

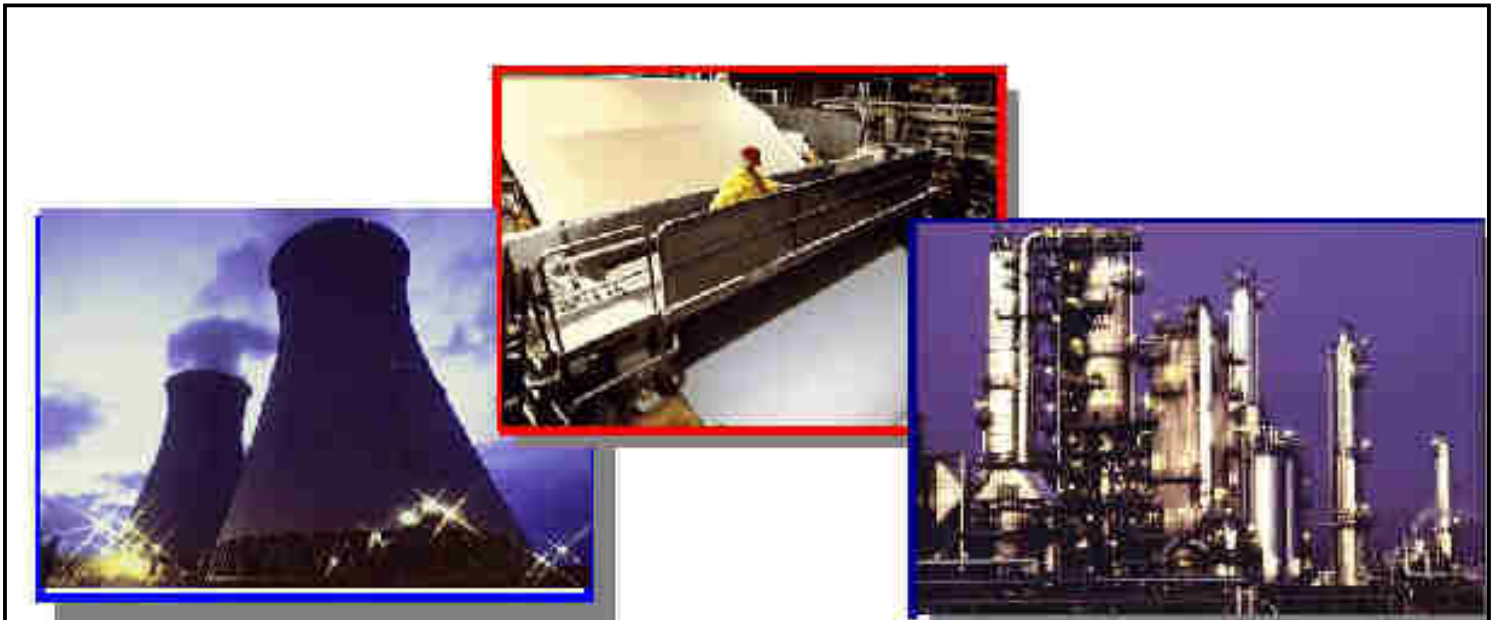


Thermographic Inspection at Microsoft Campus, Reading

~~Johnson Controls~~

Contact

~~George Bacon~~



Engineer	Alan Halcrow
Report Author	Alan Halcrow
Signature	<i>Alan Halcrow</i>



Introduction

An early indication of a component fault in both electrical and mechanical systems is a temperature rise caused by an increase in friction or resistance. This increase can be detected by a thermal camera and, when used in conjunction with other techniques such as vibration analysis, make up a comprehensive predictive maintenance program. The camera is used to scan the component under test and an image is obtained showing the temperature distribution. Any areas, which are significantly warmer than any others, are clearly visible.

Equipment

During this survey, MMS made use of an FLIR ThermoCAM PM695 thermal imager. This is a camcorder size instrument, which utilizes state of the art PCMCIA cards for image storage. These images are then unloaded into a laptop PC where ThermoCAM 2000 software is used to enhance and analyze each one. A report is then produced in the form of data sheets highlighting ONLY those areas thought to be in need of rectification. An action code is then allocated to each item on this report. (Codes may be omitted on initial reports since no trending data is available)

Data Analysis

For electrical work the generally applied rule is to "flag up" any components, which are 5 Deg C warmer than similar local components under similar loading conditions. Clearly the larger the temperature differential the higher the potential will be for break down. Load is a vitally important parameter when assessing electrical components: - they should be at least 50% loaded when tested to ensure accurate results. Under light load conditions, faults may not be apparent, as the load may not generate a sufficient temperature rise. The actual loads on site are often unknown and this must be born in mind when interpreting data as differing loads may account for temperature differences rather than a genuine fault.

Codes And Severity

Several of the data sheets may show small temperature differences between components. This typically shows the early stages of a fault. The normal recommendation is to use these as baseline or reference readings and trend over a series of surveys to see how the temperature changes.

BS 7671 Regulation 523-01, Table 52b gives maximum temperatures for current carrying conductors. These states: -

"The current to be carried by any conductor for sustained periods during normal operation shall be such that the conductor operating temperature, given in the appropriate table of current carrying capacity is not exceeded. Where a conductor operates at a temperature exceeding 70 Deg C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor temperature"

70 Deg C is therefore set as a maximum limit, with regard to safe operation, for the purposes of our surveys of electrical switchgear unless local conditions dictate otherwise

Note that Panels that are inspected externally may only show a small rise in temperature this is indicative of a larger internal increase and temperatures measured under such circumstances should therefore be treated with extreme caution.

The following tables give an indication of how the coding system works. These are based on figures found in industry generally.

CODE	ACTION
1	Immediate Action Required
2	Repair As Soon As Possible
3	Schedule Repair



