

Perpetua[®] Power Puck[®] Solutions



This guide provides basic guidelines for the Power Puck. It does not provide instructions for detailed configuration, diagnostics, maintenance, service, troubleshooting, or installation of wireless devices. Refer to the wireless device manuals and respective Quick Start Guides for more information.

▲ WARNING

Explosions could result in death or serious injury.

- Installation of this Power Puck or intelligent power module (IPM) or both in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Review the Product Certifications section for any restrictions associated with a safe installation.
- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.
- Power Pucks and IPMs may be replaced in hazardous areas. The IPM has surface resistivity greater than one gigaohm and must be properly installed in the wireless device enclosure.
- Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

▲ CAUTION

The Power Puck is designed for use on warm or hot surfaces and will generate heat itself; a burn hazard may exist. Wear thermal gloves for protection during installation or when handling the Power Puck after installation.

Each IPM contains two “C” size primary lithium batteries. Primary lithium batteries are regulated in transportation by the U.S. Department of Transportation, and are also covered by IATA (International Air Transport Association), ICAO (International Civil Aviation Organization), and ARD (European Ground Transportation of Dangerous Goods). It is the responsibility of the shipper to ensure compliance with these or any other local requirements. Consult current regulations and requirements before shipping.

Contents

What’s in the box? page 3 Verify voltage and base temperature ... page 7
 Attach to heat source page 4 Troubleshooting page 8
 Connect to transmitter page 6 Product Certifications page 10

What's in the box?

Power Pucks for magnetic mount applications include four basic components.

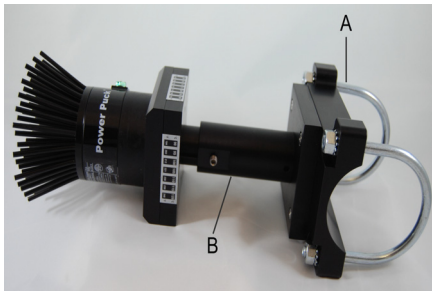
Figure 1. Magnetic Mount Components



- A. Power Puck
- B. Power cable
- C. IPM (interface to the transmitter)
- D. Cable gland

Power Pucks for pipe mount applications also include pipe adapters with sizes ranging from 1- to 12-in. nominal pipe size (NPS), and temperature-reducing heat extenders to accommodate higher pipe temperatures (see [Figure 2](#)).

Figure 2. Pipe Mount Components



- A. Pipe adapter (1- to 12-in. NPS pipe)
- B. High temperature heat extender (3- or 6-in.)

Note

The following equipment may be needed for installation:

- Protective thermal gloves
- Wire stripper/cutter
- $\frac{3}{8}$ - in. Allen wrench
- Small, slotted screw driver
- $\frac{1}{2}$ - and $\frac{9}{16}$ -in. wrench
- Adjustable wrench
- Wire brush or emery cloth
- PTFE tape

Step 1: Attach to heat source

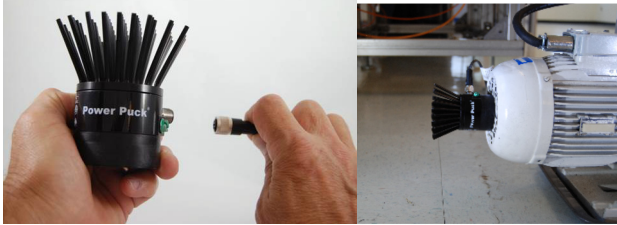
Power Pucks are mounted in two primary configurations:

- Magnetic mount
- Pipe mount

Magnetic mount Power Pucks

1. Attach the connector (4-pin M12) end of the cable to the Power Puck (see [Figure 3](#)).
2. Place the Power Puck on a flat metal surface that is less than 105 °C (220 °F) ([Figure 3](#)). A surface that is smooth, clean, and vertical, with the Power Puck mounted horizontally, provides the most efficient operation.
3. Proceed to [Connect to transmitter](#).

Figure 3. Connect Cable and Attach Power Puck to Flat Metal Surface



Pipe mount Power Pucks

Pipe mount Power Pucks include four configurations, based on the maximum variable temperature of the heat source (see [Table 1](#)).

