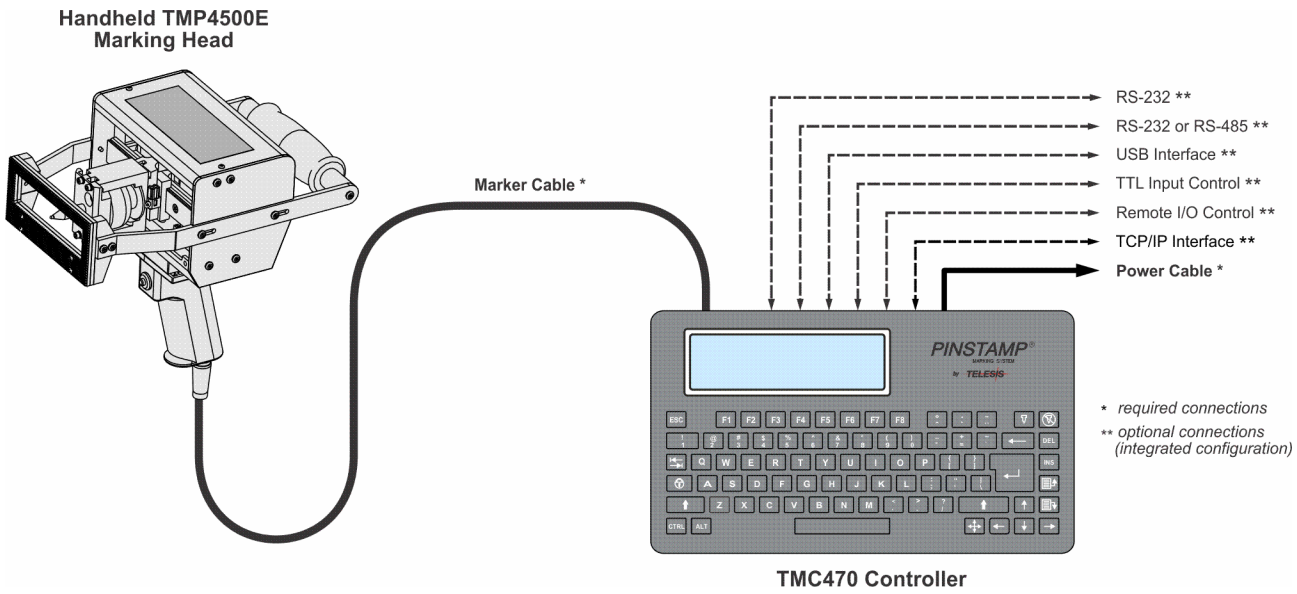


TMP4500E/470 Marking System – General Arrangement

SYSTEM OVERVIEW

The Telesis® TMP4500E marking system permanently prints messages into materials such as steel, aluminum, and plastic. A hardened pin is accelerated to indent dot matrix characters into the item being marked at depths up to .45 mm (.018 inch) in mild steel. Character shape, size, density, and location are determined by the user through the marking system software.

Marking Head. The marking head is an electromechanical marker. A metal-formed cover houses the internal mechanical components that position the pin cartridge. An electric solenoid fires the marking pin and an internal spring returns the pin to its idle position within the cartridge.

The marking head moves the pin cartridge through X- and Y-axis rectilinear motions to reach the correct position for each dot of the characters to be marked.

The system software controls pin extension to mark the message.

The marker uses two stepper-motor drives to position the pin at coordinate-defined locations in the marking window within .006 mm (.00024 inch).

The marker accommodates the rigorous dynamics of impacting, rebounding, and rapid positioning of the marking pin through a linear rail/ball bearing saddle assembly, ceramic-coated guide shaft/linear bushing assemblies, and drive motors with concentric, linear drive screws.

The lightweight and portable TMP4500E is designed for remote operation. The handheld marker can be used in virtually any orientation and incorporates a pistol grip handle with a Start Print push button switch. A rear-mounted handle provides additional stability during marking.

