KOBOLD TDD Series Digital Temperature Switch

TDD-153 and TDD-353 Series

User Instructions

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Manual-TDD_8-01

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KOBOLD TDD Series Digital Temperature Switch

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CAUTION: For safety reasons, please read the cautionary information located at the end of the manual, before attempting installation.

1.0 General

The KOBOLD TDD Series is a solid state, electronic temperature switch which employs a Pt-100 RTD as the heart of the sensing system. The measuring probe and housing are constructed of 316L stainless steel providing excellent corrosion resistance. The TDD's microprocessor based electronics allow the user to program a setpoint, adjust switching hysteresis, dampening and switch logic. There is virtually no calibration drift over its service life.

In addition to the switch output, the TDD has a digital display for local indication of temperature.

2.0 Specifications

Available Switching Ranges:	0°F to 250°F or -20°C to 120°C
Display Type:	3 Digit LED
Resolution:	±0.5° below 100° ±1° for 100° and above
Switch Status:	Red LED on when Temperature is above setpoint
Accuracy (worst case)	
32°F to 160°F:	±1°F
0°F to 31°F:	+6°F/-2°F
161°F to 230°F:	+2°F/-4°F
231°F to 250°F:	+2°F/-5°F
Sensor Element:	Pt-100 RTD
Maximum Pressure:	1150 PSIG
sensing Probe Material:	316L Stainless steel
Housing Material:	316L Stainless steel
Electrical Data	
Switch Type:	Open collector, NPN or PNP based on model number, programmable N/O or N/C
Switch Rating:	Max. 300 mA, short circuit protected
Response Time:	50 mSec.
Power Supply Requirement:	24 VDC ±20%, 40 mA Max.
Electrical Connection:	M-12 male, Micro-DC
Electrical Protection:	NEMA 4X/IP 65

Table 2.1 Part Number Identification

TDD = Compact Electronic Temperature Switch

Output Type

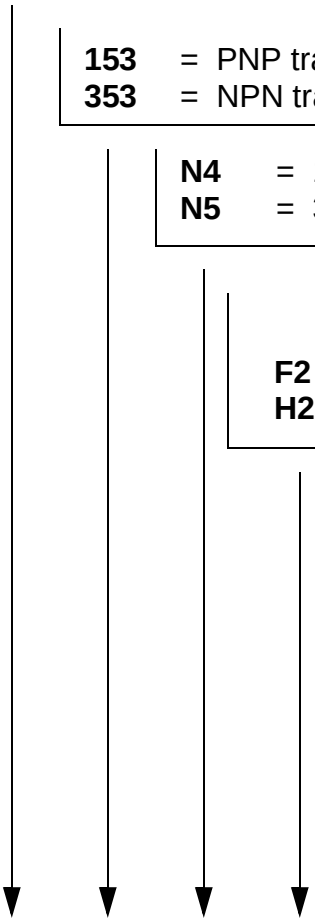
153 = PNP transistor switch
353 = NPN transistor switch

