

Perpetua[®] Power Puck[®] Solutions



- Continuous, long-life power for wireless transmitters
- High transmitter update rates without battery life impact
- Intrinsically Safe Certification
- Quick installation and maintenance-free design
- Redundant power for critical applications
- Connects to heat sources from -45 °C to 450 °C
- Robust design for use in harsh environments

Power Puck energy harvesters

Product introduction

Power Pucks are electrical power generators that convert temperature differences commonly found in industrial process environments into electrical energy.

Power Pucks provide continuous, reliable thermoelectric power for wireless transmitters. They allow wireless operation at high data update rates without battery life impact, allowing more applications and environments to take full advantage of the benefits of wireless transmitters.

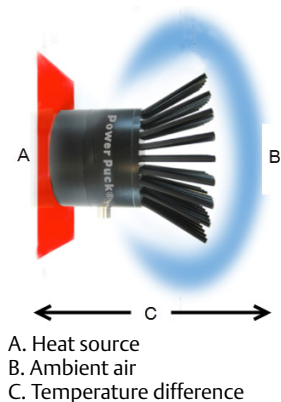
Generally, industrial equipment surfaces and pipes that are warm to the touch provide enough heat for Power Pucks to generate electricity in excess of the wireless device’s power requirements. Heat sources include motors, compressors, fans, pumps, and other rotating equipment as well as industrial process pipes with steam and process fluids.

Power Pucks interface to Emerson wireless devices using Intelligent Power Modules (IPM).

Compelling technology

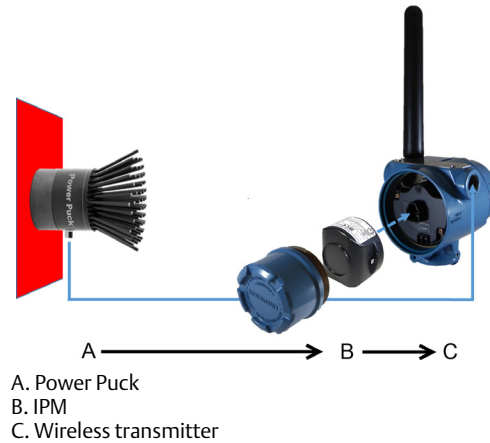
Thermoelectric power generation is a time-tested and proven technology. Temperature differences create heat flow. Much like a solar cell transforms light energy into electricity, Power Pucks use the Seebeck effect to transform the heat flowing through the device into electrical power. The same technology has delivered power reliably for deep space crafts without failure for over 50 years.

Figure 1. Converting into Energy



Power Puck solution

Figure 2. Converting into Energy



Hazardous Area Certifications

- Intrinsically Safe
- Class 1, Division 1, Groups A, B, C & D

Benefits

- Wireless update rate freedom without battery life impact
- Reduced maintenance resulting from fewer battery changes
- Improved worker safety with less time spent in hazardous locations
- Redundant power source using back-up batteries included in the IPM

Robust design

- Up to 20 years or more of power
- Designed for use in harsh environments

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Power Puck components

Figure 3. Power Puck Energy Harvester Components



- A. Power cable
- B. IPM
- C. Power Puck
- D. Cable gland

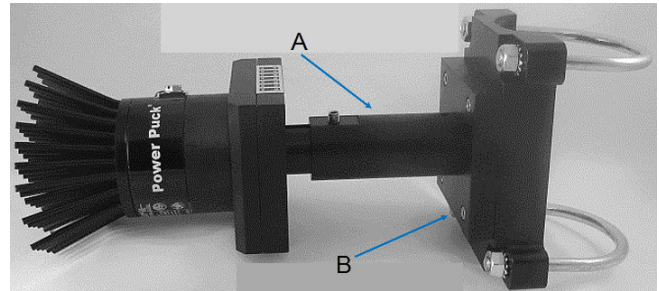
Electricity generated from the Power Puck flows to the transmitter through the IPM. The IPM ensures that electricity from the Power Puck is the primary power source for the transmitter. It supplements the Power Puck with additional power from the IPM's batteries only when required.

In most cases, a Power Puck's output power will exceed a transmitter's requirements, making the transmitter self-sustaining. Similarly, by exceeding the power requirements, Power Pucks provide power margin to withstand minor variations in the temperature of the heat source. In the event of major loss of heat to the Power Puck, for example during a process shutdown, the IPM's back-up batteries provide power to the transmitter until heat is restored.

