

## Technical information related to the temperature control in electro-thermal applications

### Technical information N°1 : Terminology and vocabulary

Standards EN60730 and EN 60335 define, sometimes with differences, the vocabulary to use. However, it is often different from what is used in practice.

#### Usual vocabulary:

*Set point:* The value set on the temperature control device, corresponding to the temperature to reach

*Differential:* the temperature difference between the opening and closing of the contact

*Snap action:* contacts open and close instantly

*Manual reset:* action to turn on by manual intervention, to heating position contacts opened by a temperature rise that does not automatically return to closed position when the temperature drops

*Automatic reset:* Contact that automatically closes when the temperature drops

*Sensing control:* automatic control in which initiation is done by an element sensitive to the activating temperature

#### Definitions of the different thermostatic systems according to EN60335-1

§3.7.1 Thermostat: temperature sensing system of which the operating temperature may be fixed or adjustable and which, during normal operation, maintains the temperature of the controlled part within certain limits by automatic opening and closing of a circuit

§3.7.2 temperature limiter: temperature-sensing device, the operating temperature of which may be either fixed or adjustable and which during normal operation operates by opening or closing a circuit when the temperature of the controlled part reaches a predetermined value

NOTE A temperature limiter does not make the reverse operation during the normal duty cycle of the appliance. It may or may not require manual resetting.

**temperature limiter:** temperature sensing control which is intended to keep a temperature below or above one particular value during normal operating conditions and which may have provision for setting by the user

A temperature limiter may be of the automatic or of the manual reset type. It does not make the reverse operation during the normal duty cycle of the appliance.

§3.7.3 Thermal cut-out : device which during abnormal operation limits the temperature of the controlled part by automatically opening the circuit,... and is constructed so that its setting cannot be altered by the user.

**thermal cut-out:** temperature sensing control intended to keep a temperature below or above one particular value during abnormal operating conditions and which has no provision for setting by the user

A thermal cut-out may be of the automatic, manual reset or non-resettable type.

§3.7.4 self-resetting thermal cut-out: thermal cut-out that automatically restores the current after the relevant part of the appliance has cooled down sufficiently

§3.7.5 non-self-resetting thermal cut-out: thermal cut-out that requires a manual operation for resetting, or replacement of a part, in order to restore the current

NOTE Manual operation includes disconnection of the appliance from the supply mains.

§3.7.6 Protective device: device, the operation of which prevents a hazardous situation under abnormal operation conditions

§3.7.7 Thermal link: thermal cut-out which operates only once and requires partial or complete replacement

**Fail safe temperature limiter:** the fail safe in a thermostat is defined by the EN60730-2-9 Standard § 6.4.3.101, as a temperature control device wherein a leakage of the filling fluid does not increase the temperature set point. More generally a system is said to be failsafe, when a loss of fluid (including electricity) leads the equipment to a stable safety state. The safety state must be maintained over time.

#### Thermostats recommended applications:

IEC (EN) 60730-1 Standards « Automatic electrical controls for household and similar use » and especially IEC (EN)

60730-2-9-(2008) : « Particular requirements for temperature sensing controls » are the standards that define the functional characteristics of thermostats. Appendix EE of the latest version of the standard describes all recommended applications for these devices.

## Technical information N°2 : Important extracts of standards related to control or safety circuits

#### Electrical cut out: (IEC 60335-1)

§3.8.1 All-pole cut out: Cutting in two conductors in a single operation, or for three phase units, the cut of the three conductors in a single step ... Note: for three-phase, the neutral lead is not considered as a power conductor.

§22.2: Phase cut out: single pole protection systems cutting heating elements in single pole circuits of Class 01 devices and continuously connected Class 01 devices, must be connected to the phase conductor.

#### Electrical conductors colors: (IEC 60446)

§3.1 ... For the identification of leads the following colors are allowed: black, brown, red, orange, yellow, green, blue, purple, gray, white, pink, turquoise.

§3.2.2 Neutral conductor or center conductor : when a circuit includes a neutral conductor or neutral conductor identified by color, the color used for this purpose should be blue ...

