



**Temposonics**

AN AMPHENOL COMPANY

# SENSOR SELECTOR GUIDE

Magnetostrictive Linear Position Sensors

**Industrial**





## MEETING THE CHALLENGES OF INDUSTRIAL APPLICATIONS

Metal Working • Wood Processing • Testing Machines • Drive Technology • Machine Tools  
Packaging & Printing Machineries • Paper & Glass Processing • Food & Beverage Plants  
Plastics & Rubber Processing • Textile Production • Renewable Energy • Power Generation

**Temposonics also offers solutions for Mobile Hydraulics (off-highway vehicles) and Liquid Level applications.**

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## COMPANY

Temposonics is recognized as an industry leader in sensing technologies and solutions. These sensors and transmitters permit high-precision and dynamic position and/or speed measurement in state-of-the-art automation and safety-relevant systems. With a versatile and ever-increasing product portfolio and a focus on superior regional support, Temposonics cooperates closely with customers, to optimize performance and reduce downtimes.

Outstanding quality associated with practical know-how ensures that customers achieve utmost productivity and success. Continuous research, development and production of sensor systems constantly enable new solutions for measuring tasks in the industrial, mobile hydraulics as well as process technology fields to be created.

Temposonics is part of Amphenol Corporation (NYSE: APH). Amphenol is one of the largest manufacturers of interconnect products in the world. The company designs, manufactures and markets electrical, electronic and fiber optic connectors, coaxial and flat-ribbon cable, and interconnect systems. As sensor solutions manufacturer, Temposonics matches the portfolio of the group of companies that are all part of Amphenol, enabling customers to benefit from an extended, complementary product selection.

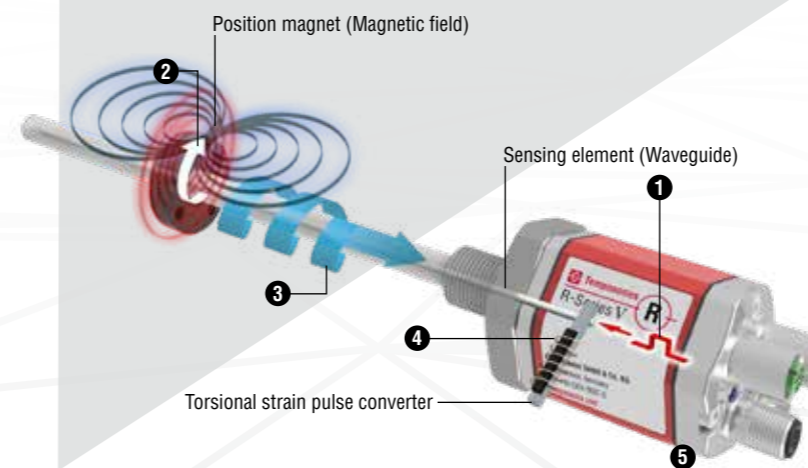
**Pioneers and innovators since 1975.**

## MEASURING TECHNOLOGY

The absolute, linear position sensors provided by Temposonics rely on the company's proprietary Temposonics® magnetostrictive technology, which can determine position with a high level of precision and robustness.

Each Temposonics position sensor consists of a ferromagnetic waveguide, a position magnet, a strain pulse converter and supporting electronics. The magnet, connected to the object in motion in the application, generates a magnetic field at its location on the waveguide. A short current pulse is applied to the waveguide. This creates a momentary radial magnetic field and torsional strain on the waveguide. The momentary interaction of the magnetic fields releases a torsional strain pulse that propagates the length of the waveguide. When the ultrasonic wave reaches the end of the waveguide it is converted into an electrical signal. Since the speed of the ultrasonic wave in the waveguide is precisely known, the time required to receive the return signal can be converted into a linear position measurement with both high accuracy and repeatability.

The technology, based on magnetostriction, does not rely on moving parts and is not exposed to mechanical stress. Therefore, the sensors exhibit considerably longer lifespans and much higher reliability when compared to other technologies, even in harsh working conditions. Furthermore, since the output from sensors with magnetostrictive technology corresponds to an absolute position, rather than a relative value, it is not required to recalibrate sensors.



### Measurement Cycle

- 1 Current pulse generates magnetic field
- 2 Interaction with position magnet field generates torsional strain pulse
- 3 Torsional strain pulse propagates
- 4 Strain pulse detected by converter
- 5 Time-of-flight converted into position

# THE NEW GENERATION

Temposonics® R-Series V position sensors are ready for Industry 4.0 applications. They support a variety of smart features that enable users to retrieve additional information from inside the application.

Users of the absolute, non-contact position sensors benefit from an improved performance as they have a higher resistance against shock, vibration, and high temperatures than ever before.

The backward compatibility of the R-Series V allows users to simply replace the current with the new generation of sensors. This means that also existing applications can benefit from the new features of Temposonics® R-Series V.



## TRUST IN WHAT YOU KNOW. NOW EVEN BETTER.

“Temposonics® R-Series V is the follow up to our current fourth generation. Based on our long-standing experiences, R-Series V is the next step in the innovative evolution of our sensors. By maintaining the qualities we are well-known for and at the same time pushing the boundaries, we are able to provide our customers the best R-Series we ever made.”

*André Beste, Technical Marketing Manager*

# SUPERIOR PERFORMANCE

Have a challenging application?  
Need reliable performance combined with  
resistance to high temperature, dirt and vibration?

Extreme demands require extraordinary solutions. Temposonics responds to this with an extensive range of measuring stroke options, simultaneous measurement of multiple magnets, smart electronic designs with built-in diagnostics, innovative housing concepts and a wide variety of controller interfaces. Our Temposonics® magnetostrictive technology is maximized with powerful electronics. The robust designs guarantee maximum reliability, high-precision position measurements and long-term operation in the harshest environments.

*Success where others fail.*



# 30 POSITIONS

# 20 METERS



# COMPACT SOLUTIONS

Need a reliable sensing solution designed for limited space or difficult access?

In line with your application requirements, Temposonics delivers solutions which fit your exact needs in terms of design and performance – from ultra-low profiles and detached electronics to compact hazardous area approved housings. In food & beverage, plastics, textiles and other industries, Temposonics® technology guarantees maximum productivity.

*Always the smartest solution.*



# MAXIMUM SAFETY

## Explosive environment or a dangerous area?

The position sensors from Temposonics are the first choice when it comes to meeting hazardous area standards – including ATEX- (Europe), UK Ex (England, Wales, Scotland), NEC- (USA), CEC- (Canada), EAC Ex- (EAC market), IECEX- (global market), KCs- (South Korea), CCC (Chinese market) and the Japanese approval for use in Class I, II, III, Division 1, Division 2 and Zone 0/1, Zone 1, Zone 2, Zone 21 and Zone 22. Optimized for applications where there is potential for exposure to flames and caustic substances, as well as the possibility of explosive atmospheres, our sensors are highly suited to implementation in chemical plants, offshore oil/gas rigs and other applications of this kind.