Power Puck mounting components allow attachment to heat sources commonly found in industrial environments and with temperatures up to 450 °C.

- Magnetic mounts attach to flat magnetic heat sources.
- Pipe adapters attach to pipes and other cylindrical heat sources ranging from 1 to 12 inches in diameter.
- Heat extenders are used to reduce the temperature applied to the Power Puck when the heat source is above the maximum service temperature of the Power Puck.
- Power cable lengths vary to accommodate the distance between the heat source and the wireless transmitter. A 6-m. power cable is standard, with 10- and 20-m. cables stocked, and custom cables up to 100-m. available.

Figure 4. Mounting Components



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

Ordering Information

Multiple configurations allow Power Pucks to mount to a wide variety of industrial heat sources. All configurations are shipped pre-assembled.

Note

IPMs must be ordered in addition to the selected Power Puck configuration.

Table 1. Power Puck Ordering Information

Temperature of heat source	Configuration	Pipe diameter	Part number
-45 °C to 105 °C -50 °F to 220 °F	Power Puck with magnetic mount	N/A	RMT-OTHR-R-1447
-45 °C to 105 °C -50 °F to 220 °F	Power Puck with 2-in. pipe adapter	2-in.	RMT-OTHR-R-1440
	Power Puck with 3-in. pipe adapter	3-in.	RMT-OTHR-R-1441
105 °C to 175 °C 220 °F to 350 °F	Power Puck with 2-in. pipe adapter and 3-in. extender	2-in.	RMT-OTHR-R-1442
	Power Puck with 3-in. pipe adapter and 3-in. extender	3-in.	RMT-OTHR-R-1443
175 °C to 450 °C 350 °F to 840 °F	Power Puck with 2-in. pipe adapter and 6-in. extender	2-in.	RMT-OTHR-R-1444
	Power Puck with 3-in. pipe adapter and 6-in. extender	3-in.	RMT-OTHR-R-1445
N/A	IPM	N/A	RMT-OTHR-R-1446

The most common configurations are listed in [Table 1](#), with an expanded offering that includes:

- 1-, 4-, 6-, 8-, 10-, and 12- in. pipe adapters and custom adapters
- Nickel plated Power Pucks for use in particularly corrosive environments
- 10-, 20-meter, and custom cables up to 100 meters

Note

All expanded offerings may be ordered through Perpetua; delivery times vary.

Specifications

Power Puck

Life expectancy

Up to 20 years or more of continuous power

Environmental specifications

Maximum service temperature 220 °F (105 °C)

Minimum service temperature -50 °F (-45 °C)

Physical specifications

Maximum base diameter 2.4 inches (60mm)

Diameter, fins projected 3.9 inches (99mm)

Maximum height 4.09 inches (101mm)

Weight 0.825 pounds (374g)

Electrical connector

M12 – Eurofast

Maximum cable length 328 feet (100m)

Design standards

IP67 Certified

CEI/IEC 60529:2001, 2004/108/EC, 2011/65/EU

2011/65/EU - RoHS compliant

Electromagnetic compatibility (EMC)

EMC Directive (2004/108/EC)

EN 61000-6-2: 2005

EN 61000-6-4: 2007

FCC Part 15, Subpart B

Industry Canada ICES-003

IPM

EC Declaration of Conformity

ATEX Directive (94/9/EC)

Certificate Number Baseefa 13ATEX0062X

Equipment Group II category 1G

Ex ia IIC T4 Ga (-40 °C ≤ Ta ≤ +85 °C)

Harmonized standards: EN 60079-0:2012 EN 60079-11:2012

ATEX Notified Body for Quality Assurance

SIRA

Notification number SIRA 07 ATEX M395

Rake Lane

Eccleston

Chester

CH4 9JN

Electromagnetic compatibility (EMC)

EMC Directive (2004/108/EC)

EN 61326-2-3:2006 (EN 61326-1:2006) &

EN 301 489-17 v2.2.1 (EN 301 489-1 v1.9.2)

Performance tables

The tables below summarize power source lifetimes for the Rosemount™ 3051S Transmitter and other wireless transmitters. For example, the 3051S table shows the transmitter operating at a 4-second update rate, with the power source life increasing from 2.2 years with a battery alone to >10 years with the Power Pucks at any temperature difference greater than 25 °C. At a 40 °C temperature difference, the power source lifetime is >10 years at all update rates.