Table 1. Pipe Mount Configurations by Temperature Category

Heat source category (maximum variable temperature)	Pipe mount configuration
-45 °C to 105 °C (-50 °F to 220 °F)	Pipe mount with adapter only (no heat extender)
106 °C to 175 °C (221 °F to 350 °F)	Pipe mount with 3-in. heat extender (no extension, insulated)
176 °C to 290 °C (351 °F to 550 °F)	Pipe mount with 6-in. heat extender (extended, insulated)
-291 °C to 450 °C (551 °F to 845 °F)	Pipe mount with 6-in. heat extender (extended, no insulation)

1. If the pipe is insulated, remove approximately six inches of insulation where the Power Puck will be installed.
2. Using a wire brush, emery cloth, or compressed air, create a clean, smooth area on the pipe where the Power Puck will be mounted.
3. (if using 6-in. heat extender) With the included Allen wrench, loosen the set screw in the heat extender and configure the extender using [Figure 4](#) and [Table 2](#).

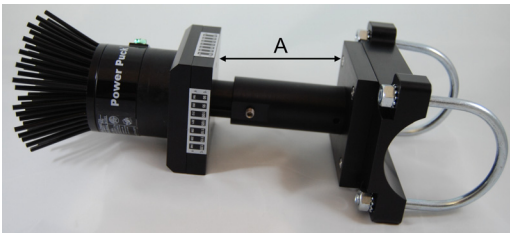
4. Remove the U-bolts and combination hex/lock nuts from the pipe adapter. Place the Power Puck and adapter assembly on the pipe in a vertical position.
5. Reinstall the U-bolts and lightly tighten the hex/lock nuts.
6. Rotate the Power Puck and adapter assembly to a horizontal position and tighten the hex/lock nuts to about 10 foot-pounds.
7. Connect the M12 connector end of the cable to the Power Puck.
8. Reinsulate the pipe, adapter base, and heat extender.

Note

With heat sources above 290 °C, do not insulate the heat extender.

9. Proceed to [Connect to transmitter](#).

Figure 4. 6-in. Heat Extender Base-to-Base Measurement



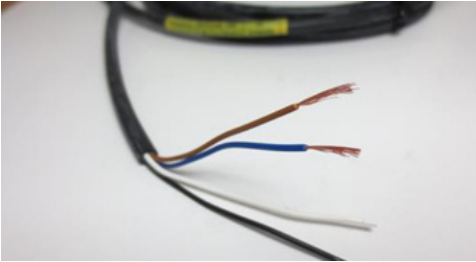
A. Base-to-base measurement

Table 2. 6-in. Heat Extender Lengths for Temperature Ranges

Heat source range (maximum variable temperature)		Base-to-base extension (insulated)	
Celsius	Fahrenheit	Centimeters	Inches
190 or less	375 or less	Fully collapsed	Fully collapsed
191-210	376-410	18.4	7.25
211-230	411-445	20.3	8.00
231-250	446-480	22.9	9.00
251-270	481-520	24.8	9.75
271-290	521-550	26.7	10.50
Heat source range (maximum variable temperature)		Base-to-base extension (not insulated)	
Celsius	Fahrenheit	Centimeters	Inches
291-320	551-610	20.3	8.00
321-350	611-660	21.6	8.50
351-380	661-715	22.9	9.00
381-410	716-770	24.1	9.50
411-440	771-825	25.4	10.00
441-450	826-845	26.0	10.25

Step 2: Connect to transmitter

1. Cut the flying lead end of the supplied cable to the desired length and trim about $\frac{1}{4}$ inch of insulation from the blue and brown leads.



2. Remove the port screw and battery cover from the transmitter.



3. Wrap the cable gland with PTFE tape and thread into port screw opening; lightly tighten the gland.



4. Feed the cable from the outside of the gland until the leads emerge inside the transmitter housing. Fold the black and white leads back on the cable and secure with electrical tape.



- With a small screwdriver, secure the blue and brown leads to the IPM (blue to positive [+] and brown to negative [0V]).



- Install the IPM in the transmitter's battery compartment, while pulling the cable through the gland to remove slack.



- Tighten the cable gland and replace the battery cover.

Step 3: Verify voltage and base temperature

It is important to verify the Power Puck's voltage and base temperature is within specification and validate the Power Puck is operating correctly. There are two ways to verify operation and two ways to verify base temperature.

Note

Power Pucks will heat fully within 30 minutes of installation.

