



Popular Applications

- Chill Chain Monitoring
- Warehouse and Building Monitoring
- Environmental Monitoring
- Composting and Waste Management Sites

Tinytag Radio System is an easy to set-up wireless system with data logging capability. It consists of a receiver connected to a PC and a number of radio loggers forming a mesh network.

Each radio logger is a self-contained, battery powered unit that can receive, log, store and transmit data to other radio loggers, and to the central receiver. If one radio logger is out of range with the receiver, its data hops to its nearest neighbour and hence finds a path

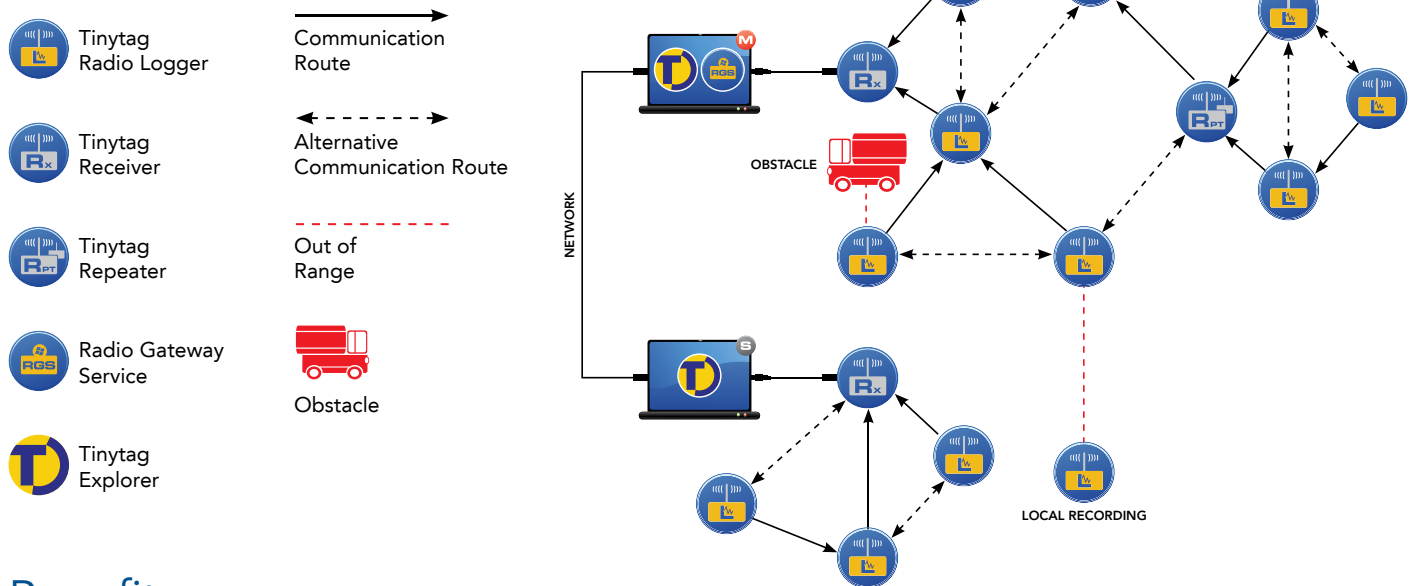
back to the receiver. If the radio logger has lost connection with all of its neighbouring radio loggers and is unable to find a path back to the receiver, data is stored locally until communication is restored.

Tinytag Radio System

The devices (loggers and receivers) in the Tinytag Radio System form a mesh network.

The mesh network is a self-configuring network where all the devices work together to send information to the Radio Gateway Service. It allows for continuous connections and reconfiguration around broken or blocked paths by "hopping" data from node to node until the destination is reached.

Tinytag Radio System Components Key



Benefits

- **Easy to set up** – simply install the software, connect the receiver and switch on the loggers; the system is now ready and will automatically form a robust mesh network. The user can configure the loggers specifying for example, logging intervals, alarms, logger and channels names, etc. Site surveys and repeaters are rarely required. If loggers are moved, the mesh automatically adjusts itself.
- **Robust** – provided a logger is in range of a receiver or another logger, data will always find an optimal route to the receiver. Even if a logger is temporarily out of range / obstructed, it will store data locally until the obstruction is removed, at which time it will be transferred to the system.
- **Local recording (cache & catch up)** – because the loggers record data locally (cache), they are suited for use in applications where loggers regularly go out of range of the receiver. For example, a truck can leave a depot to make deliveries and the logged data will automatically be transferred to the system (catch up) when the truck is parked back at the depot overnight.
- **Labour Saving** – data is automatically gathered at your PC so you do not need to collect the loggers for downloading. As well as saving labour this also has health and safety implications because loggers can be sited where users cannot easily or safely access them. Data can even be collected via a network so a user can manage loggers on multiple remote sites.
- **Quick response** – the loggers have programmable alarms. Active alarms are displayed on the logger itself and alerts can automatically be sent via e-mail (these can be converted to SMS texts).
- **Cost-efficient** – with larger networks the cost per monitoring point in a wireless network can be equal or lower than that of an equivalent conventional (non-wireless) system, even before labour costs are factored in.
- **All Weather** – the loggers can be used both indoors or out. They are battery operated so no mains power is needed.
- **Flexible Power Sources** – the loggers are powered by standard alkaline batteries. Optional lithium batteries and mains powered versions are also available.



