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English



Messko





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提示

本说明书中的数据可能会和交货的设备稍有差异。
我方保留进行更改的权利，恕不另行通知。



Note

Data contained herein may differ in details from the equipment delivered.
We reserve the right to make alterations without notice.



请保存本说明书以备日后参考!

Please keep this manual for future reference!

1 安全

1.1 安全须知

从事本设备的安装、调试、运行或维护的人员必须：

- 具有合格的专业资格
 - 严格遵守本使用说明书
- 违章操作或错误使用可能会导致：
- 严重的或致命的伤害
 - 损坏本设备或用户的其它财产
 - 降低本设备的效能

在安全须知上，本说明书采用如下三种形式强调各种重要事项



警告

这是对生命和健康有一定危险的警示。
忽视这种警示会导致严重的或致命的伤害。



注意

这是对本设备或用户其它设备有一定危险的警示。
不排除严重的或致命的伤害。



提示

这是对某一事项的重要说明。

为了确保无故障运行，一定要接保护接地。



注意

本设备的安装、电气接线和投入运行必须由合格的技术人员按本使用说明书进行。

保证本设备仅用于指定的用途由用户负责。为安全起见，事先未经MESSKO公司同意，不得在设备的安装、设备改进和更换、电气接线或试运行上擅自进行任何作业！



警告

必须严格遵守相关的各种防火规程。



注意

测量装置为精密仪器，所有部件均不能跌落、撞击或碰撞。环境温度不可超过85℃。
ZT-F2.1变压器温度传感器不耐挤压。

2 产品介绍

ZT-F2.1变压器温度传感器只能结合TRASY2系列指针式温度计一同使用，它用于表示变压器内的热点温度。

绕组温度采用间接测量的方法获得。绕组（绕组热点）和冷却剂之间的温度梯度取决于通过绕组的电流。电流互感器二次电流与变压器绕组电流成正比。二次电流流过ZT-F2.1变压器温度传感器的加热电阻器。使仪表的显示曲线（取决于变压器负载）随实际测得的油温升高而上升（即热点温度）。

在ZT-F2.1中可模拟绕组温度。由DIP开关设置在额定负载情况下直至最上层油温的热点温度梯度变化。在指针式温度计中以机械的方式显示绕组温度，其中该指针式温度计的传感器安装在ZT-F2.1中。还可以例如通过所安装的Pt100电阻或4~20 mA模拟输出，将测量值发送到动圈式显示器或数字显示器。

1.2 指定用途

ZT-F2.1变压器温度传感器只能结合TRASY2系列指针式温度计一同使用，用于表示变压器内的热点温度。

调试仪表前，务必查阅铭牌上和操作使用说明书上的操作限定值。

1.3 设备操作的重要提示

用户必须遵守国家防止意外事故的规章。特别要强调的是，在进行涉及带电部件（人碰到它们可能会有触电的危险）的工作时，只有在这些部件断电或对它们采取了保护措施，工作人员不会直接接触到时，这些工作才允许进行。

电气安装应遵守相关国家安全规则。

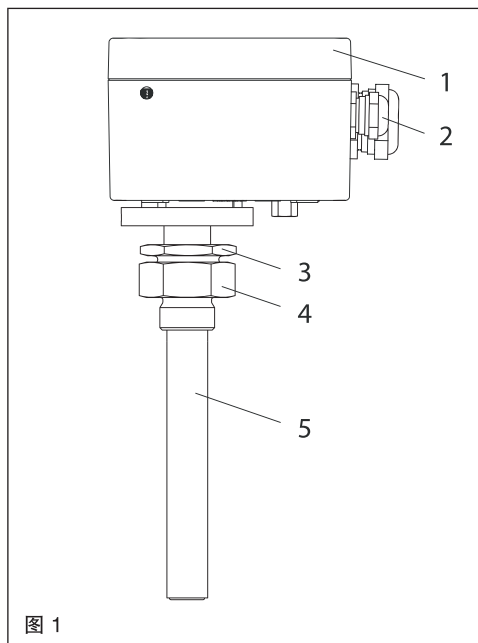


图 1

3 安装条件和测试

ZT-F2.1 变压器温度传感器应安装在按 DIN 42554 A1 型设计的温度计封套中。还可以选配其他螺纹密封盖。温度计封套必须位于变压器盖上，靠近油流量最大的位置。这样可以确保冷却剂、温度计封套和 ZT-F2.1 中的温度传感器之间达到理想的换热效果。为确保正确传热，温度计封套中必须加入 2/3 体积的油。只有在这些条件下才能保证显示热点温度的准确性。如果您希望在变压器安装之前对 ZT-F2.1 变压器温度传感器进行测试，必须使试验配置达到与变压器相同的条件（见下面的“测试条件”）。

测试条件

1. 油槽的受控运动。
2. 温度计封套安装在油槽中。
3. 温度计封套中加入 2/3 体积的油。
4. ZT-F2.1 安装在温度计封套中。

5. Pt100 或 4 ~ 20mA 模拟输出（选项）已连接（见第 6.2/6.3 节）。插入指针式温度计的传感器，直至到达止动位置（大约 210mm）。
6. 油槽温度不应超过 30°C，否则通过双接头释放的热量可能会破坏变压器条件。
7. 使传感器适应油槽温度（至少保持 30 分钟）。
8. 在达到梯度温度之前，测量循环至少应持续 20 分钟。

4 指针式温度计

ZT-F2.1 可结合各种指针式温度计和分析仪器使用。在安装此类仪器时必须遵守相关说明。

5 安装



注意

必须严格遵守本安装和使用说明书中规定的运行和安装条件。否则可能导致设备损坏和运转失灵。

5.1 安装 ZT-F2.1 变压器温度传感器

ZT-F2.1 变压器温度传感器应安装在按 DIN 42554 A1 型设计的温度计封套中。



注意

切勿在 ZT-F2.1 变压器温度传感器中注油，只有温度计封套才需注油。

在温度计封套加入 2/3 体积的油。在安装时，将双接头的底部螺母（图 1，位置 4）拧入温度计封套。插入并伸直 ZT-F2.1 变压器温度传感器的潜管（图 1，位置 5）。拧紧双接头（图 1，位置 3）。



