



# MT-SDK

## User Guide

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# Introduction

## Overview

MT-SDK provides related functions such as converting infrared raw data into temperature, isotherm, temperature matrix to rgb24 image.

## The Reader

This document (this guide) is primarily intended for engineers:

- Software Development Engineer
- Technical Support Engineer

# Revision records

The revision record accumulates instructions for each document update. The latest version of a document contains updated content from all previous document versions.

Revision sheet			
Revision No.	Date	Revision	Sig.
V1.0.0	20230522	First version	05174lg
V1.0.1	20230911	Add a distance correction interface	05174lg
V1.0.2	20240223	Change the paramline parameter data type to unsigned char* in all interfaces	05174lg

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# 1. Temperature Measurement (API)

## 1.1 API Interface

### 1.1.1 guide\_measure\_convertgray2temper

```
/* *  
 * @brief converts Y16 data to temperature  
 * @param[in] devType      Module type  
 * @param[in] lensType     lens type.  
 * @param[in] pGray        16-bit grayscale data retrieved from the  
                           thermal modules's digital port.  
 * @param[in] pParamLine   The parameter line data obtained from the digital  
                           port of the thermal modules in the format  
                           0xAA,0x55, 0x38, 0x00... .  
 * @param[in] len          The number of temperature transitions. 1- Single  
                           point, n- multiple points, width*height- full image.  
 * @param[in] pParamExt    externally set temperature parameters.  
 * @param[out] pTemper     converts temperature, externally allocated  
                           memory, same size as pGray.  
 * @return @ref gmt_ret_code_e    0 success    < 0 fail  
 * /
```

```
int guide_usb_measure_convertgray2temper(int devtype, int lenstype, short* pGray,  
    unsigned char* pParamLine, int len, guide\_measure\_external\_param\_t* pParamExt,  
    float* pTemper)
```

### 1.1.2 guide\_measure\_converttemper2gray

```
/* *  
 * @brief converts temperature data to Y16 data  
 * @param[in] devType      movement model.  
 * @param[in] lensType     lens type.
```

- \* @param[in] **pTemper** temperature data
- \* @param[in] **pParamLine** The parameter line data obtained from the digital port of the movement in the format 0xAA, 0x55, 0x38, 0x00... .
- \* @param[in] **len** The number of transitions. 1- Single point, n- multiple points, width\*height- full image.
- \* @param[in] **pParamExt** externally set temperature parameters.
- \* @param[out] **pGray** converted Y16 has the same externally allocated memory size as pTemper.
- \* @return @ref gmt\_ret\_code\_e 0 success < 0 fail
- \* /

```
int guide_measure_converttemper2gray (int devtype, int lenstype, float* pTemper, unsigned char* pParamLine,int len, guide\_measure\_external\_param\_t* pParamExt,short*, pGray)
```

### 1.1.3 guide\_isotherm

- ```
/* *  
 * @brief isotherm  
 * @param[in] devType movement model.  
 * @param[in] lensType lens type.  
 * @param[in] temperal minimum temperature  
 * @param[in] temperah Maximum temperature.  
 * @param[in] y16data y16data retrieved from the movement.  
 * @param[in] yuvsrcdata The yuv data from the movement  
 * @param[out] yuvdstdata isotherm for yuv data, externally allocated  
 memory, same size as yuvsrcdata  
 * @param[in] pParamLine The parameter line data obtained from the digital  
 port of the movement in the format 0xAA, 0x55,  
 0x38, 0x00... .  
 * @param[in] width The image width.  
 * @param[in] height Height of the image.  
 * @param[in] pParamExt externally set temperature parameters.  
 * @param[in] isothermmode, see guide\_isothermmode\_e  
 * @param[in] paletteIndex Pseudo-color index 0 to 9
```

```
* @return @ref gmt_ret_code_e 0 success < 0 fail
* /
int guide_isotherm (int devtype, int lenstype ,float temperal,float temperah, short* y16data,
                    short* yuvsrdata,short* yuvdstdata, unsigned char* paramline, int width,int height,
guide\_measure\_external\_param\_t* pParamExt,guide\_isothermmode\_e isothermmode,int paletteIndex)
```