*Maximum safety for machines and their operators.*



# INNOVATIVE TECHNOLOGY

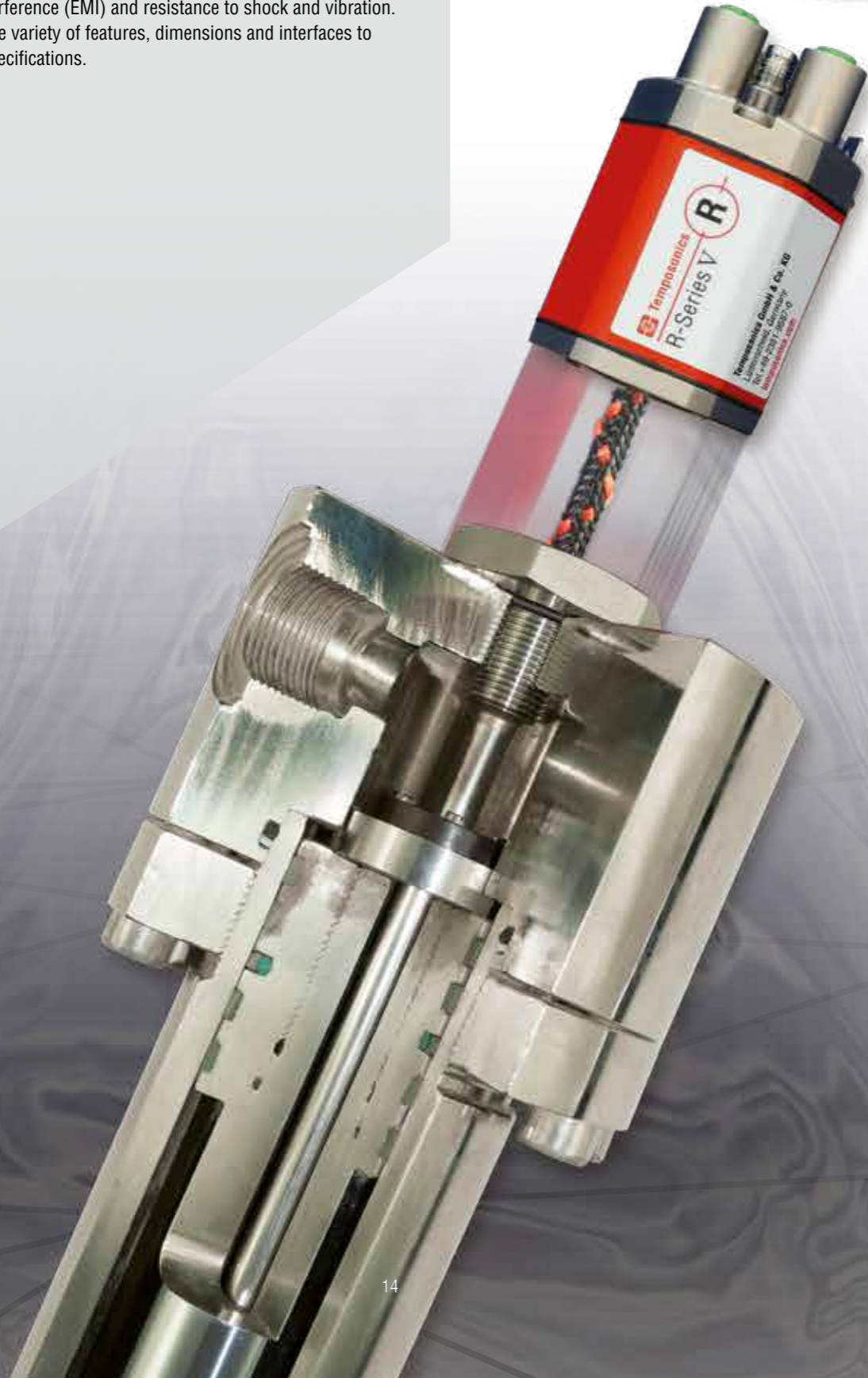
Our mission at Temposonics is to provide outstanding quality and application knowledge. We focus on understanding your challenges and delivering the best sensor solution to let you attain the highest level of productivity. Our resources are dedicated to the continual development of new products and delivering unparalleled application-oriented solutions with agility. It is no coincidence that our R&D is one of the largest team within our organization. .

*Trust the experts.*



# IN-CYLINDER APPLICATIONS

The rod-style sensor models from Temposonics are designed for direct stroke measurement inside prepared hydraulic or pneumatic cylinders. High performance, durability and value have made our Temposonics® sensors the standard for in-cylinder applications in the fluid power industry. In addition, these sensors feature high degrees of linearity, immunity to electromagnetic interference (EMI) and resistance to shock and vibration. We offer an extensive variety of features, dimensions and interfaces to match your exact specifications.



## MODULAR DESIGN

At the head of our sensors, a threaded flange and O-ring allow the device to be mounted and sealed into a port opening in the cylinder end cap. Alternatively, some sensor designs enable direct embedding of the complete sensor (including the supporting electronics) inside the cylinder. Here the sensor's pressure-resistant rod fits into a bore that is drilled through the center of the piston head and rod assembly. The position magnet is mounted on the top of the piston head or installed in a shallow counter-bore within the piston head.

### **Modular, environmentally friendly design**

The modular design of the R-Series V, R-, G- and GB-Series devices allows for easy replacement of the sensing element and electronics without breaking the cylinder's high pressure seal. This not only prevents leaks from the cylinder port, but also significantly reduces maintenance costs and downtime. Temposonics® technology is mounted inside cylinders across a broad range of industry sectors – from steel rollers to wood plants, from food processing to renewable energy.



**SERIES QUICK GUIDE**

<b>E-Series</b>	<b>G-Series</b>	<b>GB-Series</b>	<b>R-Series V</b>	<b>R-Series</b>	<b>T-Series</b>
Compact Solutions	High Durability	Innovative Design	The New Generation	Superior Performance	Rugged Design

**FEATURES**

	E-Series	G-Series	GB-Series	R-Series V	R-Series	T-Series
Velocity measurement	•			•	•	
Multi-position measurement	•	•		•	•	•
Programmable sensor parameters		•	•	•	•	•
Diagnostic LEDs		•		•	•	
Redundant version		•			•	

**OUTPUT**

	E-Series	G-Series	GB-Series	R-Series V	R-Series	T-Series
Analog – Current	•	•	•	•	•	•
Analog – Voltage	•	•	•	•	•	
Start/Stop	•	•				
PWM		•				
SSI	•		•	•	•	•
Profibus					•	
CANbus	•				•	•
DeviceNet					•	
EtherCAT®				•	•	
EtherNet/IP™				•	•	
POWERLINK				•	•	
PROFINET				•	•	
IO-Link	•					

**MINIMUM STROKE LENGTH**

	E-Series	G-Series	GB-Series	R-Series V	R-Series	T-Series
25 mm (1 in.)			•	•	•	•
50 mm (2 in.)	•	•				

**MAXIMUM STROKE LENGTH**

	E-Series	G-Series	GB-Series	R-Series V	R-Series	T-Series
1500 mm (60 in.)	ER					
2540 mm (100 in.)	EH, EE	GTE			RT4	
2900 mm (114 in.)		GT2/GT3				
3000 mm (118 in.)	EP, EL, EP2, ET					
3250 mm (128 in.)			GB			
5080 mm (200 in.)		GP			RDV, RP, RD4	
6350 mm (250 in.)					RP5	
7620 mm (300 in.)		GH			RH5, RH, RS	TH
20000 mm (787 in.)					RFV, RF	

**CERTIFICATES**

CE	UK CA	UK CA	UL/cUL	ATEX	PS	CLASSIFIED	IEC	EAC	EAC Ex	KCs	Japa-nese Approval	CCC	ClassNK
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**E-SERIES**

	CE	UK CA	UK CA	UL/cUL	ATEX	PS	CLASSIFIED	IEC	EAC	EAC Ex	KCs	Japa-nese Approval	CCC	ClassNK
EH	•	•		•					•					
ET	•	•	•		•	•		•	•				•	
EP	•	•		•					•					
EL	•	•		•					•					
EP2	•	•		•					•					
ER	•	•		•					•					
EE	•	•							•					