Note 2 – In the United States of America, Canada and Japan, identifying with white or natural gray colors for the neutral conductor or center conductor is used as a replacement for the identification by the light blue color.

§3.2.3 AC phase conductors: black and brown colors are the favorite colors for the phase conductors of AC systems.

§3.3.2 Conductor protection: The two-tone green-and-yellow combination must be used for identification of the protective conductor to the exclusion of any other use. The green-and-yellow is the only recognized color scheme for the identification of the protective conductor

Note 2 – In the United States of America, Canada and Japan, identifying with green color for the protection conductor is used as a replacement for the identification by the two-tone green-and-yellow combination.

#### Fail safe, functional safety, safety levels:

It is required by the European Directive 97/23 dealing with heat generators, pressure equipment and boilers as follows : «the procedures for conformity assessment and the essential safety requirements of the Directive apply to the complete safety chain. The requirements for the sensor itself can be different according to the safety design principles, for instance: redundancy or fail-safe ». Many "product" standards of the IEC (EN) 60335-xxx series require this type of safety.

**Definitions related to the functional safety:** this concept was introduced by the CEI 61508:1998 Standard. « Functional Safety for electrical /electronic and programmable electronic (E/E/PES) systems.» This standard defines the requirements and provisions for the design of electronic and programmable complex systems and subsystems. This is a general standard that can be used in all industrial sectors. The categories of protection of industrial heating equipment have been classified into three levels by the old EN 954-1 Standard.

**Level 1** includes mainly the process control instrumentation: temperature sensors, thermostats, controllers, programmers. This level provides a control either permanently or in a sequence by programmed commands initiated by the operator (for example: control disc, bimetal, bulb and capillary thermostats, electronic temperature controls).

**Level 2** consists essentially of an instrumentation composition close to that of level one, but functionally completely independent of this level.

This level 2 protects the process by a discontinuous unsystematic function, that is to say not initialized by the operator, from threshold violation information on critical parameters of the process.

(For example, disc thermostat + disk limiter, bulb and capillary temperature limiters + bulb and capillary thermostat, double electronic controllers)

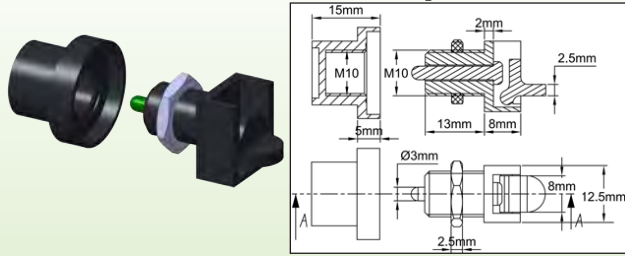
**Level 3** is the ultimate protection of the process. It does not include identical instrumentation to those of Level 1 and 2, but devices working without auxiliary energy (for example: fixed temperature limiters with manual or automatic reset on circuits controlled by electronic controllers, thermal fuses for systems controlled by disc or bulb and capillary thermostats, or by electronic controllers).

The design of Y6, Y7 and Y8 enclosure series allows the making of products that comply with Level 1, Level 1+2 and Level 1 +2 +3, and optionally including failsafe systems.



# Accessories for electro thermal complementary boxes

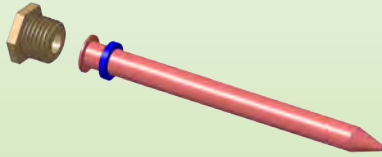
## Manual reset kit with side push button



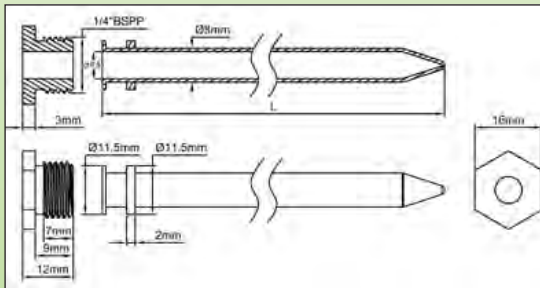
Enables the mounting of a manual reset thermostat on a face, with access to the reset push button by the orthogonal side. Sealed with the protection cap mounted. Access with a tool (EN60335-1 §22-10, §30.1). Requires a single 10mm drilling in the wall.