The integral standoff with its padded front surface is held against the marking surface while marking. The standoff can be adjusted forward and aft to change the pin stroke.

A tapped hole is provided in the top of the marking head (beneath the label) to allow for installation of an eye bolt. The eye bolt allows the marker to be suspended from a mechanical-assist device such as a cable or cable balancer.

Pin Cartridge. The pin cartridge, machined from engineered plastic materials, offers long life with little maintenance. Screws attach the pin cartridge to the marking head for easy removal, cleaning, and pin replacement.

The cartridge/solenoid assembly can be configured for Long Throw or Short Throw operation. *Long Throw* configuration allows for deeper marks; *Short Throw* configuration allows for faster marking.

Marking Pins. The marking pins are made of carbide and are available in 30° and 45° cone angles.

Marker Cable. The marker cable connects the marker to the controller. The cable is 4 m (13 feet) and is prewired to the marking head.

TMC470 Controller. The TMC470 controller provides the electrical interface and software control of the TMP4500E marking head. Refer to *TMC470 Controller Specifications* for details.

SYSTEM OPTIONS

- Backup Utility Software
- Barcode Scanner
- Barcode Wand
- Logo/Font Generator Software
- TMC470 Controller Panel-Mounting Bezel/Bracket Kit
- TMC470 Controller Wall-Mounting Bracket Kit
- TMC470N NEMA® Enclosure
- Tool Stand (for fixed-mounting applications)
- Upgrade Utility Software

SYSTEM SETUP

The marking head is designed to be used as a handheld marker. It can optionally be suspended from a cable balancer or mounted on a Telesis tool stand.

The following procedures provide only a general overview of the installation process. For complete installation instructions, refer to the *TMP4500E Installation & Maintenance Manual* and the *TMC470 Controller Installation & Maintenance Manual*.

CAUTION

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

1. Locate the controller as close as practical to marking head. Standard marker cable length is 4 m (13 feet).
2. Install the controller as a tabletop, wall-mounted, panel-mounted, or enclosure-mounted unit.
3. Ensure the controller power switch is **OFF**.
4. Connect the marker cable to the controller.
5. Connect the power cable to the controller.
6. Position the controller power switch (on the back panel) to **ON** to start the marking system software.
7. Adjust the pin stroke for impact depth as necessary.

TMP4500E MARKING HEAD

Specifications

The TMP4500E marking head specifications are subject to change without notice.

Dimensions	see *TMP4500E Handheld Marking Head Dimensions*
Rating	NEMA 1 (I. P. 30)
Weight	3.82 kg (8.4 lb), marker and cable 3.00 kg (6.6 lb), marker only
Noise (maximum)	81.4 dB; 73.1 dB (LEQ) see *Marking Noise*
Vibration	Does not exceed 2.5 m/s^2 see *Vibration Data*
Marking Area (W x H)	100 x 25 mm (4.0 x 1.0 inches)
Number of Impact Pins	1
Pin Types	30° or 45° cone angle
Pin Type	Carbide with 30° or 45° cone angle
Pin Stroke (maximum)	
Long Throw	8.26 mm (.325 inch)
Short Throw	4.45 mm (.175 inch)
Operating Temperature	0° to 50°C (32° to 122°F), non-condensing
Humidity	10% to 80%

Marking Characteristics

The TMP4500E can produce character sizes from 1.5 to 25 mm (.060 to 1.0-inch) increments.

Characters can be rotated 359° in 1° increments with a printing resolution range from 4 dots/cm (10 dots/inch) to 31 dots/cm (80 dots/inch) for an engraved look.

The depth of mark can be adjusted by adjusting the pin stroke or adjusting the Depth parameter in the marking system software.

Marking Speeds

The system can mark 3.175 mm (.125-inch) characters in the 5 x 7 font at a rate of 2 characters per second at a depth of .45 mm (.018 inch) in mild steel.