Tinytag Radio Loggers



Tinytag radio loggers collect data and transmit it back to the radio gateway, a Windows service that manages data in a Tinytag Radio system. When turned on, they will automatically find their place in the radio network and work out the best path to get information back to a receiver.

If a logger cannot communicate with a system for any reason, it will store data locally and then transmit it once the connection has been restored.

The units are housed in rugged, waterproof (IP67) cases and are suitable for use in many different applications.

Units are supplied with alkaline batteries by default, but other power options, including lithium batteries and mains power, are available should a longer battery life or a wider operating temperature range be required.

Features

- Wireless temperature and humidity monitoring
- Self-configuring, for easy installation
- 200m range, typical (line of sight)
- User-programmable logging interval
- Local cache can store 2 weeks of readings
- User-programmable alarms
- Waterproof case
- Software and LED low battery warning
- User-replaceable battery

Logging Specification

Logging Interval	2 minutes to 10 days
Local Storage Capacity*	Two Weeks, at a typical 10 minute logging interval

Data loggers can be set to record in intervals of once every 2 minutes or greater (by default the logging interval is set to once every 10 minutes).

When radio communications are good, data is transmitted immediately and stored by the gateway service.

When communications with the gateway service are interrupted, by a power failure to the computer running the gateway service or an obstacle causing a blockage in radio communications, data loggers can record for

up to 2 weeks locally when set to the default 10 minute logging interval (when communications are restored, the stored data on the logger will be transmitted to the gateway service).

*The local storage capacity of the logger is an indication of how much data the unit can record when it is unable to communicate with a receiver.

Data Logger Alarms

Alarms	2 Programmable alarms per channel
Alarm Delay	1 second to 10 days

Loggers can be programmed with alarm limits that will cause warnings to be shown in Tinytag Explorer and to flash the units LED red.

Two alarm limits can be programmed per channel, allowing upper and lower boundaries to be set.

Delays can be set on the alarms so that routine tasks, such as restocking a fridge or freezer, can be performed without causing alarms to be activated.

E-mail warnings can be sent when alarm limits are breached, and these in turn can be used to send SMS messages using third party messaging services.

**TGRF-3021: Tinytag Radio Temperature Logger for Thermistor Probe**

(-40 to +125°C)

A single channel radio temperature logger for use with a thermistor probe.

**TGRF-3022: Tinytag Radio Temperature Logger for 2 x Thermistor Probes**

(2 x -40 to +125°C)

A dual channel radio temperature logger for use with two thermistor probes.

**TGRF-3024: Tinytag Radio Temperature Logger for 4 x Thermistor Probes**

(4 x -40 to +125°C)

A four channel radio temperature logger for use with four thermistor probes.

**TGRF-3201: Tinytag Radio Temperature Logger for PT1000 Probe**

(-200 to +200°C)

A single channel radio temperature logger for use with a PT1000 probe, for monitoring over a wide range of temperatures.

**TGRF-3202: Tinytag Radio Temperature Logger for 2 x PT1000 Probes**

(2 x -200 to +200°C)

A dual channel radio temperature logger for use with two PT1000 probes, for monitoring over a wide range of temperatures.

**TGRF-3204: Tinytag Radio Temperature Logger for 4 x PT1000 Probes**

(4 x -200 to +200°C)

A four channel radio temperature logger for use with four PT1000 probes, for monitoring over a wide range of temperatures.

**TGRF-3500: Tinytag Radio Temperature/Relative Humidity Logger**

(-18°C to +55°C and 0 to 100%RH)

A dual channel radio temperature and relative humidity logger.

Battery Information

Alkaline Batteries

Unless otherwise specified, Tinytag Radio loggers are supplied with 2 x Alkaline C cell batteries.

Alkaline batteries are the preferred power option because they are readily available and inexpensive to replace.

Data loggers supplied with alkaline batteries have a part number that ends with a -XK suffix and a label on the base of the unit saying "Alkaline".

Battery Type	2 x Alkaline C (LR14) Duracell Procell MN1400 or Duracell Ultra MX1400
Battery Life†	12 months, typical
Operational Range*	-18°C to +55°C (-0.4°F to +131°F)

The logger will operate with equivalent battery types, but performance cannot be guaranteed.

Lithium Battery Option

A lithium battery option, that operates over a wider temperature range and can have a longer life, can also be supplied.

To comply with shipping restrictions, lithium powered loggers are supplied with reduced capacity lithium batteries.

Data loggers supplied with lithium batteries have a part number that ends with a -XL suffix and a label on the base of the unit saying "Lithium".