CODE

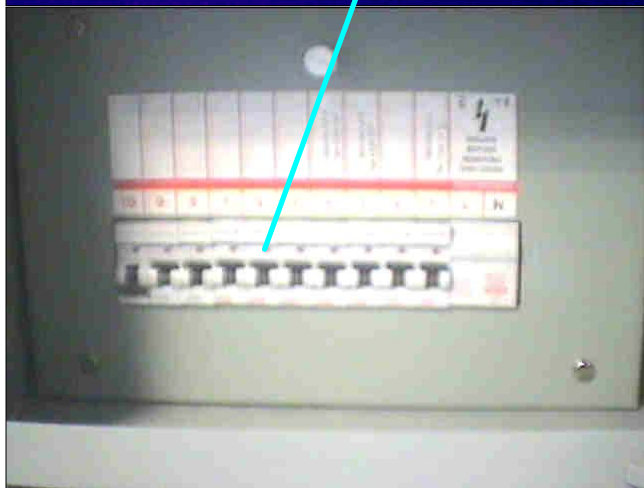
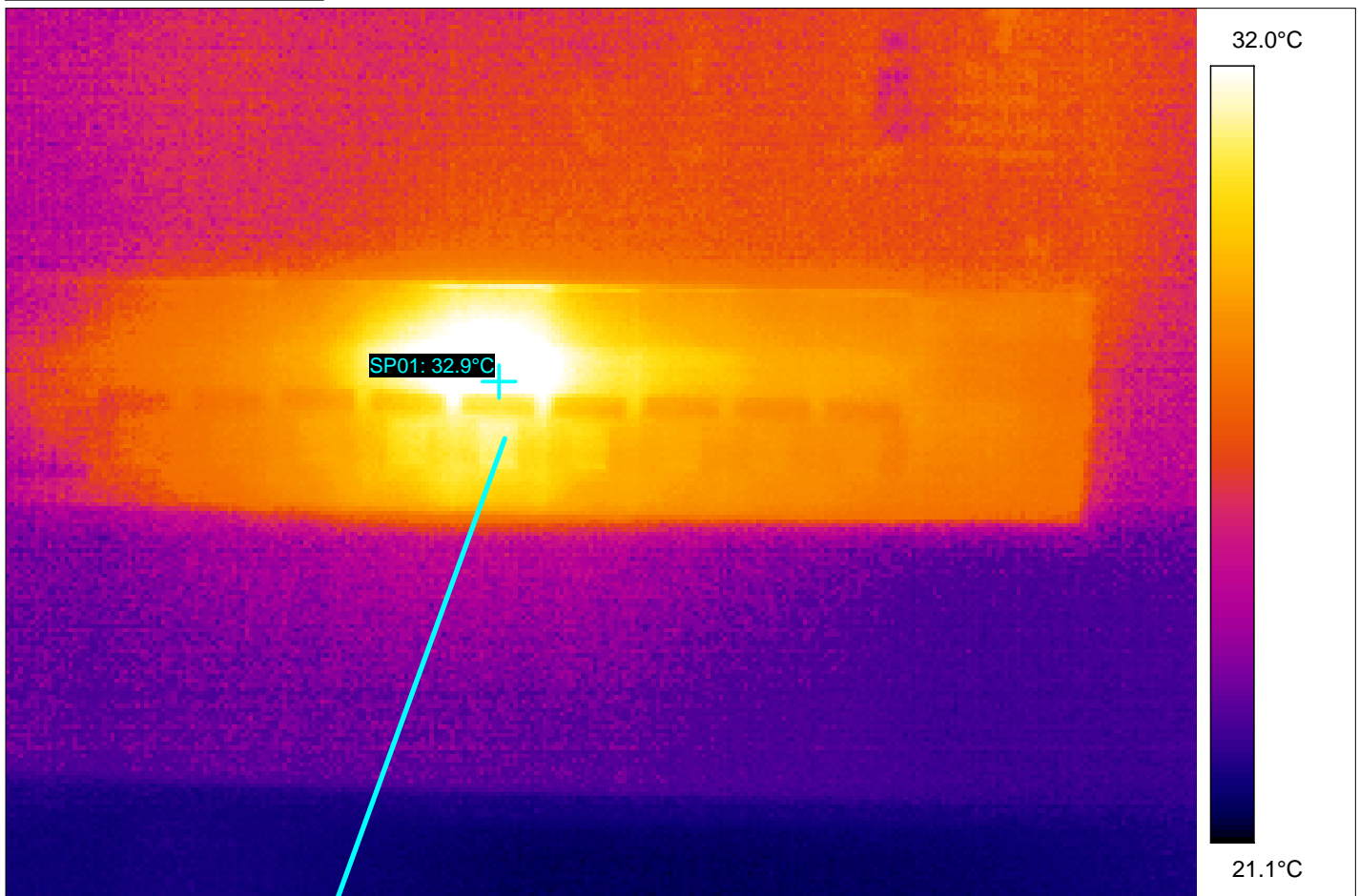
Red

Location

Building 1

Area

Gnd Flr, NET LAB Data Ctr'



IR information	Value
Date of creation	16/08/2012
Object parameter	Value
Ambient temperature	20.0°C
Label	Value
IR : max	34.6°C
SP01	32.9°C

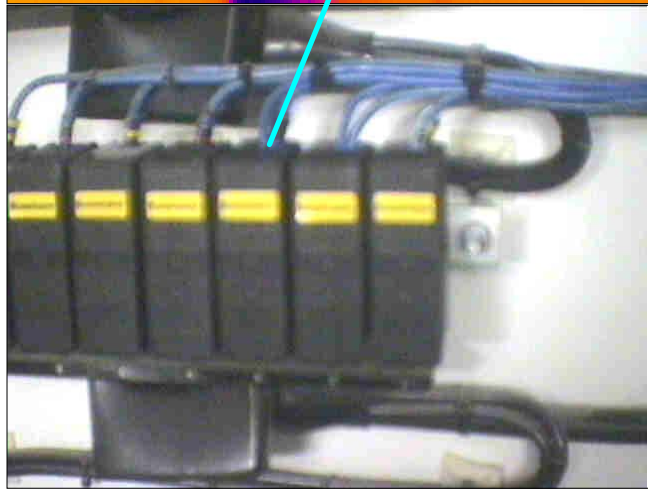
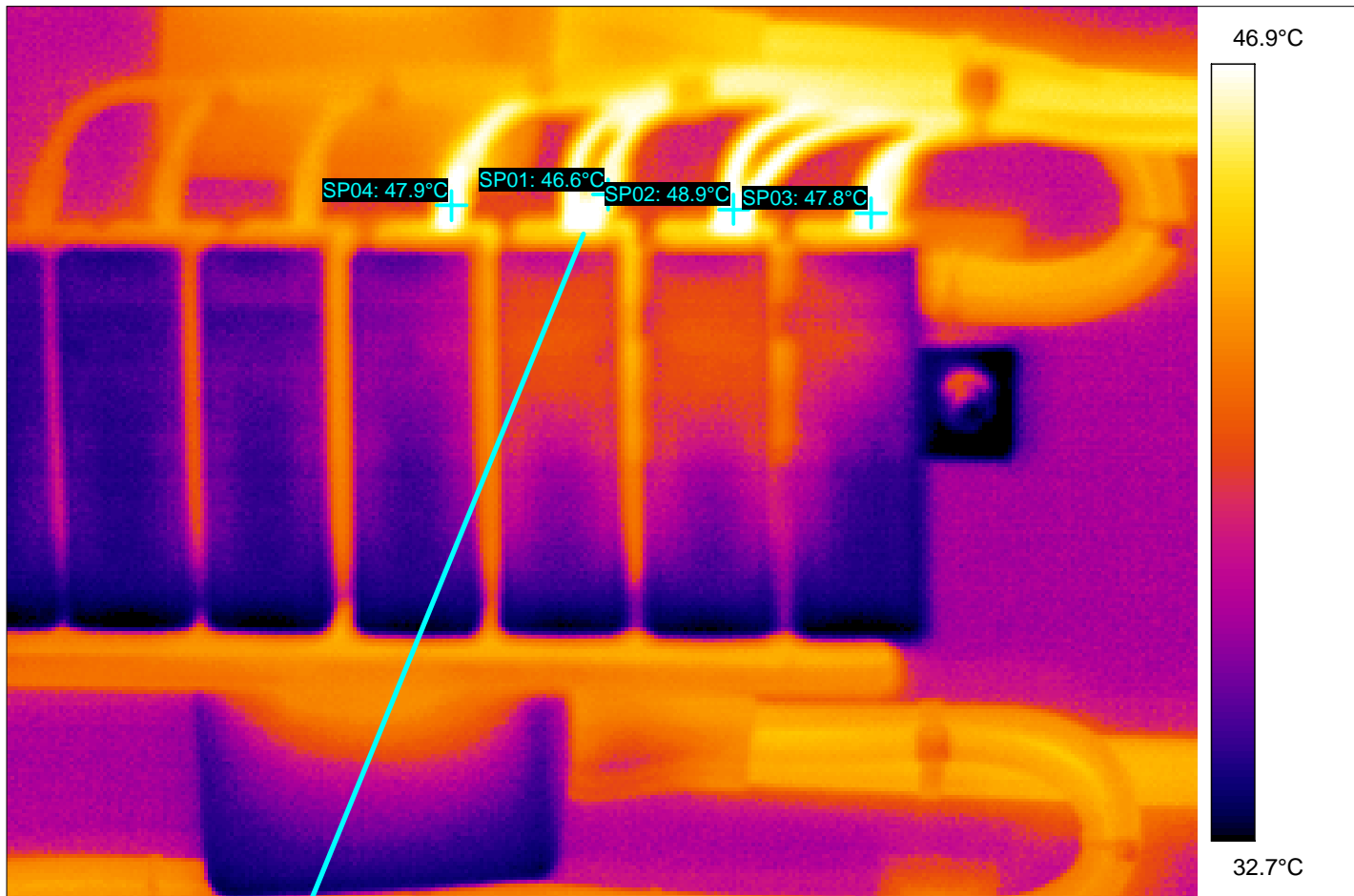
Section	PDU DBB
Equipment	MCB 5
Fault	High MCB operating temperature
Recommendation	Load test and check connections.
Note	As this is a Data Centre PDU it should be treated as high priority