Speeds vary depending on the selected character size, style, and dot density. Specific times can be verified by a Telesis representative.

Marking 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 is based on several factors: the type of material being marked, how hard or abrasive it is, dot density, duty cycle, required marking depth, etc. On typical metals with a hardness of Rockwell Rb60 (aluminum and similar metals), marking at a depth of .127 mm (0.005 inch) and 5x7 font, the 25 series powdered metal pins average at least 10 million impressions before needing sharpened. Carbide pins average two to three times as long as powdered metal pins. These numbers can vary substantially, based on the application.

Vibration Data

Total hand-arm vibration does not exceed 2.5 m/s^2.

Vibration tests were performed under controlled conditions imitating normal operation.

Conditions such as rigidity of the work piece, material, and setting of the machine might vary in operational use and might alter the vibration level.

Despite detailed guidance instructions provided with each machine, such conditions are beyond the control of Telesis and must remain the responsibility of end users. End users should conduct their own tests to establish safe working levels.

The vibration tests were conducted using the following parameters:

Pin Stroke (Long Throw)	8 mm (.31 inch)
Marking Base	20 mm (.79 inch), thick steel
Marking Surfaces	3 mm (.125 inch), thick steel plate
Marking Mode	Dot
Text Marked	QWERTYUI12345678 5 x 7 font, 3 mm (.12-inch) characters

The worst-case scenarios under the given test conditions are listed in the following tables:

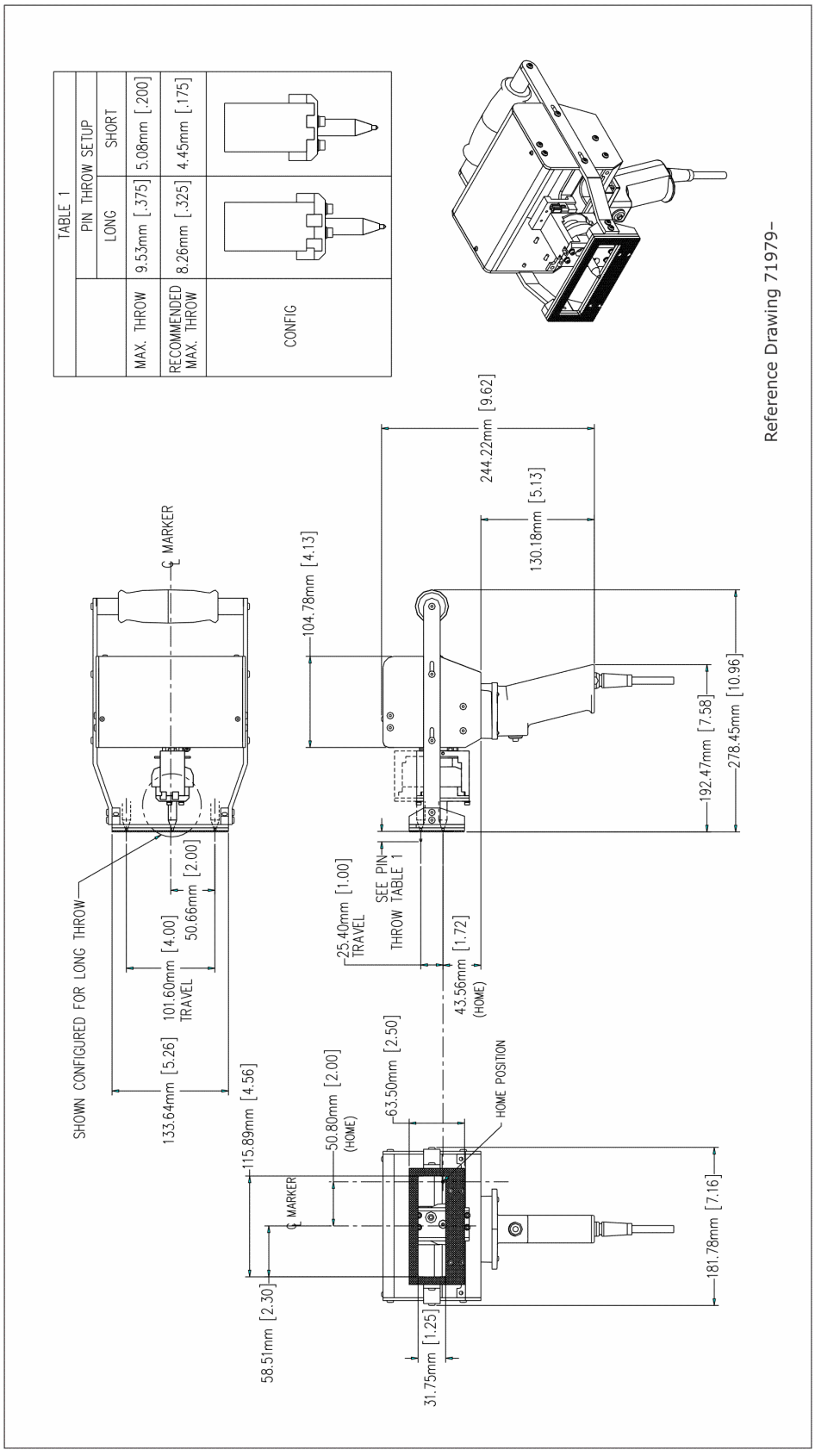
Pistol Grip Handle		
VM	**$T_{(EAV)}$**	**$T_{(ELV)}$**
0.933 m/s^2	more than 24 hr	more than 24 hr