Battery Type	1 x Saft LSH14 C 3.6V Lithium Light
Battery Life†	12 months, typical
Operational Range*	-40°C to +85°C (-40°F to +185°F)

Standard capacity lithium batteries can be used to give the unit a typical battery life of 24 months. The following types of battery are recommended:

- Tekcell SB-C02,
- SAFT LS26500 or
- Tadiran SL-2770

Standard capacity lithium batteries must be sourced locally by the user.

General Battery Information

†Battery life is dependent on the logging interval used, the number of loggers in a network and the operating temperature of the unit. The battery life figures quoted above are for a typical 10 minute logging interval in a network containing 25 loggers or less operating at 25°C. Continuous operation at very low temperatures will result in a shorter battery life.

*The operational range indicates the temperature limits to which the unit can be exposed for the battery type fitted.

A low battery warning will be displayed in the Tinytag Explorer software, and on the data logger, when a battery needs replacing.

Data stored on the logger will be retained after a battery is replaced.

Alkaline batteries should always be replaced in pairs.

If used at low temperatures data loggers should be allowed to warm to room temperature before they are opened to avoid condensation forming inside them.

External Power Option

Radio loggers may optionally be powered from an external DC supply. For further information, please contact your supplier.

Physical Specification

IP Rating IP67 waterproof

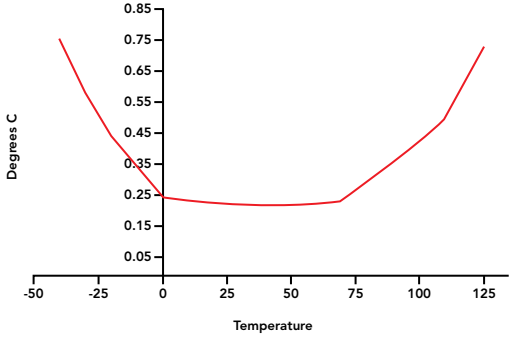
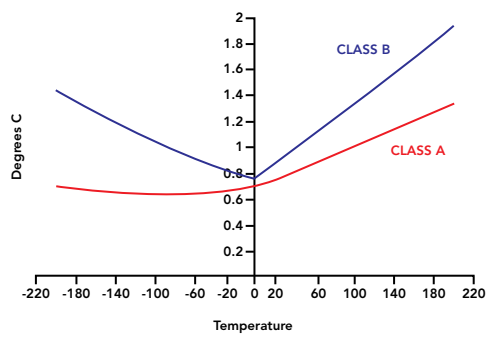
Weight and Case Dimensions

P/N	WEIGHT	HEIGHT*	LENGTH	WIDTH
TGRF-3021-XK TGRF-3021-XL	435g / 15.34oz 330g / 11.64oz	140mm / 5.51"	142mm / 5.59"	80mm / 3.15"
TGRF-3022-XK TGRF-3022-XL	440g / 15.52oz 335g / 11.82oz	140mm / 5.51"	142mm / 5.59"	80mm / 3.15"
TGRF-3024-XK TGRF-3024-XL	455g / 16.05oz 350g / 12.35oz	140mm / 5.51"	155mm / 6.10"	80mm / 3.15"
TGRF-3201-XK TGRF-3201-XL	435g / 15.34oz 330g / 11.64oz	140mm / 5.51"	142mm / 5.59"	80mm / 3.15"
TGRF-3202-XK TGRF-3202-XL	440g / 15.52oz 335g / 11.82oz	140mm / 5.51"	142mm / 5.59"	80mm / 3.15"
TGRF-3204-XK TGRF-3204-XL	455g / 16.05oz 350g / 12.35oz	140mm / 5.51"	155mm / 6.10"	80mm / 3.15"
TGRF-3500-XK TGRF-3500-XL	445g / 15.70oz 340g / 11.99oz	140mm / 5.51"	210mm / 8.27"***	80mm / 3.15"

* Including Aerial

** Including Probe

Reading Specification (Temperature)

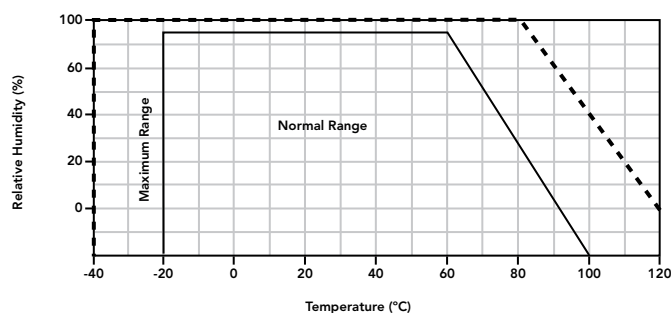
MODEL	TGRF-3021, TGRF-3022, TGRF-3024, TGRF-3500	TGRF-3201, TGRF-3202, TGRF-3204
Reading Range	-40°C to +125°C (-40°F to +185°F)*	-200°C to +200°C (-328 to +392°F)
Reading Accuracy		
	The overall accuracy quoted above includes a thermistor probe (where appropriate).	The graph above shows the accuracy of the unit when used with both class A and class B PT1000 sensors.
Sensor Type	10K NTC Thermistor	PT1000 (external probe)
Reading Resolution	Better than 0.2°C (-40 to +125°C) Better than 0.05°C (-4°C to 85°C)	Better than 0.2°C (-200 to -100°C) Better than 0.4°C (-100 to +120°C) Better than 0.5°C (+120 to +200°C)
Temperature Stability	0.002°C/°C	0.001°C/°C