Table 2. Rosemount 3051S Wireless Pressure Transmitter

Battery only		Energy harvesting (ΔT =temperature difference)							
No EH		ΔT °C ΔT °F	20 36	25 45	30 54	35 63	40 72	50 90	60 108
1 sec	0.60		0.7	0.9	1.33	2.7	>10	>10	>10
2 sec	1.30		2.0	5.2	>10	>10	>10	>10	>10
4 sec	2.20		5.5	>10	>10	>10	>10	>10	>10
8 sec	3.70		>10	>10	>10	>10	>10	>10	>10
16 sec	5.80		>10	>10	>10	>10	>10	>10	>10
32 sec	8.60		>10	>10	>10	>10	>10	>10	>10
60 sec	10.00		>10	>10	>10	>10	>10	>10	>10

Table 3. Rosemount 3051SMV Wireless Pressure Transmitter

Battery only		Energy harvesting (ΔT =temperature difference)							
No EH		ΔT °C ΔT °F	20 36	25 45	30 54	35 63	40 72	50 90	60 108
1 sec	0.40		0.4	0.5	0.63	0.8	1.3	>10	>10
2 sec	0.70		0.9	1.2	1.95	7.3	>10	>10	>10
4 sec	1.30		2.0	5.2	>10	>10	>10	>10	>10
8 sec	2.20		5.5	>10	>10	>10	>10	>10	>10
16 sec	3.50		>10	>10	>10	>10	>10	>10	>10
32 sec	5.20		>10	>10	>10	>10	>10	>10	>10
60 sec	6.80		>10	>10	>10	>10	>10	>10	>10

Table 4. Rosemount 248 Wireless Temperature Transmitter

Battery only		Energy harvesting (ΔT =temperature difference)				
No EH		ΔT °C ΔT °F	20 36	25 45	30 54	>35 >63
1 sec	0.90		1.2	1.9	5.13	>10
2 sec	1.70		3.2	>10	>10	>10
4 sec	2.80		>10	>10	>10	>10
8 sec	4.50		>10	>10	>10	>10
16 sec	6.90		>10	>10	>10	>10
32 sec	9.70		>10	>10	>10	>10
60 sec	10.00		>10	>10	>10	>10

Table 5. Rosemount 648 Wireless Temperature Transmitter

Battery only		Energy harvesting (ΔT =temperature difference)				
No EH		ΔT °C ΔT °F	20 36	25 45	30 54	>35 >63
1 sec	0.90		1.2	1.9	5.13	>10
2 sec	1.70		3.2	>10	>10	>10
4 sec	2.80		>10	>10	>10	>10
8 sec	4.50		>10	>10	>10	>10
16 sec	6.90		>10	>10	>10	>10
32 sec	9.70		>10	>10	>10	>10
60 sec	10.00		>10	>10	>10	>10

Table 6. Rosemount 702 Wireless Discrete Transmitter

Battery only		Energy harvesting (ΔT =temperature difference)				
No EH		ΔT °C ΔT °F	20 36	25 45	30 54	>35 >63
1 sec	1.50		2.5	>10	>10	>10
2 sec	2.59		>10	>10	>10	>10
4 sec	4.10		>10	>10	>10	>10
8 sec	6.20		>10	>10	>10	>10
16 sec	8.80		>10	>10	>10	>10
32 sec	10.00		>10	>10	>10	>10
60 sec	10.00		>10	>10	>10	>10

Table 7. Rosemount 2160 Wireless Vibrating Fork Liquid Level

Battery only		Energy harvesting (ΔT =temperature difference)				
No EH		ΔT °C ΔT °F	20 36	25 45	30 54	>35 >63
1 sec	1.20		1.8	3.9	>10	>10
2 sec	2.10		4.9	>10	>10	>10
4 sec	3.20		>10	>10	>10	>10
8 sec	4.90		>10	>10	>10	>10
16 sec	6.90		>10	>10	>10	>10
32 sec	9.10		>10	>10	>10	>10
60 sec	10.00		>10	>10	>10	>10