Padded (Rear-Mounted) Handle		
VM	**$T_{(EAV)}$**	**$T_{(ELV)}$**
0.87 m/s^2	more than 24 hr	more than 24 hr

VM = hand/arm Vibration Magnitude.

$T_{(EAV)}$ = time to reach the Exposure Action Value based on continuous marking.

$T_{(ELV)}$ = time to reach the Exposure Limit Value based on continuous marking.



TMP4500E Handheld Marking Head Dimensions

TMC470 CONTROLLER

The TMC470 controller can be installed as a tabletop, wall-mounted, panel-mounted, or 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 notice.

Compliance	CE, RoHS
Configurations	Tabletop, wall-, panel-, or enclosure-mounted
Rating	NEMA 1 (I. P. 30), tabletop 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 the appropriate *TMC470 Controller Dimensions* drawing
Weight	3.69 lb (1.68 kg), controller 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
Operating Temperature	32° to 122°F (0° to 50°C)
Operating 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 @ 12 VDC; 4.9 mA @ 24 VDC (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)

Environmental Considerations

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

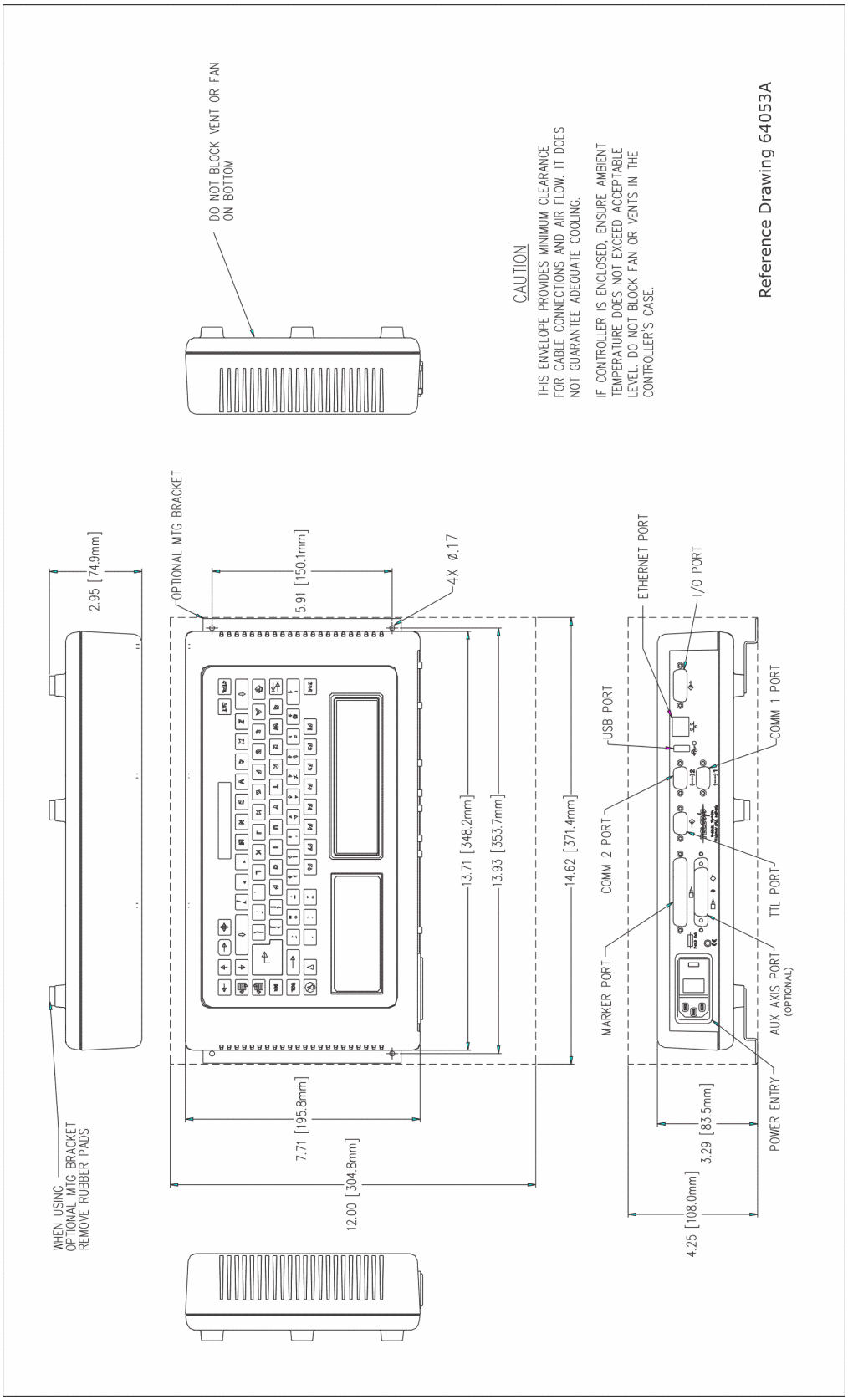
Contaminants. The vented TMC470 is rated NEMA 1 (I. P. 30) and contains a thermostatically controlled, variable-speed fan.

In environments where solid or liquid contaminants are present, the contaminants can be drawn into the TMC470 controller and cause the equipment to fail. For that reason, in these types of environments, the controller **must** be located in a sealed industrial enclosure.