Reference	6Y4903RESET90
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## Seamless pockets

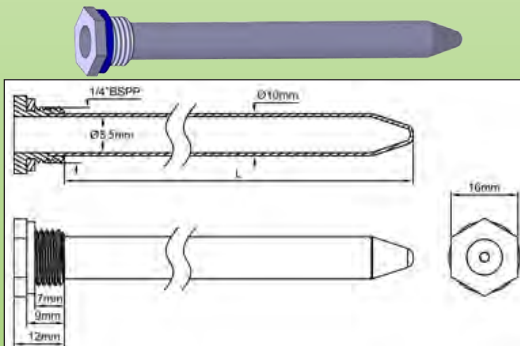


External diameter 8 mm, internal 6.5 mm, with flat seal bearing. Mounting with 1/4" BSPP brass nut and a flat internal fiber gasket (included). These cheap pockets (no solder nor brazing between the joint and the tube) are designed for dia. 6mm bulb or sensor insertion. They are not suitable for the pre-wired thermal cut-offs (see page 130). Putting some thermal compound on the sensors improves the response time. The kit includes: nut, pocket, fiber gasket.



Reference	Length (mm)	Material
66DC14P10008075N	100	Nickel plated copper
66DC14P20008075N	200	Nickel plated copper
66DC14P30008075N	300	Nickel plated copper
66DC14P40008075N	400	Nickel plated copper
66DI14P10008075B	100	Stainless steel 304
66DI14P20008075B	200	Stainless steel 304
66DI14P30008075B	300	Stainless steel 304
66DI14P40008075B	400	Stainless steel 304

## Brazed pockets for dia. 8 mm sensors and probes

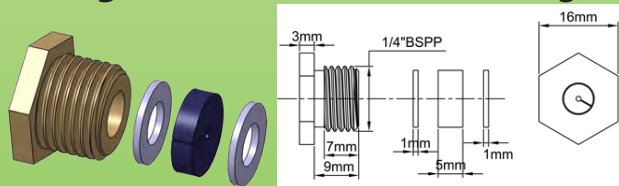


External diameter 10 mm, internal 8.5 mm, with 1/4" BSPP brazed joint and a flat internal fiber gasket (included). Flat seal bearing under the joint hexagon. These pockets are designed for dia. 8 mm bulb, sensor and thermal cutoff insertion. Putting some thermal compound on the sensors improves the response time. The kit includes: pocket, fiber gasket. Stainless steel versions on custom manufacturing only.

*Using these pockets requires a 10mm re-drilling of the 8mm holes of the 1/4" BSPP taps in the boxes.*

Reference	Length (mm)	Material
66DL14P10010075N	100	Nickel plated copper
66DL14P20010075N	200	Nickel plated copper
66DL14P30010075N	300	Nickel plated copper
66DL14P40010075N	400	Nickel plated copper

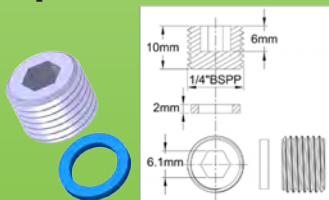
## Stuffing box 1/4" BSPP (kit including nut, silicone gasket and washers).



Enables a through-wall mounting of probe cables and capillaries while keeping the sealing.

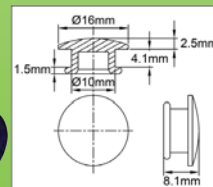
Reference	Gasket and packing diameters
66RA14PK010B	Dia. 1 mm capillary
66RA14PK015B	Dia. 1.5 mm capillary
66RA14PK030B	Dia. 3 mm temperature sensor cable

## Caps



This kit includes a cap and a flat fiber gasket. Used to seal the 1/4" BSPP that are not used. Stainless steel 304.

Reference	6YEBI14BK
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Silicone cap for dia. 10 mm holes. Used to seal the holes dedicated to manual reset thermostats.

Reference	6YEB510RM
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Because of permanent improvement of our products, drawings, descriptions, features used on these data sheets are for guidance only and can be modified without prior advice