Reading Specification (Humidity)

TGRF-3500 (Humidity Channel)

Reading Range	0% to 100%RH (see below)
Accuracy	$\pm 3.0\%$ RH (over normal operating range, see below)

The normal operating range for the humidity sensor is -20 to +60°C, 0 to 95% humidity (see below).



Long term exposure (more than 60 hours) to conditions outside the normal range, shown above, may result in a temporary drift of up to +3% RH. Once within the normal range again it will return to the calibrated state.

Reading Resolution	0.04% RH
Sensor Location	External probe
Response Time	16 seconds* to 90% FSD in moving air
Stability	Better than 1% per year typical

*The thermal response of humidity measurement is 2.5 minutes.

The IP67 rating does not apply to the unit's RH sensor.

If moisture forms on the RH sensor readings may become unpredictable.

Any dust or residue that is allowed to build up on the RH sensor will affect the reading accuracy.

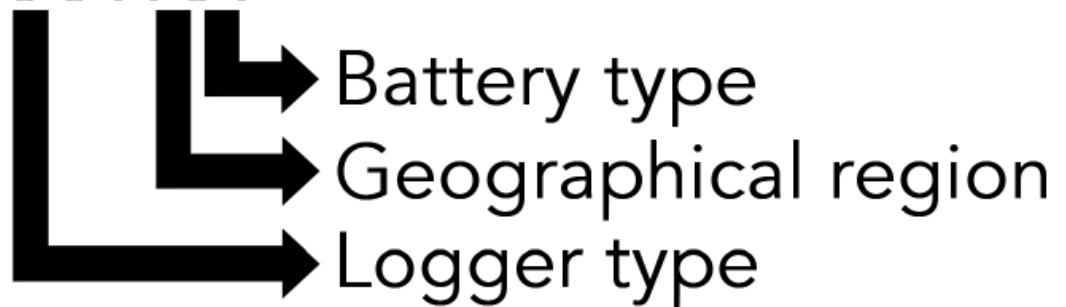
The sensor may be cleaned with de-ionised water or compressed air.

Ordering Guide

Radio logger part numbers indicate the type of battery fitted in the unit and the geographical region it has been manufactured to work in.

When ordering, please state the correct region and battery code for the data logger type you require.

TGRF-3XXX-XX



Geographical Region:

A: UK and EU
B: Australia
C: USA

Battery Type:

K: Alkaline
L: Lithium

Example Part Number:

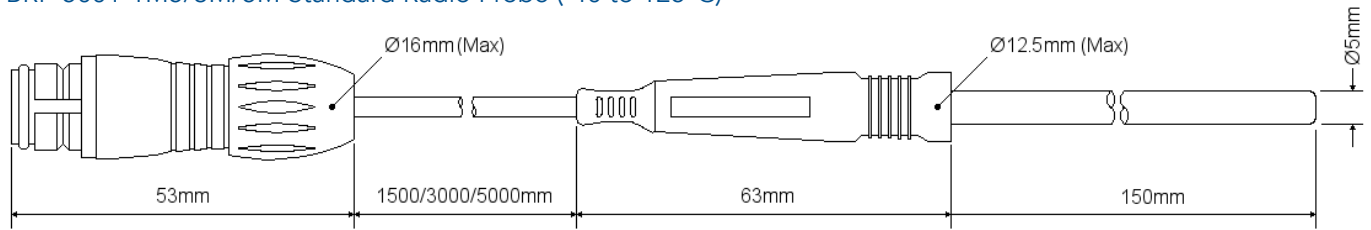
TGRF-3500-AK: A Tinytag Radio temperature and humidity logger, for use in the UK or Europe, fitted with alkaline batteries.

Radio Logger Probes

Thermistor Probes for TGRF-3021, TGRF-3022, TGRF-3024

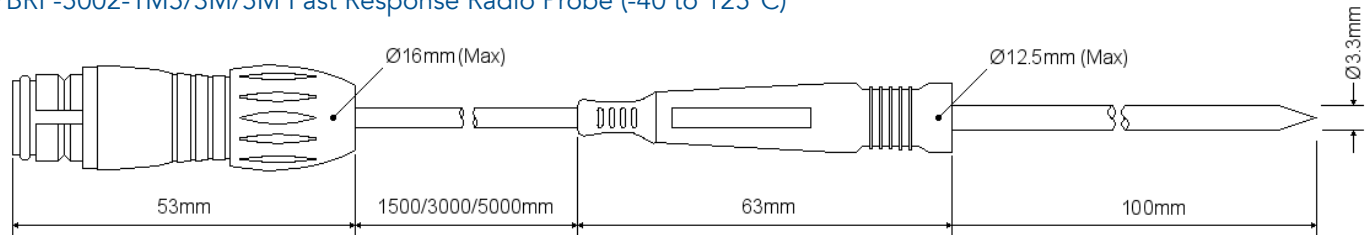
A range of thermistor probes is available for use with the above radio loggers.