注意

不能用力旋转 ZT-F2.1 变压器温度传感器。必须松开双接头。

5.2 安装指针式温度计的温度感应器

按下 ZT-F2.1 变压器温度传感器的保护盖（图 1，位置 1）。拧下 M16x1,5 压紧螺丝（图 1，位置 1）。将压紧螺丝、止推环和密封圈推上温度感应器（直径 9.5 毫米）和毛细管。将温度感应器

从小电缆接头中穿过40 ~ 50cm，直至接触到ZT-F2.1变压器温度传感器的指针式温度计的温度传感器套管中的止动位置（深度大约为 210 mm）。拉直毛细管。然后拧紧电缆接头，以防液体流入。

6 电气接线

6.1 电流互感器的连接



注意

电气接线必须由合格的经过国家实施的相关安全规程培训的专业人员进行。



警告

有电！致命危险！
开启设备前所有连接线路必须不带电。

将电流互感器连接到ZT-F2.1变压器温度传感器的端子1+2（图3, 位置1）。额定二次电流应为1.5至2 A。如果电流强度较大或较小，可按照要求的热点梯度使用连接器。

6.2 Pt100 测量电阻

ZT-F2.1配有一个符合 IEC 751标准的Pt100 测量电阻。使用的显示仪可设计成2、3或4线制。

连接电缆的长度

连接电缆的长度将取决于需要连接的信号转换器或者显示设备的规格（例如Pt-MU中每条电缆100 Ω ）。一般情况下，如果采用3线制，则线路长度不应超过50 m。在采用3或4线制时，一定要确保各导线均相同（即长度相同、截面积相同）。否则，受线路电阻不正确补偿的影响，可能会出现偏差。

3线制

采用3线制显示仪（2条测量线路和1条补偿线路）。传感器线路连接到端子3和4，平衡线路连接到端子3a（见图3, 位置2）。

2线制

采用2线制显示仪（2条测量线路）时，一条测量线路连接到端子3，另一条测量线路连接到端子4（见图3, 位置2）。

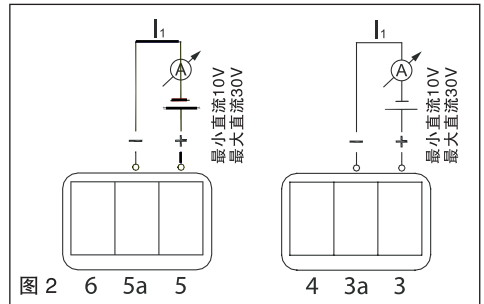
4线制

采用4线制（2条测量线路和2条补偿线路）时，连接方式与3线制相同。第二条补偿线路也必须连接到端子3（见图3, 位置2）。

选项

如果ZT-F2.1 配备了2个 Pt100测量电阻，则可以另外将一个显示仪连接到端子6、5a和5（图3, 位置3）。

6.3 选项：4..20 mA 模拟输出



ZT-F2.1 可使用4 ~ 20 mA模拟输出来代替 Pt100 测量电阻。采用2线制（直流24V 下的最大R/L为750 Ω ）连接到端子3a和3（见图2和图3, 位置2）。

作为无源模拟输出的电流环路 I₁:

该装置作为受控电阻，在供电电压为直流10 ~ 30 V时，将电流控制在4 ~ 20 mA，从而显示测量温度的大小。

选项

ZT-F2.1 也可选配2个模拟输出，将另一个连接到端子5a和5（见图2和图3, 位置3）。

7 热点梯度的设置

7.1 2A CT额定电流的设置

通过位于ZT.F2.1板上的2个DIP开关S1和S2，来设置热点梯度（额定负载下）。在附录表中（第13.2节2 A CT额定电流的热点梯度表）获得要求的梯度，确定开关S1和S2的位置，然后进行相应设置（见图3）。热点梯度的设置范围为4 K ~ 50 K，增量为1 K。

例如，如果开关位置如图3, 位置4所示，则必须设置为25 K的热点梯度。

7.2 CT 额定电流 $\neq 2\text{ A}$ 和 $\leq 2.2\text{ A}$ 的设置

如果CT额定电流大于或小于2 A，则必须根据如下公式来计算应设置的温度梯度：

$$Hg[K] = Hg_{\text{nenn}} * 4\text{ A}^2 / CT_{\text{nenn}}^2$$

z.B.) $Hg_{\text{nenn}} = 16\text{ K}$

$CT_{\text{nenn}} = 1,6\text{ A}$

$Hg[K] = 16\text{ K} * 4\text{ A}^2 / (1,6\text{ A})^2 = 25\text{ K}$ (在 2 A CT 额定电流下)

