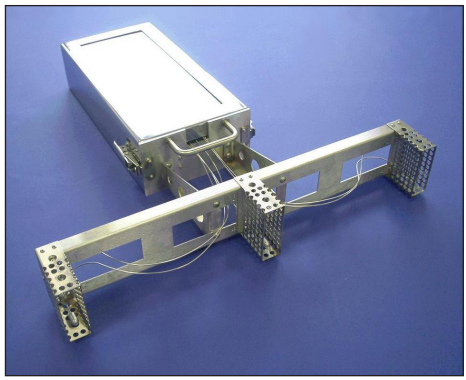
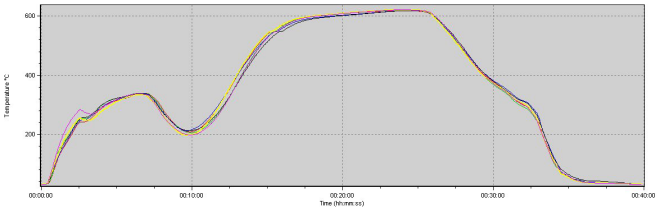
Furnace Tracker®
CAB Surveyor
USER GUIDE



FURNACE performance is typically monitored by recording the temperature profile experienced by the product as it passes through the furnace. The Datapaq® CAB Surveyor system, however, monitors the furnace itself by running a standard instrumented survey jig through it to gather temperature data. Temperature-profile results obtained from this are then compared with a previous baseline survey of the furnace to assess whether furnace conditions remain within tolerance or are drifting sufficiently from the ideal that product quality may be affected.

The Surveyor assembly comprises a Datapaq data logger contained in a thermal barrier and rigidly connected to a set of survey arms over which are distributed six thermocouples. The thermocouples terminate in aluminum thermal dampers which minimize transient heat fluctuations as well as simulating product profiles that the user can recognize. Analysis of the temperature data is carried out using the Insight™ CAB Surveyor software supplied.



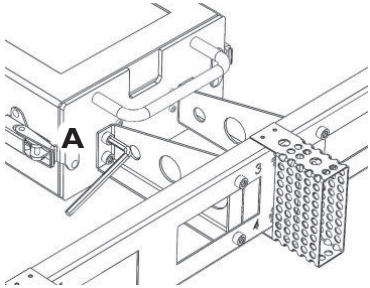
Temperature profile for a typical CAB process.

A suitable CAB process will normally involve two heating cycles. The first is in the dryer (to dry the flux solution on the product), where the temperature may peak at 180–350°C/ 355–660°F. The next stage is in a nitrogen-atmosphere brazing furnace where the temperature generally peaks around 600°C/1,110°F. The process is generally 30–45 min long, the drying cycle being c. 25% of this.

Assembling the System

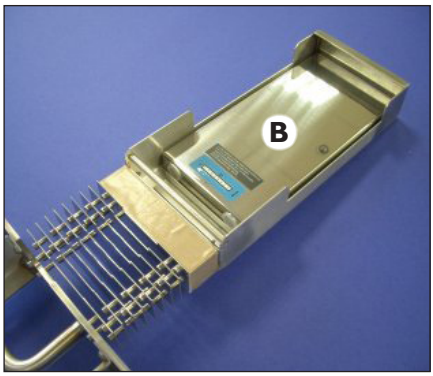
1 Fit arms to face-plate

Using the four Allen screws supplied, fit the survey arms to the face-plate of the thermal barrier (**A**).



2 Setup thermocouple correction factors

Before fitting the thermocouples, enter the thermocouple calibration data (from the calibration certificate supplied) into the Insight software: with the software in Technician Mode (selected at startup), run the Correction Factor Wizard (click , or select File > New > Correction Factors, or Edit > Setup Thermocouple Correction Factors) and follow the wizard's instructions.

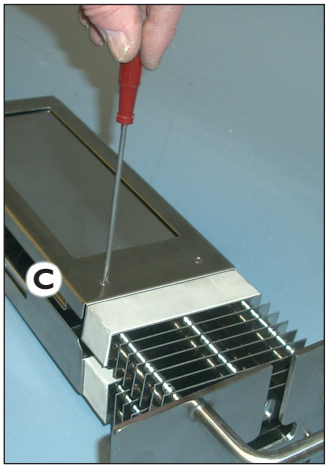


3 Fit heatsinks and logger

Slide the heatsink assembly out of the thermal barrier.