PBRF-5001-1M5/3M/5M Standard Radio Probe (-40 to 125°C)



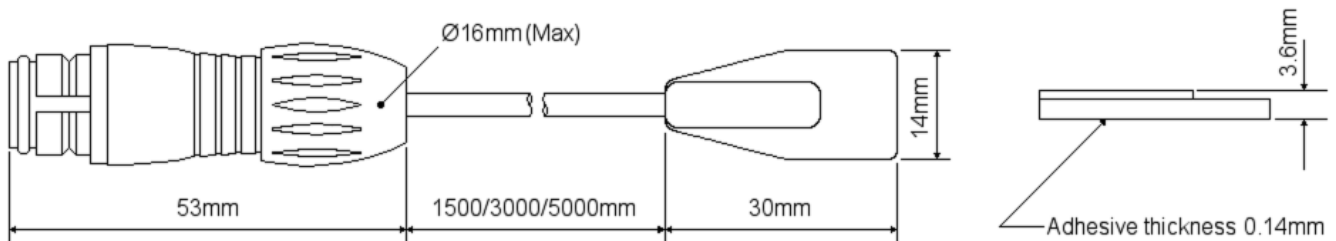
Typical Applications	Air and liquid monitoring
Cable lengths	1.5, 3 & 5m
IP Rating	IP68 (waterproof)
Weight	55g (1.5m cable version)
Response Time (Water)	15 seconds (to 90% FSD)

PBRF-5002-1M5/3M/5M Fast Response Radio Probe (-40 to 125°C)



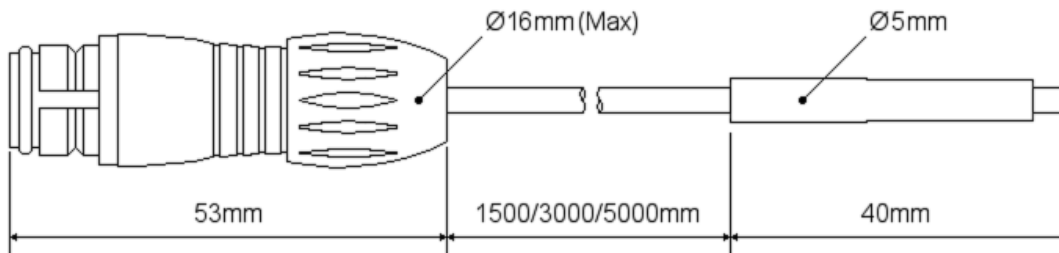
Typical Applications	Product monitoring
Cable lengths	1.5, 3 & 5m
IP Rating	IP68 (waterproof)
Weight	45g (1.5m cable version)
Response Time (Water)	10 seconds (to 90% FSD)

PBRF-5003-1M5/3M/5M Surface Radio Probe (-40 to 125°C)



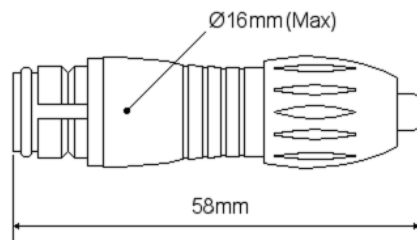
Typical Applications	Surface temperature and pipe monitoring
Cable lengths	1.5, 3 & 5m
IP Rating	IP68 (waterproof)
Weight	40g (1.5m cable version)
Response Time (Water)	30 seconds (to 90% FSD)

PBRF-5006-1M5/3M/5M Flexible Radio Probe (-40 to 125°C)