Table 8. Rosemount 3308A Wireless Guided Wave Radar Level

Battery only		Energy harvesting (ΔT =temperature difference)				
No EH		ΔT °C ΔT °F	20 36	25 45	30 54	>35 >63
1 sec	N/A		N/A	N/A	N/A	N/A
2 sec	N/A		N/A	N/A	N/A	N/A
4 sec	1.30		2.0	5.2	>10	>10
8 sec	2.30		6.1	>10	>10	>10
16 sec	4.10		>10	>10	>10	>10
32 sec	6.60		>10	>10	>10	>10
60 sec	9.50		>10	>10	>10	>10

Table 9. Rosemount Analytical 6081 Wireless Transmitter

Battery only		Energy harvesting (ΔT =temperature difference)				
No EH		ΔT °C ΔT °F	20 36	25 45	30 54	>35 >63
1 sec	1.00		1.4	2.4	>10	>10
2 sec	1.20		1.8	3.9	>10	>10
4 sec	1.60		2.8	>10	>10	>10
8 sec	2.00		4.4	>10	>10	>10
16 sec	2.50		7.8	>10	>10	>10
32 sec	3.20		>10	>10	>10	>10
60 sec	4.00		>10	>10	>10	>10

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 °C ≤ Ta ≤ +65 °C

UL File Number: e464513

Table 10. Power Puck Safety Parameters

U_o	12.6V
I_o	19mA
P_o	59mW
C_o	1.15µF
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

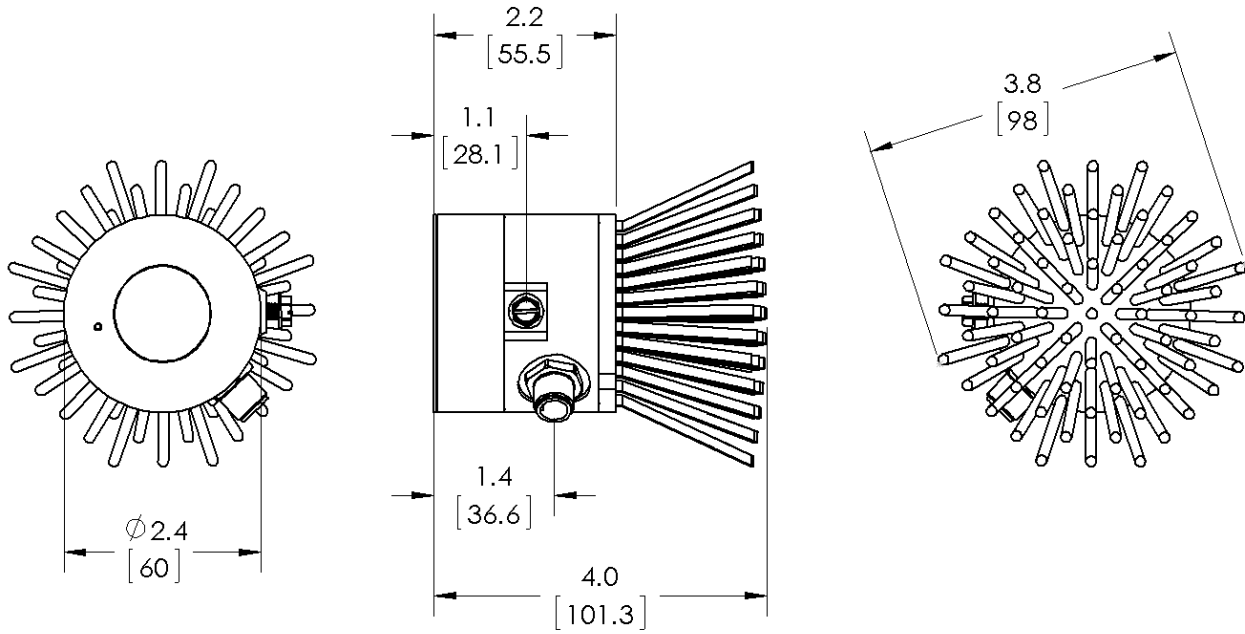
IECEX Intrinsic Safety
Certificate: IECEX BAS 13.0036X
Standards: IEC 60079-0:2004
IEC 60079-0:2007-10
IEC 60079-11:2006
Ex ia IICT4 Ga (-40 °C to +85 °C)

Table 11. 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	9.3µF
L _o	0	14.9µH

Dimensional Drawings

Figure 5. Power Puck Dimensions



Dimensions are in inches (millimeters).

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