**G-SERIES**

	CE	UK CA	UK CA	UL/cUL	ATEX	PS	CLASSIFIED	IEC	EAC	EAC Ex	KCs	Japa-nese Approval	CCC	ClassNK
GH	•	•		•	•				•					
GP	•	•		•	•				•					
GT2/GT3	•	•							•					
GTE	•	•	•		•			•	•				•	

**GB-SERIES**

	CE	UK CA	UK CA	UL/cUL	ATEX	PS	CLASSIFIED	IEC	EAC	EAC Ex	KCs	Japa-nese Approval	CCC	ClassNK
GB	•	•							•					

**R-SERIES V**

	CE	UK CA	UK CA	UL/cUL	ATEX	PS	CLASSIFIED	IEC	EAC	EAC Ex	KCs	Japa-nese Approval	CCC	ClassNK
RH5	•	•		•					•					
RP5	•	•		•					•					
RFV	•	•		•					•					
RDV	•	•		•					•					

**R-SERIES**

	CE	UK CA	UK CA	UL/cUL	ATEX	PS	CLASSIFIED	IEC	EAC	EAC Ex	KCs	Japa-nese Approval	CCC	ClassNK
RH	•	•		•					•					
RP	•	•		•					•					
RF	•	•							•					
RD4	•	•							•					
RT4	•	•							•					
RS	•	v							•					

**T-SERIES**

	CE	UK CA	UK CA	UL/cUL	ATEX	PS	CLASSIFIED	IEC	EAC	EAC Ex	KCs	Japa-nese Approval	CCC	ClassNK
TH (Analog)	•	•	•		•	•		•	•	•	•	•	•	•
TH (SSI, CANbus)	•	•	•		•	•		•	•	•	•	•	•	•

**HPH FOR G-/R-SERIES**

	CE	UK CA	UK CA	UL/cUL	ATEX	PS	CLASSIFIED	IEC	EAC	EAC Ex	KCs	Japa-nese Approval	CCC	ClassNK
GH	•	•		•	•	•		•	•	•	•	•	•	•
RH	•	•		•		•		•	•	•	•	•	•	•
RH5	•	•		•		•		•	•	•	•	•	•	•

# SAVE YOUR TIME FOR THE THINGS YOU LOVE.

...trust the experts!

Have you ever thought about how much time you're wasting waiting for adequate support or your order?

Our commitment at Temposonics is to consistently deliver quality products on time to meet your schedules and provide first-class service. Trust in our continuous product development of high-performance position sensors and rely on our highly qualified personnel.

At Temposonics, we live by the promise of unparalleled service that enables us to take all available means to exceed your expectations. Our goal is to support you optimizing your productivity and we love the idea to make you save your valuable time.

**Your Temposonics Team**



# E-SERIES

(EH, ET, EP, EL, EP2, ER, EE)

The Temposonics® E-Series are very compact sensor models suitable for situations where space-constrained mounting is a critical factor. Temposonics offers different designs to meet the needs of various industrial applications.

This series features three rod models for in-cylinder integration: EH, ET, EE (embedded in cylinder) and three profile models with a slim housing: EP, EL and EP2. On the EP2 sensor, the position magnet can travel along the entire flat housing profile.

The ER sensor has an aluminum cylinder with a guided driving rod which contains both the sensor element and the electronics. The position is detected via the solid extractable driving rod. Temposonics® E-Series IO-Link now available with multi-position measurement. These sensors can now detect the position of up to eight magnets or the position and the velocity of up to four magnets simultaneously.

Typical applications for E-Series sensors are plastics processing, food & beverage processing, control systems and packaging.

## Output (resolution)

	EH	ET	EP/EL	EP2	ER	EE
Current	Infinite	16 bit*	Infinite	Infinite	Infinite	Infinite
Voltage	Infinite	16 bit*	Infinite	Infinite	Infinite	-
Start/Stop	**	**	**	**	**	-
SSI	20 µm	5 µm	20 µm	20 µm	20 µm	-
CANopen	10 µm	-	10 µm	10 µm	10 µm	-
IO-Link	5 µm	-	5 µm	5 µm	5 µm	-

## Operating conditions

Temperature	EH/EP/EL/EP2/ER:	-40...+75 °C (-40...+167 °F)
	ET (Analog):	-40...+85 °C (-40...+185 °F)
	ET (SSI):	-40...+90 °C (-40...+194 °F)
	ET (Start/Stop):	-40...+105 °C (-40...+221 °F)
	EE:	-40...+85 °C (-40...+185 °F)
Shock test	100 g (single shock), IEC standard 60068-2-27	
Vibration test	EH/EP/EL/EE:	15 g/10...2000 Hz
	ET:	20 g/10...2000 Hz
	EP2:	8 g/10...2000 Hz
	ER:	5 g/10...2000 Hz
	IEC standard 60068-2-6 (excluding resonant frequencies)	

## Design

Stroke length	EH/EE:	50...2540 mm (2...100 in.)
	ET/EP/EL/EP2:	50...3000 mm (2...118 in.)
	ER:	50...1500 mm (2...60 in.)

## Accuracy

Linearity	≤ ±0.02 % F.S.
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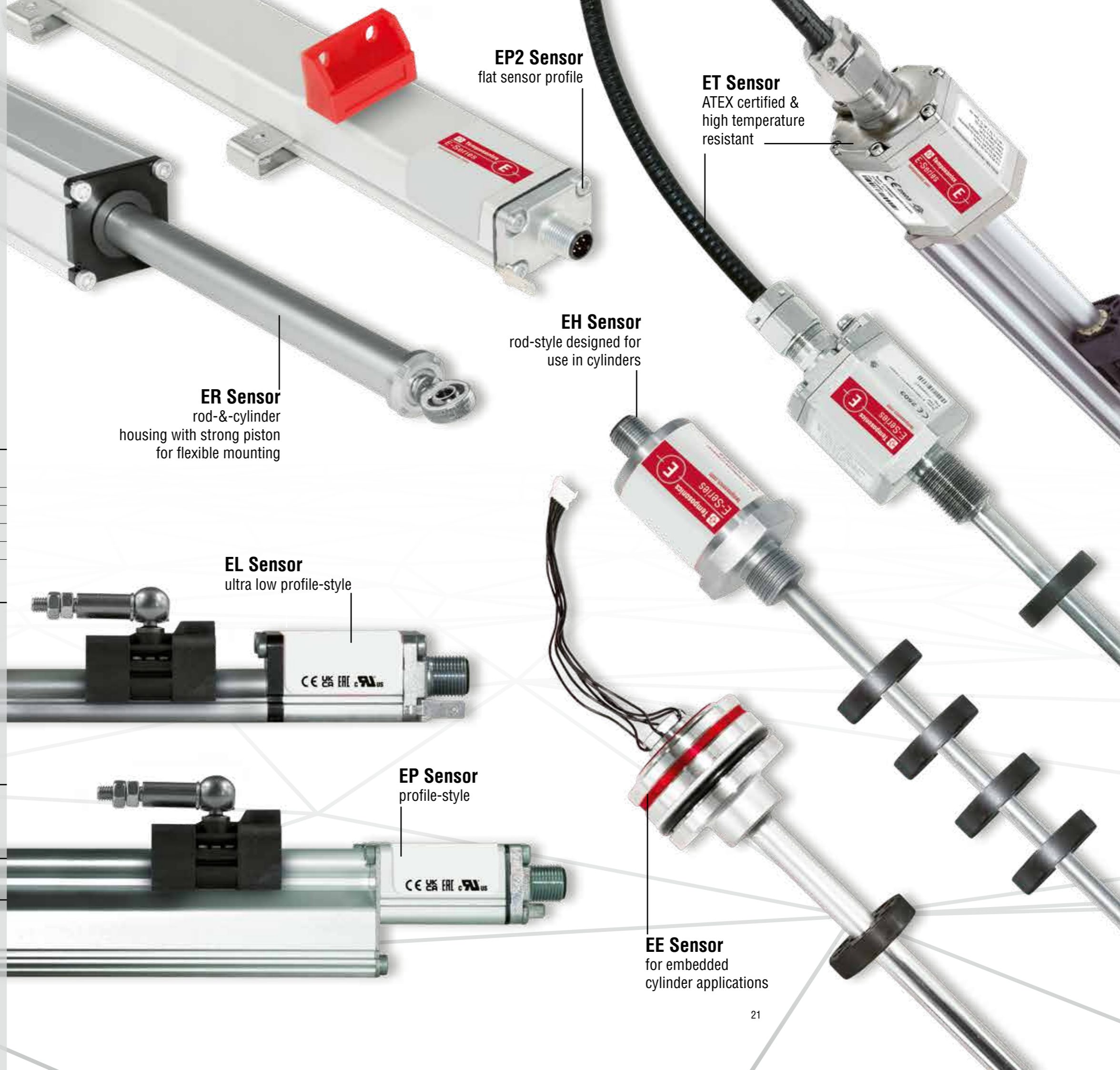
## Electrical connection