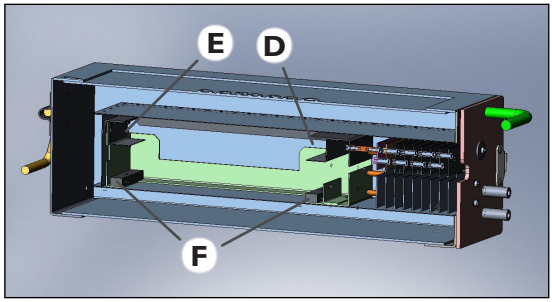
TB4990 thermal barrier:

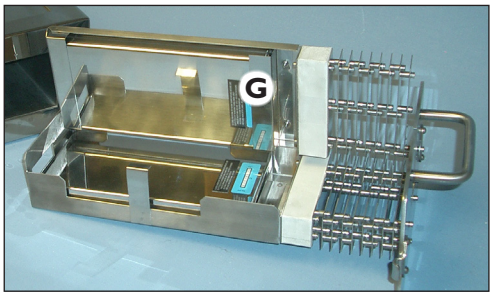
Place the single heatsink in its holder as shown (**B**), and place the logger on top of that.



TB4998 thermal barrier:

- Remove the front bracket (**C**) of the upper heatsink by first removing the two screws (and their nuts) on the top of the heatsink assembly.



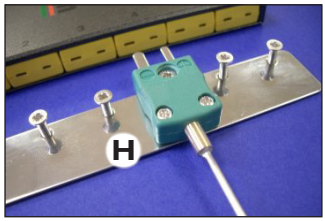


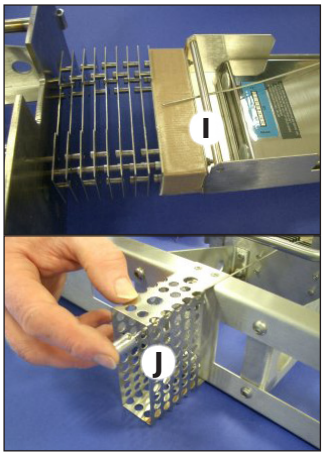
- Place the rear of the upper heatsink into the rear bracket (**D**), and re-fit the front bracket (**C**) such that it holds the front end of the heatsink in place (**G**).
- If using a**Tpaq21 logger**, remove the two blocks (**F**) in the base of the heatsink assembly. If using a **Q18 logger**, leave these blocks in place.
- Place the lower heatsink into the bottom of the heatsink assembly, and the logger can then lie between the upper and lower heatsinks.

4 Fit thermocouples

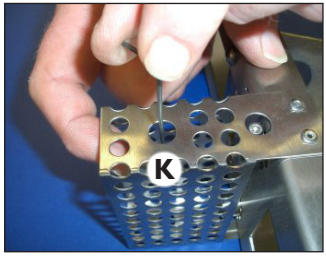
Channel numbers 1–6 are marked above the thermocouple sockets on the logger and by the probe positions on the survey arm; thermocouples must be correctly connected according to these numbers. Fit the thermocouples into place one at a time, starting with one of the two shorter thermocouple cables occupying the central positions (3–4).

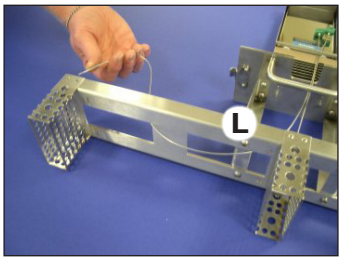
- First, screw the thermocouple plug to the clamp (**H**), ensuring correct plug-pin orientation relative to the logger socket (larger positive pin is to the left, as shown), and slide the cable beneath the retaining bar (**I**).





- Thread the thermocouple through its locking bush on the survey arm until it protrudes c. 12 mm/0.5 in. beyond the mesh guard (**J**). Slide a thermal damper all the way onto the end of the thermocouple, then gently push the probe back until the damper's Allen grub-screw is under the access hole in the guard which is furthest from the arm (**K**). Lock the damper in position with the screw; do not overtighten (tighten until resistance is felt, then a further quarter- to half-turn). With the thermocouple in this position, lock it to the survey arm by tightening the Allen screw in the locking bush, accessible through the



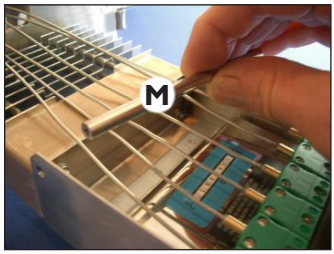


hole in the mesh guard next to the arm; do not overtighten.