DIP 开关 (图3, 位置4) 应设置的开关位置, 见第13.2节 2 A CT 额定电流的热点梯度表。

由于可以设置的值的范围为 4 K ~ 50 K 且增量为 1 K, 因此必要时, 可将计算值四舍五入成整数。

可以利用如下的图4和图5, 来以图形形式确定设置值。

如果CT额定电流与目标温度梯度的交叉点位于图中两条曲线之间, 则对相应曲线进行插补, 或者必须用上述公式来确定需设置的值。

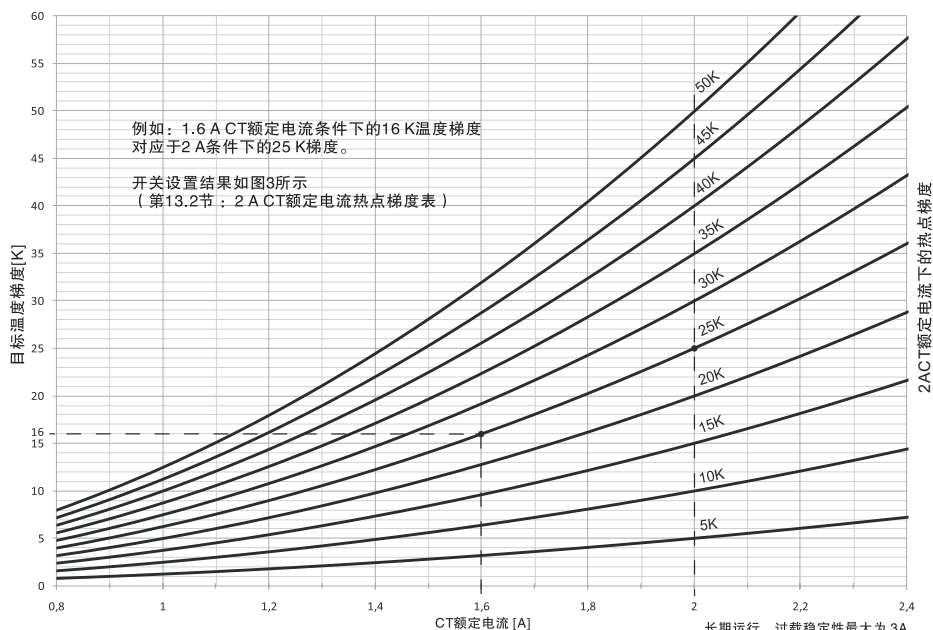
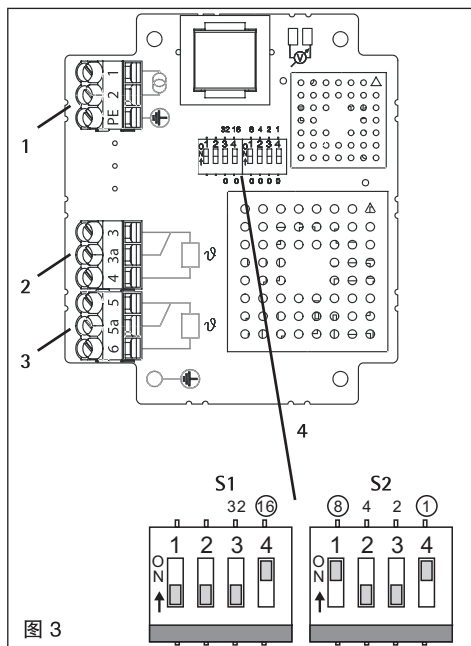


图 4

8 检查显示器

预热30分钟后，比较指针式温度计与电子显示屏上的读数。这些读数应在两个设备的公差范围内。

9 服务

如果上述说明不能满足您的要求，请联系我厂。

10 维护

ZT-F2.1变压器温度传感器产品免维护。

11 过压保护

所有输入和输出均配备有安全电路，用以对故障电流导流所述故障电流可以在雷击、切换等事件中产生。

如果在外壳与输入或输出之间进行大于交流300 V的高压测试，则可以对大于最大允许故障电流的故障电流进行导流。

12 技术参数

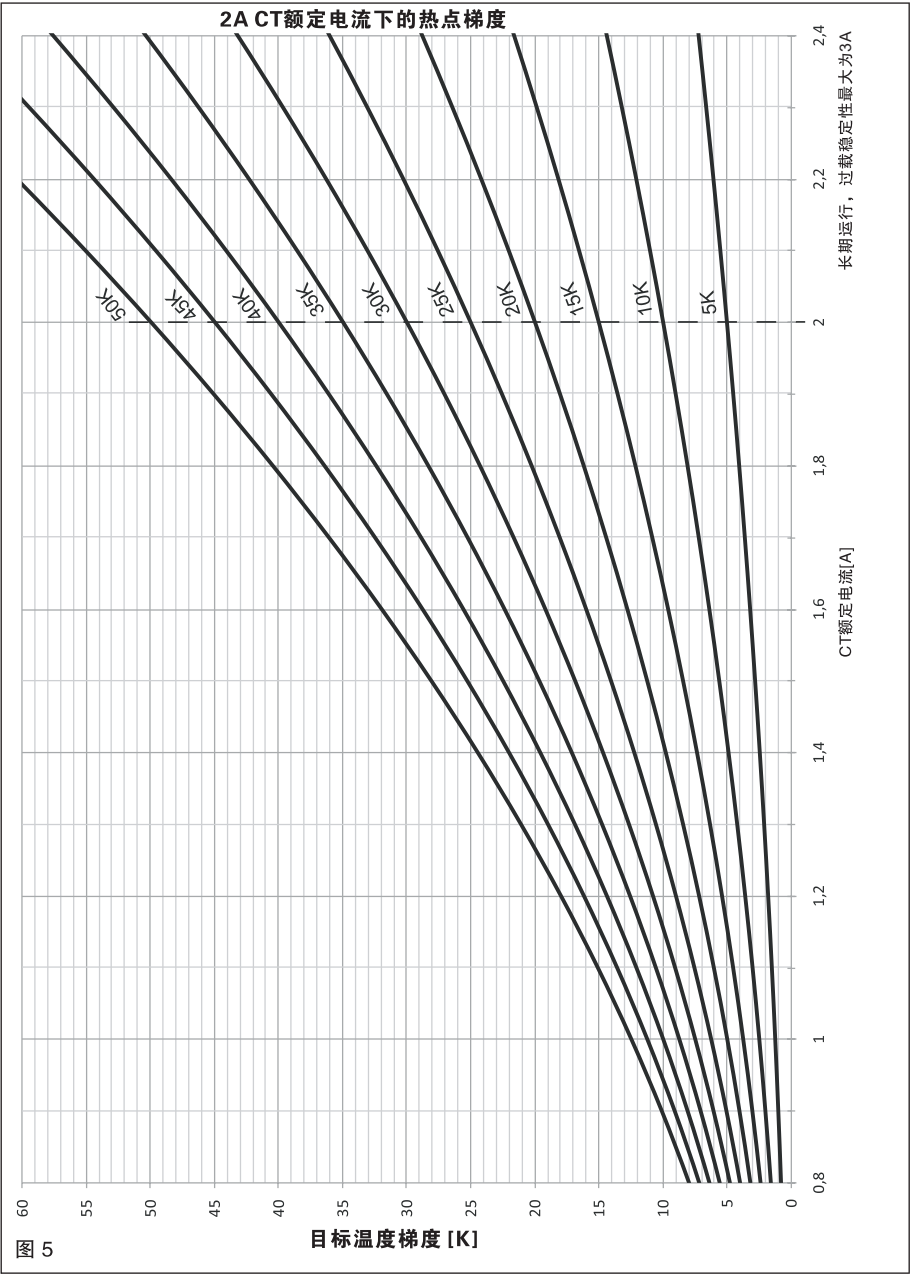
尺寸:	见附录第13.1节
材料:	
外壳/接线盒:	铝合金铸造件，涂层 RAL 7033, RAL 7038
接头:	双接头 G1B, 黄铜 抛光 可选双接头 M27x2, M27x1,5, G3/4B
安装:	温度计封套 DIN EN 50216-4 A1型 或类似产品 符合 DIN EN 60 529 标准为IP 55
保护等级:	特氟隆 (Teflon)
法兰:	
重量:	1,7 kg
接线盒:	室内或室外，热带地区
安装场所:	1x M16 x 1,5 WADI;
电缆接头:	2 x M25 x 1,5 WADI
端子连接说明:	见第 6章
连接端子:	4 mm ² 单芯
通风:	防结露