Operating voltage	+24 VDC (-15/+20 %)
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\* Minimum 1 µm depending on stroke length

\*\* Controller dependent

More information available at:  
www.temposonics.com



**EP2 Sensor**  
flat sensor profile

**ET Sensor**  
ATEX certified &  
high temperature  
resistant

**EH Sensor**  
rod-style designed for  
use in cylinders

**ER Sensor**  
rod-&-cylinder  
housing with strong piston  
for flexible mounting

**EL Sensor**  
ultra low profile-style

**EP Sensor**  
profile-style

**EE Sensor**  
for embedded  
cylinder applications

# G-SERIES

## (GH, GP, GT2/GT3, GTE)

The Temposonics® G-Series provides high durability and accurate position measurement solutions in harsh industrial settings. The sensor element is installed in a pressure-resistant stainless steel rod or aluminum profile. A double-shielded housing protects the electronics and offers excellent EMI immunity.

The GT2/GT3 and GTE models feature multiple independent measuring systems contained in one compact housing. Each measuring system has its own channel with sensor element, power and evaluation electronics and output signal. The GTE model is embedded in a cylinder for added robustness. Example applications include control valves, fluid cylinders, turbine pitch control, ship control systems and floodgates.

### Output (resolution)

	GH	GP	GT2/GT3	GTE
Current	Infinite	Infinite	Analog	Infinite
Voltage	Infinite	Infinite	Analog	Infinite
Start/Stop	*	*	–	–
PWM	*	*	–	–

### Operating conditions

Temperature	GH/GP:	–40...+80 °C (–40...+176 °F)
	GT2/GT3:	–40...+75 °C (–40...+167 °F)
	GTE:	–20...+75 °C (–4...+167 °F)
Shock test	100 g (single shock), IEC standard 60068-2-27	
Vibration test	GH**:	15 g/10...2000 Hz
	GP:	15 g/10...2000 Hz
	GT2/GT3:	5 g/10...2000 Hz
	GTE:	10 g/10...2000 Hz
	IEC standard 60068-2-6 (excluding resonant frequencies)	

### Design

Stroke length	GH:	50...7620 mm (2...300 in.)
	GP:	50...5080 mm (2...200 in.)
	GT2/GT3:	50...2900 mm (2...114 in.)
	GTE:	50...2540 mm (2...100 in.)

### Accuracy

Linearity	< ±0.02 % F.S.
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### Electrical connection

Operating voltage	+24 VDC (–15/+20 %)
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\* Controller dependent

\*\* Option: High vibration resistant

More information available at:  
[www.temposonics.com](http://www.temposonics.com)



Floating magnet

GTE Sensor  
 embedded rod-style with  
 redundant measurement

GP Sensor  
 profile-style

GT2/GT3 Sensor  
 rod-style with dual  
 or triple redundant  
 measurement

GH Sensor  
 rod-style designed  
 for use in cylinders

## GB-SERIES

### With threaded flange (GB-M, GB-T) or pressure fit flange (GB-M, GB-T)

The Temposonics® GB-Series is designed to be incorporated into hydraulic cylinders, such as those typically used in power generation plants. The flat, compact electronics housing facilitates deployment in restricted spaces.

The operational advantages of these sensors are: high pressure resistance (the GB-J sensor offers up to 800 bar operating pressure), strong immunity to EMI and ability to operate in temperatures up to +100 °C (+212 °F). High durability and increased resistance to rust is achieved by using 316L stainless steel (GB-N model). GB-Series sensors can be programmed using a hand-programmer unit, through the USB port.

The GB with threaded flange (GB-M/GB-T) offers further advantages such as a sensor electronics housing with its electrical connection that can be rotated 360 degrees to easily achieve the necessary connection orientation. If needed, the sensor element and electronics can be replaced while the flange is still installed in the cylinder. This means that the hydraulic circuit is not interrupted which results in lower maintenance costs and reduced downtime.

#### Output (resolution)

Current	16 bit
Voltage	16 bit
SSI	5 µm

#### Operating conditions

Temperature	-40...+100 °C (-40...+212 °F)
Shock test	100 g (single shock), IEC standard 60068-2-27
Vibration test	15 g/10...2000 Hz IEC standard 60068-2-6 (excluding resonant frequencies)

#### Design

Stroke length	25...3250 mm (1...128 in.)
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#### Accuracy

Linearity	< ±0.02 % F.S.
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#### Electrical connection

Operating voltage	+24 VDC (-15/+20 %)
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More information available at:  
[www.temposonics.com](http://www.temposonics.com)

360°



**GB Sensor  
with threaded flange**  
Sensor element & electronics  
can be easily replaced

**GB Sensor  
with pressure fit flange**  
high pressure rod-style  
for high operating temperature

# R-SERIES V

## The new generation

(RH5, RP5, RFV, RDV)

Temposonics® R-Series V is the successor to our current fourth generation. The new sensors have higher resistance to vibration and high temperatures, are ready for Industry 4.0 and fit perfectly into existing applications.

The new Industry 4.0 features for all outputs offer users unique advantages, as they provide additional information about the process in addition to the pure process data (position/speed). Status and statistical data are recorded and processed during operation and can be used to better understand the processes within the application.

In combination with the increased performance and improved robustness, the user is offered the certainty that existing applications work even more reliably and that future requirements are already being met.

### Output (resolution)

	RH5	RP5	RFV	RDV
Current	16 bit	16 bit	16 bit	16 bit
Voltage	16 bit	16 bit	16 bit	16 bit
SSI	0.1 µm	0.1 µm	0.1 µm	0.1 µm
EtherCAT®	0.5 µm	0.5 µm	0.5 µm	0.5 µm
EtherNet/IP™	1 µm	1 µm	1 µm	1 µm
POWERLINK	0.5 µm	0.5 µm	0.5 µm	0.5 µm
PROFINET	0.5 µm	0.5 µm	0.5 µm	0.5 µm

### Operating conditions

Temperature	-40...+85 °C (-40...+185 °F)
Shock test	RH5/ RP5: 150 g/11 ms
	RFV: 100 g/6 ms
	RDV: 100 g/11 ms
	IEC standard 60068-2-27
Vibration test	RH5/ RP5: 30 g/10...2000 Hz
	RFV: 5 g/10...2000 Hz
	RDV: 10 g/10...2000 Hz
	IEC standard 60068-2-6 (excluding resonant frequencies)

### Design

Stroke length	RH5:	25... 7620 mm (1...300 in.)
	RP5:	25... 6350 mm (1...250 in.)
	RFV:	150...20,000 mm (6...787 in.)
	RDV:	25... 5080 mm (1...200 in.)

