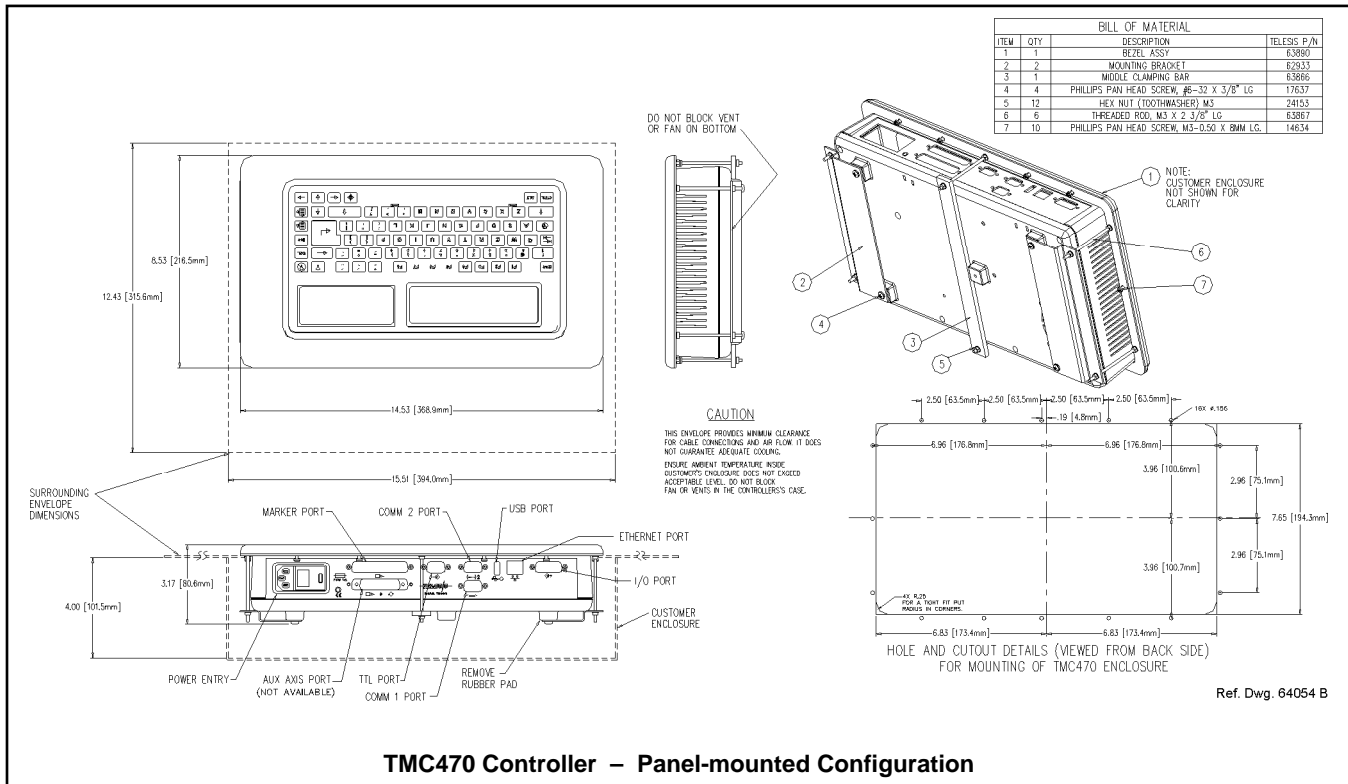
The TMC470 Controller specifications are subject to change without prior notice.

Compliance	CE, RoHS
Configurations	Table-top, Wall-mounted, Panel-mounted, or Enclosure-mounted
Rating	NEMA 1 (I.P. 30) table-top or wall-mounted NEMA 12 (I.P. 65) panel-mounted using customer-supplied panel NEMA 12 (I.P. 65) using Telesis-supplied TMC470N enclosure
Dimensions	refer to TMC470 Mounting Drawings
Weight	3.69 lb. (1.68 kg) controller only 3.90 lb. (1.77 kg) with wall-mount kit 5.52 lb. (2.51 kg) with panel-mount kit 28.1 lb. (12.77 kg) with TMC470N enclosure

TMC470 Specifications (continued)