Validating voltage

Using the transmitter's LCD display

The easiest way to validate Power Puck operation is to check the supply voltage on the transmitter LCD display. The LCD display indicates the value of several process variables, including supply voltage, shown as *SUPLY VOLTS*. Supply voltages at 6.8V or greater indicate the Power Puck is fully powering the transmitter.

Using the AMS[®] Device Manager

The supply voltage can also be monitored remotely with AMS Device Manager under *Device Variables*. Supply voltages at 6.8V or greater indicate the Power Puck is fully powering the transmitter.

Verifying base temperature

Using reusable temperature strips (pipe mount only)

Pipe mounts include two reusable temperature strips. The base temperature is indicated by the point on the scale glowing bright green. Verify the base temperature is below 105 °C (220 °F). If the temperature exceeds this value, the Power Puck must be reconfigured with a heat extender or moved to a lower temperature.

Using IR sensor or thermocouple (magnetic and pipe mount)

The base temperature of either a pipe or magnetic mount Power Puck may be verified using an IR sensor or thermocouple probe. Always take the temperature reading in close proximity to the base of the Power Puck. Verify the base temperature is below 105 °C (220 °F). If the temperature exceeds this value, the Power Puck must be reconfigured with a heat extender or moved to a lower temperature.

Troubleshooting

Once the Power Puck is connected, the transmitter's supply voltage should read 6.8 volts or greater, indicating the Power Puck is fully powering the transmitter. If the supply voltage is below 6.8 volts, check the following:

- Determine whether sufficient, consistent process heat is available for the desired update rate (reference power source lifetime tables in [Power Puck Solutions Product Data Sheet](#)).
- Check cable connections between Power Puck and wireless device.
- Check mounting surface; clean and smooth is best.

Warning on product labels

Power Puck solutions connect to Emerson transmitters using an IPM. The IPM includes a printed warning label, as shown in [Figure 5](#).

The text of the warning is as follows: “*WARNING Potential Static Hazard. Use Caution when Handling. Risk of Fire, Explosion or Severe Burn Hazard. DO NOT Recharge, Disassemble, Heat above 100°C, Incinerate or Expose Contents to Water. Li metal content approx 5g.*”

Figure 5. IPM Warning Label



Disposal/recycling of depleted IPMs

Dispose in accordance with applicable laws and regulations in your country and state.

Disposal should only be performed by authorized professionals in accordance with applicable requirements for hazardous waste transportation and disposal.

Shipping regulations

Primary lithium batteries are regulated in transportation by the U.S. Department of Transportation, and are also covered by IATA (International Air Transport Association), ICAO (International Civil Aviation Organization), and ARD (European Ground Transportation of Dangerous Goods). It is the responsibility of the shipper to ensure compliance with these or any other local requirements. Consult current regulations and requirements before shipping.

Handling considerations

Each IPM contains two “C” size primary lithium batteries.

Under normal conditions, the battery materials are self-contained and not reactive as long as the batteries and the battery pack integrity are maintained. Care should be taken to prevent thermal, electrical, or mechanical damage. Contacts should be protected to prevent premature discharge.

Use caution when handling the IPM. It may be damaged if dropped onto a hard surface. Battery hazards remain when cells are discharged.

Environmental considerations

As with any battery, local environmental rules and regulations should be consulted for proper management of spent batteries. If no specific requirements exist, recycling through a qualified recycler is encouraged. Consult the material safety data sheet for specific battery information.

Product Certifications

Power Puck Certifications

Approved Manufacturing Locations

Perpetua Power Source Technologies, Inc.—Corvallis, Oregon USA

U.S.A.

UL Intrinsically Safe

Certificate: E464513

Class I, Division 1, Groups A, B, C, and D;

Class II, Division 1, Groups E, F, and G;

Class III, Division 1; Class I, Zone 0,

AEx ia IIC T4

Canada

UL Intrinsically Safe

Class I, Division 1, Groups A, B, C, and D;

Class II, Division 1, Groups E, F, and G;