- For the outer probes, feed the thermocouple beneath the retainer bar, then through the frame to left or right of the central guard (**L**). Loop the thermocouple back through the frame and then back through the locking bush. Fix the thermal dampers as above.

Replacing a Thermocouple

1. Loosen the Allen grub-screw in the thermal damper and remove the damper from the thermocouple (due to corrosion between the screw and the aluminum damper, it may be necessary to heat the damper to loosen it).
2. Loosen the Allen screw in the thermocouple locking bush.
3. Take out the old thermocouple complete, removing the thermocouple retaining bar (**M**) if necessary.
4. If required, enter the new thermocouple calibration data in the software (see above), and then fit the new thermocouple as above.



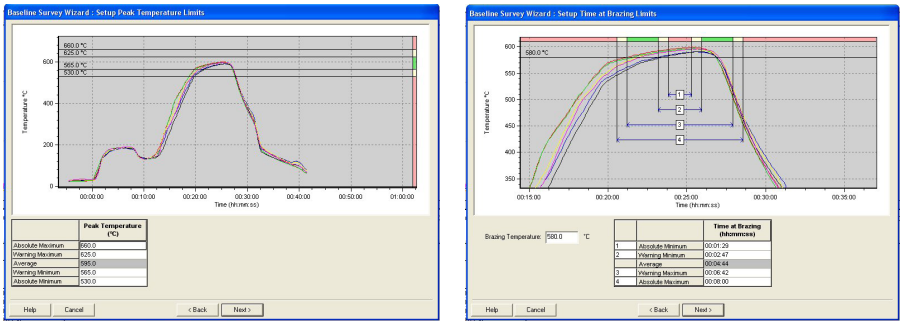
Principles of the System

When a given product is meeting all physical specifications after brazing, CAB Surveyor is used to capture the furnace's 'ideal' temperature profile. This profile – known as the baseline survey – is then used as a standard against which to compare all future profile runs. Insight's Baseline Survey Wizard guides you through the process: click , or select File > New > Baseline Survey, and follow the instructions.

Full details on using the Insight software are contained entirely within its online Help system: access this by clicking Help, and then Contents, on Insight's main menu. Then, within Help, click on Contents headings and topics to expand and read them. You may also click the Help button in any dialog – or press the F1 key – to bring up help information relevant to the task being performed.

In the wizard, define limits within which the furnace's performance must fall. Criteria used to assess performance are: peak temperature, and the time spent above the set brazing temperature. Appropriate limits often take a few trials to

establish, as (e.g.) gaps in production and variation in product size must be taken into account.



Setting limits for peak temperature (left) and time above brazing (right) during the Baseline Survey Wizard.

A baseline survey is specific to the furnace conditions in place at the time it was created (temperature settings, line speed, loading, etc.). Furnace loading significantly affects the measured furnace temperature: in an empty furnace the temperature will rise as there is no product to absorb the heat. For the most consistent results, CAB Surveyor should be deployed regularly in the same loading conditions.

A new baseline survey should be set up for any new product, or for any change in conditions, e.g. for an established product run in a different furnace or with new furnace or line-speed settings.

Gathering and Using the Data

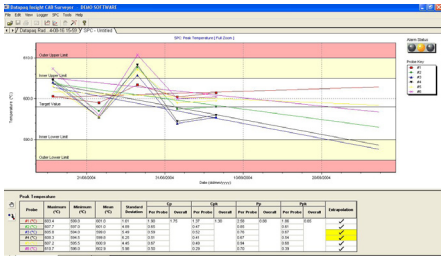
Once a process's baseline survey has been established, and whenever the same product and furnace settings are employed, CAB Surveyor should be used regularly to perform a profile run and thus check that conditions are still within specification. For a profile run, Insight can (if preferred) be run in its simplified Operator Mode – or run the Profile Wizard if using Technician Mode. When the data is downloaded from the logger to the PC, the wizard displays simple 'traffic-light' results, and furnace adjustments can then be made if necessary.

