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Glycerin Cells for TPL3 Digital Temperature Probes (#50001 and #50003)

Networked Robotics' Glycerin Cells for TPL3-series digital temperature probes enable the measurement of stable, mass-reflective, temperature data from refrigerators and freezers. A fill, usually a glycerin/water solution (however beads can be used as well) dampens the response to temperature fluctuations in emulation of sample or product of similar mass.

These Glycerin Cells are designed for use with Networked Robotics' TPL3-series digital temperature probes (see Networked Robotics products #30002 and #30012). Digital probes are ordered separately. The cell/probe assembly is used with the Networked Robotics NTMS (Network Telemetry Monitoring System) hardware and with Networked Robotics Tempurity™ System software in order to monitor temperatures in regulated environments. Most commonly these will be the interior chambers of refrigerators, freezers, and other cold storage devices, but may also include incubators, rooms, and other environmentally-sensitive areas.

Glycerin Cells are available in 35ml (#50001) and 200ml (#50003) sizes. Select the cell and the type of fill that is appropriate for the regulatory environment that applies to your laboratory and/or to match the thermal mass of the product being stored.

Description

Glycerin/water (glycerol) solutions of 33% and 50% are common in monitoring applications. Ethylene glycol and other liquids and solids like glass beads can also be used with this product. For some applications water may be required. The cell can also be used empty – with no fill.

See your regulatory rules and the "Liquids in Temperature Monitoring" section for the applicability of this product in your regulatory or quality environment.

The 200-ml version (product #50002} is shown below.

Packing List

This package includes:

- (1) Glycerin cell with cap
- (3) Dual-lock mounting strips

Digital temperature probes and glycerin or other liquid solutions used as fill are obtained separately.

Installation

The cell is comprised of two pieces – 1) the "chamber" and 2) the cap. In the 200-ml version the cover assembly contains the digital temperature probe and fits into the liquid-filled chamber.

The acrylic cells are fragile – sensitive to impacts. Please handle carefully during the process of installation.

The main steps in installation are as follows:

1) Partially fill the chamber with the desired solution.
2) Insert the Networked Robotics TPL3 Digital Temperature Probe in the chamber to a point near the bottom.
3) Attach the entire cell to the freezer using either the dual-lock strips provided or the cell's hook.

1. Fill the chamber

Remove the Glycerin Cell from the box. Stand the chamber on the bottom of a sink, on a table, or another flat surface.

The solution that you select must be appropriate for the type of device (refrigerator, freezer, incubator, etc.) being monitored. The solution must not freeze as a frozen chamber will not be capable of measuring temperature effectively. Frozen liquid will also affect the cell's physical integrity. Do not use water in any device that could reach below 0º C.

Fill the chamber about 2/3 of the way full with the chosen solution. You may choose to adjust the liquid level. For example 10 ml in the 35ml cell or even empty may provide sufficient temperature stability. See the response time chart in the "Reference" section.

If you intend to mount the cell via its hook, do not fill the unit completely as the cell will tilt forward a few degrees and will leak briefly if filled to the maximum before mounting.

2. Insert the Temperature Probe

35ml version: The dual-lock that is attached physically to the back of the TPL3 digital probe need not be removed. If the mating dual lock piece is on the probe disconnect it.

Slowly lower the probe into the filled chamber with the clear window facing the interior of the chamber until it reaches near the bottom. Ensure that the probe is completely submerged in liquid. There is no slot for the wire in the cap on the 35 ml version as there is for the 200 ml version.

200 ml version: Insert the probe into the matching square slot. Lower the cap assembly into the chamber. The probe wire will be placed in the slot in the cap top.

3. Attach the Glycerin Cell with Probe to the Monitored Device

Attach the cap to the cell. The cap is not waterproof and a tilt will cause the cell to leak briefly. You may consider using petroleum jelly or another removable sealant on the top of the cell or lid to help reduce evaporation. Check that the area under the installation location is free from any product or sample that could be affected by a spill from the cell. Move any sensitive product.

The cell should be mounted in a visible location because from within the cell, the temperature probe's LED tells you at-a-glance whether temperature data collection is enabled properly.

Some refrigerators and freezers have wire shelves from which the glycerin cell can be hung. If you are going to hang the unit from the hook, make sure that it is placed in an open space where its position will not interfere with the movement of samples in and out of the freezer. Ensure that samples and sample movement will not damage the hook as it extends slightly over the plane of the rack. The cell will tilt forward slightly when hung. Ensure that the probe wire has no visible slack that could snag or cause stress on the cell. You may wish to use packing tape or laboratory tape or other means to secure the wire internally.

You may also wish to attach the cell assembly to the interior side wall. When side-wall mounting Networked Robotics recommends attachment to the hinge-side wall about 2/3 to the top vertically and at least a foot backward from the door. The unit should not be mounted in a location where it touches any sample as this may affect the reading.

When applying the dual-lock to the side of the freezer use a gloved hand to warm the location, wipe off any moisture or condensation with a paper towel, and apply the dual-lock. Check to ensure that the unit is mounted vertically and is stable.