操作和环境条件:

最大 CT额定电流:	互感器电流 为 2 A
抗过载能力:	符合IEC 60076-2标准， 长期运行，最大电流为3 A， 12 A 时为 30 秒
温度梯度调节:	采用DIP 开关（见第 7章和 附录第 13.2节）
温度计测量范围:	取决于所使用的温度计
环境温度:	-50 ~ +85°C
安装场所:	室内或室外，热带地区
加热:	与潜管一体化
安装位置:	任意
额定绝缘电压:	交流300 V, 50 Hz
模拟输出信号:	最多 2x PT100 / Cu10 / PT1000 或 2x 4 ~ 20 mA, 其它规格可根据要求

输出电流 4...20 mA:

电源:	最小直流 10 V 至最大直流30 V
负载:	在直流24 V下，最大 750 Ω



- 1 Safety
- 2 Product specification

1 Safety

1.1 Safety instructions

All personnel involved in installation, commissioning, operation or maintenance of this equipment must:

- be suitably qualified and
- strictly observe these operating instructions.

Improper operation or misuse can lead to

- serious or fatal injury,
- damage to the equipment and other property of the user
- a reduction in the efficiency of the equipment.

Safety instructions in this manual are presented in three different forms to emphasize important information.



WARNING

This information indicates particular danger to life and health. Disregarding such a warning can lead to serious or fatal injury.



CAUTION

This information indicates particular danger to the equipment or other property of the user. Serious or fatal injury cannot be excluded.



NOTE

These notes give important information on a certain issue.

1.2 Specified application

The ZT-F2.1 transformer temperature transmitter can only be used in conjunction with a TRASY2 series dial thermometer. It is used to present the hot-spot temperature in the transformer. It is important to read and observe the limit values for operation indicated on the nameplate and in the operating instructions prior to commissioning the device.

1.3 Important notes on equipment operation

The user is advised to strictly comply with the national accident prevention regulations.

It is especially emphasized that work on active or live components is only permissible while these components are either de-energized or protected against direct contact.

Electrical installation is subject to the relevant national safety regulations. It is imperative to connect the grounding cable in order to ensure trouble-free operation.



CAUTION

Installation, electrical connection, commissioning, and maintenance of the device may only be carried out by qualified, skilled personnel and only in accordance with these operating instructions.

It is the responsibility of the user to make sure that the device is used for the specified application only.

For safety reasons, any unauthorized and improperly executed work, i.e. installation, modification, alteration of the equipment, electrical connection, or commissioning of the equipment, is forbidden without first consulting Messko!



WARNING

All relevant fire protection regulations must be strictly observed.



CAUTION

Since measuring instruments are sensitive, all parts should be protected against falling and knocks and vibration.

Make sure that the maximum ambient temperature of 80° C and the maximum oil temperature of 85° C are not exceeded.

The ZT-F2.1 transformer temperature transmitter cannot bear your weight.

2 Product specification

The ZT-F2.1 transformer temperature transmitter can only be used in conjunction with a TRASY2 series dial thermometer. It is used to present the hot-spot temperature in the transformer. The winding temperature is measured indirectly. The temperature gradient between the winding (hot-spot) and the coolant is dependent on the current in the winding: the measuring transformer's secondary current is proportional to the current in the winding of the transformer. The measuring transformer's secondary current supplies a heating resistor in the ZT-F2.1 transformer temperature transmitter. This causes an indicator increase corresponding to the transformer load (i.e., hot-spot temperature) in the actually measured oil temperature.

The winding temperature is simulated in the ZT-F2.1. The gradient of the hot-spot temperature to the temperature of the uppermost layer of oil at nominal load is set by DIP switches. The winding temperature is displayed mechanically on a dial thermometer, the temperature detector of which is incorporated in the ZT-F2.1. The measured value can also be transferred to a moving-coil or digital display, for example, via the installed Pt100 resistor or a 4 – 20 mA analog output.

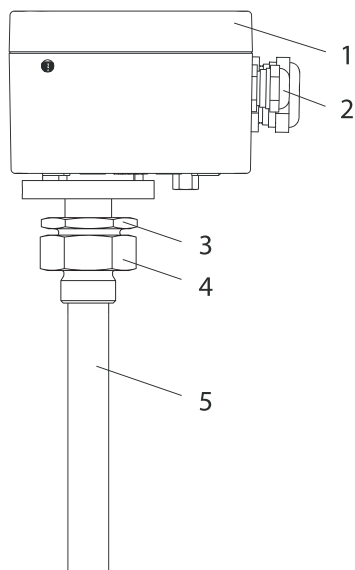


Fig. 1

3 Installation conditions and testing

The ZT-F2.1 transformer temperature transmitter is designed to be installed in a DIN EN 50216-4 type A1 thermometer pocket. Other screwed glands are available as options. The thermometer pocket must be located on the transformer cover near the largest oil flow. This will ensure a satisfactory heat exchange between the coolant, thermometer pocket and the temperature sensors in the ZT-F2.1. The thermometer pocket must be 2/3 full of oil in order to ensure a correct transfer of heat. The hotspot temperature may not be indicated accurately if these prerequisites are not met. If you want to test the ZT-F2.1 transformer temperature transmitter before installing it on the transformer, you must create the same conditions in the test set-up as occur on the transformer (see „Testing conditions“ below).