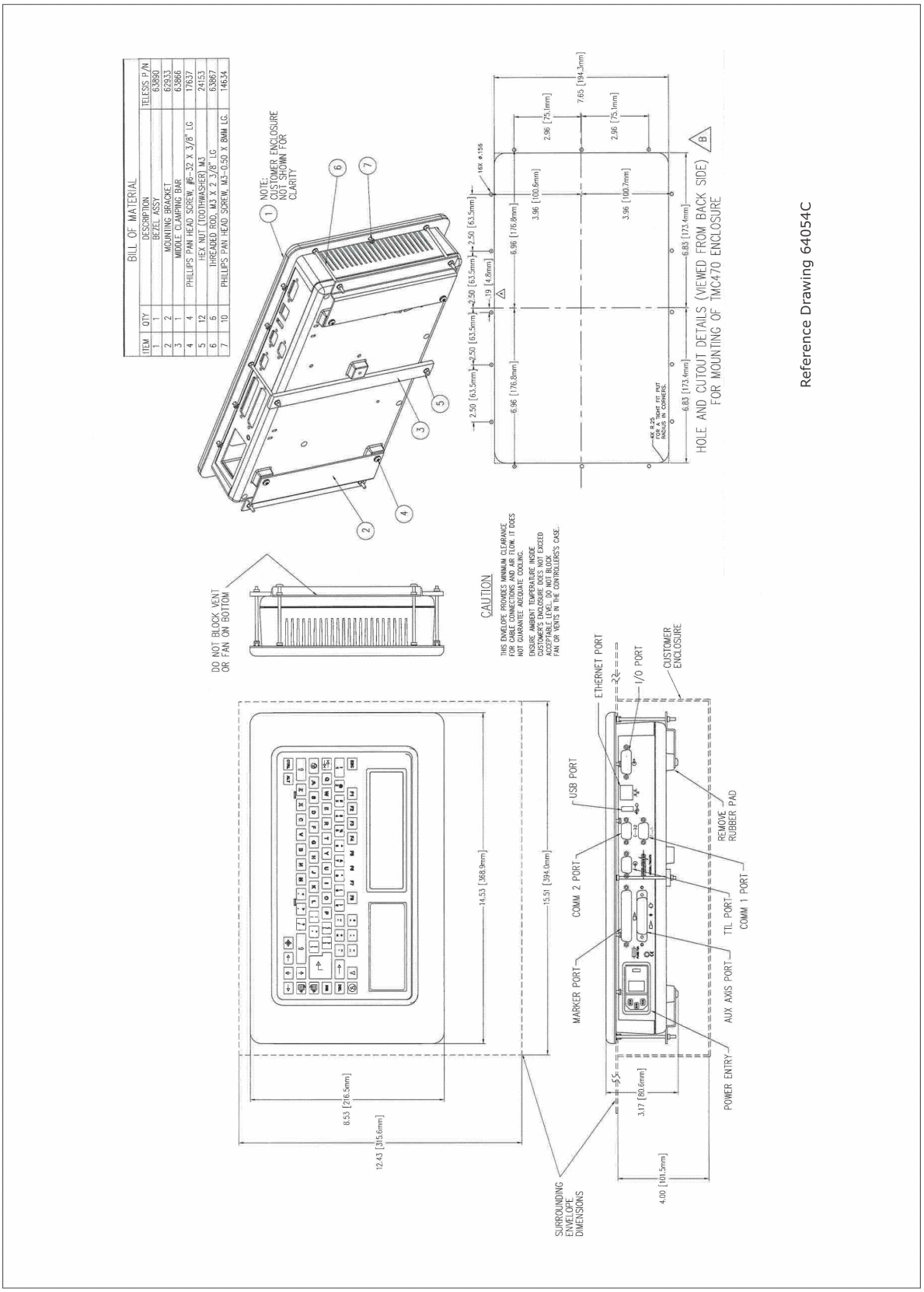
To facilitate such installations, Telesis offers on optional panel mounting kit for use with an appropriate customer-supplied panel or enclosure. Telesis also offers an optional TMC470N NEMA 12 (I. P. 65) enclosure in which the controller can be mounted.

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).