#### 1.1.4 guide\_temp\_to\_rgb24

```
/* *
* @brief temperature matrix to rgb image
* @param[in] pTemp temperature matrix
* @param[out] pRgb externally allocated, size width * height * 3
* @param[in] width The image width
* @param[in] height Height of the image
* @param[in] minT Minimum temperature
* @param[in] maxT Maximum temperature
* @param[in] paletteIndex Pseudo-color index 0 to 9
* @return @ref gmt_ret_code_e 0 success < 0 fail
* /
int guide_temp_to_rgb24(float* pTemp, unsigned char* pRgb, int width,int height,
                        float minT, float maxT,int paletteIndex)
```

#### 1.1.5 guide\_measure\_distance\_correction

```
/**
* @brief Distance correction function
* @param al Temperature correction quadratic term coefficient
* @param bl The temperature corrects the coefficient of the first order term
* @param cl Temperature correction constant term
* @param distance_enable 0- No correction 1- Correction
* @return @ref gmt_ret_code_e 0 success <0 fail
* /
int guide_measure_distance_correction(double al,double bl,double cl,int distance_enable);
```



## 1.2 Data Types

### 1.2.1 enum guide\_usb\_measure\_external\_param\_t

#### Type definition

typedef struct

```
{  
    unsigned short emiss;  
    unsigned short relHum;  
    unsigned short distance;  
    short reflectedTemper;  
    short atmosphericTemper;  
    unsigned short modifyK;  
    short modifyB;  
} guide_usb_measure_external_param_t;
```

#### Functional Description

External temperature parameters can be set.

**emiss:** range [1, 100], Default 98.

**relHum:** range [0, 100], Default 0.

**distance:** range [5, 5000], Default 50. Set with 10x magnification, 50 represents 5m.

**reflectedTemper:** range [-400, 5500], Default 230. Set at 10x magnification, 230 represents 23°C.

**atmosphericTemper:** range [-400, 1000], Default 230. Set at 10x magnification, 230 represents 23°C.

**modifyK:** Curvature correction parameter, range [0, 200], Default 100.

**modifyB:** Absolute temperature correction parameter, range [-100, 100], Default 0. When set at 10x magnification, 1 represents an increase of 0.1 °C to the converted temperature value.

## 1.2.2 enum gsdk\_usb\_ret\_code\_e

### Type Definition

typedef enum

```
{  
    GMT\_SUCCESS = 0,  
    GMT\_ERROR\_PARAMLINE = -1,  
    GMT\_ERROR\_EMISS = -2,  
    GMT\_ERROR\_RELHUM = -3,  
    GMT\_ERROR\_DISTANCE = -4,  
    GMT\_ERROR\_REFLECTED\_TEMPER = -5,  
    GMT\_ERROR\_ATMOSPHERIC\_TEMPER = -6,  
    GMT\_ERROR\_MODIFY\_K = -7,  
    GMT\_ERROR\_MODIFY\_B = -8,  
    GMT\_ERROR\_SHUTTER = -9,  
    GMT\_ERROR\_POINTER\_NULL = -10,  
    GMT\_ERROR\_PALETTE\_INDEX = -11,  
    GMT\_ERROR\_INPUT\_PARAM = -12  
} gsdk_usb_ret_code_e;
```

### Functional Description

The individual interfaces run return value error codes.

## 1.2.3 struct guide\_isothermmode\_e

### Type Definition

typedef enum

```
{  
    ISOTHERM_MODE_RANGE_NONE = 0,  
    ISOTHERM_MODE_RANGE_MIDDLE,  
    ISOTHERM_MODE_RANGE_UP_DOWN
```

```
} guide_isothermmode_e;
```

### Functional Description

Isotherm mode configuration, divided into general mode [0], intermediate mode [1], up and down mode [2].

## 1.3 Error Analysis

### 1.3.1 GMT\_SUCCESS

Return 0, success.

### 1.3.2 GMT\_ERROR\_PARAMLINE

Return -1, parameter row data error, confirm the size of the data side problem.

### 1.3.3 GMT\_ERROR\_EMISS

Return -2, emissivity is set incorrectly.

### 1.3.4 GMT\_ERROR\_RELHUM

Return -3, humidity setting error.

### 1.3.5 GMT\_ERROR\_DISTANCE

Return -4, the distance is not set correctly.

### 1.3.6 GMT\_ERROR\_REFLECTED\_TEMPER

Return -5, the reflection temperature is set incorrectly.

### 1.3.7 GMT\_ERROR\_ATMOSPHERIC\_TEMPER

Return -6, the atmospheric temperature is set incorrectly.

