

# Temperature - Electromotive Force (EMF) Tables for Non-Letter Designated Thermocouples <sup>1</sup>

This reference manual consists of reference tables that give temperature-electromotive force (emf) relationships for Pyromation, Inc. Types C, M, and P thermocouples. These are not ANSI reconized coded thermocouple types

These tables give emf values to three decimal places (1 uV) for each degree of temperature. Such tables are satisfactory for most industrial uses but may not be adequate for computer and similar applications. If greater precision is required, the reader should contact the manufacturer for equations which permit easy and unique generation of the temperature-emf relationship.

<sup>1</sup> All temperature - electromotive force data in Tables 21 to 26 have been developed from wire manufacturers' data. The data in these tables are based upon the International Temperature Scale of 1990 (ITS-90).

## List of Tables

Following is a list of the thermocouple tables included in this reference manual.

| Table | Type   | Range          |
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| 19    | Limits of error  |                |
| 20    | Recommended upper temperature limits for protected thermocouples |                |
| 21    | C W,5%Re - W,26%Re   | 0 to 2315 °C   |
| 22    | C W,5%Re - W,26%Re   | 32 to 4200 °F  |
| 23    | M Ni - Ni,18%Moly  | -50 to 1410 °C |
| 24    | M Ni - Ni,18%Moly  | -58 to 2570 °F |
| 25    | P Platinel II  | 0 to 1395 °C   |
| 26    | P Platinel II  | 32 to 2543 °F  |

**Table 19 — Initial Limits of Error for Thermocouples**

| Type | Temperature Range |             | Tolerances-Reference Junction 0°C (32°F) |        |                    |        |
|------|-------------------|-------------|--|--------|--------------------|--------|
|      | °C                | °F          | Standard Tolerances                      |        | Special Tolerances |        |
|      |                   |             | °C                                       | °F     | °C                 | °F     |
| C    | 0 to 400          | 32 to 750   | ±4.5                                     | Note 1 | n/a                | Note 1 |
| C    | 400 to 2315       | 750 to 4200 | ±1.0 %                                   |        | n/a                |        |
| M    | -50 to 277        | -58 to 530  | ±2.2                                     |        | ±1.1               |        |
| M    | 277 to 1410       | 530 to 2570 | ±0.75 %                                  |        | ±0.4 %             |        |
| P    | 0 to 1395         | 32 to 2543  | ±1.0 %                                   |        | n/a                |        |

Note 1 — The Fahrenheit tolerance is 1.8 times larger than the °C tolerance at the equivalent °C temperature. Note particularly that percentage tolerance apply only to temperature that are expressed in °C

**Table 20 — Recommended Upper Temperature Limits for Thermocouples**

| Upper Temperature limit for Various Wire Gage Sizes (Awg). °C (°F) |                          |                          |             |             |             |
|--|--------------------------|--------------------------|-------------|-------------|-------------|
| Type   | 8 Gage                   | 18 Gage                  | 20 Gage     | 24 Gage     | 28 Gage     |
| C  |                          |                          | 2315 (4200) | 2315 (4200) | 2315 (4200) |
| M  | 1260 (2300) <sup>A</sup> | 1204 (2200) <sup>A</sup> |             |             |             |
| P  |                          |                          | 1250 (2280) | 1250 (2280) | 1250 (2280) |

<sup>A</sup> Note that the upper temperature limits only apply in a protected sheath