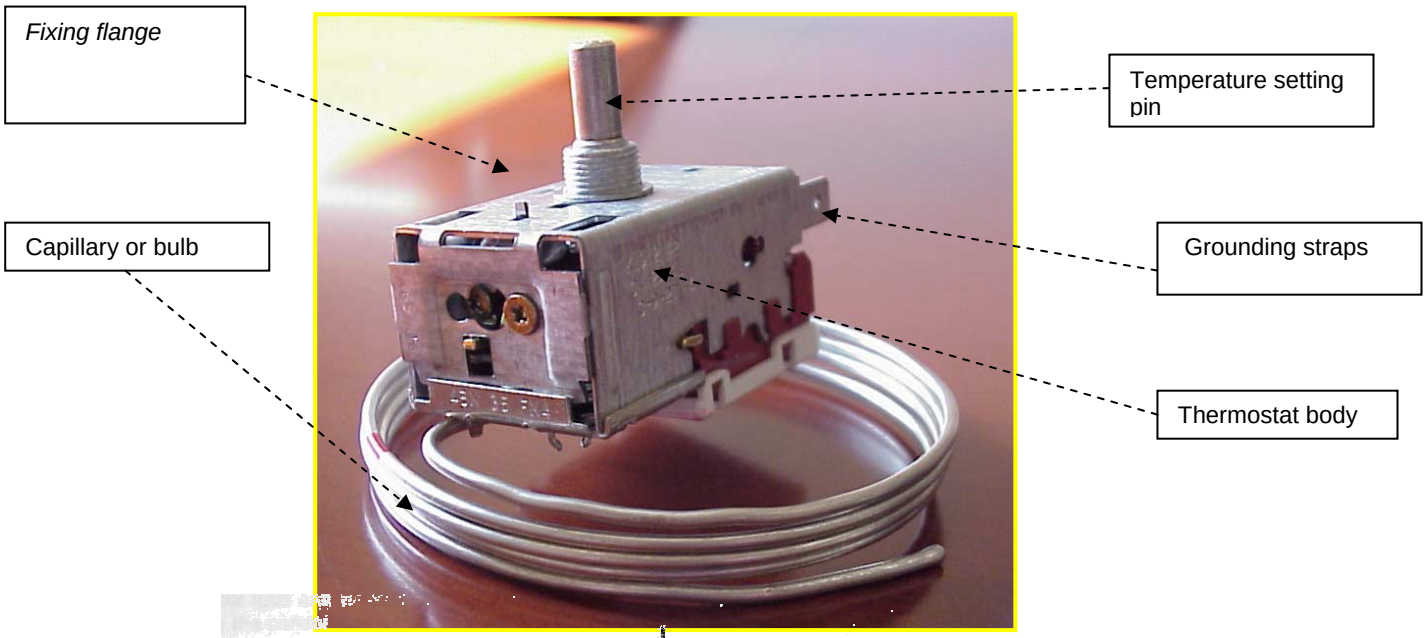
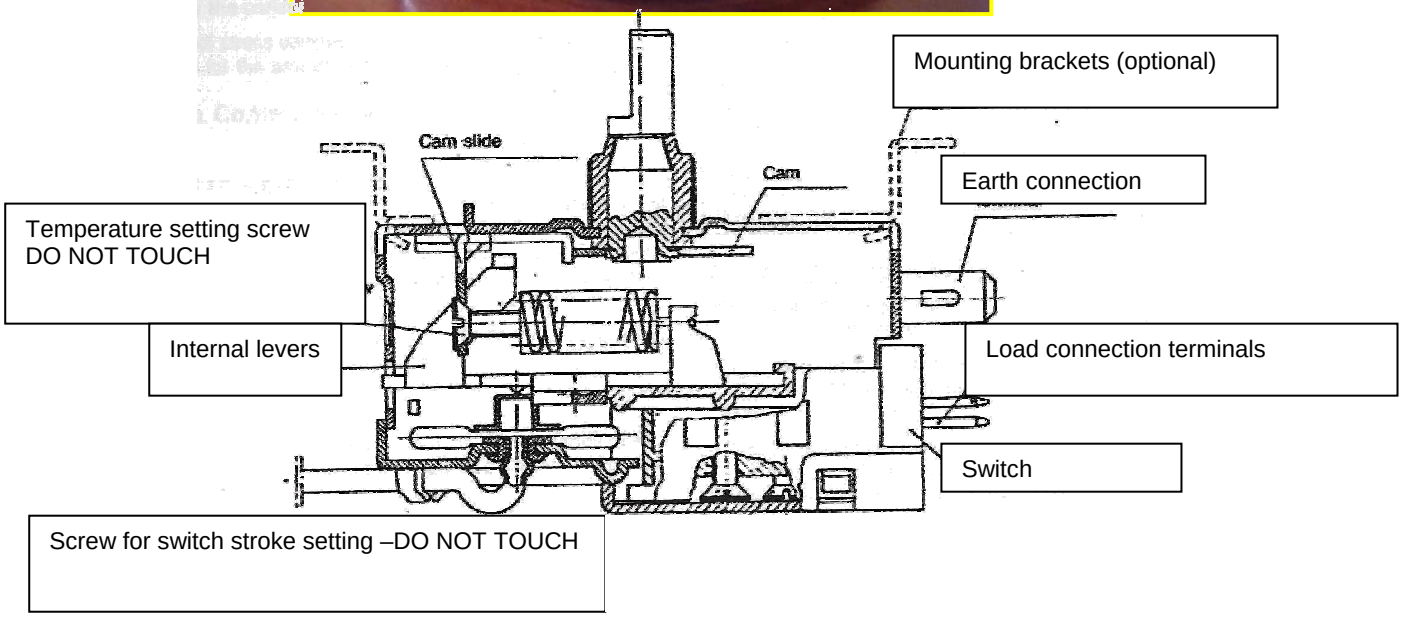
Technical Support
Bulletin Nr. 9 – "K" Thermostats Series