CODE
Red

Location	Building 2
-----------------	------------

Area	Roof plant room
-------------	-----------------



IR information	Value
Date of creation	14/08/2012
Object parameter	Value
Ambient temperature	20.0°C
Label	Value
IR : max	49.8°C
SP01	46.6°C
SP02	48.9°C
SP03	47.8°C
SP04	47.9°C

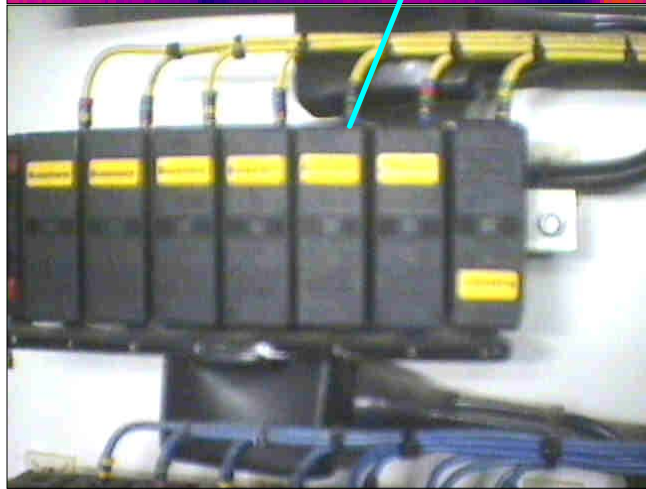
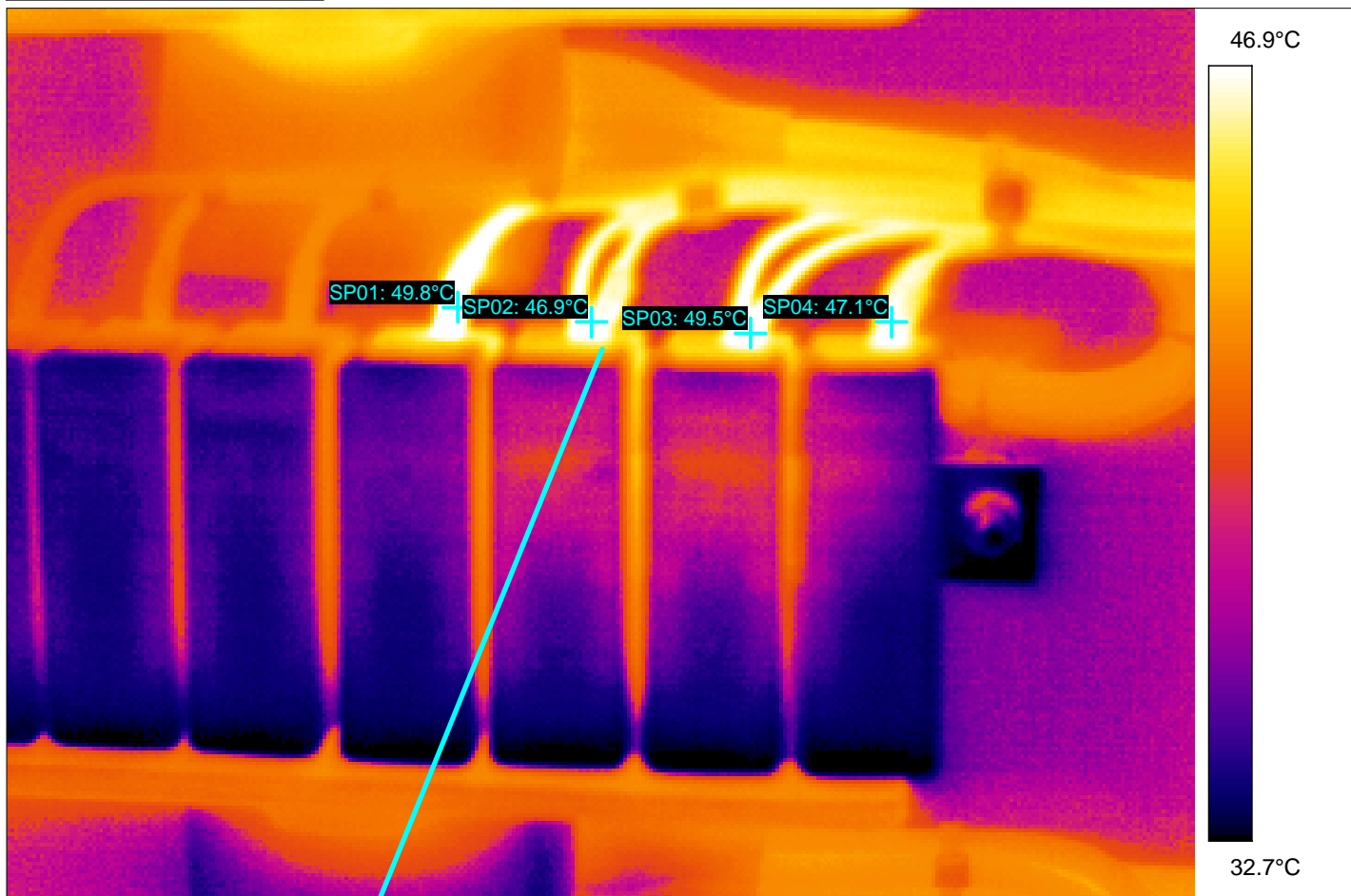
Section	Essential Vent' section MCC
Equipment	Fuses (R-L) Blue 1,2 3
Fault	High operating temperature
Recommendation	Load test & check connections and integrity of cable



CODE
Red

Location	Building 2
-----------------	------------

Area	Roof plant room
-------------	-----------------



IR information	Value
Date of creation	14/08/2012
Object parameter	Value
Ambient temperature	20.0°C
Label	Value
IR : max	52.2°C
SP01	49.8°C
SP02	46.9°C
SP03	49.5°C
SP04	47.1°C

Section	Essential Vent' section MCC
Equipment	Fuses (R-L) Yellow 1,2 3
Fault	High operating temperature
Recommendation	Load test & check connections and integrity of cable