Testing conditions

1. Controlled movement of the oil bath.
2. Thermometer pocket installed in the oil bath.
3. Thermometer pocket 2/3 full of oil.
4. ZT-F2.1 installed in the thermometer pocket.
5. Pt100 or 4..20mA analog output (optional) is connected (refer to chap. 6.2/6.3).
Insert the sensor of the pointer thermometer until it reaches

the stop (approx. 210mm).

6. The bath temperature should not exceed 30 °C, or the heat emitted via the double joint would distort the transformer conditions.
7. Allow the sensor to adapt to the bath temperature for at least 30 minutes.
8. The measuring cycle until the temperature jump is reached should take at least 20 minutes.

4 Pointer-type thermometer

The ZT-F2.1 can be combined with various pointer-type thermometers and analytical instruments. Always follow the instructions provided when installing such instruments.

5 Assembly



CAUTION

The operating and installation requirements described in this manual must be strictly complied with. If not, the device may be damaged or may malfunction.

5.1 Assembling the ZT-F2.1 transformer temperature transmitter

The ZT-F2.1 transformer temperature transmitter is designed to be installed in a DIN EN 50216-4 type A1 thermometer pocket.



CAUTION

Never fill the ZT-F2.1 transformer temperature transmitter with oil. Only the thermometer pocket should be filled with oil.

Fill the thermometer pocket with oil until it is 2/3 full. To assemble, screw the bottom nut of the double joint (figure 1, item 4) into the thermometer pocket. Insert and straighten the immersion tube (figure 1, item 5) of the ZT-F2.1 transformer temperature transmitter. Tighten the double joint (figure 1, item 3).



CAUTION

Do not apply force to turn the ZT-F2.1 transformer temperature transmitter. Always loosen the double joint!

5.2 Installing the temperature bulb of the pointer-type thermometer

Unscrew the cover of the ZT-F2.1 transformer temperature transmitter (figure 1, item 1). Unscrew the M16x1,5 pressure screw. Push the pressure screw, thrust collar and gasket over the temperature detector (9.5 mm diameter) and the capillary tube. Thread the temperature detector 40 – 50 cm through the small cable gland connection until it reaches the stop (at a depth of approx. 210 mm) in the transformer temperature

sensor sleeve of the ZT-F2.1 transformer temperature transmitter. Pull the capillary tube until it is straight and then install it. Then tighten the cable gland connection until it is liquid-tight.

6 Electrical connection

6.1 Connecting the current transformer



CAUTION

Electrical connections may only be carried out by qualified, skilled personnel trained in the applicable safety regulations of the relevant country.



WARNING

Hazardous electrical voltages!

All connecting wiring must be free of voltage before opening the device.

Connect the current transformer to terminals 1 + 2 of the ZT-F2.1 transformer temperature transmitter. The rated secondary current should be 1.5 to 2 A. Use a connector unit according the desired hot-spot gradient for other currents.

6.2 Pt100 measuring resistor

The ZT-F2.1 is equipped with a Pt100 measuring resistor conforming to IEC 751. The indicator instrument that is used can be designed as 2, 3 or 4-conductor.

Length of the connection lines

The length of the connection lines depends on the specifications of the measuring transducer or indicator device to be connected (e.g., one Pt-MU 100Q per line). In general, a line length of 50 m should not be exceeded if the 3-conductor technique is used. With the 3 or 4-conductor technique, make sure that the individual leads are identical (i.e., same length, same cross section). Otherwise differences may occur due to incorrect compensation of the line resistors.

3-conductor technique

A 3-conductor indicator instrument (2 measuring lines and 1 compensation line) is to be used. The sensor lines are connected to terminals 3 and 4 and the equalizing line to terminal 3a (see figure 3, item 2).

2-conductor technique

When a 2-conductor indicator instrument is used (2 measuring lines), one measuring line is connected to terminal 3 and the other measuring line is connected to terminal 4 (see figure 3, item 2).

4-conductor technique

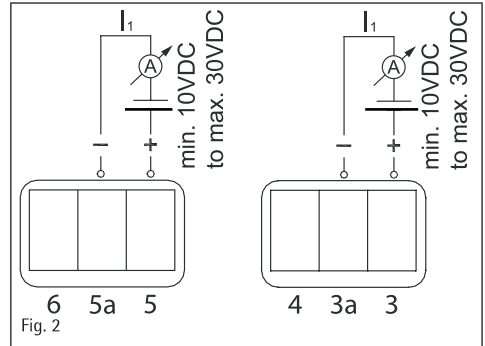
When a 4-conductor indicator instrument is used (2 measuring lines and 2 compensation lines), the same connections are used as for the 3-conductor technique. The second compensation

line must also be connected to terminal 3a (see figure 3, item 2).

Option

When the configuration of the ZT-F2.1 with two Pt100 measuring resistors is used, an additional indicator instrument can be connected to terminals 6, 5a and 5 (see figure 3, item 3).

6.3 Option: analog output 4..20mA



The ZT-F2.1 can be delivered with the 4..20mA analog output instead of the Pt100 measuring resistor. The 2-conductor connection technique (R/L max. 750Ω at 24 VDC) is used with connection to terminals 3a and 3 (see figure 2 and figure 3, item 2).

Current loop I1 as passive analog output:

The device acts as a controlled resistance which, at a supply voltage between 10-30 V DC, controls the current flow between 4-20 mA as the measured temperature to be shown

Option

Optional configuration of the ZT-F2.1 with two analog outputs is also possible. Connection is then made to terminals 5a and 5 (see figure 2 and figure 3, item 3).

7 Setting the temperature gradient

7.1 Setting for 2A CT nominal current

The hot-spot gradient (at nominal load) is set via with the two DIP switches S1 and S2 located on the ZT-F2.1 board. Determine the position of switches S1 and S2 for the desired gradients in the table in the appendix (chap. 12.2 - hot-spot gradient table for 2A CT nominal current) and set these accordingly (see figure 3). The hot-spot gradient can be set from 4 K to 50 K in increments of 1 K.

