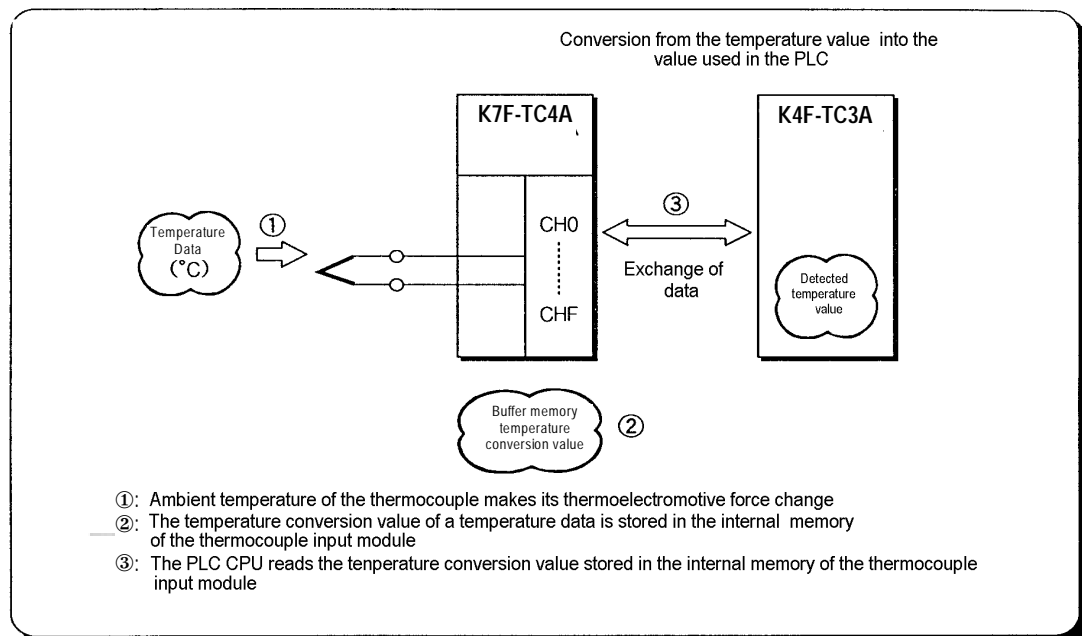


Chapter 1. INTRODUCTION

This manual is a learning and reference guide for the K7F-TC4A and K4F-TC2A. The K7F-TC4A is a thermocouple input module used with the CPU of MASTER-K PLC K1000S series, and the K4F-TC2A is used with the CPU of K300S series. Hereafter, the two modules called thermocouple input module.

The thermocouple input module converts a temperature input by a thermocouple (Type K, J, E, T, B, R or S) into a signed 16-bit digital binary data and outputs it.

1.1 Features

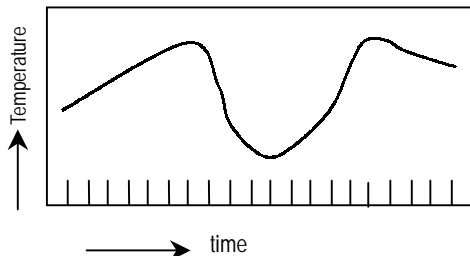


► The thermocouple input module has following features.

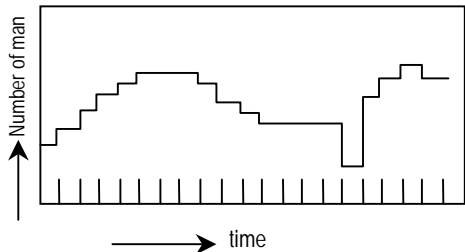
- 1) With direct connection of one of seven types of thermocouple to the thermocouple input module, a temperature data (°C) can be converted into a digital value to be processed in the PLC
- 2) The temperature data (°C) input can be processed to one digit after the point as a digital value.
- 3) 16 point (K7F-TC4A) or 4-point (K4F-TC2A) of thermocouple can be connected to one module.
- 4) Disconnection and Out-of-range detection function for every channel are included
- 5) The thermocouples in accordance with five specifications (KS, JIS, ANSI, DIN, BS) are available.
- 6) The temperature sensor loaded onto terminal block performs automatic reference junction compensation.

1.2 Glossary

1.2.1 A - Analog Value



[Fig.1.1] Analog Value

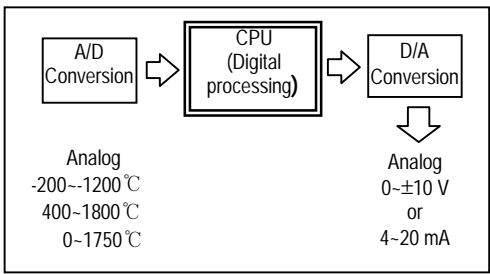


[Fig.1.2] Digital Value

Continuous changeable quantity such as voltage, current, temperature, velocity, pressures and flux is called an analog quantity. For example, temperature changes continuously with time as shown in Fig. 1.1. The PLC can process that continuous changeable temperature by use of the thermocouple input module.

1.2.2 D - Digital Value

In the Fig.1.2, the number of man can be counted as 0, 1, 2 and 3. A discontinuous changeable quantity as such is called a digital quantity. On and Off signals can be denoted as a digital value 0 and 1, respectively.



[Fig. 1.3] Processing in the PLC

An analog quantity cannot be directly input to the CPU module for digital processing. Therefore, an analog value should be converted into a digital value to be input to the CPU module. In addition, for external output of an analog quantity, a digital quantity of the CPU module should be converted into an analog quantity.

1.2.3 Compensating Wire

This means a wire used to compensate error (temperature change) by the distance between terminal of an input thermocouple and input terminal of a thermocouple input module. This has the thermoelectromotive force characteristics between the two terminals under the temperature of 90 to 150 °C or less.

1.2.4 Thermocouple

If two different metals are joined and two different temperatures are applied to the two junctions, the temperature difference generates a thermoelectromotive force between them and thermal current flows. This effect called thermoelectric effect. Thermocouple is a temperature sensor using thermoelectric effect. The magnitude of a thermoelectric force is determined by the type of junction metals and temperature difference between two junctions, and the shape and dimensions of metals and intermediate temperature change do not influence it.

1.2.5 Temperature Conversion Characteristics

The thermoelectromotive force to a temperature of a thermocouple has non-linear characteristics, therefore, linear processing should be applied to a A/D conversion digital value and it will be output as a detected temperature value.

1.2.6 Burn-out Detection

If a connected thermocouple or compensating wire has disconnection in some part of them, the internal burn out circuit measures an out of range-voltage and then the thermocouple input module detects the disconnection.

1.2.7 Reference Junction Compensation (RJC)

As the thermoelectromotive force table of various specifications has 0°C as its reference, the difference between the present temperature at measuring point (input terminal) and the reference temperature (0°C) should be compensated.