Op. Temperature	32° to 122° F (0° to 50°C)
Op. Humidity	10% to 80% non-condensing
Cooling	Internal, thermostat-controlled fan
Power Requirements	95 to 250 VAC, 2 amps, 50-60 Hz, single phase
Communications	TTL, Discrete I/O, RS232, RS485, TCP/IP, and USB (data backup and data transfer)
Input Signals	Twelve (12) total, optically isolated: 8 dedicated, 1 programmable, 3 available 10 VDC (minimum voltage) 30 VDC (maximum voltage) 12 to 24 VDC (nominal voltage) 2.3 mA @ 12VDC; 4.9 mA @ 24VDC (nominal current)
Output Signals	Six (6) total, optically isolated: 4 dedicated, 2 available 0.25 amps (maximum current) 0.50 ohms (maximum On resistance) 40 VDC (maximum line voltage) 12 to 24 VDC (nominal line voltage)

TMM5100/470 Marking System



Environmental Considerations

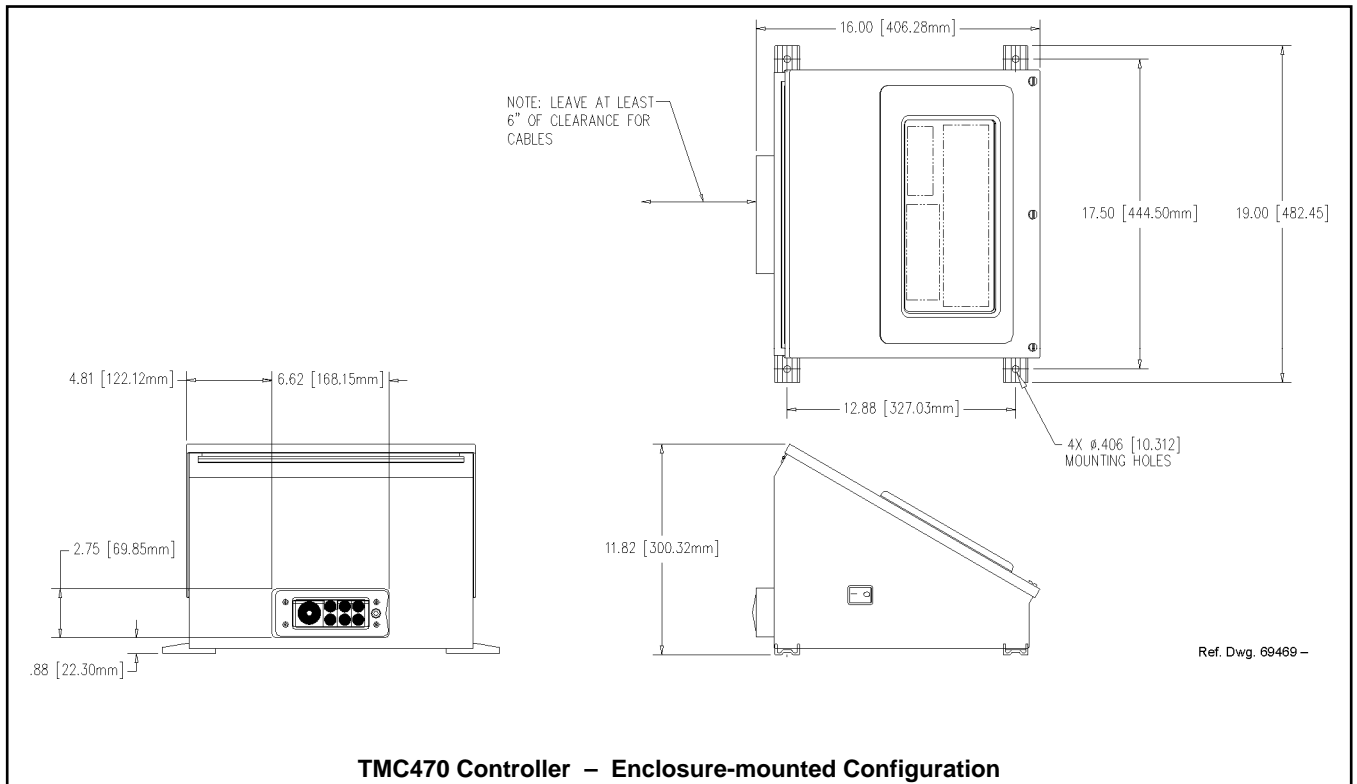
The following environmental considerations must be taken into account when installing the TMC470 Controller.

Contaminants. The vented TMC470 is rated NEMA 1 (IP30) and contains a thermostatically-controlled, variable speed fan. Accordingly, in environments where solid and/or liquid contaminants are present, the possibility exists that these contaminants can be drawn into the TMC470 controller and possibly result in failure. For that reason, in these types of environments, the controller must be located in a sealed industrial enclosure. To facilitate such installations, Telesis offers an optional panel mounting kit for use with an appropriate customer-supplied panel or enclosure. Telesis also offers an optional TMC470N NEMA 12 (I.P. 65) enclosure in which the controller can be mounted.