Fitting

N4 = 1/2” NPT
N5 = 3/4” NPT

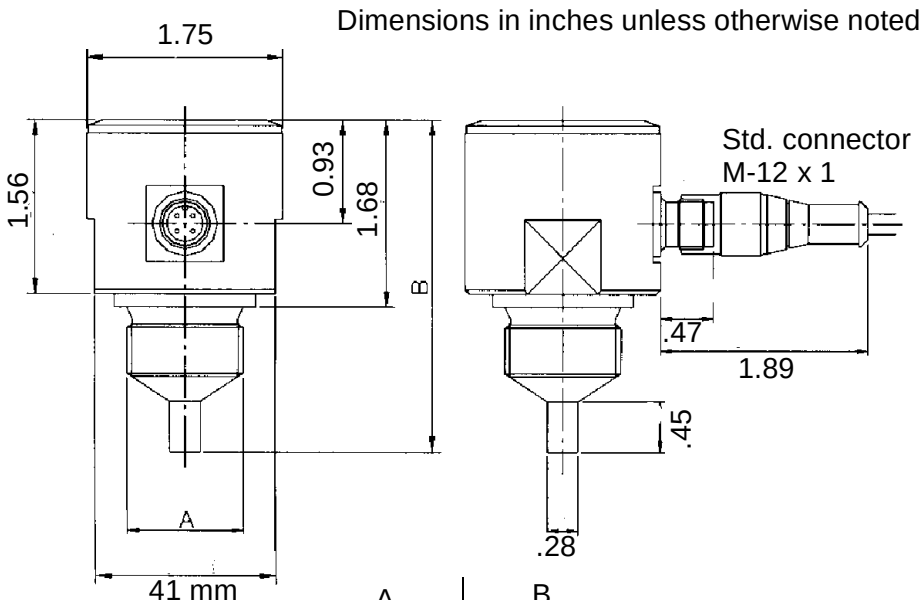
Range

F2 = 0 to 250°F
H2 = -20 to 120°C



TDD - 353 - N4 - F2 Example

Diagram 2.1 Dimensions



A	B
1/2” NPT	2.76
3/4” NPT	2.78

3.0 Mechanical Installation

The following general installation instructions and precautions must be followed to insure proper, reliable switch operation:

1. Select a suitable location on the piping system for installation. Installation in a location where sediments can collect on the switch’s temperature sensing probe (such as the underside of a horizontal piping run) will cause sluggish or faulty operation.
2. The switch should not be installed directly on top of a horizontal piping run (12 O’clock position). Air pockets which can form at the top of the pipe will prevent the measuring probe from obtaining accurate temperature measurement. Mounting at the 2 O’clock to 5 O’clock or the 7 O’clock to 10 O’clock position is best.
3. The ambient temperature range which the switch can withstand is -4°F to +140°F. If the switch is located outdoors in a cold environment the switch must be protected from excessively cold temperatures with insulated heat tracing or by other suitable means. In hot environments the switch should be located in an area where the ambient temperature does not exceed 140℉.
4. In order to obtain an accurate measurement of the bulk fluid temperature in a pipe, the fitting into which the switch is installed must allow the sensing probe tip to protrude past the ID of the pipe and into the flow stream. The turbulent fluid flow will then promote mixing and yield an accurate measurement.

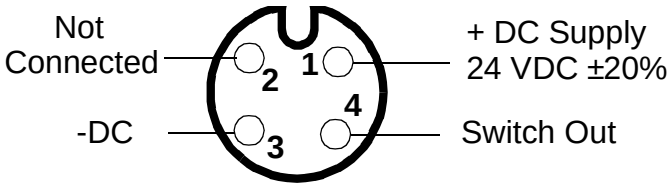
4.0 Electrical Installation

The following electrical installation instructions and precautions must be followed to insure proper switch and analog output operation. Failure to follow these instructions may result in irreparable damage to the switch:

1. The unit employs an open collector NPN or PNP transistor switch. To verify which model you are installing, check the model number codes in Section 2.0, Specifications. When the PNP version activates, it connects the DC supply voltage to the switch output pin. When the NPN version activates, it connects the DC ground to the switch output pin.
2. This switch can only switch fixed polarity DC loads with a maximum current draw of **300 mA.** To switch higher current DC loads or AC loads use an appropriately sized relay.
3. In order to minimize electromagnetic noise pickup, a jacketed instrument and control cable with shield should be used. The shield should be connected to the power system earth ground at one end of the cable only.

Diagram 4.1 Electrical Connections

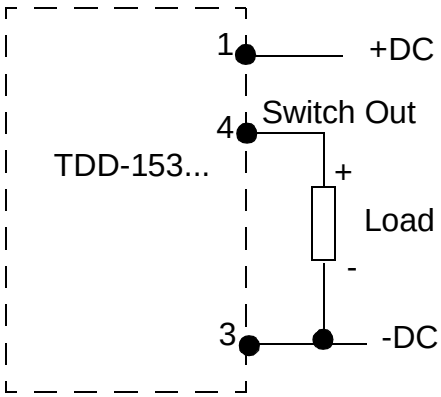
Optional Mating Connector



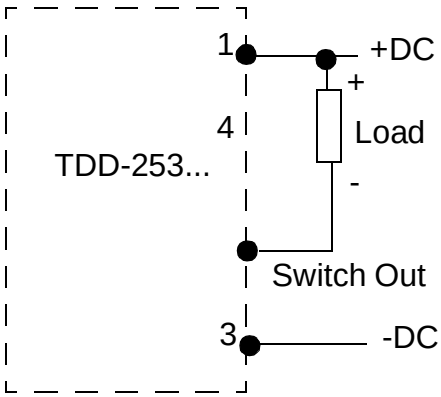
Brown = 1 = +DC
White = 2 = Not Connected
Blue = 3 = -DC
Black = 4 = Switch Out