For example, the switch setting shown in figure 3, item 4 must be set for a hot-spot gradient of 25 K.

7.2 Setting for 2A CT nominal current $\neq 2\text{ A}$ and $\leq 2,2\text{ A}$

If the CT nominal current is greater or smaller than 2 A, the temperature jump to be set must be calculated with the following formula:

$$Hg[K] = Hg_{\text{nenn}} * 4\text{ A}^2 / CT_{\text{nenn}}^2$$

z.B.) $Hg_{\text{nenn}} = 16\text{ K}$

$CT_{\text{nenn}} = 1,6\text{ A}$

$Hg[K] = 16\text{ K} * 4\text{ A}^2 / (1,6\text{ A})^2 = 25\text{ K}$ at 2A CT nominal current

See chap. 13.2 (hot-spot gradient table for 2 A CT nominal current) for the switch positions to be set for the DIP switches (figure 3, item 4).

If necessary, round off the calculated value to a whole number since the value to be set from 4 K to 50 K can only be set in 1-K increments.

The setting can also be determined graphically with the following diagram in figure 4 or figure 5.

If the intersection point of CR nominal current and target temperature jump is located between two of the pictured curves, the required curve must be interpolated or the above mentioned formula must be used to determine the value to be set.

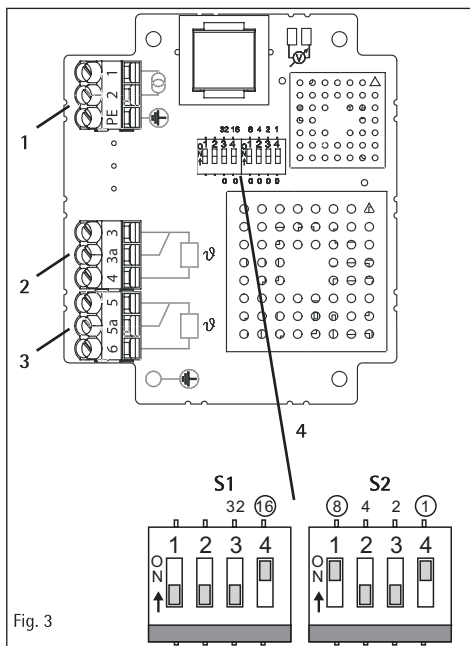


Fig. 3

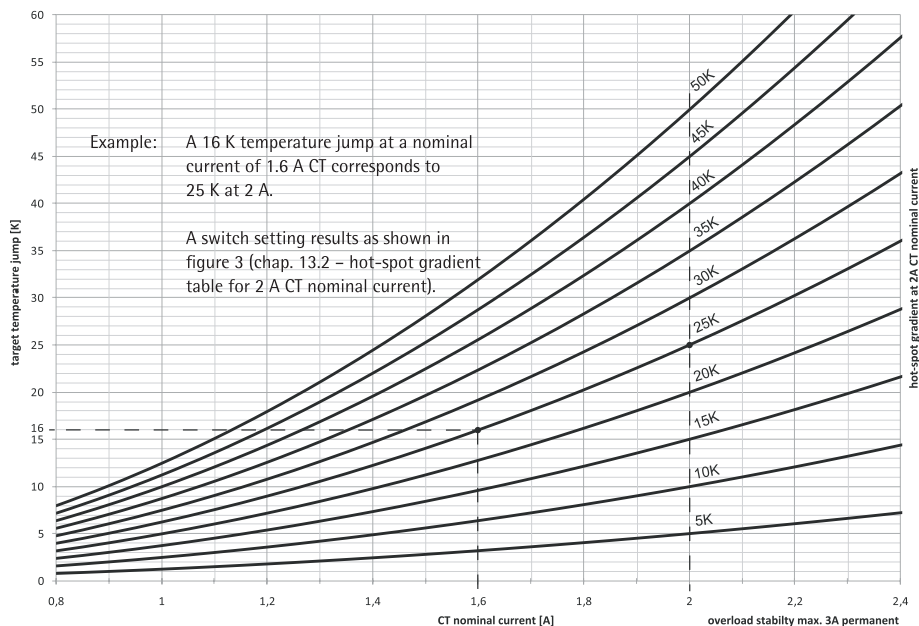


Fig. 4

8 Checking the display

Allow the pointer-type thermometer to warm up for 30 minutes and then compare the readings on the dial and the electronic display. The readings should be within the tolerance ranges of both devices.

9 Service

If the above instructions are not sufficient, please contact our factory.

10 Maintenance

The ZT-F2 transformer is maintenance-free.

11 Overvoltage protection

All inputs and outputs are equipped with a safety circuit to divert fault currents which can be created during lightning strikes, switching events, or similar.

When a high voltage test > 300 VAC occurs between housing and inputs or outputs, fault currents can be diverted which are greater than the maximum permissible fault current.

12 Technical data

Dimensions: Refer to appendix, chap. 13.1

Materials:

Housing/terminal box: Aluminum alloy, die-casting, RAL 7033, RAL 7038
Thread joint: Double thread G1B, brass, blank

Installation: Thermometer pocket
 DIN EN 50216-4 type A1 or similar

Protection mode: IP 55 acc. DIN EN 60 529

Flange: Teflon

Weight: 1,7 kg

Terminal box:

Cable glands: 1x M16 x 1,5 WADI;
 2 x M25 x 1,5 WADI

Connection diagram: Refer to chap. 6

Connection terminals: 4 mm² single core

Ventilation: To prevent condensation

Operating and ambient conditions:

Max. nominal CT current: 2 A from current transformer

Overload stability: Permanent max. 3 A acc. IEC 60076-2,

12 A for 30 sec.

Gradient adjustment: Via dip-switch (refer to chap. 7 and appendix chap. 13.2)