EMI Susceptibility. Although the system has been found to be in compliance with pertinent susceptibility standards, care should be taken when installing near welders and other extreme generators of electromagnetic interference (EMI). Particular care should be taken to ensure welder currents are not injected through the marking head chassis. The marking head chassis is connected to the electrical service earth ground through the marking head cable. The marking head should be electrically isolated from all surfaces which could become part of a welder current path.

TMC470-based System Software

The system software is permanently installed in the controller. It provides the user interface for the operator to control the marker. The software also provides a library for storing, loading, and editing user-defined patterns. Patterns are files stored in the controller's memory. Depending on the size of the pattern files, the controller can store up to 200 patterns. Each pattern contains one or more fields; each field defines a single object. Printable objects may be created to define text strings, arc-text strings, geometric shapes, graphics, and machine-readable data matrix symbols. Non-printable objects may be defined to specific commands to the marker (e.g., Pause, Go to, Input, or Output). Printable text fields may include alphanumeric characters, symbols, and special message flags. Message flags automatically insert data into the text string, such as serial numbers, times, dates and user-defined codes.



Interface Panel

The back panel of the controller provides various ports for connecting the marker, host computers, logic controllers, optional accessories, and remote I/O devices. See below.

Serial Interface. The Comm 1 and Comm 2 Ports allow connection to remote serial devices such as a host computer or a bar code scanner. See Host Communications for details.

Discrete I/O Interface. The optically-isolated I/O Port allows you to connect a Programmable Logic Controller (PLC) or other DC I/O source for remotely controlling marker operations. See Discrete I/O Controls for details.

TTL Interface. The TTL Port allows the system to connect with a simple contact closure circuit such as a remote push button station or foot pedal switch. These types of devices can remotely control Start Print and Stop Print operations.

TCP/IP Interface. The Ethernet Port typically connects to a PC over a local area network (LAN). It allows you to define the controller as a client or a server socket using Telesis Extended Protocol. See Host Communications for details.

USB Interface. The USB Port allows you to connect a memory stick/flash drive for pattern storage/retrieval and for software upgrades.

Discrete I/O Controls

The TMC470 is configured for 12 VDC to 24 VDC I/O only and is provided to connect a PLC or other DC I/O source. The optically-isolated I/O Port allows you to remotely select and load patterns, start printing, stop printing, place the marker online, and monitor the system output signals. Cable connectors and connector pins are supplied with the controller for constructing appropriate interface cables.

Input Signals. These input signals provide the following controls:

INPUT COMM	For all inputs (+ or – supply)
START PRINT	Begins print cycle
STOP	Stops the print cycle
SEL_0 thru _6 *	Remotely selects & loads up to 127* pattern files
SPARE_1, 2, 3	Three (3) spares for custom applications

* System software allows SEL_6 signal to be configured for remotely selecting patterns or for remotely placing the marker online. If used for marker online, pattern selection is reduced to 63 patterns (max).

Output Signals. These output signals indicate the following states:

OUTPUT COMM	For all outputs (+ or – supply)
DONE	Print cycle is complete
READY	System ready for message or for start print command
PAUSED	System paused (waiting timeout or command)
NO FAULT	System status (normal or fault detected)
SPARE_1, 2	Two (2) spares for custom applications

TMM5100/470 Marking System

Host Communications

The marking system software allows you to configure communication parameters to transmit and receive data to and from a host computer. To provide maximum integration flexibility, the system software supports RS-232 and RS-485 serial interfaces and Ethernet TCP/IP interfaces. The system software also provides two protocol choices: Programmable Protocol and Extended Protocol.

RS-232 Interface. The serial (RS-232) communications interface is most often used with remote devices such as host computers, terminals, or bar code scanners. The Comm 1 RS-232 interface supports both Telesis Extended Protocol and Telesis Programmable Protocol. The Comm 2 RS-232 interface supports only Telesis Programmable Protocol.

RS-485 Interface. The RS-485 interface is normally used for long transmission distances or multi-drop networks of up to 31 TMC470 controllers. You must use Telesis Extended Protocol with the RS-485 interface.

The following describes the serial data character format on all transmissions to and from the TMC470 Controller.

- Asynchronous
- 1200, 2400, 4800, 9600, 19200, 38400, or 115200 Baud
- 1 or 2 Stop Bits
- 7 or 8 Data Bits
- None, Even or Odd Parity

TCP/IP Interface. The Ethernet (TCP/IP) interface is most often used with host computers communicating over a local area network (LAN). You must use Telesis Extended Protocol with the TCP/IP interface.