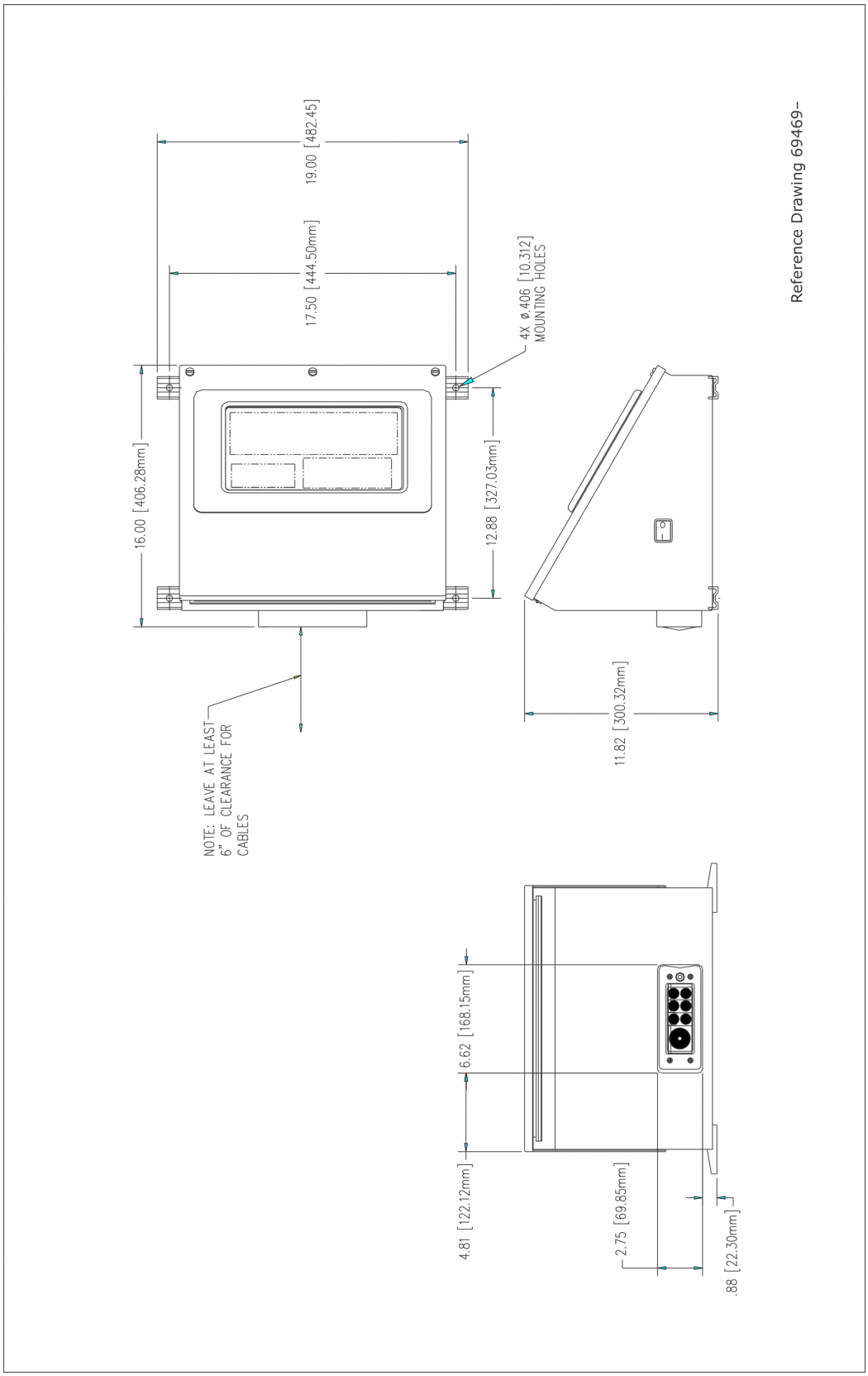
Particular care should be taken to ensure welder currents are not injected through the marking head chassis. The marking head chassis is connected to the electrical service earth ground through the marking head cable. The marking head should be electrically isolated from all surfaces that could become part of a welder current path.



TMC470 Controller Dimensions – Tabletop and Wall-Mounted Configurations



TMC470 Controller Dimensions – Panel-Mounted Configuration



TMC470 Controller Dimensions – Enclosure-Mounted Configuration

TMC470-Based System Software

The system software provides the user interface for the operator to control the marker and is installed in the controller.