Measuring range thermometer: Depends on thermometer used

Ambient temperature: -50... +85° C

Location: Indoors and outdoors, tropical proof

Heating: Integrated in immersion tube

Mounting orientation: Any

Rated insulation voltage: 300 VAC, 50Hz

Analog output signal: Up to 2x for Pt100 / Cu10 / Pt1000
 or up to 2x 4...20 mA, others on request

Current output 4...20 mA:

Power supply: min. 10 VDC ... max. 30 VDC

Load: max. 750 Ω for 24 VDC

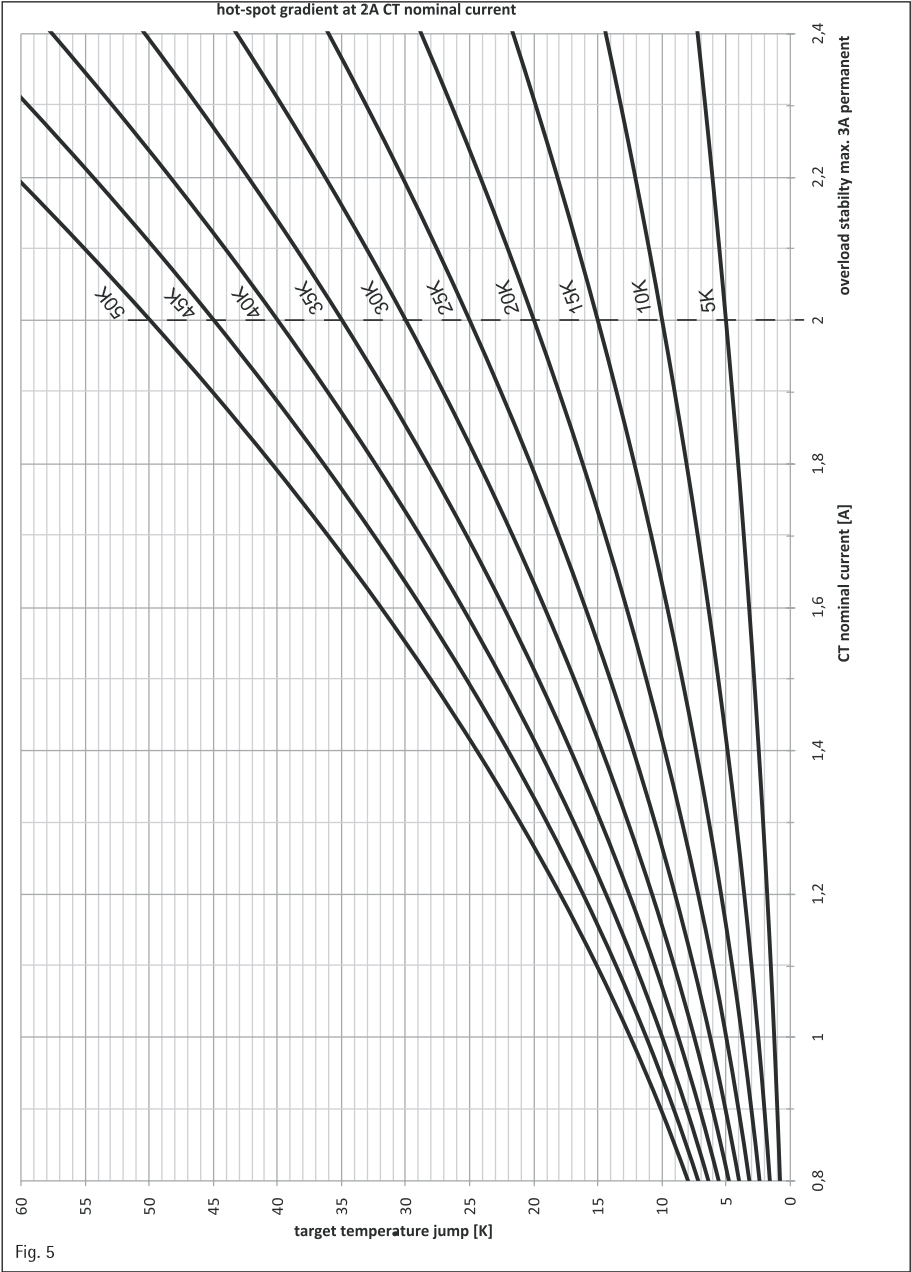


Fig. 5

13 附录 / Appendix

13.1 尺寸图/ Dimensions

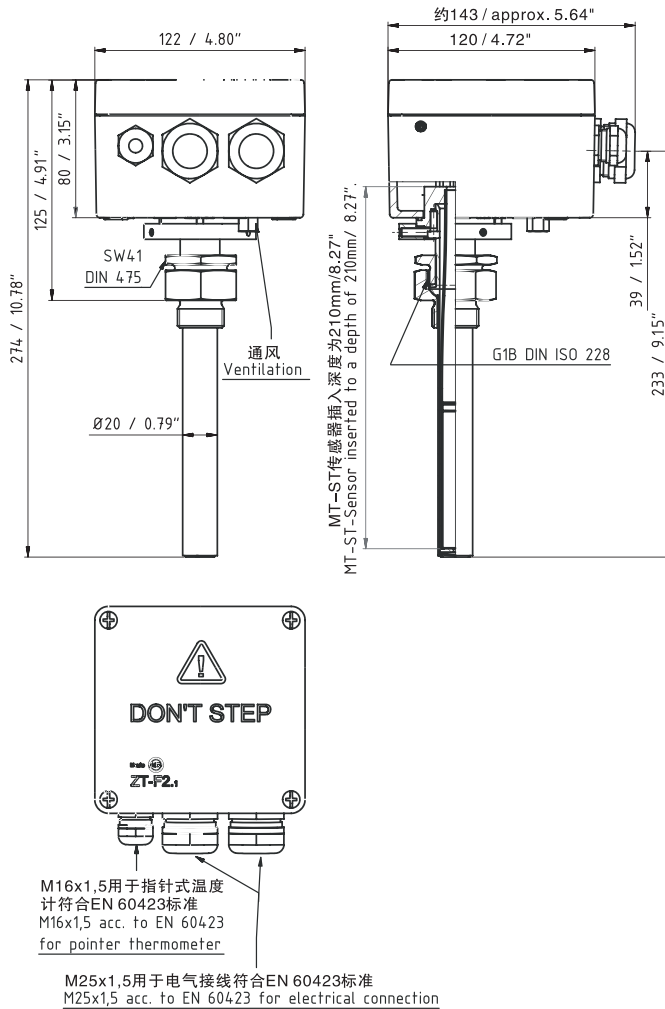
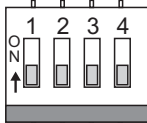
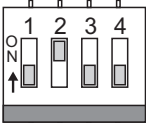
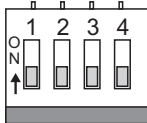
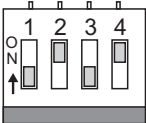
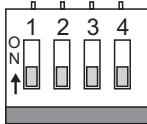
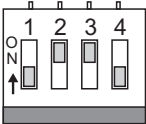
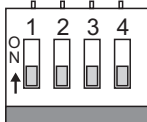
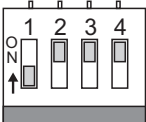
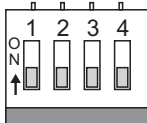
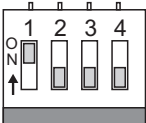
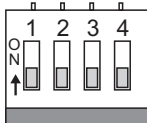
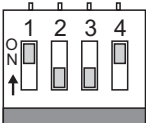
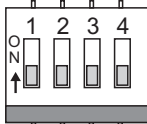
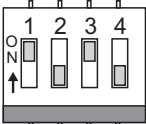
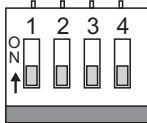
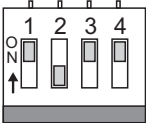
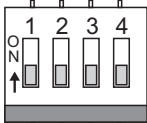
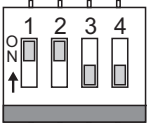
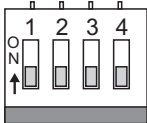
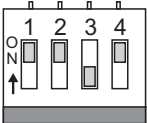
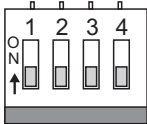
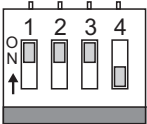
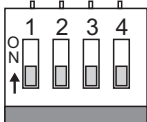
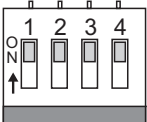
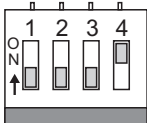
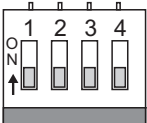
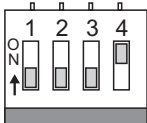
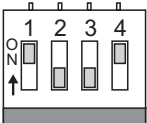
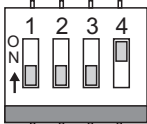