Typical Wiring

PNP Switch Version

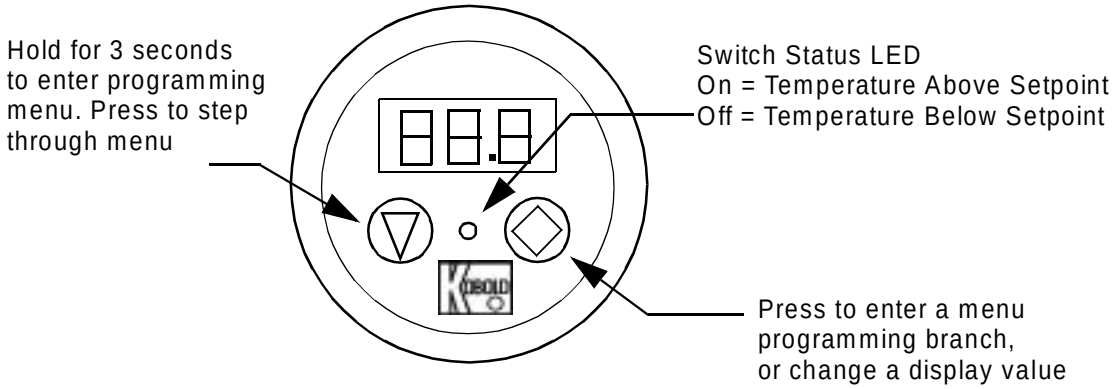


NPN Switch Version



5.0 Operation

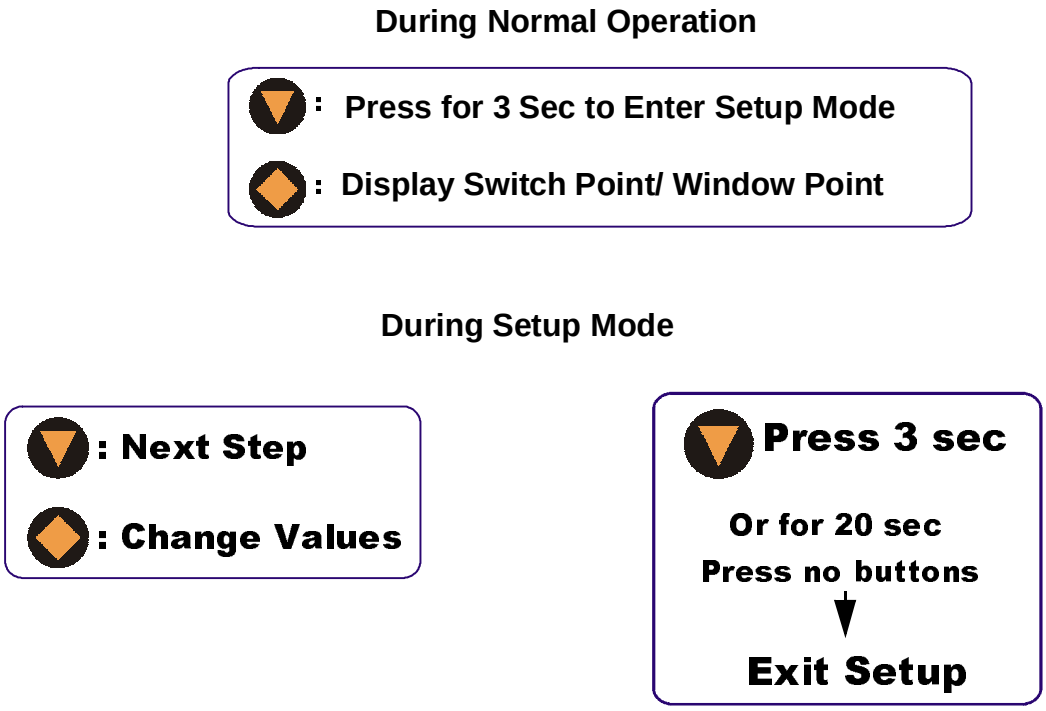
Diagram 5.1 Displays and Controls



5.1 Programming Functions

The TDD digital Temperature switch is programmed via membrane push-buttons on the faceplate of the switch as shown in the following figure:

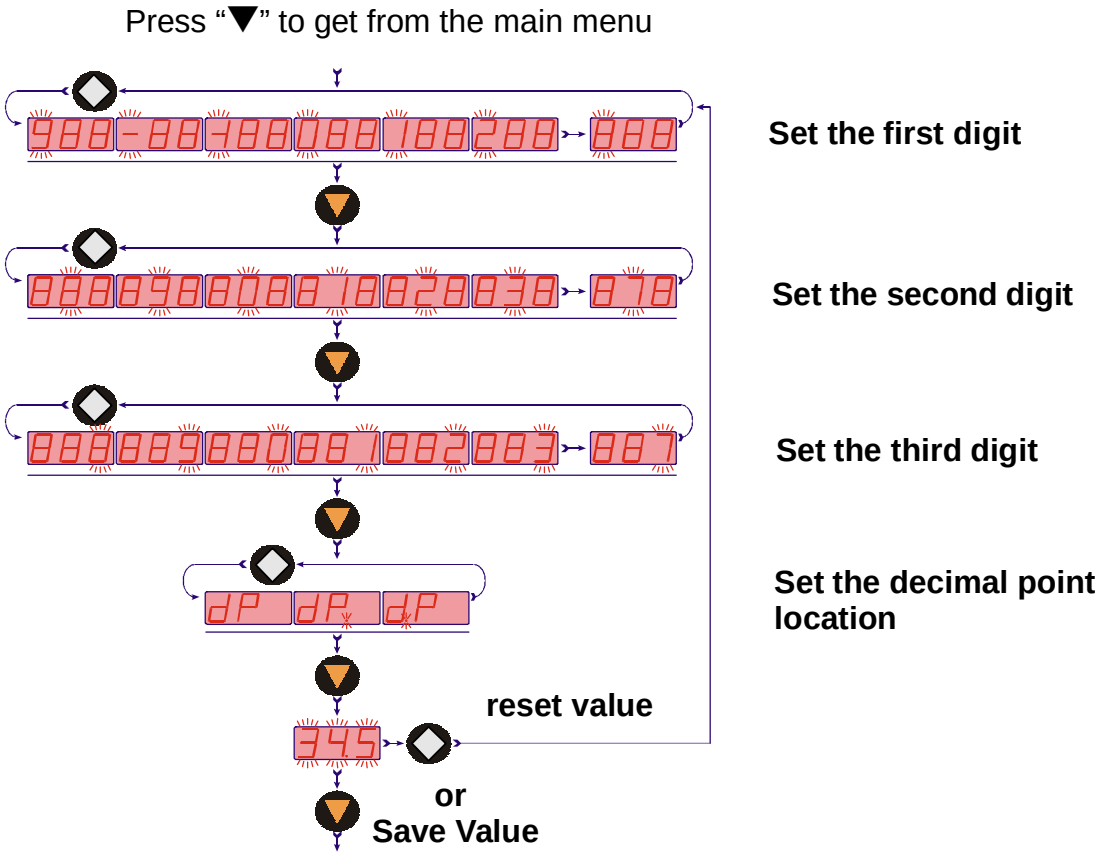
Diagram 5.2 Programming Functions



5.1.1 Changing Values in Setup Mode

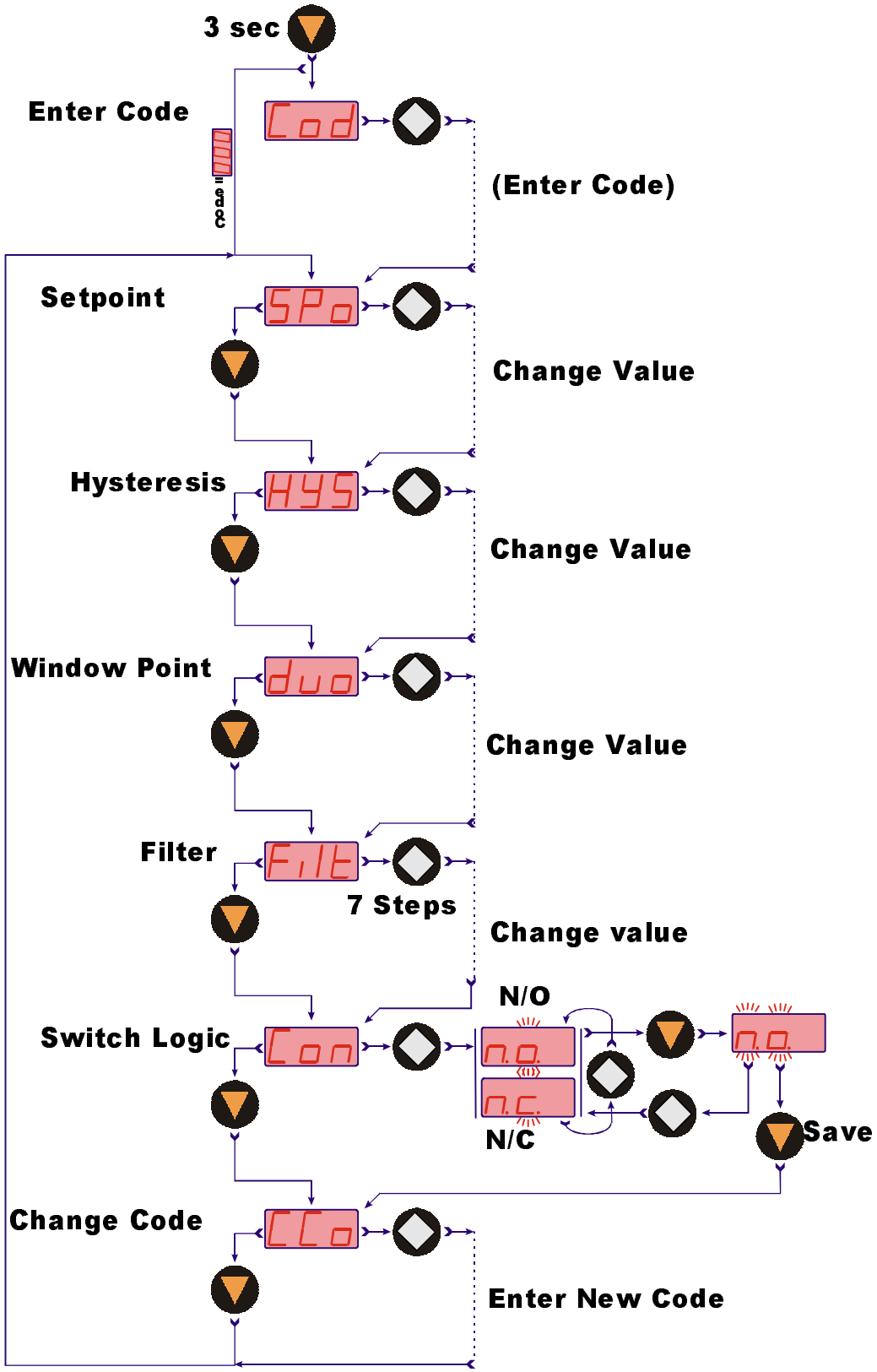
When in the Setup Mode the actual values of setpoint, hysteresis, switch logic and other functions are adjusted as required by the user. From the main menu (e.g. switching point "**SPo**"), press the "▼" button to adjust that functions value. The following diagram shows the sequence of steps required to change a value:

Diagram 5.3 Sequence to Change a Value



5.1.2 Programming Flow Chart

Diagram 5.4 Programming Flowchart



5.2 Programming Menu Item Descriptions

After the "▼" Button is depressed for three seconds to enter the setup mode, and the lockout code is entered (if lockout is enabled), the programming menu may be accessed. Diagram 5.3 provides a flowchart of the programming menu. Section 5.1.1 and diagram 5.2 provide details on how to change the value of each menu item parameter. The following is a detailed description of each menu item.