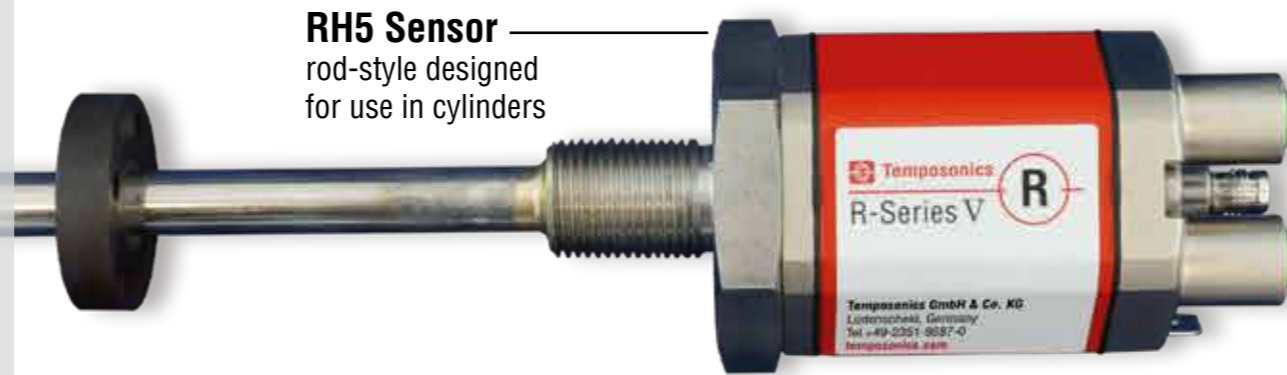
### Accuracy

Linearity deviation	RH5/ RP5/ RDV:	< 0.01 % F.S. (minimum ± 50 µm)
	RFV:	< ± 0.02 % F.S. (Minimum ± 100 µm)

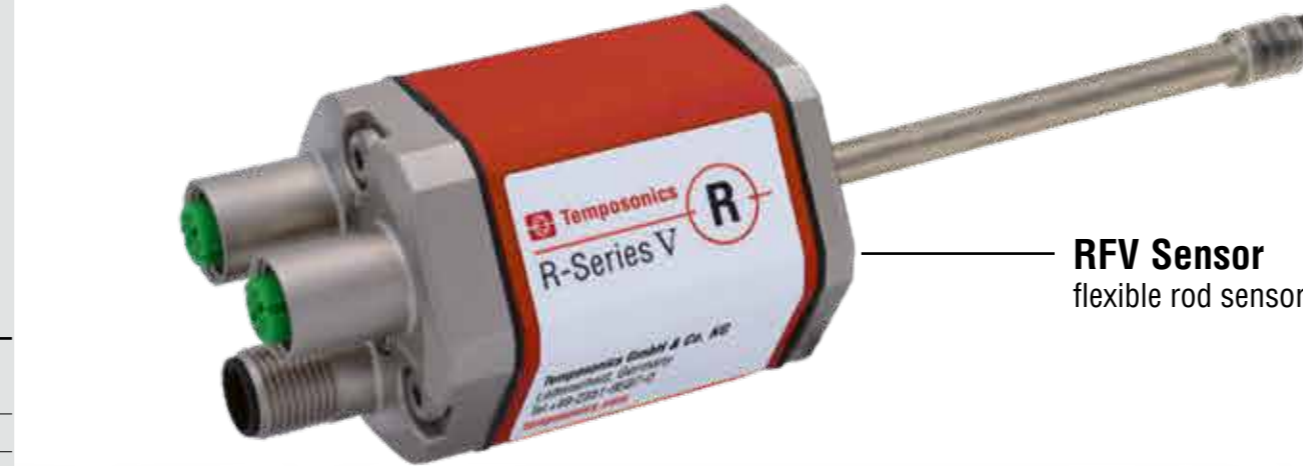
### Electrical connection

Operating voltage	+12...30 VDC ± 20 % (9.6...36 VDC)
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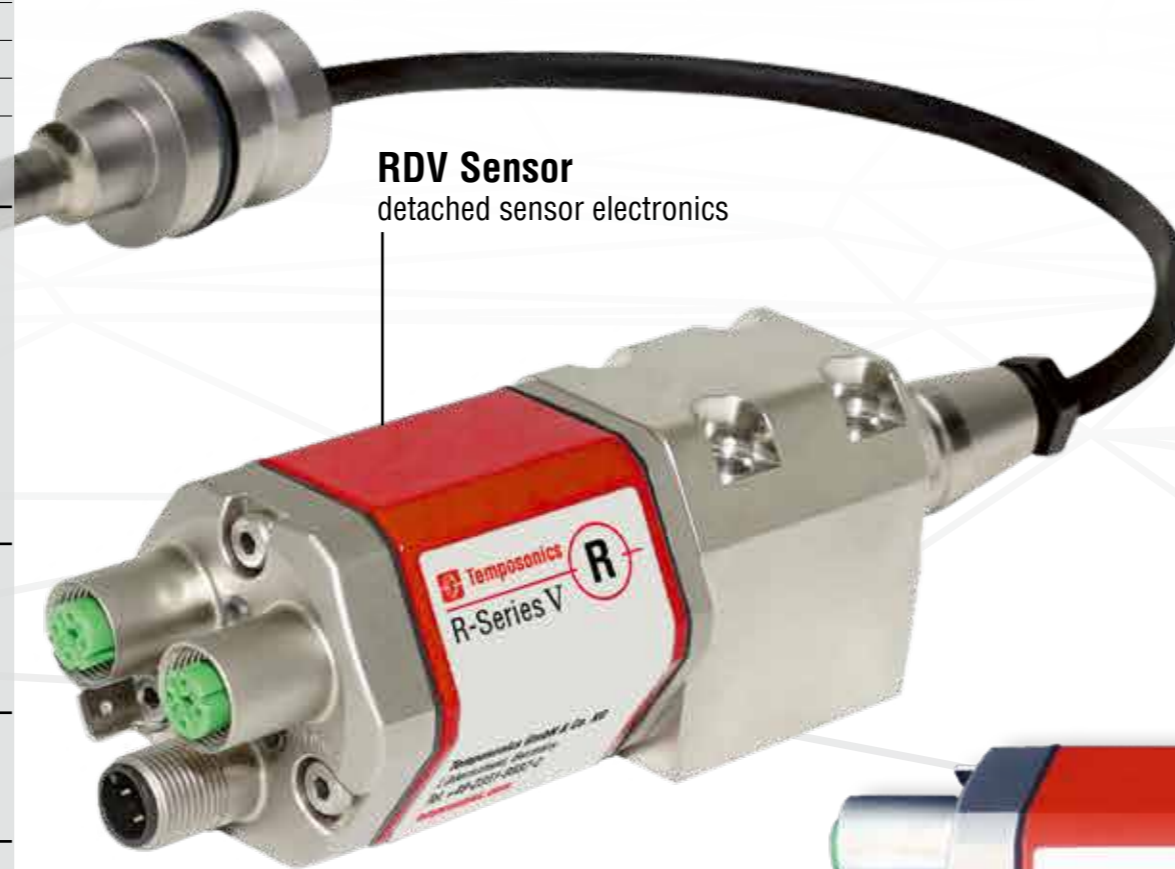
More information available at:  
www.temposonics.com