CODE

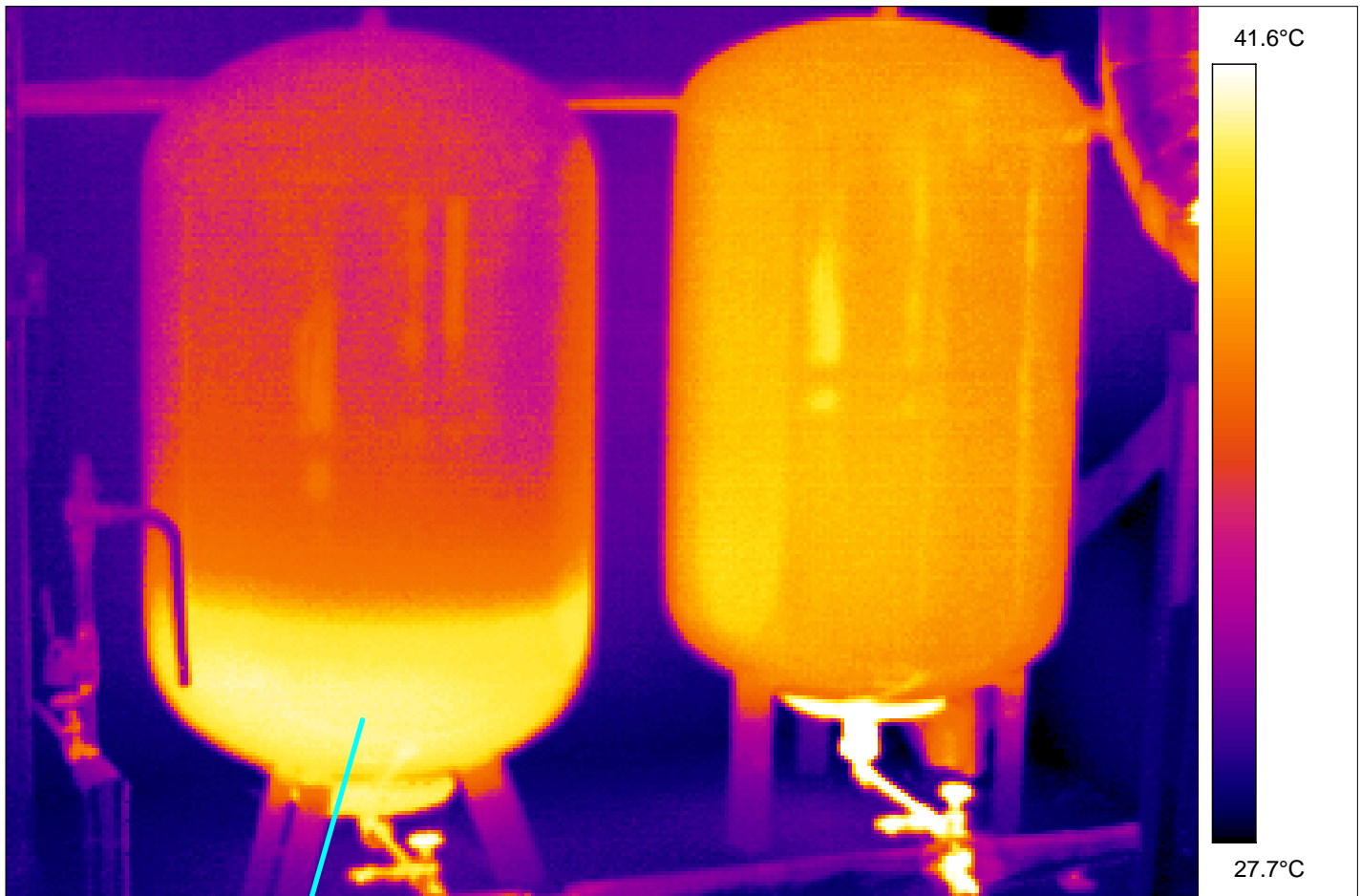
Red

Location

Building 4

Area

Roof plant room



IR information	Value
Date of creation	15/08/2012
Object parameter	Value
Ambient temperature	20.0°C
Label	Value
IR : max	50.8°C

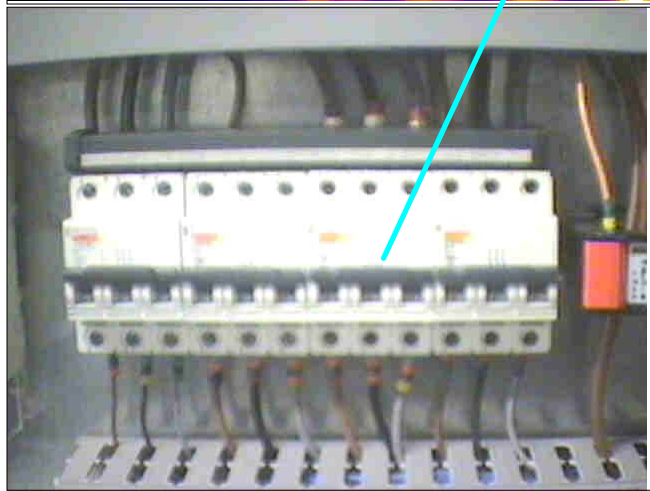
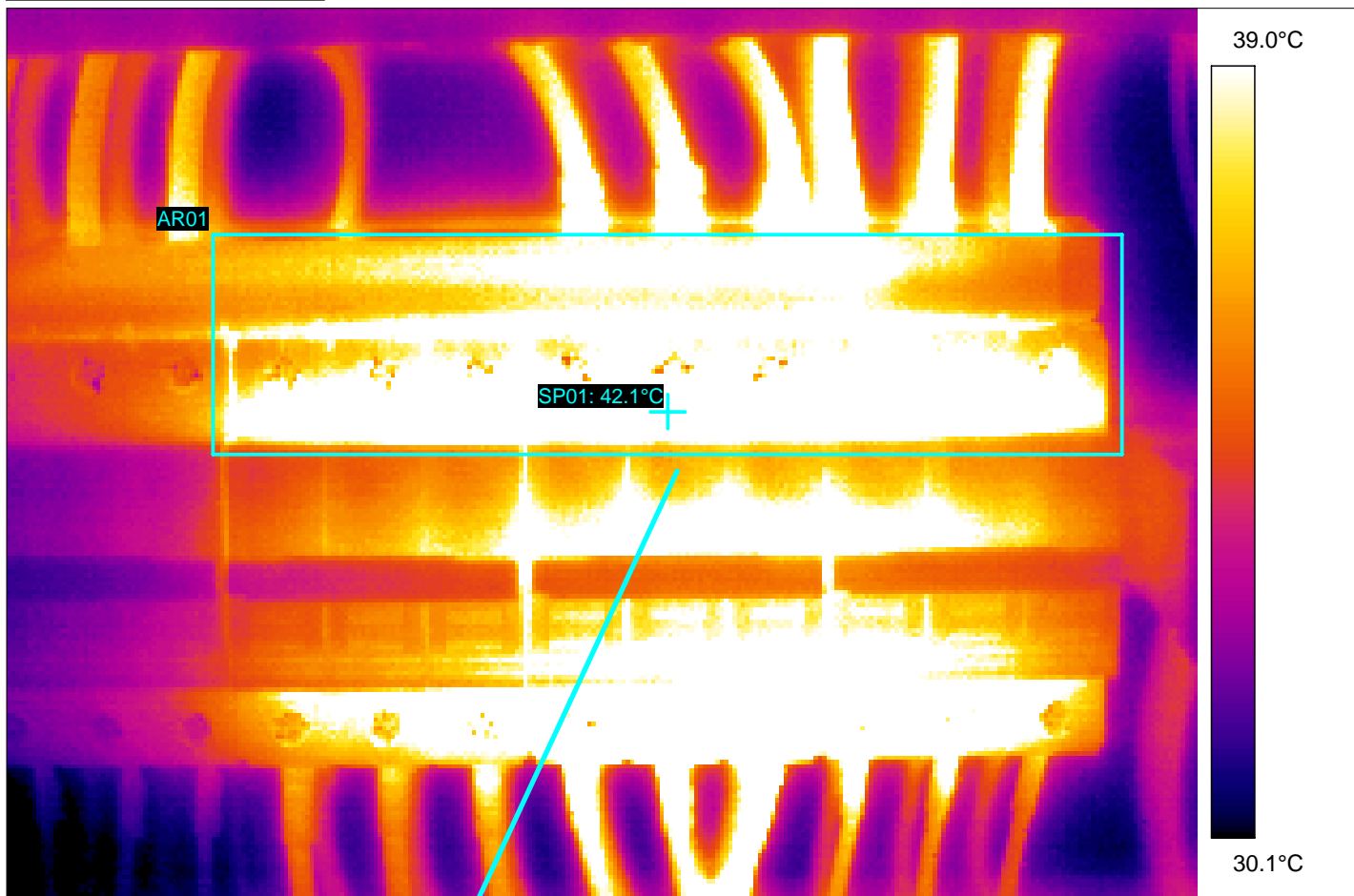
Section	Pressurisation Unit
Equipment	Left side vessel
Fault	Suspect membrane is perforated
Recommendation	Replace membrane