5.2.1 **Cod** - Code

If the lockout feature was enabled during a prior setup, the user code which was selected at that time must be entered. Section 5.1.1 'Changing Values in Setup Mode' on page 6 provides steps required to enter the value.

5.2.2 **SPo** - Switchpoint

This menu item allows the user to input the desired switching point. Any number between -199 and 999 can be entered. Additionally, a decimal point can be added if desired. Section 5.1.1 'Changing Values in Setup Mode' on page 6 provides steps required to change a value. If the measured temperature exceeds the switchpoint value, the switch will activate.

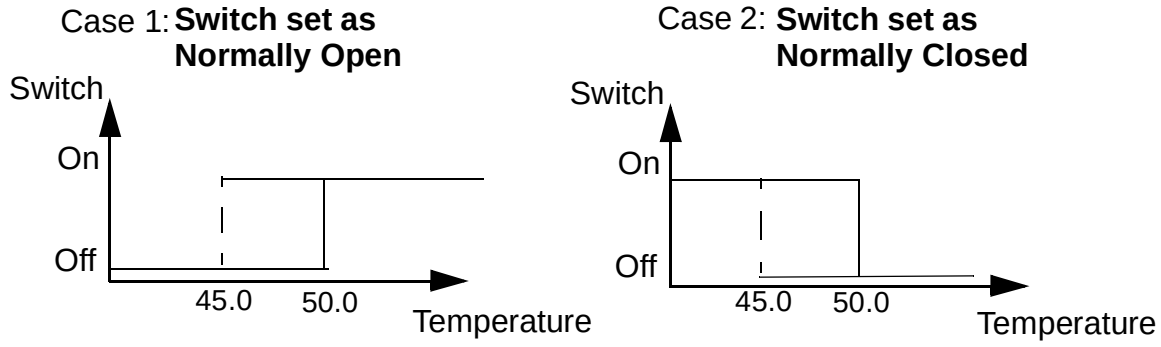
5.2.3 **HYS** - Hysteresis

This menu item allows the user to set a deadband value below the switchpoint such that the switch will not de-activate until the measured temperature falls below the setpoint, minus the hysteresis value. The hysteresis value will always be a negative value and can be set as any number between 0 and -199. Additionally, a decimal point can be added if desired. Section 5.1.1 'Changing Values in Setup Mode' on page 6 provides steps required to change a value.

Example: Switchpoint Value (**SPo**) is set at 50.0

Hysteresis Value (**HYS**) is set at -5

The switch will activate (LED on) when measured temperature is above 50.0 and will de-activate (LED off) when measured temperature is below 45.0.



5.2.4 **duo** - Window Point

This menu item allows the user to set a value above the switchpoint such that a temperature band, or window can be monitored.

Note: The **duo** value must be a positive number and it must be a larger value that the **SPo** value. If it is not, an error message is displayed. If the error occurs both the **SPo** value and the **duo** values are cleared and must be re-entered.

Additionally, a decimal point can be added if desired. Section 5.1.1 ‘Changing Values in Setup Mode’ on page 6 provides steps required to change a value. When the measured temperature is above the switchpoint, the switch will activate. The switch will de-activate when the measured Temperature either increases to above the window point value or decreases to below the switchpoint value. The window point can also used with the hysteresis function if desired.

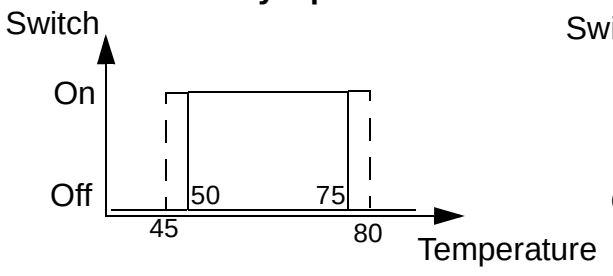
Example: Switchpoint Value (**SPo**) is set at 50

Window Point (**duo**) value is set at 75

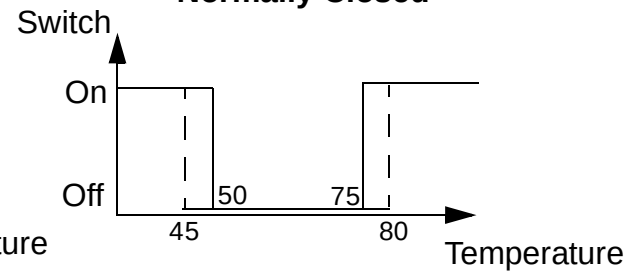
Hysteresis Value (**HYS**) is set at -5

The switch will activate (LED on) when measured Temperature is above 50.0 and will de-activate (LED off) when measured Temperature is above 80 (75 + 5) or below 45 (50 - 5).

