DrX Application Note

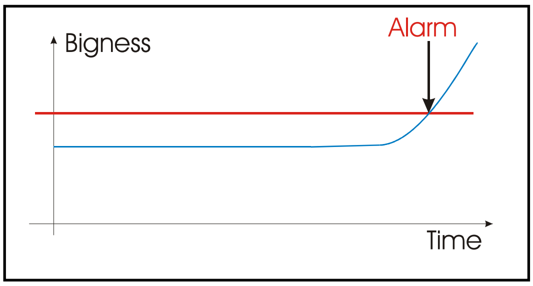
DrX DrHeat, DrCool

Subject Setting the alarm level and amount of hysteresis

Note Ref. **AN270.12**

How much higher is the alarm level?

All DrX units depend on the alarm level being set slightly above the normal operating level.



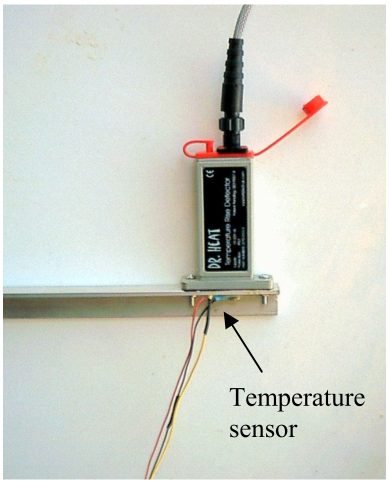
Application of the product depends on the fact that catastrophes cause great and accelerating changes – whether the alarm level equates to 5% or 20% of the total signal, it should be of little consequence to catching the problem before disaster strikes.

However many users are keen to attain an appreciation of 'how much' half a turn of the setting screw equates to in physical measurement.

This application note reports the quantitative results of two Dr Heat units which were exposed to heating and cooling cycles.

Method

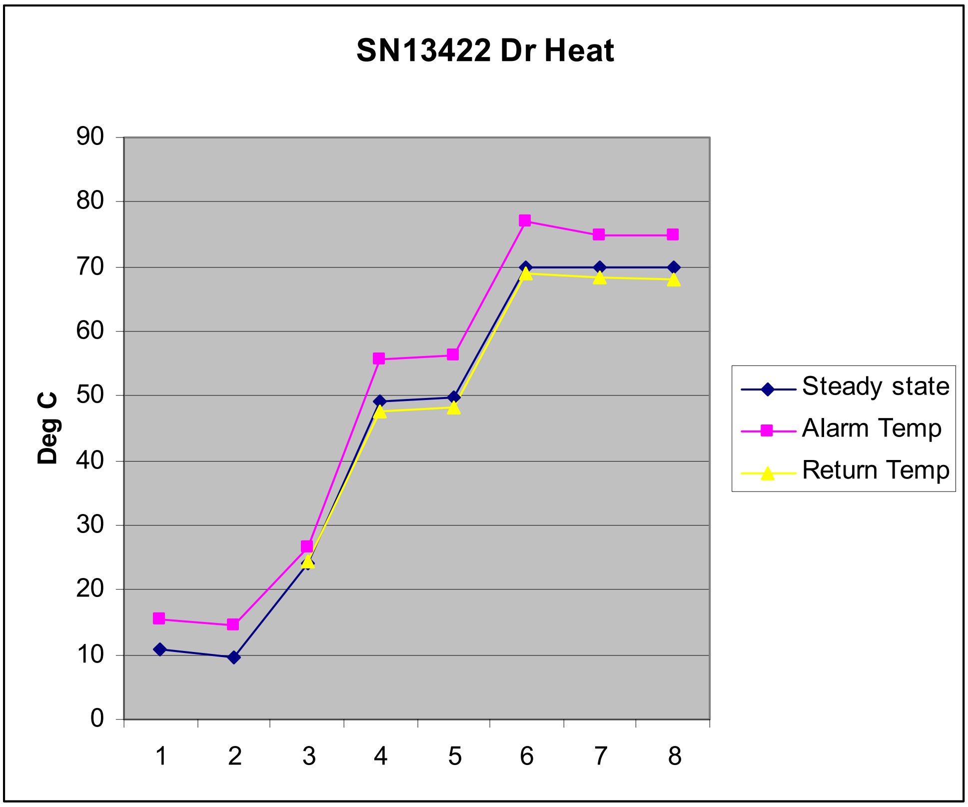
A test rig was made using an aluminium bar with a DrHeat on one side and a temperature sensor bonded on the opposite side. This positioning ensured that the temperature being measured was the same as the temperature being detected.

