- **Sample Interval** – The shorter the sample interval, the shorter will be the battery life. This is because power is being consumed each time the logger takes a reading. A short sample interval will achieve the maximum amount of information, but this must be balanced against the greater battery charge required.
- **Operating with RF Telemetry** – Sending data to a receiver outside the furnace or kiln requires almost double the power needed to simply read and store the data.
- **Programming and Downloading the Data** – When these operations are carried out it is necessary to connect to the computer via a communications cable, and power is consumed as soon as the cable is plugged into the logger. The software warns the user to disconnect from the PC, but if the logger is left connected this will affect battery life.

Battery life is thus obviously difficult to predict accurately. The LEDs on the logger will give the best indication of when the battery is low. In the user's own conditions, experience will quickly indicate typical battery life, and a log should be kept for the first few runs, noting sample interval and whether telemetry was used. The following data can serve as a guide – though values given here are no more than an indication of the battery life that can be expected.

The data below are from tests with a Tpaq21 logger and ExpansionPaq fitted with eight lithium batteries and operating at a constant 100°C/212°F.

Sample Interval	Logger Temp.	No. of Channels	Battery Life (hrs)
3 s	100°C/212°F	10	> 85
3 min	100°C/212°F	10	> 500

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

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Tpaq21 Logger Battery ExpansionPaq

FITTING BATTERIES

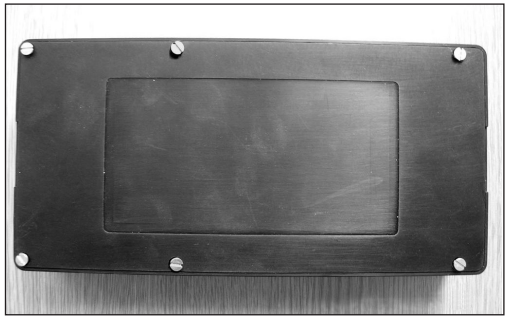
The Tpaq21 data logger, when fitted by Datapaq® with an enlarged battery compartment – the BP0020 ExpansionPaq – is capable of extending data-collection times beyond the limitations of the standard logger's four batteries. Long-duration processes can then be monitored.

The ExpansionPaq compartment takes eight BP0021A lithium thionyl chloride batteries which must be depassivated before use. This process is carried out during installation of the batteries, as described below.

WARNING
Lithium batteries – Fire, explosion and severe burn hazard
Lithium batteries are potentially dangerous and require great care in handling and storage.
• Do not short-circuit • Do not attempt to recharge •
• Do not reverse-connect • Do not open batteries •
• Do not expose battery contents to water •
• Do not solder anything to the battery • Do not incinerate •
• Do not mix cells • Do not leave discharged cells in the logger •
*You **must** read the section 'Handling Lithium Batteries' in your Tpaq21 Data Logger User Manual, and the Safety Data Sheet supplied with the batteries.*

If the logger has been recently in use, allow it to cool below 45°C/113°F before proceeding as follows.

1. Select a clean, dry, non-conductive work surface; do not use a metallic surface or anti-static matting. Take off any conductive jewellery and put it out of the way. Wear eye protection.
2. Remove the six screws retaining the battery cover.
3. Carefully remove each of the old batteries, one at a time, from the battery compartment.



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Ensure that the battery terminals cannot be short-circuited in any way – to each other, to the logger or to any tools. There is risk of explosion.

4. Place each battery separately on the work surface, maintaining good separation between them. Mark the work surface area into which they are placed, in order to identify them as the old batteries.
5. Ensure each of the battery chambers is clean and dry, and carefully wipe the battery contacts with a dry lint-free cloth or tissue with attention to the contact area. Do not bend or distort the contacts.
6. Remove the new batteries from their protective UN-compliant packaging, and retain this for later use.
7. Carefully install each new battery one at a time into the four battery chambers, two batteries in each. The red LED adjacent to each battery chamber now lights up or begins to glow.

Observe the polarity of the batteries and of the contacts within the battery compartment.
Ensure that the battery terminals cannot be short-circuited in any way – to each other, to the logger or to any tools. There is risk of explosion.
Always replace all of the batteries at the same time.
Never use batteries other than BP0021A supplied by Datapaq.

8. BP0021A batteries must be depassivated before they are used for the first time, as follows.
   - When two new batteries are first placed in a chamber, their adjacent red LED will glow, showing that depassivation has begun. LED brightness may first appear quite dim, but, as depassivation proceeds, the battery voltage and LED brightness increase. During depassivation the logger's battery-status yellow LED will flash; this is because the batteries have yet to reach their normal operating voltage.
   - Wait for each red LED to go out, indicating that the battery pair has reached its normal operating voltage and is now ready. This may take up to c. 30 minutes for new batteries (see below).
   - When all four red LEDs have gone out, the batteries are ready for use.
9. Re-check that all four red LEDs are off, and that the batteries are installed with correct polarity, then refit the battery cover and all six retaining screws.

10. Check that the logger's battery-status yellow LED has stopped flashing and is now off. This indicates a successful battery installation and a healthy battery set.

The logger is now ready for use. Carefully place the old batteries one at a time into the empty packaging; do not allow them to be short-circuited.

For disposal of used lithium batteries, refer to 'Handling Lithium Batteries' in your Tpaq21 Data Logger User Manual.

Depassivation Time

The time taken for the battery compartment's red LEDs to go out depends on many factors. Batteries that have been stored for long periods at temperatures higher than normal room temperature may take longer to depassivate. Some batteries will take only a few minutes while others may take much longer.

Battery-compartment LED Indications

The battery compartment's four red LEDs are useful in indicating battery condition and in diagnosing problems during installation.

- When installing batteries, always ensure that each battery pair's LED lights up.
- If an LED does not light, and remains unlit, then one or both batteries are inserted the wrong way round, or are totally exhausted or old, or are new but faulty – or the logger is excessively hot.
- If the LED lights up but is dim, does not brighten, and remains on continuously, then one or both batteries are partially exhausted, or are new but faulty.
- If the LED lights up brightly but only for 1–30 seconds and then goes out, then both batteries have been recently depassivated and used before.
- If the LED lights up dimly, brightens quickly and goes out after some minutes, then both batteries are new and depassivated and ready for use.

Battery Life

Battery life is affected by the following factors.

- **Operating Temperature** – Essentially, the higher the ambient temperature the battery operates in, the lower will be the life. Batteries that operate for a large part of the process cycle at relatively low temperatures will have a longer life than those that operate for the majority of the process cycle at the maximum operating temperature.