CODE
Red

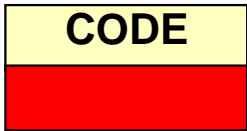
Location	Building 5
-----------------	------------

Area	Roof plant room
-------------	-----------------



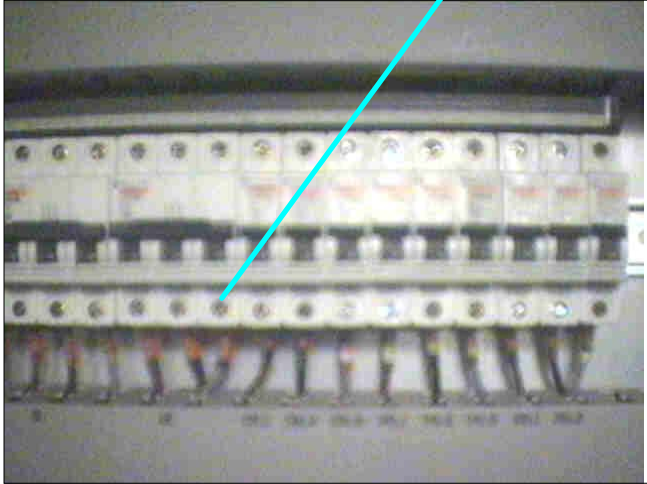
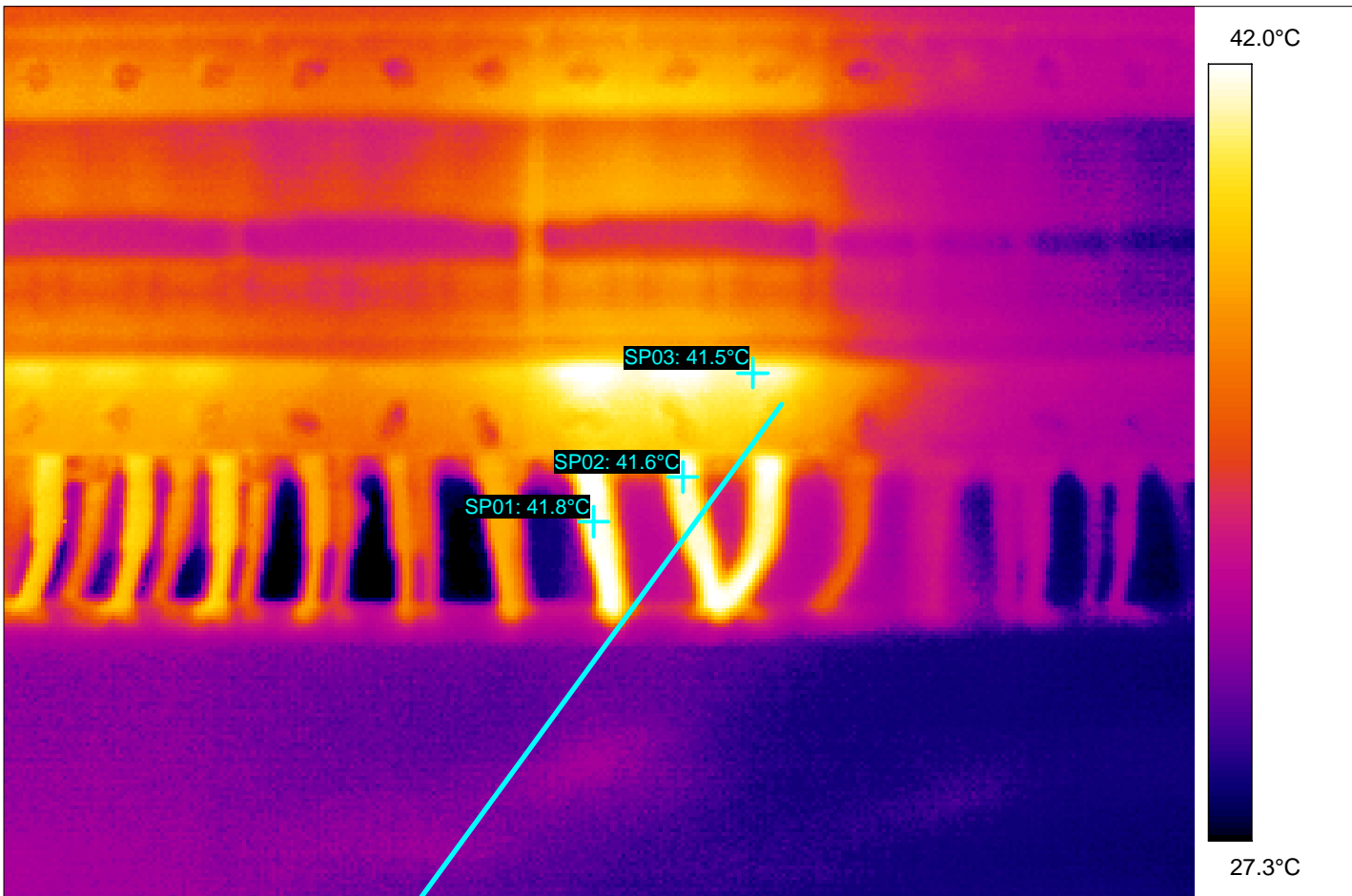
IR information	Value
Date of creation	15/08/2012
Object parameter	Value
Ambient temperature	20.0°C
Label	Value
IR : max	43.3°C
SP01	42.1°C
AR01 : max	43.3°C

Section	MSCP4 right side
Equipment	MCB4
Fault	High MCB operating temperature
Recommendation	Load test, check connections & integrity of cable
Note	I suspect the thermal pattern in adjacent eqpt is the result of conduction these MCBs and cables should also be tested.