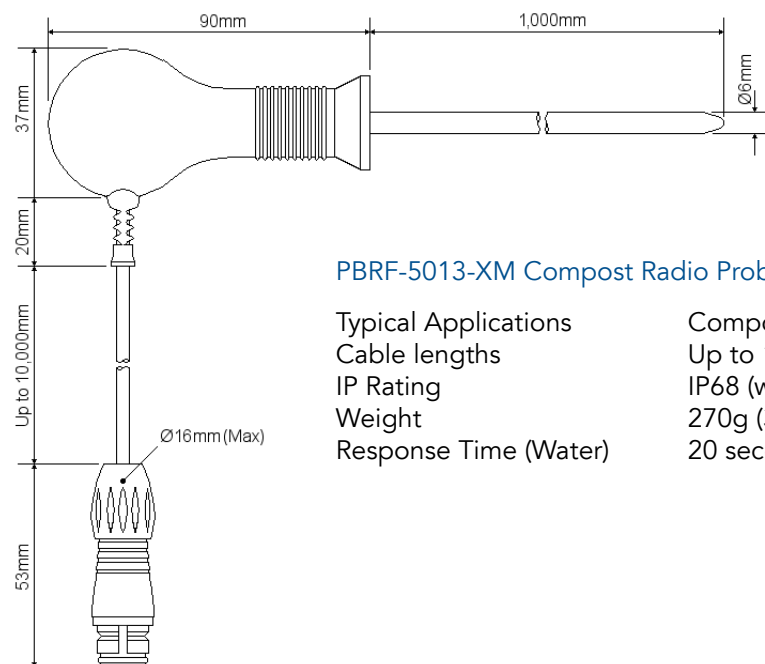


Typical Applications	Building and product monitoring
Cable lengths	1.5, 3 & 5m
IP Rating	IP68 (waterproof)
Weight	40g (1.5m cable version)
Response Time (Water)	12 seconds (to 90% FSD)

PBRF-5010 Radio Thermistor Probe (-15to +60°C)



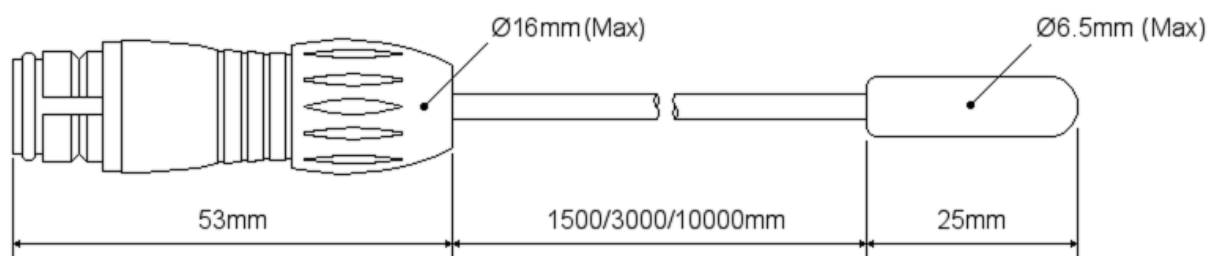
Typical Applications	Building monitoring
IP Rating	IP67
Weight	15g
Response Time (Moving Air)	Typically 10 minutes (to 90% FSD)



PBRF-5013-XM Compost Radio Probe (-40 to 125°C)

Typical Applications	Composting
Cable lengths	Up to 10m
IP Rating	IP68 (waterproof)
Weight	270g (3m cable version)
Response Time (Water)	20 seconds (to 90% FSD)

PBRF-5015-1M5/3M/10M Encapsulated Radio Thermistor Probe (-20 to 105°C)



Typical Applications

Cable lengths

IP Rating

Weight

Response Time (Water)