Contents

Description of parts





Overview of operation

These electromechanical devices are designed to enable/disable connected loads according to the temperature measured by the sensitive component (capillary). The capillary contains a small amount of gas (usually R134 or R290). In ordinary working conditions, the gas handled by the device is a mixture of liquid and steam. A change in temperature causes the gas to condensate and/or evaporate. This change of status causes a pressure variation inside the capsule which enables a contact. Terminals differ by position (they can be fitted on the rear or lower section), size and rating. *The thermostat is calibrated in the manufacturing plant and set to a reference pressure of 737 mmHg (see section "Main criteria for the selection of thermostats" for additional information) and CANNOT be changed by the user despite the calibration screws being accessible.* The control temperature can be specified by the user by rotating the pin to the desired position. Minimum and maximum values cannot be changed.

Applications

Domestic refrigerators, vertical or horizontal refrigerators and freezers
Commercial refrigerators, ice makers
Chillers and heat pumps
Transportation of frozen products
Temperature and load control (usually compressors)

Mechanical assembly

- The hole in which the pin is inserted must have a diameter of 10-11 mm. The flange on the threaded base MUST project from the hole at the correct distance, to prevent the locking nut from transferring the closing torque to the body and causing the detachment of the bushing.
- As a general rule, assembly should not deform the thermostat or expose it to mechanical stresses. This applies also to all equipment fitted next to the thermostat. None of the moving mechanical parts of the thermostat should be hindered by the external bodies.

Parts and installation instructions

- If the capillary (in its whole length) is sensitive to different temperatures, control and tripping limits should be adjusted taking into account the lowest temperature. It is therefore essential that the coldest point measured by the capillary corresponds to the point that needs controlling and that the last 150 mm of the capillary are in contact with this part.
- The capillary contains gas and CANNOT therefore be shortened. If bending is required, this should be done at a minimum distance of 10 mm from the body of the thermostat. The minimum oval section of the capillary should NEVER be below 1.5 mm. Therefore, it is generally advisable not to use straps or other fixing parts that could affect this value.
- If the capillary needs to be bent, it is important to verify that the bending radius is NEVER below 5 mm.
- To ensure optimum performance of the thermostat, it is necessary to place the body of the thermostat in an area with a temperature at least 2°C above the "warm cut-in"+ tolerance value. Example: if "warm cut-in" = 10°C, ±1, the limit shall be equivalent to 11°C, which corresponds to the warm cut-in + tolerance value. The body of the thermostat should be placed in an area with a temperature of 13°C. If

this is not possible, the thermostat must be fitted with a bulb. Thermostats can also be fitted with an electric heater to heat the thermostat body. Electric heaters are supplied on request and can be fitted on some models only.

- All terminals should be connected taking into account the maximum current that can be handled by the device. NEVER weld the wires on the terminals. The connected wires should not cause mechanical stresses to the thermostat body.