Location	Building 5
-----------------	------------

Area	Roof plant room
-------------	-----------------



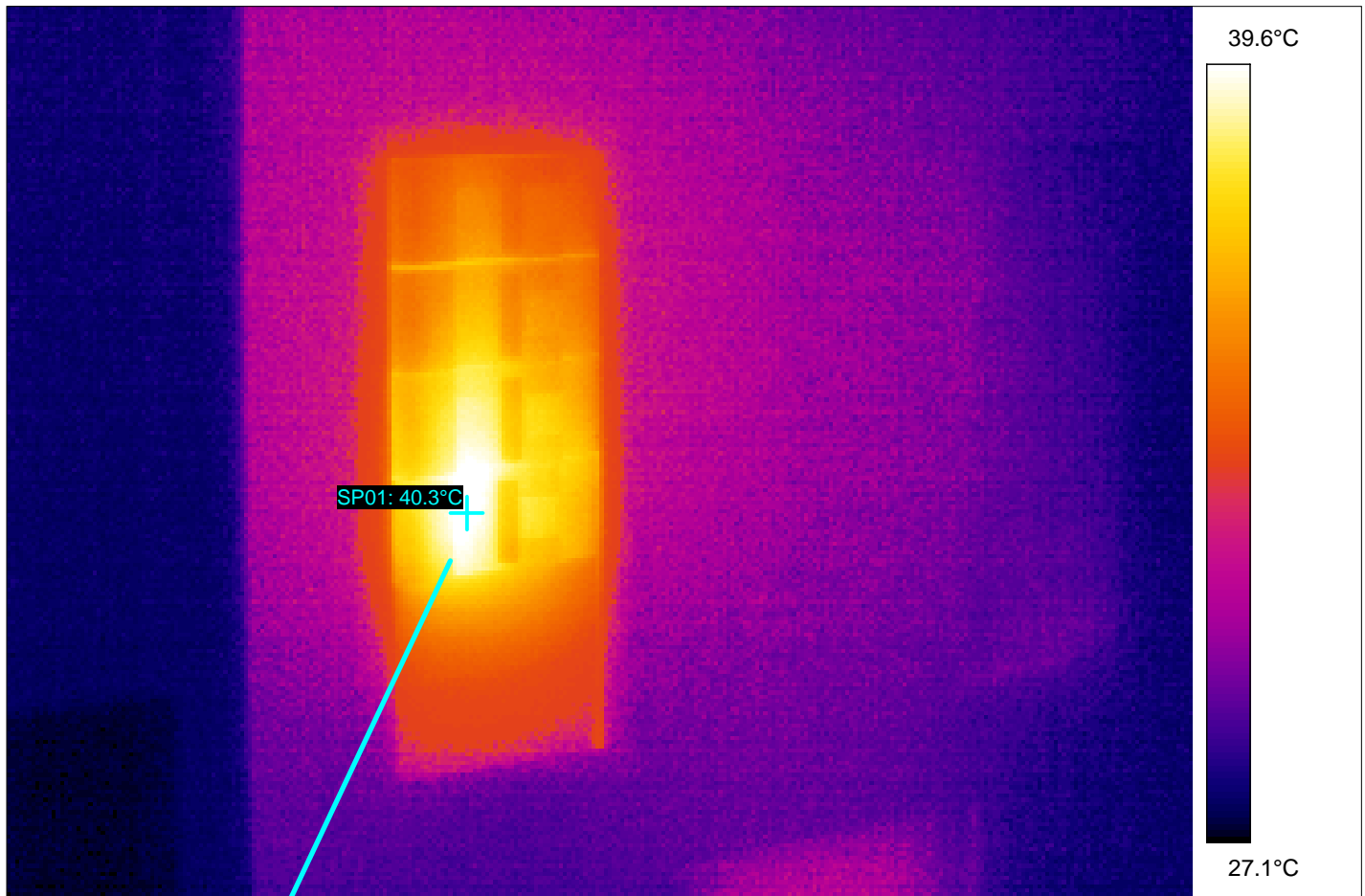
IR information	Value
Date of creation	15/08/2012
Object parameter	Value
Ambient temperature	20.0°C
Label	Value
IR : max	43.5°C
SP01	41.8°C
SP02	41.6°C
SP03	41.5°C

Section	MSCP2/3 cooling
Equipment	MCB 12
Fault	High MCB & cable operating temperature
Recommendation	Load test & check connections



CODE

Location	Building 4
Area	1st Flr, print room riser



IR information	Value
Date of creation	15/08/2012
Object parameter	Value
Ambient temperature	20.0°C
Label	Value
IR : max	40.9°C
SP01	40.3°C

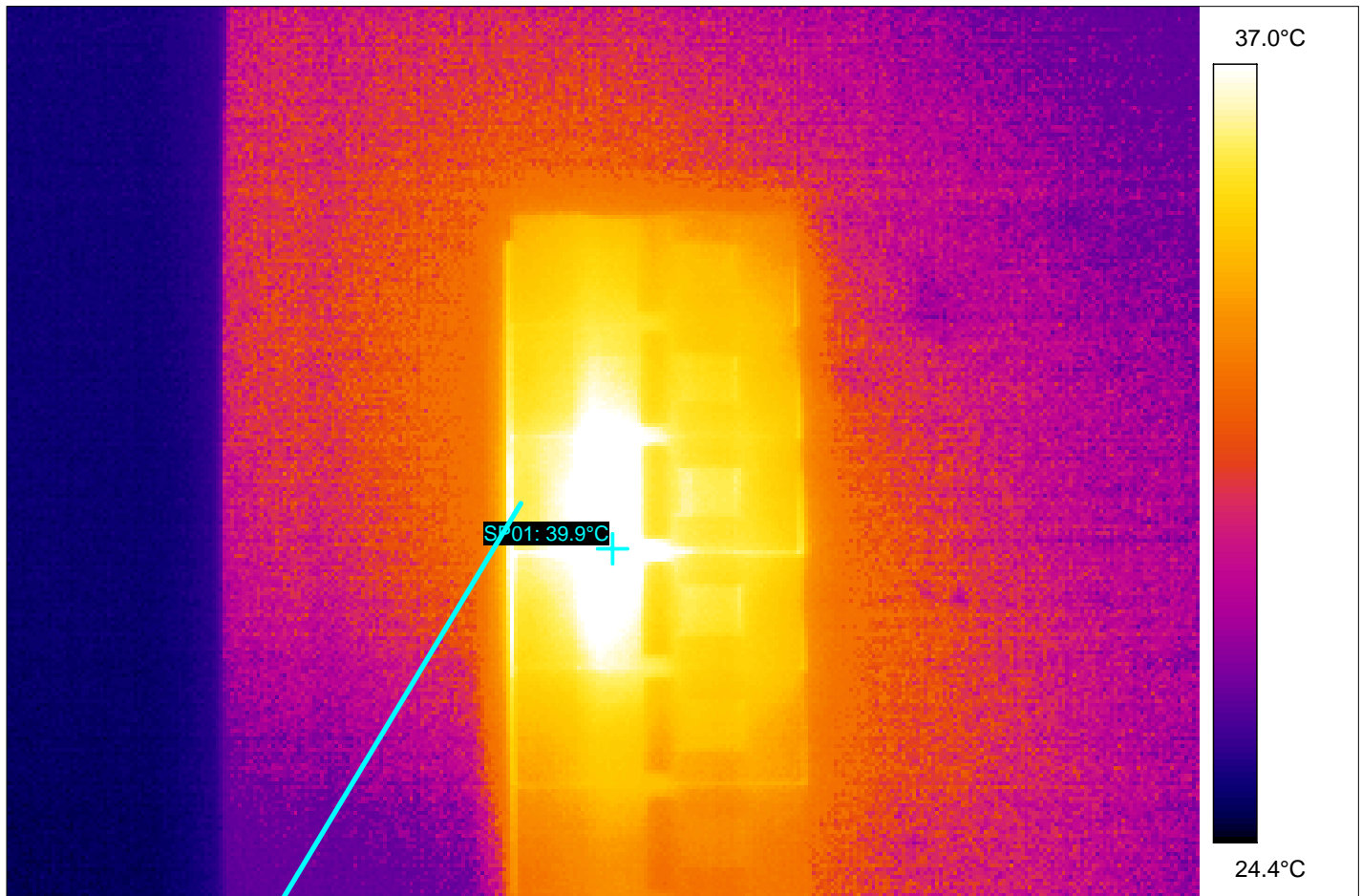
Section	DB 1/2A/UF
Equipment	MCB 2, L1
Fault	High MCB operating temperature
Recommendation	Load test & check connections