Composting

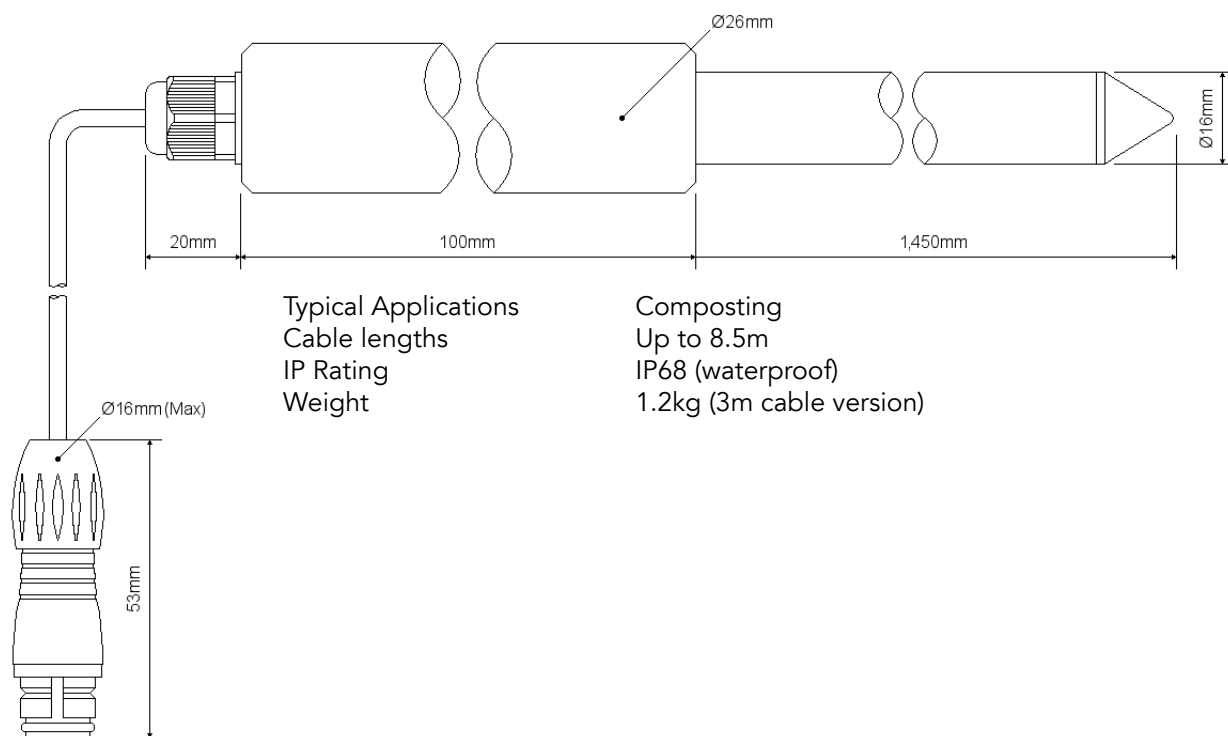
1.5, 3 & 10m

IP68 (waterproof) to a depth of 1m

150g (1.5m cable version)

45 seconds (typical to 90% FSD)

PBRF-5018-XM Heavyweight Compost Radio Probe (-40 to 125°C)



Typical Applications

Cable lengths

IP Rating

Weight

Composting

Up to 8.5m

IP68 (waterproof)

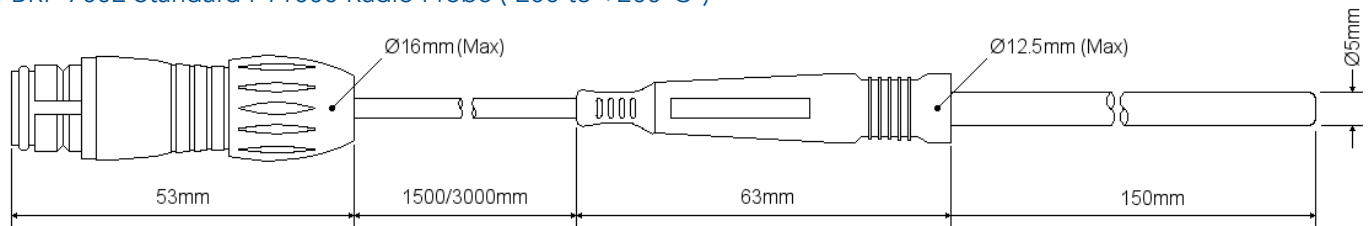
1.2kg (3m cable version)

PT1000 Probes for TGRF-3201, TGRF-3202, TGRF-3204

Below are two probes we supply for use with the above PT1000 radio loggers.

Customers can also use their own PT1000 sensors; 3-wire, class A sensors are recommended.

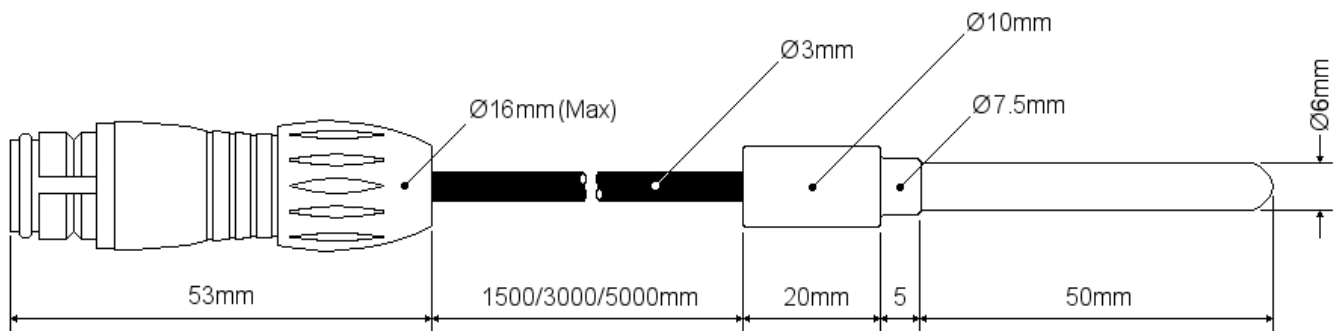
PBRF-7002 Standard PT1000 Radio Probe (-200 to +200°C*)



Typical Applications	Cryogenic storage
Cable lengths	1.5 & 3m
IP Rating	IP68 (waterproof)
Weight	70g (1.5m cable version)
Response Time (Water)	15 seconds (to 90% FSD)

*Only the tip of the probe is rated to -200/200°C, the handle of the probe is limited to -40 to 130°C

PBRF-7003 PT1000 Radio Freezer Probe (-80 to +100°C)



Typical Applications	Freezer monitoring
Cable lengths	1.5, 3 & 5m
IP Rating	IP66 (splash-proof)
Weight	65g (1.5m cable version)
Response Time (Water)	Typically 20 seconds (to 90% FSD)
Response Time (Moving Air)	Typically better than 3 minutes (to 90% FSD)

Temperature and Humidity Probes for TGRF-3500

The TGRF-3500 is supplied with a PBRF-8001 temperature and relative humidity probe.

This probe can be plugged directly into the unit or be used remotely in confined spaces and at higher temperatures with the use of an extension cable.

CAB-0025-XM: Sensor extension cable (maximum length 10m).