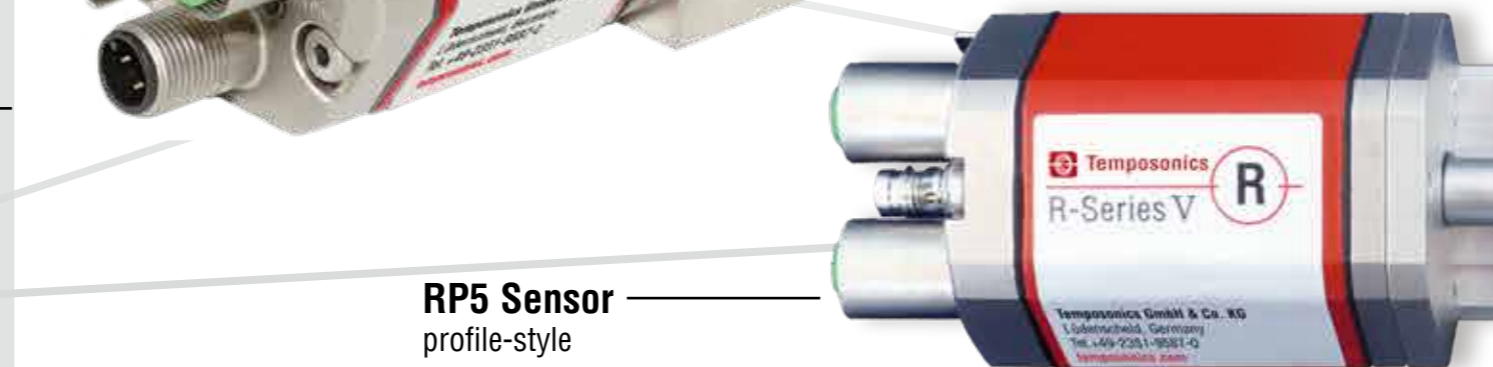
**RH5 Sensor**  
rod-style designed  
for use in cylinders



**RFV Sensor**  
flexible rod sensor



**RDV Sensor**  
detached sensor electronics



**RP5 Sensor**  
profile-style

## TempoLink® Smart Assistant for R-Series V

The TempoLink® smart assistant supports the integration of the sensor into the application and the transfer of additional information to the user. With the assistant, the user can call up data such as the current sensor status, the internal sensor temperature, the number of operating hours and the distance travelled by the position magnets. An evaluation of these values can help in the creation of predictive maintenance plans and thus lead to an optimization of production.

The connection and communication between the Temposonics® R-Series V sensor and the TempoLink® smart assistant is via the power supply. The assistant can transfer the various sensor parameters wirelessly or via the USB port while the sensor continues to operate.

Because the TempoLink® smart assistant provides its own WiFi access point, WiFi-enabled devices such as smartphones, tablets or laptops can access it very easily. No software installation or app is required, nor is access to a company network.



## TempoGate® Smart Assistant for R-Series V

The TempoGate® smart assistant is designed for the permanent integration into control cabinets and supports all R-Series V sensors with smart diagnostics and operating statistics. Once connected via power supply, the sensors and the assistant can communicate bidirectional. Via the integrated OPC UA server, this data can also be transmitted to other devices via OPC UA during operation. This allows the user to monitor additional sensor parameters and combine this information with other machine status data. In addition, the data can be transferred via LAN or WiFi to a graphical user interface on the smartphone, tablet or computer.

The Temposonics® R-Series V position sensors, in conjunction with the TempoGate® smart assistant, provide the operator with detailed information to improve machine performance, optimize maintenance cycles and detect problems early to increase machine operating availability.



# R-SERIES

## (RH, RP, RF, RD4, RT4, RS)

The Temposonics® R-Series features the highest performance, accuracy and reliability in magnetostrictive linear position sensors designed for advanced motion control implementations. With a variety of housing styles and electrical interfaces, the R-Series can be integrated into a wide range of applications. They have a modular construction and are extremely robust. The double-shielded design assures the best immunity against EMI. Whether it is a rod version (RH), profile version (RP), has detached electronics (RD4), built-in redundancy (RT4) or a flexible rod (RF), the R-Series is a highly compelling sensor solution. For extremely harsh environments Temposonics offers the RS sensor with IP69K protective housing.

### Output (resolution)

	RH	RP	RF	RD4	RT4	RS
Current	-	-	16 bit	16 bit	-	-
Voltage	-	-	16 bit	16 bit	-	-
SSI	-	-	2 µm	1 µm	1 µm	-
Profibus	1 µm	1 µm	1 µm	1 µm	-	1 µm
CANbus	2 µm	2 µm	2 µm	2 µm	-	2 µm
DeviceNet	2 µm	2 µm	2 µm	2 µm	-	-
EtherCAT®	-	-	1 µm	1 µm	-	-
EtherNet/IP™	-	-	1 µm	1 µm	-	-
POWERLINK	-	-	1 µm	1 µm	-	-
PROFINET	-	-	1 µm	1 µm	-	-

### Operating conditions

Temperature	-40...+75 °C (-40...+167 °F)					
Shock test	100 g (single shock), IEC standard 60068-2-27					
Vibration test	RH/ RP*	15 g/10...2000 Hz				
	RF:	5 g/10... 150 Hz				
	RD4:	10 g/10...2000 Hz				
	RT4:	5 g/10...2000 Hz				
	IEC standard 60068-2-6 (excluding resonant frequencies)					

### Design

Stroke length	RH:	25... 7620 mm (1...300 in.)
	RP/RD4:	25... 5080 mm (1...200 in.)
	RF:	150...20000 mm (6...787 in.)
	RT4:	25... 2540 mm (1...100 in.)
	RS:	50... 7620 mm (1...300 in.)

### Accuracy

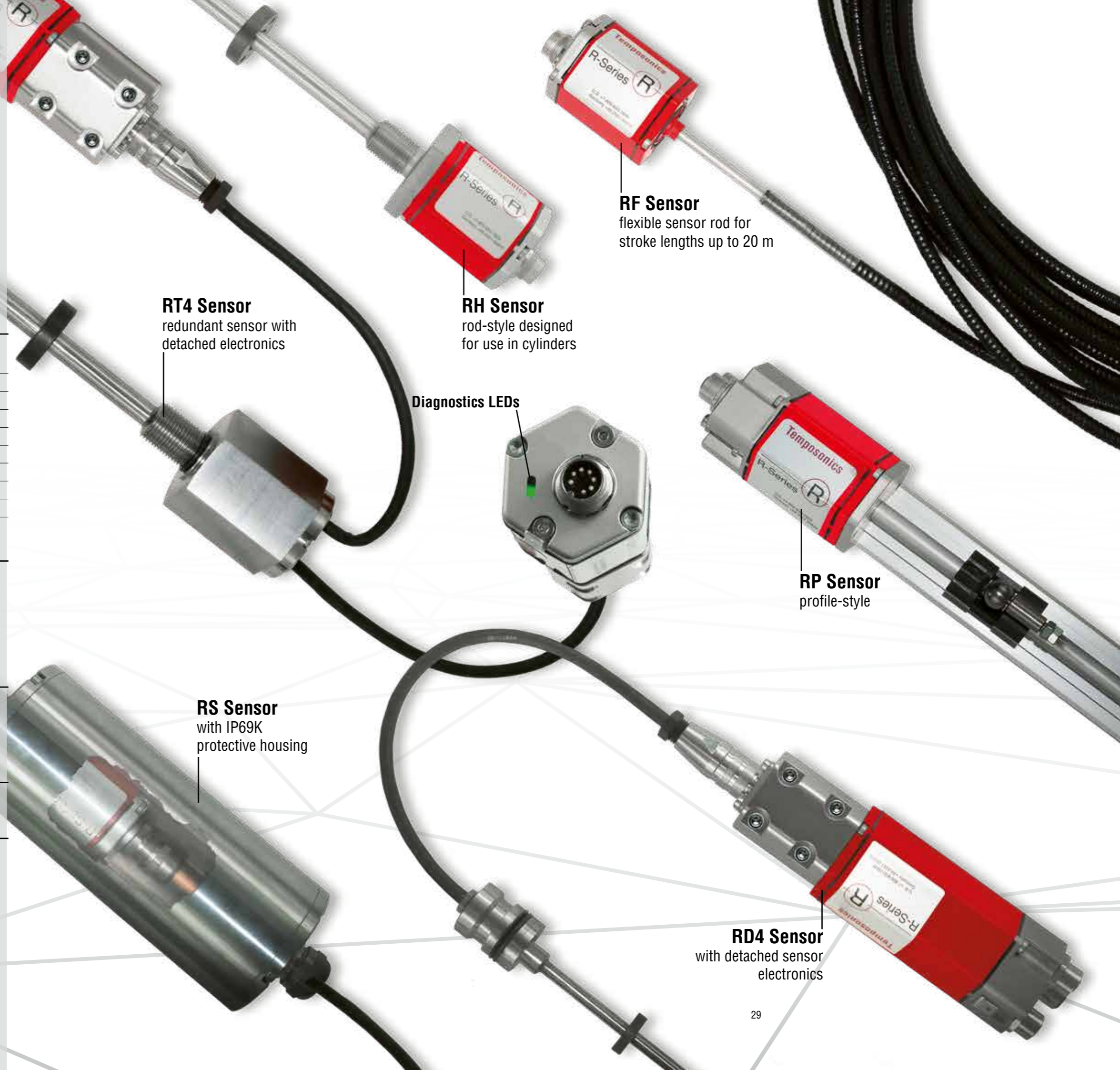
Linearity	RH/ RP/ RS:	< ±0.01 % F.S.
	RF/ RD4/ RT4:	< ±0.02 % F.S.