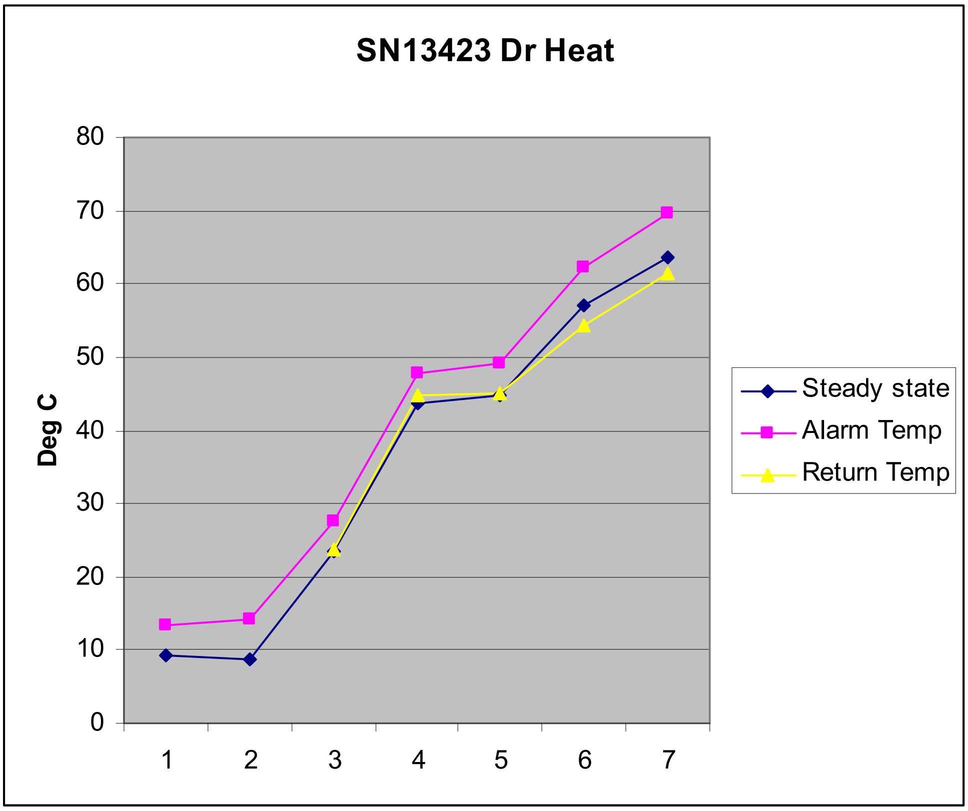


The aluminium bar was then heated up or cooled until a constant temperature was reached. At this point the adjusting screw was turned until the LED turned from green to red. This sets the operating level. The screw was then turned back half a turn (180^o) to set the alarm level. At this stage the LED is green.

The aluminium bar was then heated up further and the alarm temperature noted when the LED turns to red. At this point heat was then taken off and the return temperature also noted – this illustrates the extent of hysteresis of the device.

Results
Two standard production units were tested in this manner; Serial numbers SN13422 & SN13423.





As can be seen there is no appreciable difference throughout the range of test of the fixed offset caused by the 180^{o} turn, which as a general rule of thumb is approximately 5^{o}C. Similarly the hysteresis is about 1 or 2 degrees.

The quantitative results are as follows:

SN13422				
Steady state	**Alarm Temp**	**180 degrees difference**	**Return Temp**	**Hysteresis difference**
10.7	15.4	4.7		
9.5	14.6	5.1		
24.0	26.7	2.7	24.3	0.3
49.2	55.8	6.6	47.6	1.6
49.8	56.2	6.4	48.1	1.7
69.9	76.9	7.0	68.9	1.0
69.9	74.9	5.0	68.4	1.5
69.9	75.0	5.1	67.9	2.0

SN13423				
Steady state	**Alarm Temp**	**180 degrees difference**	**Return Temp**	**Hysteresis difference**
9.3	13.5	4.2		
8.8	14.1	5.3		
23.5	27.5	4.0	23.7	0.2
43.8	47.7	3.9	44.9	1.1
44.9	49.1	4.2	45.1	0.2
57.0	62.3	5.3	54.2	2.8
63.6	69.7	6.1	61.4	2.2

In general this confirms the graphical evidence of an approximate 5^{o}C alarm threshold for a 180^{o} turn.

Conclusions

The devices work as they should:

1) They adequately set a nominal alarm threshold above the steady state by about 5^{o}C for half a turn.

2) Accuracy of the results depends upon the accuracy of the half turn as well as the characteristics of the instrument, but the nature of applications is to be approximate.

3) The units are neither designed for, nor suitable for, accurate alarming of small temperature changes. They are for simple detection of large shifts in process.

4) The hysteresis of the devices is well within the application requirements.