ALARM – *The data is outside acceptable limits.*

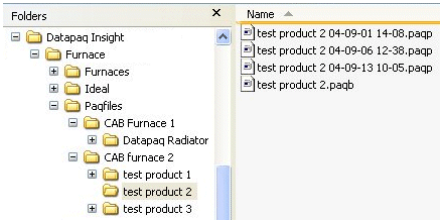
WARNING – *The data is not fully acceptable.*

Data is within acceptable limits.

Trends in the data generated by these frequent tests can be analyzed from time to time to assess whether the process is liable to drift out of specification in the future: for a detailed explanation, select Insight's online Help and see Data Analysis > Statistical Process Control.



A trend analysis using Statistical Process Control.



A sample file structure, showing the profile runs (.paqp files) and baseline survey (.paqb) for a given product grouped together.

All baseline surveys and profile runs are automatically archived in a logical system – by furnace name, product name and date/time. A customer request for details of a run carried out months ago can thus easily be met.

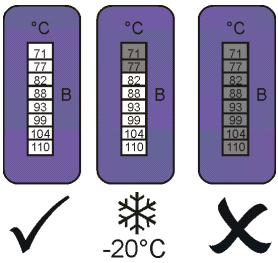
In the Furnace

For both baseline surveys and profile runs, the CAB Surveyor assembly should be positioned centrally on the mesh belt, between products – ideally in a fully loaded furnace. Always check the furnace for vertical clearance: the assembly's height is 103 mm/4 in.

The logger and heatsink must be removed from the thermal barrier as soon as possible after exiting the furnace. The logger will overheat if left in a closed thermal barrier.

Using heat-resistant gloves, loosen the catches at the front of the thermal barrier and slide out the logger and heatsink assembly. Data can then be downloaded from the logger without disconnecting the thermocouples. Allow the thermal barrier to cool for at least 1.25 hrs before re-use: leave it in a cool place, standing on its base with the open end upwards.

Exceeding Specified Thermal Duration



The temperature-indicator labels on the heatsink show the temperature reached during the process. Should the heatsink exceed 77°C/170°F (the color of the non-reversible labels will show this), the heatsink should be frozen at a temperature of -20°C/-4°F for 24 hours, and then left to return to room temperature.

RESTRICTIONS AND CAUTIONS

Not for use in vacuum brazing furnaces.

Not for use with Datapaq 2000 logger (software incompatible).

***Always** check furnace for vertical clearance before a run.*

Do not run in a CAB process longer than 1 hr total duration (including time to unload).

Do not use for at least 1.25 hrs after carrying out a run (system needs to cool).

SPECIFICATIONS

Thermal Barrier

	TB4990 – low profile, short duration	**TB4998 – normal profile and duration**
Overall height (level with arms)	103 mm	129 mm
Overall width (inc. catches at sides)	233 mm	233 mm
Overall length (inc. handles front and rear)	476 mm	480 mm
Weight (inc. heatsink)	9.65 kg	12.0 kg
Heatsink	1 × TB1001	2 × TB1001
Suitable loggers	Q18 model DQ1860, or Tpaq21	Q18 model DQ1860, or Tpaq21
Thermal duration	45 mins with peak temperature 600°C	60 mins with peak temperature 600°C
Practical duration	Four runs, each of maximum 35–45 mins; 75-min pause to cool between runs, with heatsink assembly removed.	Four runs, each of maximum 45–60 mins; 75-min pause to cool between runs, with heatsink assembly removed.

Surveyor Assembly

Overall length (back of barrier to front of arms)	650 mm
Overall width (width over arms)	602 mm
Overall height (arms level with barrier-top)	103 mm
Weight (inc. heatsink and arms)	11.1 kg

Part Numbers

TB4989A	Surveyor arm (without probes or dampers)
CS2039	6-channel standard probe-clamp kit
PA0919	1.6-mm-diameter thermocouple, 700 mm
PA0918	1.6-mm-diameter thermocouple, 385 mm
CS0900	Thermal damper (set of 8)
TB4991	Complete barrier system inc. thermocouples
SW5330	Insight CAB Surveyor software

User manuals are available in other languages. Contact Datapaq for details.

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