Class III, Division 1; Class I, Zone 0,

Ex ia IIC T4

Europe

ATEX Intrinsic Safety

Certificate: DEMKO 14 ATEX 1303X

Standards: EN 60079-0:2012+A11:2013

EN 60079-11:2012 EN 60079-26:2007

II1G Ex ia IIC T4 II1D Ex ia IIIC T135 °C

International

Certificate: IECEx UL 14.0083X

Standards: IEC 60079-0:2011

Ex ia IIC T4 Ga Ex ia IIIC T135 °C Da

T4: $-45\text{ °C} \leq T_a \leq +65\text{ °C}$

UL File Number: e464513

Table 3. Power Puck Safety Parameters

U_o	12.6V
I_o	19mA
P_o	59mW
C_o	1.15 μ F
L_o	98mH

IPM Certifications

Approved Manufacturing Locations

Perpetuum Ltd—Southampton, United Kingdom

North America

FM Approvals Intrinsically Safe

Certificate: 3047349

Europe

ATEX Intrinsic Safety

Certificate: Baseefa 13ATEX0062X

Standards: EN 60079-0:2009

EN 60079-11:2007

ATEX Intrinsic Safety

Certificate: Baseefa 13ATEX0062X

Standards: EN 60079-0:2009

EN 60079-11:2007

Ex ia IICT4 Ga (-40 °C to +85 °C)

International

IECEx Intrinsic Safety

Certificate: IECEx BAS 13.0036X

Standards: IEC 60079-0:2004

IEC 60079-0:2007-10

IEC 60079-11:2006

Ex ia IICT4 Ga (-40 °C to +85 °C)

Table 4. IPM Safety Parameters

Parameter	Input (from power source)	Output (to WSN)
U_o	20V	7.8V
I_o	20mA	1.84A
P_o	0.165W	0.77W
C_o	0	9.3 μ F
L_o	0	14.9 μ H

Figure 6. Perpetua Declaration of Conformity

Declaration Of Conformity



Standards to which Conformity is declared:

Application of Council Directive: Electro Magnetic Compatibility (EMC) - (2004/108/EC)

Standards to which Conformity is declared:

- EN 61000-6-2: 2005
- EN 61000-6-4: 2007
- FCC Part 15, Subpart B
- Industry Canada ICES-003
- EN61000-3-2: 2006/A1: 2009/A2: 2009
- EN61000-3-3: 2008
- Class: A

Intertek: Report Number: 101404198MPK-001, Project Number: G101404198

Application of Council Directive: European Directive 2011/65/EU (RoHS)

Standards of excellence, Ingress Protection: IP67

- Equivalency through UL PROCESS CONTROL EQUIPEMENT FOR USE IN HAZARDOUS LOCATIONS, UL 60079-11 and UL 60079-0 Sixth Edition, dated 2013-07-26

Manufacturer Name: Perpetua Power Source Technologies, Inc.

Manufacturer Address: 1749 SW Airport Avenue, Corvallis, OR 97333, USA

Type of Equipment: Power Puck Thermoelectric Energy Harvester

Model Number: 9-IS/BLACK and 5-IS/BLUE

Serial Number(s) All First year of manufacture 2014

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive and Standards, and this Declaration is supported by a Technical File located at the Factory. Conformity Assessment is consistent with the requirements of EU directives for Guidance on CE marking for professionals.

Place – Corvallis, OR, USA

Kevin Thompson (Signature)

April 24, 2014 (DATE)

Kevin Thompson (Printed Name)

VP Engineering and Products (Position)

Figure 7. Perpetuum Declaration of Conformity

Doc No: DC86



**EC Declaration of Conformity
Perpetuum Ltd**

Perpetuum declares under our sole responsibility that the product(s) listed below conform with the relevant provisions of directive 94/9/EC of 23rd March 1994.

**Product(s): Intelligent Power Module Pt No. 71008
Quantity 7 off**

Notified Body: SGS Baseefa Limited (1180)
Rockhead Business Park
Staden Lane, Buxton,
Derbyshire, SK17 9RZ

Conformity has been demonstrated with reference to the following documentation:

EC type-examination Certificate Baseefa13ATEX0062X
Quality Assurance Notification SIRA 07 ATEX M395 dated 30th Oct 2013
Marking:



II 1 GD
Ex ia IIC T4 Ga
(Ta = -40°C to +85°C)

Compliance with the Essential Health & Safety Requirements has been assessed by reference to the following standards:

EN 50079-0:2012 EN 60079-11:2012

.....
Signature Date

Terry Maynard NPI Manager, Perpetuum Ltd, Epsilon House, Enterprise Road,
Southampton Science Park, Southampton, Hampshire, SO16 7NS, United Kingdom



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