Main criteria for the selection of thermostats

To select the most suitable thermostat, always take into account the following:

1. Adjustable temperature range. Example: calibration in Warm, Warm In +5.0°C, Warm Out 0.0°C, Cold Out –10°C position. Calibrated values and preset limits CANNOT be changed.
2. Operating reference pressure. Calibration is performed at a reference pressure of 737 mmHg. The use of higher ambient pressures causes the operating temperature to increase as compared to that set with the knob and vice versa.
3. Area in which the thermostat is used: on evaporator? In rooms?
4. Design, position and length of the capillary (horizontal? vertical? other?). This information enables to decide whether to use a straight capillary or a capillary with an end bulb. Presence of a protective blanket.
5. Current and voltage of the load that needs controlling. Type of terminals.
6. Accessories (knob, graduated plate, nuts…).
7. Code of a thermostat with similar characteristics.

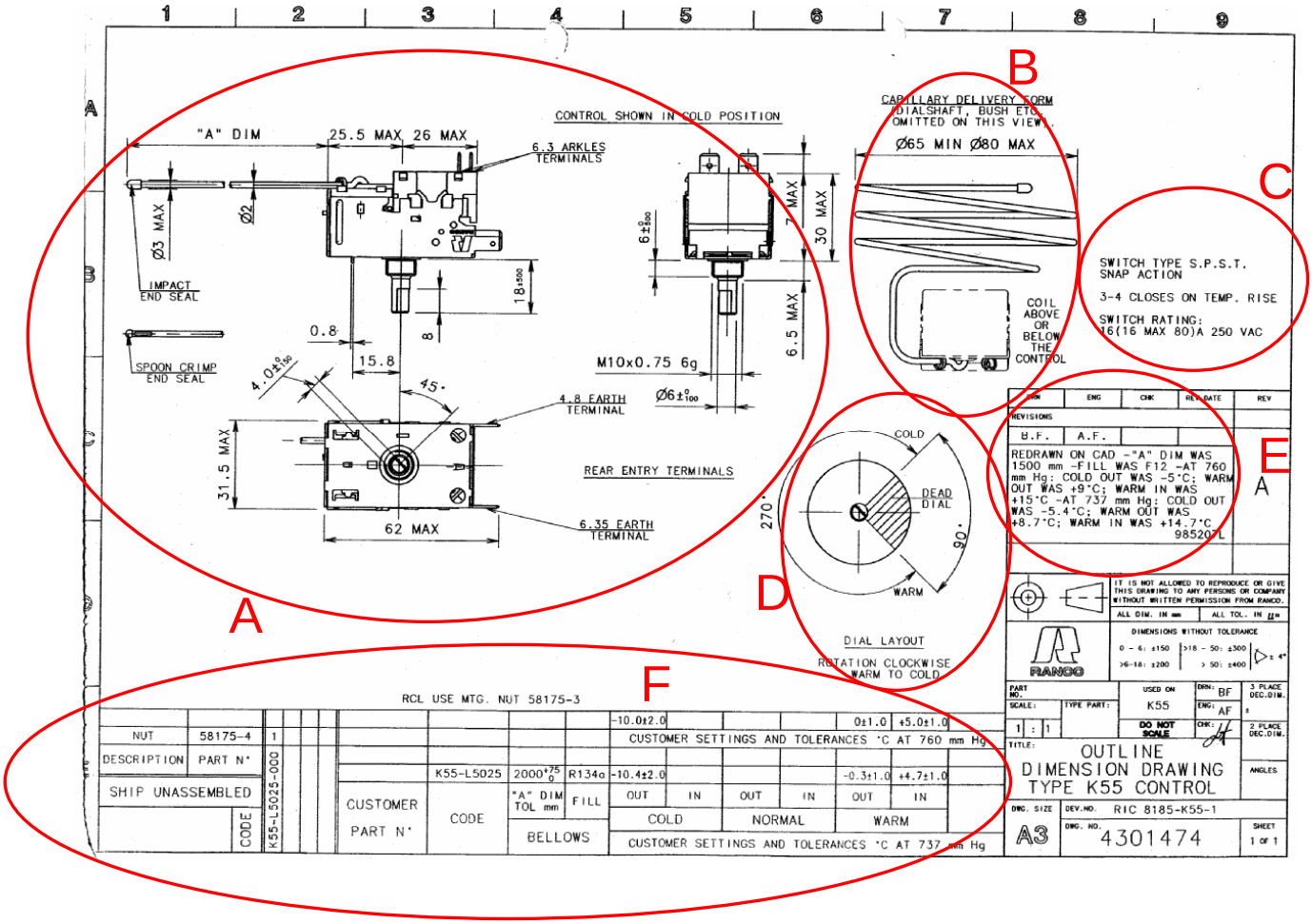
This information enables to decide whether to use a standard thermostat or configure a customized one.