CODE

Location	Building 5
-----------------	------------

Area	Gnd Flr, kitchen riser
-------------	------------------------



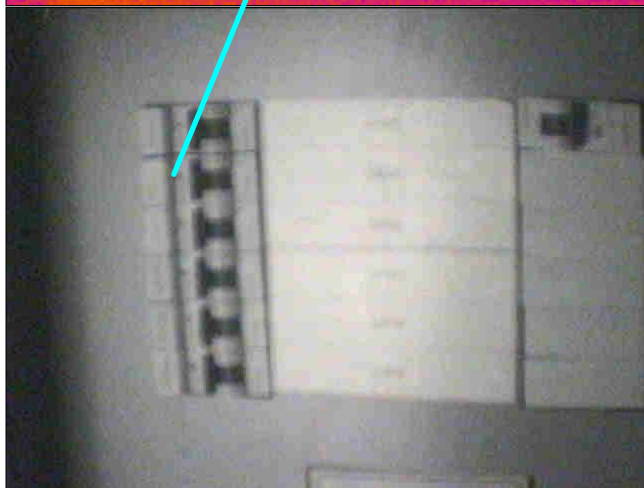
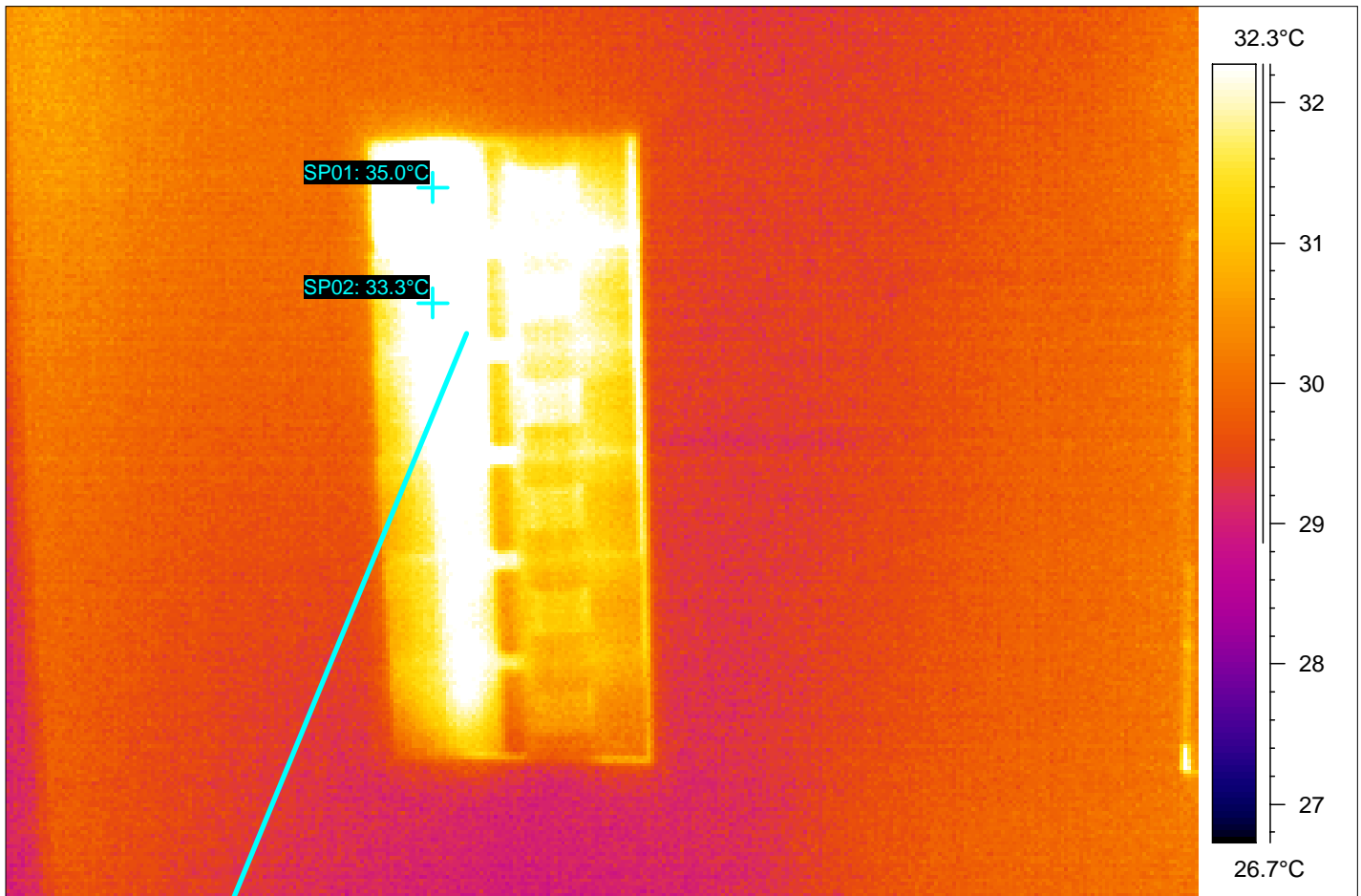
IR information	Value
Date of creation	15/08/2012
Object parameter	Value
Ambient temperature	20.0°C
Label	Value
IR : max	40.8°C
SP01	39.9°C

Section	DB G-2-2
Equipment	MCBs, 1L3, 2L1,2L2
Fault	High MCB operating temperature
Recommendation	Load test & check connections



CODE

Location	Building 4
Area	1st Flr, print room riser



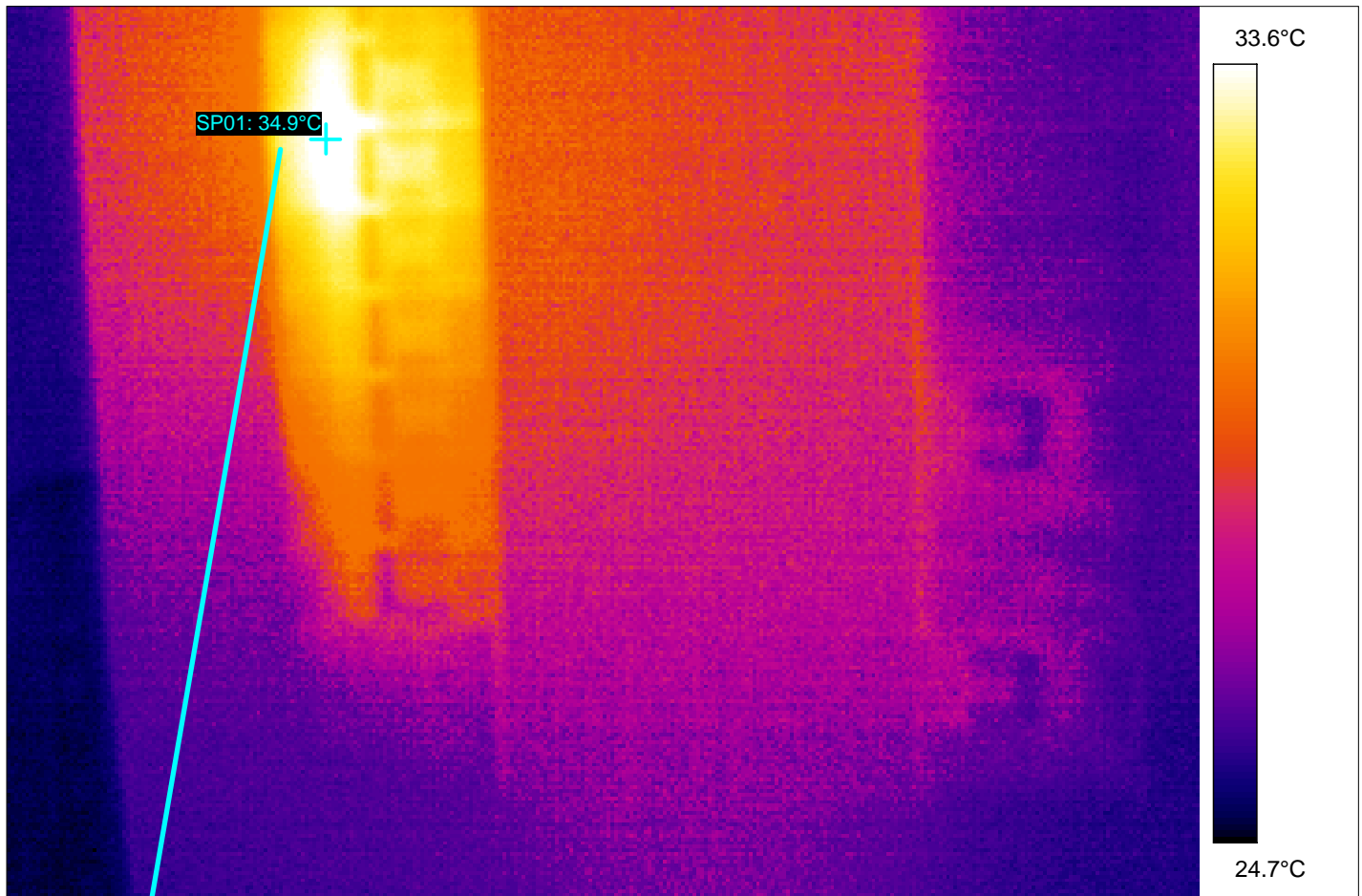
IR information	Value
Date of creation	15/08/2012
Object parameter	Value
Ambient temperature	20.0°C
Label	Value
IR : max	35.5°C
SP01	35.0°C
SP02	33.3°C