Calibration

Radio loggers meet the published technical specification at the time of manufacture.

The calibration of units should be checked annually against a calibrated reference meter.

A UKAS traceable certificate of calibration can be supplied for an additional charge either at the time of purchase or if the unit is returned for a service calibration.



Tinytag Radio Receivers ACSRF-3030



Tinytag Radio receivers manage the data flow from the radio loggers to the computer running the radio gateway.

The receivers have been designed for easy installation, and will automatically find their place in a radio network when turned on.

Receivers are powered from the computer they are connected to, via the USB cable, but they also have a battery back-up that will maintain the mesh network in the event of a power failure.

Multiple receivers can be used in a radio system to extend the range of a mesh network (this can be through another computer on the same LAN as the existing system, or through a direct TCP connection).

Two receivers can also be wired together to enable communications through barriers that radio waves cannot pass.

Receivers that are not connected to a computer, or that need to be fitted in a location where access for battery changes would be inconvenient, can be powered from the mains.

Features

- Self-configuring, for easy installation
- 200m range, typical (line of sight)
- Waterproof case (IP67)
- Software and LED low battery warning
- User-replaceable battery

Battery Information

The ACSRF-3030 receiver is powered by the USB connection to the computer. A battery backup is provided to maintain the radio network in the event of a power failure to the PC.

Alkaline Batteries

Unless otherwise specified, Tinytag Radio receivers are supplied with 2 x Alkaline C cell batteries.

Alkaline batteries are the preferred power option because they are readily available and inexpensive to replace.

Receivers supplied with alkaline batteries have a part number that ends with a -XK suffix and a label on the base of the unit saying "Alkaline".

Battery Type	2 x Alkaline C (LR14) Duracell Procell MN1400 or Duracell Ultra MX1400
Battery Life [†]	12 months, typical
Operational Range*	-18°C to +55°C (-0.4°F to +131°F)

The receiver will operate with equivalent battery types, but performance cannot be guaranteed.

Lithium Battery Option

A lithium battery option, that operates over a wider temperature range and can have a longer life, can also be supplied.

To comply with shipping restrictions, lithium powered loggers are supplied with reduced capacity lithium batteries.

Receivers supplied with lithium batteries have a part number that ends with a -XL suffix and a label on the base of the unit saying "Lithium".

Battery Type	1 x Saft LSH14 C 3.6V Lithium Light
Battery Life [†]	12 months, typical
Operational Range*	-40°C to +85°C (-40°F to +185°F)

Standard capacity lithium batteries can be used to give the unit a typical battery life of 24 months. The following types of battery are recommended:

- Tekcell SB-C02,
- SAFT LS26500 or
- Tadiran SL-2770

Standard capacity lithium batteries must be sourced locally by the user.

General Battery Information

[†]The battery life quoted is an indication of how long the unit will work for if a USB connection is not present. Battery life is dependent on the logging interval used, the number of loggers in a network and the operating temperature of the unit. The battery life figures quoted above are for a typical 10 minute logging interval in a network containing 25 loggers or less operating at 25°C. Continuous operation at very low temperatures will result in a shorter battery life.

*The operational range indicates the temperature limits to which the unit can be exposed for the battery type fitted.

A low battery warning will be displayed in the Tinytag Explorer software, and on the receiver, when a battery needs replacing.

Alkaline batteries should always be replaced in pairs.

If used at low temperatures receivers should be allowed to warm to room temperature before they are opened to avoid condensation forming inside them.

External Power Option

Radio receivers may optionally be powered from an external DC supply. For further information, please contact your supplier.

Physical Specification

IP Rating IP67 waterproof
Weight and Case Dimensions

P/N	WEIGHT	HEIGHT*	LENGTH	WIDTH
ACSRF-3030-XK	435g / 15.34oz	140mm / 5.51"	130mm / 5.12"	80mm / 3.15"
ACSRF-3030-XL	330g / 11.64oz			

* Including Aerial

Cables and Accessories

The ACSR-3030 is supplied with a CAB-0022 Radio receiver cable and a radio enabled copy of the Tinytag Explorer software.

The CAB-0022 is a 1.5m USB cable that connects the receiver to a computer.

A CAB-0023-XM extension cable can also be supplied, to enable the receiver to be sited remotely from the computer it is connected to.

This cable can be supplied in lengths of up to 50m.

Radio Specification

Radio Frequency	EU	869.88MHz	(-AX part numbers)
	AUS	917.8MHz	(-BX part numbers)
	USA	917.8MHz	(-CX part numbers)
Radio Power	<3mW		
Radio Range	200m, typical line of sight (75m for -CX part numbers)		
Radio License	SRD licence-free		

Approvals

Gemini Data Loggers (UK) Ltd. operates Quality and Environmental Management Systems which conform to ISO 9001 and ISO 14001. The scope of these systems covers the manufacture, design and supply of data loggers and their associated software, accessories and services.

The radio system complies with the R&TTE Directive (1999/5/EC), EN 300 220 and EN 301 489-3.