### Electrical connection

Operating voltage +24 VDC (-15/+20 %)

\*Option: High vibration resistant

More information available at:  
www.temposonics.com



**RT4 Sensor**  
redundant sensor with detached electronics

**RH Sensor**  
rod-style designed for use in cylinders

**RF Sensor**  
flexible sensor rod for stroke lengths up to 20 m

**Diagnostics LEDs**

**RP Sensor**  
profile-style

**RS Sensor**  
with IP69K protective housing

**RD4 Sensor**  
with detached sensor electronics

# T-SERIES (TH)

The Temposonics® T-Series sensors are designed for hazardous working environments, where they may have to deal with flames, caustic substances and potentially explosive atmospheres (such as chemical plants, offshore oil/gas rigs, etc.).

The T-Series carries the ATEX certification for Europe, the UK Ex certificate for market in England, Wales and Scotland, the NEC and CEC certificates for the US and Canada, the EAC Ex certificate for the EAC market, the IECEx certificate for the global market, the KCs certificate for the South Korean market, the CCC certificate for the Chinese market as well as the Ex certificate for Japan for use in Class I, II, III, Division 1, Division 2 and Zone 0/1, Zone 1, Zone 2, Zone 21 and Zone 22.

## Output (resolution)

Current	Minimum 16 bit
SSI	Minimum 0.5 $\mu$ m
CANbus	Minimum 2 $\mu$ m

## Operating conditions

Temperature	Standard: -40...+75 °C (-40...+167 °F)
Shock test	100 g (single shock), IEC standard 60068-2-27
Vibration test	15 g/10...2000 Hz IEC standard 60068-2-6 (excluding resonant frequencies)
Ingress protection	IP66/IP67/IP68/IP69 and NEMA 4 (NEMA 4x)

## Design

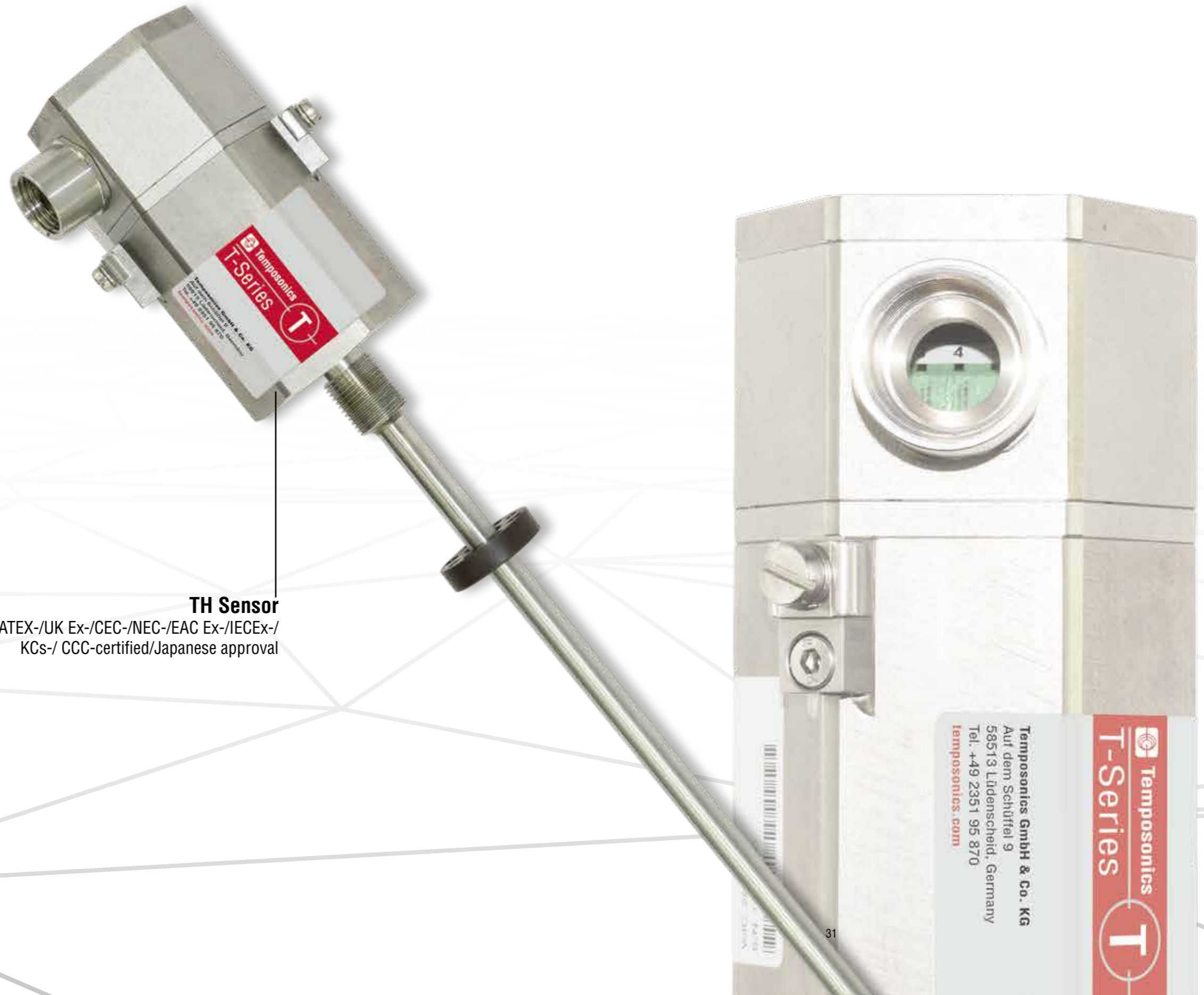
Stroke length	25...7620 mm (1...300 in.)
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## Accuracy

Linearity	< $\pm$ 0.01 % F.S.
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## Electrical connection

Operating voltage	+24 VDC (-15/+20 %)
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### TH Sensor

ATEX-/UK Ex-/CEC-/NEC-/EAC Ex-/IECEx-/  
KCs-/ CCC-certified/Japanese approval

More information available at:  
[www.temposonics.com](http://www.temposonics.com)

Temposonics GmbH & Co. KG  
Auf dem Schüffel 9  
58513 Lüdenscheid, Germany  
Tel. +49 2351 95 870  
[temposonics.com](http://temposonics.com)

Temposonics  
T-Series  
T



# HAZARDOUS AREAS

Temposonics responds to the user's need of maximum safety with sensor models specifically designed for applications found in hazardous areas (type of protection: flameproof, increased safety, protection by enclosure, non-sparking electrical equipment and sealed device).