Section	DB 1/2/UF
Equipment	MCB 1, L1 & L2
Fault	High MCB operating temperatures
Recommendation	Load test & check connections



CODE

Location	Building 5
Area	1st Flr, meeting room Severn, riser



IR information	Value
Date of creation	15/08/2012
Object parameter	Value
Ambient temperature	20.0°C
Label	Value
IR : max	35.1°C
SP01	34.9°C

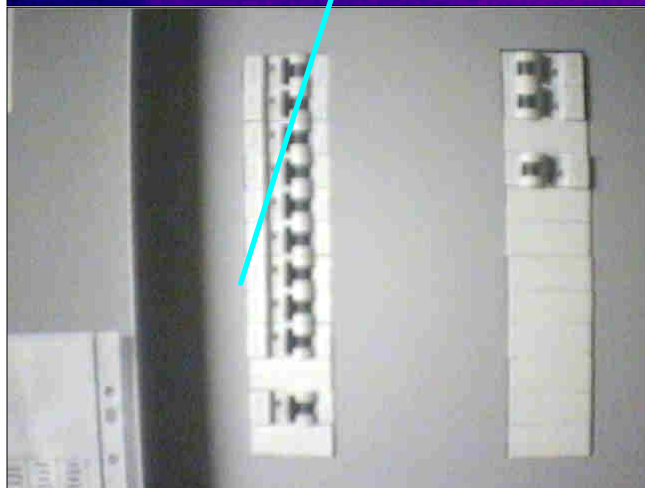
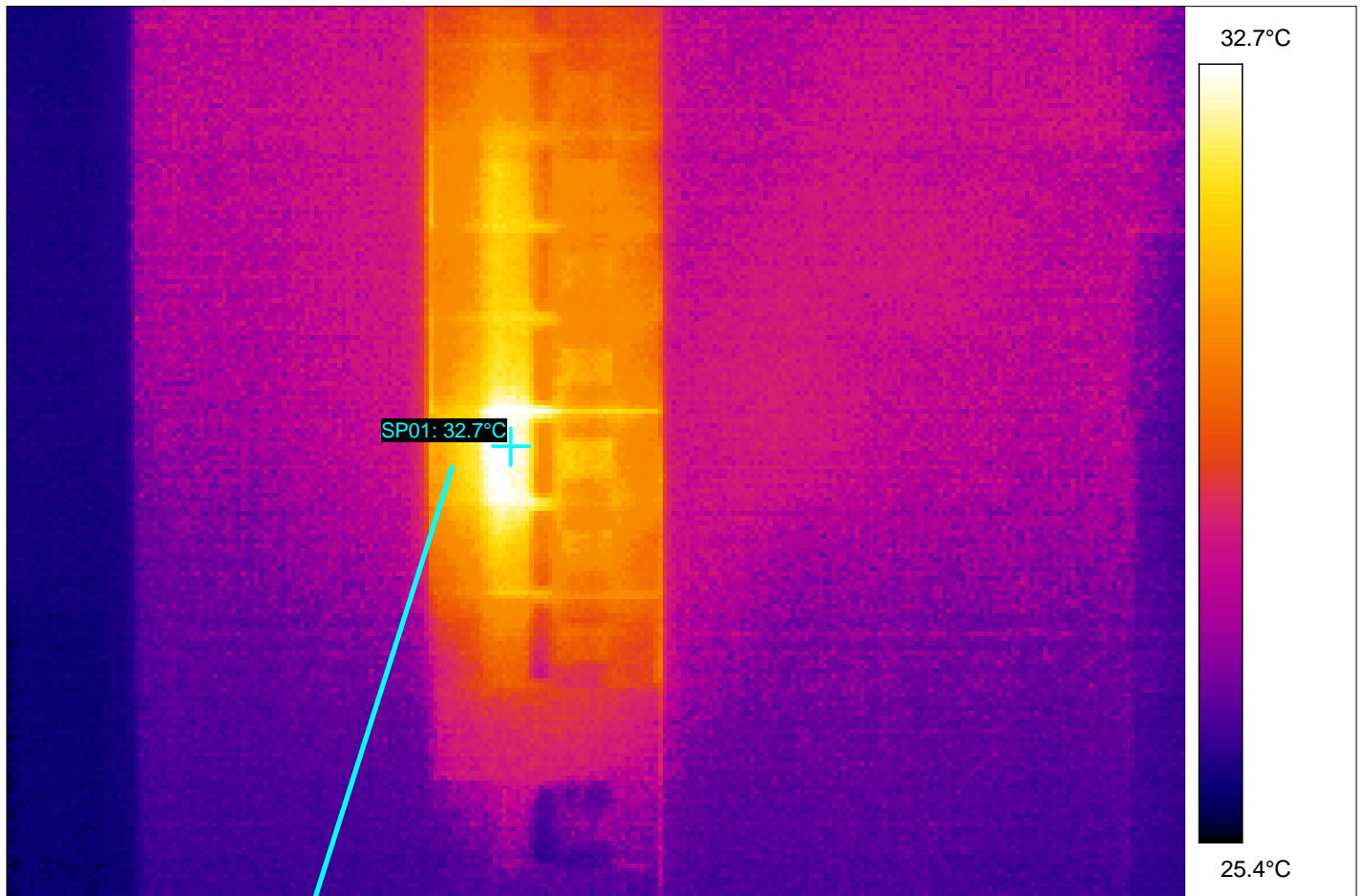
Section	DB 1-1-2
Equipment	MCB 2/2
Fault	High MCB operating temperature
Recommendation	Load test & check connections



CODE

Location	Building 5
-----------------	------------

Area	3rd Flr, meeting room Dart, riser
-------------	-----------------------------------



IR information	Value
Date of creation	15/08/2012
Object parameter	Value
Ambient temperature	20.0°C
Label	Value
IR : max	33.4°C
SP01	32.7°C

Section	DB 3-2-2
Equipment	MCB 3L1
Fault	High MCB operating temperature
Recommendation	Load test and check connections.



LOCATION	AREA	SECTION	CODE
Building 1	Gnd Flr, NET LAB Data Ctr'	-	Red
Building 2	Roof plant room	-	Red
Building 2	Roof plant room	-	Red
Building 4	Roof plant room	-	Red
Building 5	Roof plant room	-	Red
Building 5	Roof plant room	-	
Building 4	1st Flr, print room riser	-	
Building 5	Gnd Flr, kitchen riser	-	
Building 4	1st Flr, print room riser	-	
Building 5	1st Flr, meeting room Severn, riser	-	
Building 5	3rd Flr, meeting room Dart, riser	-	

Please note that the report contained herein represents the observed condition of the equipment at the time of survey. Machine Monitoring Systems accepts no liability for faults that occur after completion of the survey. It is recommended that regular thermographic surveys be carried out to ensure faults are detected.