

Energy Harvesting Switches offer Maintenance Free, Simple to Install, Long Lifetime alternative to conventional Electro-Mechanical types

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In our increasingly connected world, there is growing demand for low energy consumption, simple to use flexible data transmission. ZF has developed an innovative wireless and batteryless Energy Harvesting Technology which can provide cost effective switching solutions in a wide range of environments and applications. Energy Harvesting applications can be found in almost every market sector, including industrial installations, building automation, smart home and medical. Designed for global use, the technology enables ZF to offer an excellent alternative to wired or battery-powered solutions. Compatible with multiple wireless protocols, the products are suitable for global use across countless markets and applications. As there is no need to change or dispose of batteries, the solution is both environmentally friendly and maintenance-free.

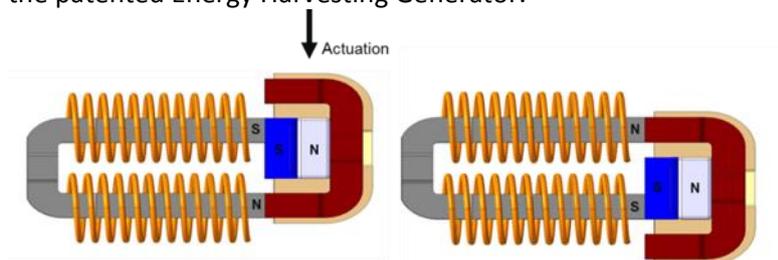
The ZF Energy Harvesting product portfolio includes a stand-alone generator and a number of packaged switch variants including a rocker switch for actuation by hand and a snap-action switch for mechanical actuation by a machine or proximity switch.

Wireless receivers to work with ZF push button modules are available as either a self-contained packaged module, or as a “RF stamp” for OEM use complete with wire antenna and without an enclosure. The receiver module has multiple output options (i.e. RS232 TTL) and is suitable for wall-mounting.

Activating any switch variant provides data transfer via RF technology, eliminating the need for expensive and complex cabling and increasing flexibility of use. Flexible pairing allows the operation of several switches with one receiver and vice-versa. Each switch has a “Unique ID” providing clear identification when operating several switches at once. Up to three “telegrams” are sent per actuation, with pseudo-random timing to assure robust data transmission.

Energy Harvesting Generator Technology overview

Based on the inductive principle, the direction change of the magnetic field in an inductive magnetic circuit transforms mechanical energy into the electrical energy required to send an RF signal from the patented Energy Harvesting Generator.



This technology is then packaged and assembled, together with an operating mechanism, resulting in the raw form of the standard product – the generator

ZF's Energy Harvesting Generator:



The Energy Harvesting Generator is available separately for OEM applications with or without the RF electronics and integrated into ZF's Energy Harvesting switch modules. It consists of a coil and a magnet block which is actuated when a mechanical force acts vertically on the end of the generator's lever. A patented mechanism causes the magnetic block to move down abruptly (switching) and a positive pulse is created by reversing the polarity of the coil. When the lever is released, the system returns to the initial position (resetting) by means of the mechanism and a negative pulse is created. The energy produced is used to transmit a wireless signal indicating operation of the switch.

ZF's Energy Harvesting Generator with Wireless Transmitter Electronics:



The initial energy pulse created provides the harvested electrical power output, which is then transformed and averaged over time by internal energy management components to create the supply voltage for the wireless transmitter. The small size, high efficiency and long life expectancy (minimum 1,000,000 cycles) makes the product, in either form factor, ideal for installation in tight spaces without having to take in to consideration routine maintenance.

Technical Features of the Generator and RF Generator Module:

Feature	Specification
Size	20.1 x 7.3 x 14.3 mm
Energy Output	min 330 μ J (per half cycle)
Lifetime	min 1.000.000 switching cycles
Actuation Force	13 N (momentary) 5 N (latching, lever length depend.)
Temperature Range	-40°C to 85°C
Frequency Bands	868.3 MHz, 915.0 MHz
Protocol	ZF Protocol 2.0
RF Distance	up to 300 m (open space) up to 30 m (in building)
Protection	IP40

In addition to pre-assembled switch modules for general HMI purposes use two switch modules have been designed specifically for building automation, a 1-way and a 2-way pushbutton.

Wireless Push Buttons:



Technical Features of Wireless Push Buttons:

Feature	Specification
Design	Universally adaptable customer-specific design parts (mechanically compatible to EnOcean module)
Lifetime	min 100.000 switching cycles
Temperature Range	-20°C to 45°C
Frequency Bands	868.3 MHz, 915.0 MHz, 2.4 GHz
Protocol	KNX Ready EnOcean ZigBee Greenpower ZF Protocol 2.0 Customer specific

Key benefits of using energy harvesting powered switching systems include; wireless signal output, no power source or battery required, energy saving, low system installation and maintenance costs, flexible system design, long lifetime, simple installation, maintenance free and eco-friendly.

Typical applications include; smart home light switch or handheld controller, RF enabled bulb control, wall socket outlet or adapter control, window handle linked to room thermostat, building and office automation, industrial control limit switch, control pedal, emergency stop actuator, machine remote control.

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