The Port parameter identifies the host computer socket that is assigned to the marking system. If more than one marking system is installed in a network configuration, each system must use a separate and unique port number. The Address parameter identifies the IP address of the host computer. The marking system software supports both fixed addressing and dynamic addressing.

Programmable Protocol. Use this protocol where very simple one-way communications are required (such as with bar code scanners). Programmable Protocol provides no error checking or acknowledgment of the transmitted data. Note that XON/XOFF Protocol applies even when Programmable Protocol is selected.

Starting Character specifies where the software begins to count character positions. This number must be entered in ASCII decimal format such as 2 for STX.

Terminating Character identifies the end of transmitted string (usually ASCII carriage return character, decimal 13).

Character Position counted from the starting character ignoring all characters preceding it.

Character Length accepts variable length messages (if set to 0) or messages of a pre-specified, fixed number of characters.

Ignore Character identifies the character to ignore when sent from the host (usually ASCII line feed character, decimal 10).

Message Type allows message-type recognition which defines how the marking system will use data it receives from the host.

- 49** Message type 49 (1) overwrites first text field with data extracted from the host
- 80** Message type 80 (P) loads a specific pattern identified by data extracted from host
- 81** Message type 81 (Q) updates text in first query buffer with data extracted from host
- 86** Message type 86 (V) updates first variable text field with data extracted from host
- 0** Message type 0 (zero) indicates that host will provide message type, field number (if applicable), and data; delegates message type selection to the host on message-by-message basis. The host message must use the format:

Tnn<string>

where:

- T = 1, P, Q, or V to indicate message type
- nn = two-digit field number or query text buffer where data will be placed. (Note: No number is used with Message Type P.)
- <string> = field data (Message Types 1, Q, or V) or pattern name (Message Type P)

Extended Protocol. This protocol selection includes error checking and transmission acknowledgment. It should be used in applications where serial communication is a vital part of the marking operation. All communications are carried out in a parent/child relationship with the host being the parent. Only the host has the ability to initiate communications. If the host does not receive a response within three seconds, it should re-transmit its original message. If no response is received after three tries, it should declare the link to be down.

Extended Protocol *(continued)*

The following describes the Extended Protocol message format as sent from the host to the TMC090 controller.

SOH TYPE [##] STX [DATA] ETX BCC CR

where:

- SOH** ASCII Start of Header character (001H). The controller ignores all characters received prior to the SOH.
- TYPE** A single, printable ASCII character that defines the meaning (type) and content of the message downloaded from the host, where:
- 1** Message Type 1 overwrites specified field of currently loaded pattern, using the data format nn<string> where nn is the field number.
 - P** Message Type P specifies pattern name to be loaded for printing
 - Q** Message Type Q updates specified query buffer with data received from host, using the data format nn<string> where nn is the buffer number.
 - V** Message Type V updates specified variable text field of currently loaded pattern, using the data format nn<string> where nn is the field number.
 - O** Message Type O resets marker and places it online
 - G** Message Type G initiates a print cycle to mark the currently loaded pattern
 - I** Message Type I requests the marker return the status of standard output and input signals. The system will return a hexadecimal code for the 6 output signals and 12 input signals in the following format:

O O ; I I I

where:

bit 1	READY	0x01
bit 2	DONE	0x02
bit 3	PAUSED	0x04
bit 4	NO_FAULT	0x08
bit 5	SPARE_1	0x10
bit 6	SPARE_2	0x20
bit 1	START	0x001
bit 2	STOP	0x002
bit 3	SEL_0	0x004
bit 4	SEL_1	0x008
bit 5	SEL_2	0x010
bit 6	SEL_3	0x020
bit 7	SEL_6 *	0x040
bit 8	SEL_4	0x080
bit 9	SEL_5	0x100
bit 10	SPARE_1	0x200
bit 11	SPARE_2	0x400
bit 12	SPARE_3	0x800

Note: Input SEL_6 may be configured to place machine online (default) or for Remote Pattern Selection.

- [##]** Two optional ASCII decimal digits that specify the Station ID number for use in multi-drop network applications. The ID may range from 00-31. Note that "00" is reserved for applications where only one controller is used. In such applications, this field may be eliminated and "00" will be assumed.
- STX** ASCII Start of Text Character (002H).
- [DATA]** Optional character string that may be required for certain message types (e.g., Type 1, P, Q, and V).
- ETX** ASCII end of text character (003H).
- BCC** Optional Block Check Code that is generated and sent to improve link reliability by providing fault detection. The BCC is calculated by taking an eight bit addition of the TYPE and DATA TEXT characters and transmitting them as a three digit ASCII decimal number in the range from 000 to 255. If the sum is greater than 255, the most significant bit overflows and is discarded.
- CR** ASCII Carriage Return Character (00DH).

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