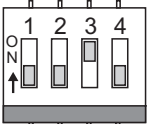
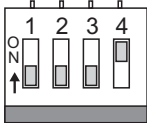
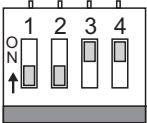
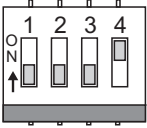
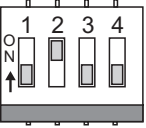
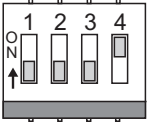
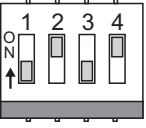
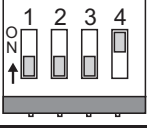
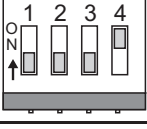
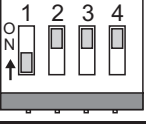
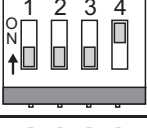
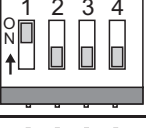
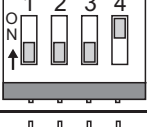
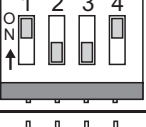
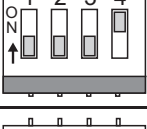
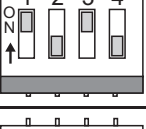
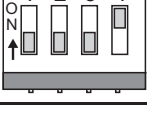
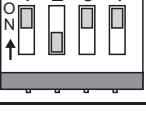
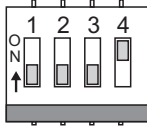
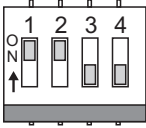
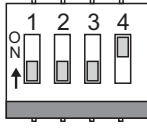
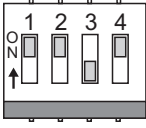
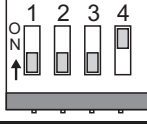
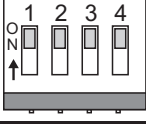
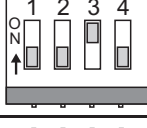
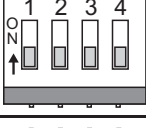
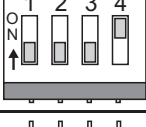
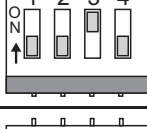
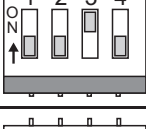
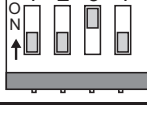
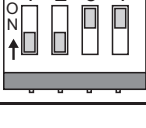


图 6/ Fig. 6

13.2 2 A CT额定电流的热点梯度表
Hot-spot gradient table for 2A CT nominal current

梯度/ gradient	S1 32 16	S2 8 4 2 1
4K		
5K		
6K		
7K		
8K		
9K		
10K		
11K		
12K		
13K		
14K		
15K		
16K		
17K		
18K		
19K		

梯度/ gradient	S1 32 16	S2 8 4 2 1
20K		
21K		
22K		
23K		
24K		
25K		
26K		
27K		

梯度/ gradient	S1 32 16	S2 8 4 2 1
28K		
29K		
30K		
31K		
32K		
33K		
34K		
35K		



梯度/ gradient	S1 32 16	S2 8 4 2 1
36K		
37K		
38K		
39K		
40K		
41K		
42K		
43K		

梯度/ gradient	S1 32 16	S2 8 4 2 1
44K		
45K		
46K		
47K		
48K		
49K		
50K		