Discussion: The Use of Liquids in Temperature Monitoring

Decades ago mercury thermometers were the only means of measuring the temperature within a freezer. On their own, they respond too quickly to temperature changes. In compliance with the Heisenberg Uncertainty Principle the simple act of removing the thermometer from the freezer in order to read it, raised the temperature.

The cold storage industry's long-standing solution has been to mount the bulb of the thermometer in a sealed container of glycerin or other non-freezing liquid. This increases the total mass and damps the temperature response – thus allowing the thermometer to be read without changing the reading.

A small-mass probe like a plain, not-in-liquid mercury thermometer can detect fast transient temperature changes. Higher-mass thermometers lose the ability to detect these fast rise-times. From the point-of-view of providing the most information therefore the small-mass probe is better. Any temperature fluctuation in the internal air is detected.

The goal of most monitoring applications however is to detect whether important products or samples that are stored in the freezer might be compromised. From this point-of-view the thermal-mass-dampened measurement sensors are better because they have the potential to provide readings that more correctly reflect the temperature of the stored product. This is true as long as the thermal properties of the sensor and its dampening are similar to that of the product.

Operation

Caution must be used when implementing this product. This product slows the reaction of sensors to temperature changes. The Tempurity System will send alarm notifications later than if the probe alone is used. Consider the possibility of reducing your Stage One and/or Stage Two threshold times which will counteract the delay produced by these cells.

If needed wash the cell with dish soap and sterilize with alcohol or bleach. If you are using water in the cell, consider the possibility of adding bleach to the tank during monitoring. The glycerin cell is made of acrylic and may be cleaned in a dishwasher.

Glycerin is hygroscopic and if exposed to the air will absorb moisture over time changing thermal properties slightly. Also some liquids evaporate. The cells may lose fluid over time slowly and must be refilled.

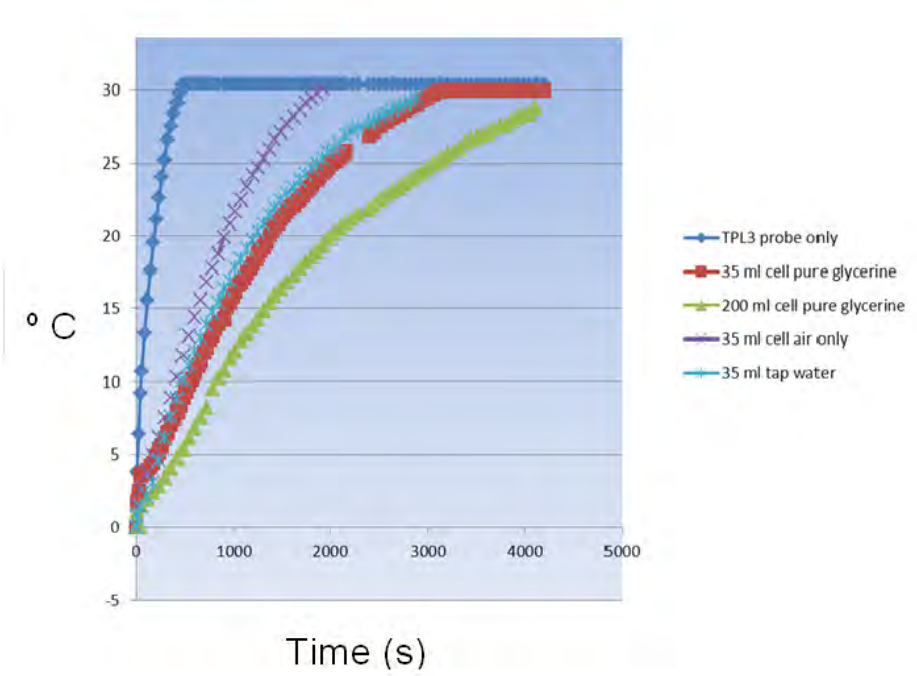
The cells are strong but have poor impact resistance! Store them independently in individual boxes filled with bubble-wrap or other packing material.

Reference

Response Time Analysis and Graph

The graph below shows the response time of several cells and fill types when the ambient temperature of the probe/cell combination is changed from near 0º C conditions to 36º C. Response time is tracked to 30º C.

Pure glycerin and water have roughly the same thermal properties however water cannot be used in freezers. Using less liquid than 35 ml in the smaller cell will produce a curve intermediate to the air-only curve and the filled pure glycerin curve. Some customers may find sufficient thermal dampening by using glycerin cells without any liquid fill.



Physical Specifications

	35 ml cell	**200 ml cell**
Weight (empty):	36.7 grams	147.4 grams
Weight (full - water)	73.3 grams	374.2 grams
Depth:	31.8 mm (1.25 inches)	57.2 mm (2.25 inches)
Width:	25.4 mm (1 inches)	108 mm (4.25 inches)
Height:	103.1 mm (4.06 inches)	79.4 mm (3.125 inches)

Support

If you need assistance with your Glycerin Cell, your TPL3 digital temperature probe or other Networked Robotics products, contact us by phone at 877-FRZ-TEMP (877-379-8367) or by email at support@networkedrobotics.com