### 1.3.8 GMT\_ERROR\_MODIFY\_K

Return -7, the curvature correction is set incorrectly

### **1.3.9 GMT\_ERROR\_MODIFY\_B**

Return -8; the absolute temperature is not set correctly

### **1.3.10 GMT\_ERROR\_SHUTTER**

Return -9, shutter compensation is detected, and the raw data is abnormal at this time.

### **1.3.11 GMT\_ERROR\_POINTER\_NULL**

Return -10, the input pointer is empty, please check the accuracy of the pointer.

### **1.3.12 GMT\_ERROR\_PALETTE\_INDEX**

Return -11, pseudo-color index value out of range, please enter the correct index value.

### **1.3.13 GMT\_ERROR\_INPUT\_PARAM**

Return -12, the input parameters are incorrect, please enter the correct parameters.

## 1.4.Apendix

### 1.4.1 Movement lens model configuration table

| devType | Module type |
|---------|-------------|
| 0       | COIN612R    |
| 1       | COIN417R    |
| 2       | iTL612R     |
| 3       | TWIN612R    |
| 4       | iTL612R-G2  |

| lenType | Lens type |
|---------|-----------|
| 0       | 8.8mm     |
| 1       | 9.1mm     |
| 2       | 13mm      |
| 3       | 19mm      |
| 4       | 25mm      |
| 5       | 35mm      |
| 6       | 50mm      |
| 7       | 4.9mm     |

### 1.4.2 Pseudo color table serial number

| Serial number | Pseudo color |
|---------------|--------------|
| 0             | White hot    |
| 1             | Fulgurite    |
| 2             | Iron red     |
| 3             | Hot iron     |
| 4             | Medical      |
| 5             | Arctic       |
| 6             | Rainbow1     |
| 7             | Rainbow2     |
| 8             | Tint         |
| 9             | Block Hot    |

## 1.5 Paramline Protocol

PARAM data is a necessary parameter of the temperature measurement interface. In addition to being used for temperature measurement, this data also comes with some information.

| Parameter line |               |                                        |        |           |                                                      |
|----------------|---------------|----------------------------------------|--------|-----------|------------------------------------------------------|
| Index          | Serial number | Delivering content                     |        | Bit width | Description                                          |
| 0              | head1         | 0x55AA                                 | [15:0] | 16        | Frame header                                         |
| 1              | head2         | 0x0038                                 | [15:0] | 16        | Frame header                                         |
| 2              | 1             | Correlation of temperature measurement | [15:0] | 16        | humidity tempsysctl.usrelum                          |
| 3              | 2             |                                        | [15:0] | 16        | distance (True distance*10)                          |
| 4              | 3             |                                        | [15:0] | 16        | emissivity                                           |
| 5              | 4             |                                        | [15:0] | 16        | reflectivity                                         |
| 6~27           | 5~26          | reservation                            | [15:0] | 16        | reservation                                          |
| 28             | 27            | Shutter status flag                    | [15:0] | 16        | 0: Not shooting the shutter, 1: shooting the shutter |
| 29~43          | 28~42         | reservation                            | [15:0] | 16        | reservation                                          |
| 44             | 43            | Hot spot X coordinates                 | [15:0] | 16        | Enlarge the measured temperature by 10 times         |
| 45             | 44            | Hot spot Y coordinates                 | [15:0] | 16        |                                                      |
| 46             | 45            | Hot spot temperature                   | [15:0] | 16        |                                                      |
| 47             | 46            | Coldest point X coordinate             | [15:0] | 16        |                                                      |
| 48             | 47            | Coldest point Y coordinate             | [15:0] | 16        |                                                      |
| 49             | 48            | Coldest point temperature              | [15:0] | 16        |                                                      |
| 50             | 49            | The x-coordinate of the cursor point   | [15:0] | 16        |                                                      |
| 51             | 50            | The Y-coordinate of the cursor point   | [15:0] | 16        |                                                      |
| 52             | 51            | Temperature of the cursor point        | [15:0] | 16        | reservation                                          |
| 53             | 52            | Regional mean temperature              | [15:0] | 16        |                                                      |
| 54~58          | 53~57         | reservation                            | [15:0] | 16        | reservation                                          |
| 59             | 58            | 0x6666                                 | [15:0] | 16        | End of frame                                         |