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 can be created to define text strings, arc-text strings, geometric shapes, graphics, and machine-readable data matrix symbols.

Non-printable objects can be defined for specific commands to the marker (for example, Pause, Go to, Input, or Output).

Printable text fields can include alphanumeric characters, symbols, and special message flags.

Message flags insert data such as serial numbers, times, dates, and user-defined codes, into the text string.

Interface Panel

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

Serial Interface. The Comm 1 and Comm 2 ports allow connection to remote serial devices such as a host computer or a barcode 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 or retrieval and for software upgrades.

Discrete I/O Controls

The TMC470 is configured only for 12 VDC to 24 VDC I/O 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. 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

*The system software allows the SEL_6 signal to be configured for remotely selecting patterns or for remotely placing the marker online. If used to place the marker online, pattern selection is reduced to a maximum of 63 patterns.

Output Signals. 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

Host Communications

The marking system software allows you to configure communication parameters to transmit 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 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 barcode scanners.

The Comm 1 RS-232 interface supports both Telesis Extended Protocol and Telesis Programmable Protocol. T

he 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 serial data character format on all transmissions to and from the TMC470 controller is described below:

- 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 and dynamic addressing.

Programmable Protocol. Use this protocol where very simple one-way communications are required (such as with barcode 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 decimal format (for example, "2" for ASCII Start of Text "STX").

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

Character Position counts from the starting character and ignores 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 "10" for the ASCII line feed character)).

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

1	overwrites the first line of the first text field with data extracted from the host
P	loads a specific pattern identified by data extracted from host
Q	updates the text in the first query buffer with data extracted from the host
V	updates the first variable text flag found in the pattern with data extracted from the host
0	(zero) indicates the host will provide the message type, field number (if applicable), line number (if applicable), and data; delegates message type selection to the host on a message-by-message basis. The host message must use the format: **Tnn<string>** where:

T	1, P, Q, or V indicates the message type.
nn	Two-digit field number or query text buffer where data will be placed. **Note**: Not used with Message Type P.
<string>	For Message Type P, indicates the pattern name to be loaded. For Message Type 1, Q, or V, indicates the data to be inserted into the field or the query text buffer.

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 can initiate communications. If the host does not receive a response within three seconds, it should retransmit the original message. If no response is received after three tries, it should declare the link to be down.

The following describes the Extended Protocol message format as sent from the host to the TMC470 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** overwrites a specific field in the currently loaded pattern with data supplied in the host message. See *[DATA]* for details.
- **C** clears the error from the screen.
- **G** initiates a print cycle to mark the currently loaded pattern.
- **I** requests the marker return the status of standard output and input signals. The system returns 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

  *Input SEL_6 can be configured to place the machine online (default) or to remotely select a pattern.

- **O** resets the marker and places it online.
- **P** specifies the pattern name to be loaded for printing. See *[DATA]* for details.
- **Q** updates a specific query buffer with data supplied in the host message. See *[DATA]* for details.
- **S** requests the error status.
- **V** updates the variable text in a specific text field of the currently loaded pattern with data supplied in the host message. See *[DATA]* for details.

[##] Optional two-digit ASCII number that specifies the Station ID of the controller when used in multi-drop network applications. The Station ID can range from 00-31. Note "00" is reserved for applications where only one controller is used. In such applications, this field can be eliminated and "00" is assumed.

STX ASCII Start of Text Character (002H).

[DATA] Optional character string that might be required for certain message types (for example, Type 1, P, Q, and V).

Data is typically sent in the format:

nn<string>

where:

nn = two-digit field number or query text buffer where data will be placed.
Note: Not used with Message Type P.

<string> = For Message Type P, indicates the pattern name to be loaded. For Message Type 1, Q, or V, indicates the data to be inserted into the field or the query text buffer.

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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