Case 1: **Switch set as Normally Open**



Case 2: **Switch set as Normally Closed**



5.2.5 **Filt** - Filtering

This menu item allows the user to average the measured output over 1, 2, 4, 8, 16, 32 or 64 samples. Section 5.1.1 ‘Changing Values in Setup Mode’ on page 6 provides steps required to change a value. Adding filtering provides a more stable display and prevents false switching for systems in which spurious temperature fluctuations are a problem. The larger the number of samples the more stable the display and switch. A **Filt** value of “1” shuts off the filtering.

When filtering is being used, the TDD series employs an integrated overshoot function which detects any overshoot above 6.25% and processes that measured value without filtering. This feature allows the switch to differentiate between spurious fluctuations and

actual system temperature changes and process the temperature change signals without filtering. This greatly enhances the switch's response time when the filtering function is being used.

5.2.6 **Con** - Switch Logic

This menu item allows the user to select the output switch logic as either normally closed (**nc**), or normally open (**no**):

Normally Open: Switch activates when measured temperature is above the switchpoint.

Normally Closed: Switch activates when measured temperature is below the switchpoint.

5.2.7 **CCo** - Change Code

This menu item allows the user to set a pass code which will lock out the programming functions. This protects the device from un-authorized access to the setup menu. Section 5.1.1 'Changing Values in Setup Mode' on page 6 provides steps required to change a value. The code can be any value from 000 to 999. A code of 000 disables the lockout function. A value other than 000 will require entry of that code to access the setup menu.

6.0 Maintenance

The TDD series temperature switches have no moving parts and are therefore virtually maintenance free. Depending on the type of media, the temperature sensing probe may become coated over time. Sluggish response to changes in system temperature would be evidence of this. If coating occurs, remove the switch from the system and clean the temperature sensing probe.

CAUTION

PLEASE READ THE FOLLOWING WARNINGS BEFORE ATTEMPTING INSTALLATION OF YOUR NEW DEVICE. FAILURE TO HEED THE INFORMATION HEREIN MAY RESULT IN EQUIPMENT FAILURE AND POSSIBLE SUBSEQUENT PERSONAL INJURY.

- **User's Responsibility for Safety:** KOBOLD manufactures a wide range of process sensors and technologies. While each of these technologies are designed to operate in a wide variety of applications, it is the user's responsibility to select a technology that is appropriate for the application, to install it properly, to perform tests of the installed system, and to maintain all components. The failure to do so could result in property damage or serious injury.
- **Proper Installation and Handling:** Use a proper thread sealant with all installations. Take care not to overtighten the fittings. Always check for leaks prior to system start-up.
- **Wiring and Electrical:** Section 2.0, Specifications and Section 4.0, Electrical Connections, provide the voltage and current limitations and the wiring for the various sensor types. The sensor electrical ratings should never be exceeded. Electrical wiring of the sensor should be performed in accordance with all applicable national, state and local codes.
- **Pressure and Temperature:** Section 2.0, Specifications, provides the pressure and temperature limits for each model. Operation outside these limitations will cause damage to the unit and can potentially cause personal injury.
- **Material Compatibility:** Make sure that the model which you have selected is chemically compatible with the application liquids. While the meter is liquid and spray resistant when installed properly, it is not designed to be immersed.
- **Flammable, Explosive and Hazardous Applications:** The TDD series is not an intrinsically safe or explosion proof design. They should not be used in installations in which an instrinsically safe or explosion proof design is required.
- **Make a Fail-safe System:** Design a fail-safe system that accommodates the possibility of switch or power failure. In critical applications, KOBOLD recommends the use of redundant backup systems and alarms in addition to the primary system.