Main models and characteristics

K50 Thermostat with On/Off function, SPST contact
K55 Thermostat with On/Off function, SPST contact, post. thermal output
K14 Thermostat with On/Off function, SPST contact, for applications that require limited differentials and a very accurate calibration
K22 Thermostat with On/Off function and SPST contact for heating or cooling control
K59 With defrost for each temperature control cycle
K61 With defrost for each temperature control cycle, SPDT contact
K54 Thermostat with On/Off function and high temperature alarm
K58 Thermostat with On/Off function, high temperature alarm and manual defrost
K56 Thermostat with On/Off function and high temperature contact
K60 Thermostat with On/Off function and manual defrost
K52 Two capillaries, respectively in room and on capillary

Interpreting drawings - Terminology

All information related to thermostats can be intuitively acquired from the applicable drawing. The section below provides an example of drawing and describes some of the most common terms used:



A Mechanical dimensions and overall size of the thermostat and capillary
B View of the thermostat as supplied (with capillary winding size)
C Rating and type of contact
D Adjustment range and direction of rotation of pin
E Table of reviews
F From left to right: product code, capillary length, gas inside the capillary, calibrations, reference pressure for calibration

CUT-I N	Value that causes the contact to close and the load to be enabled.
CUT-OUT	Value that causes the contact to open and the load to be disabled.
DIFFERENTIAL	Difference between the CUT-IN and CUT-OUT temperatures. Example: knob in WARM position, Warm In +5, Warm Out 0°C, Differential 5°C
COLD POSITION	It represents the lowest temperature value that can be selected with the knob.
WARM POSITION	It represents the highest temperature value that can be selected with the knob.
NORMAL POSITION	Intermediate temperature, between the COLD and WARM settings. It is shown on the drawing only if it is included in the product specifications

TEMP. RANGE	Temperature range calculated as difference between the WARM CUT-IN and COLD CUT-IN or the WARM CUT-OUT and COLD CUT-OUT settings.
DIAL LAY-OUT	It represents the positions in which the pin sets the values for COLD/NORMAL/WARM, and provides information on the type of pin (with screwdriver design, knob fixing…)
FIXED DIFFERENTIAL	Fixed differential that remains constant throughout the adjustable scale of the thermostat. This value cannot be changed.
VARIABLE DIFFERENTIAL	Differential that can be manually changed by the user. Typical of thermostats with constant CUT-IN.
SIGNAL CONTROL-SWITCH	Thermostat with fixed differential and auxiliary contact connected in parallel to the control contact, which enables if the preset limit is exceeded. It is generally used for lamps or acoustic warnings.
PUSH-BUTTON DEFROST	Thermostat with fixed differential and manual defrost (the defrost ends when the end defrost temperature is reached).
PUSH-BUTTON FASTFREEZE	Thermostat with signal contact and manual "fast freezing" function (that ends when the required temperature is reached). A low forced control temperature is generally applied.
DUAL BELLOWS CONTROL	Control with two capillaries, respectively used for the temperature of the air and the evaporator. The air capillary is used for CUT-IN, the evaporator capillary for CUT-OUT.
MECHANICAL OFF	Action that mechanically disables the internal switch to prevent it from enabling the load. This can be achieved by positioning the pin on OFF (if present).
ELECTRICAL OFF	Action that electrically disables the internal switch to prevent it from enabling the load. This is achieved by means of an additional contact with serial connection. It can also be used to disable other loads.
BELLOW HEATER	Electric heater connected in parallel to the main contact and used to heat the thermostat body. It prevents the thermostat body from acting as temperature sensor.
CLOSE ON RISE-SPST	Control logic that closes that contact as the temperature increases, transmitting a signal to a contact output.
OPEN ON RISE-SPST	Control logic that opens the contact as the temperature increases, transmitting a signal to a contact output.
CHANGE OVER-SPDT	Change-over contact that opens a contact while simultaneously closing another one.
LOCKED ROTOR RATING	Rating of the contact, set to 100-500ms, which is used to manage the torque current of a motor (it is 6-9 times the rated one).
FULL LOAD RATING	Rating required to manage, without limitations in time, the rated current of the load. It can be resistive, inductive or both.
PILOT DUTY RATING	Rating of the switch required to manage the relatively low currents used for signaling lamps or relays.
BREAK POINT	It represents the limit temperature after which the status of the capillary switches from saturated to overheated. In this case, pressure remains the same when the temperature changes, thus preventing the capillary from detecting temperature variations.

M.O.T.	Stands for “Maximum Operating Temperature”, which represents the maximum temperature that can be set on thermostat without exceeding the BREAK POINT.
CROSS AMBIENT	Condition that causes the temperature end part of the capillary, which is used for temperature measurement, to increase (see “*Parts and installation procedure*” for further information) and affects the control. This problem can be avoided by using a bulb instead of a straight capillary.

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