## G-Series GH/GP

Stroke length	50...1650 mm (2...65 in.)
Marking	II 3G Ex ec IIC T4 Gc II 3D Ex tc IIIC T101°C Dc
Operating temperature	-20 °C (-4 °F) ≤ Ta ≤ 75 °C (+167 °F)
IP ingress protection	GH: IP67/GP: IP65
Outputs	Analog & Start/Stop

## G-Series GTE

Marking	II 3G Ex nA IIC T4 Gc
Operating temperature	-20...+75 °C (-4...+167 °F)
IP ingress protection	IP64
Output	Analog

## HPH (G-/R-Series/R-Series V)

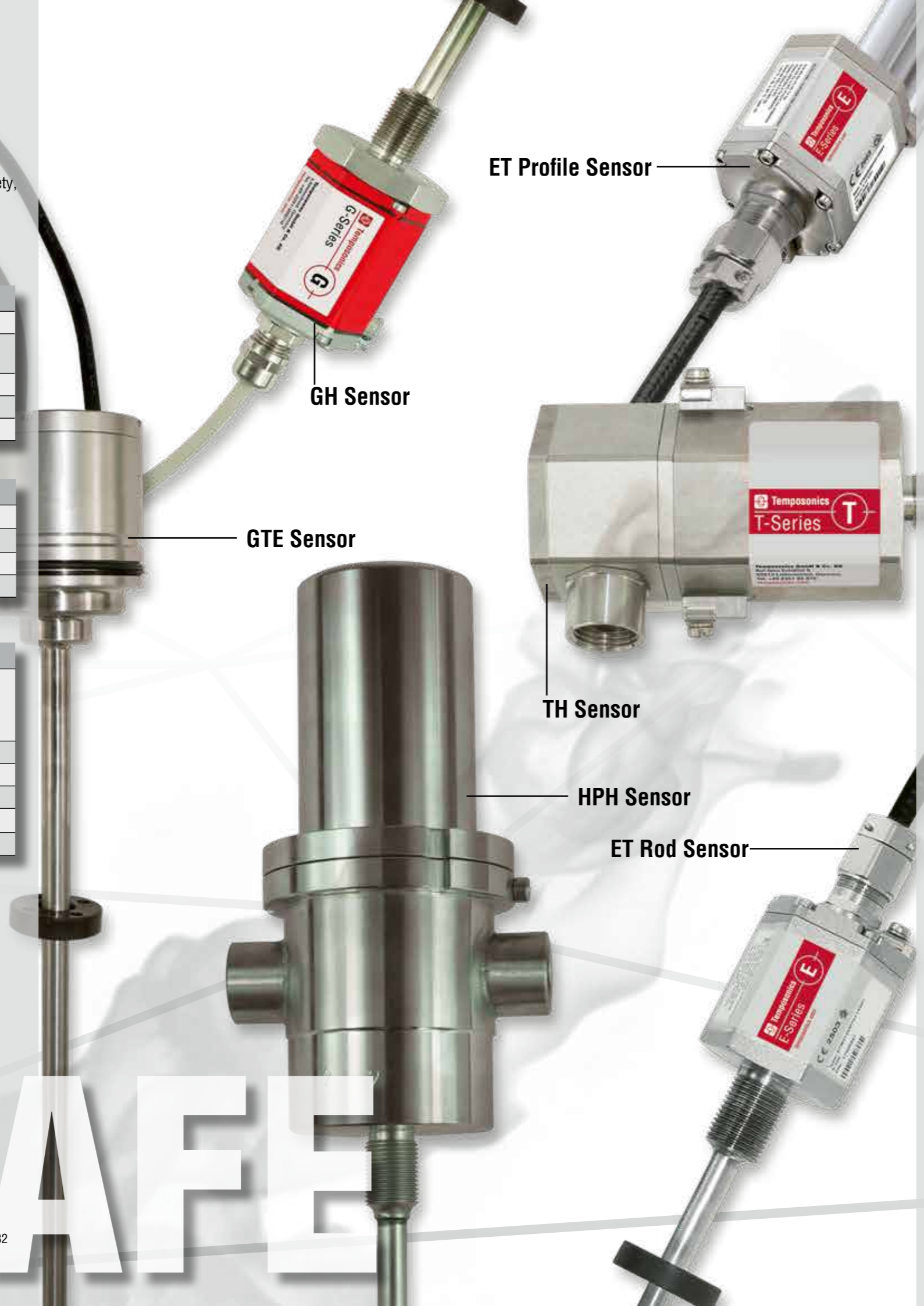
Marking	II 2G Ex db IIC T5 Gb II 2D Ex tb IIIC T100°C Db Class 1, Div 1, Groups A, B, C, D
Operating temperature	-40...+75 °C (-40...+167 °F)
IP ingress protection	IP68
Outputs G-Series	Analog, Start/Stop & PWM
Outputs R-Series	Profibus, CANbus & DeviceNet
Outputs R-Series V	Analog & SSI

## T-Series TH

Marking	Enclosure type D/G: ATEX, IECEx, UK Ex: II 1/2G Ex db IIC T4 Ga/Gb II 1G/2D Ex tb IIIC T130°C Ga/Db Ga/Gb Ex db IIC T4 X Ex tb IIIC T130°C Db X Ex d IIC T4 Ex tb IIIC T130°C Ex d IIC T4 Ex tD A21 IP66/67 T130°C Japanese approval: Ex d IIC T4 Ga/Gb Ex t IIIC T130°C Db ClassNK approved: 19A037 Enclosure type G: Class I Div. 1 Groups A, B, C, D T4 Class II/III Div. 1, Groups E, F, G T130°C Class I Zone 0/1 AEx d/Ex d IIC T4 Class II/III Zone 21 AEx tb/Ex tb IIIC T130°C Group A is not approved for Canada Enclosure type E: ATEX, IECEx, UK Ex: II 1/2G Ex db eb IIC T4 Ga/Gb II 1G/2D Ex tb IIIC T130°C Ga/Db Ga/Gb Ex db eb IIC T4 X Ex tb IIIC T130°C Db X Ex d e IIC T4 Ex tb IIIC T130°C Ex d IIC T4 Ex tD A21 IP66/67 T130°C Japanese approval: Ex d e IIC T4 Ga/Gb Ex t IIIC T130°C Db
Operating temperature	-40 °C (-40 °F) ≤ Ta ≤ 75 °C (+167°F)
IP ingress protection	IP66/IP67/IP68/IP69 and NEMA 4 (NEMA 4X)
Outputs	Analog, CANopen & SSI

## E-Series ET

Marking	II 3G Ex nC IIC T4 Gc II 3D Ex tc IIIC T130 °C Dc Class I/II/III Div 2 T4 ABCDFG Class I Zone 2 T4 IIC Zone 22 AEx tc/Ex tc IIIC T130 Dc
Operating temperature	-40 °C (-40 °F) ≤ Ta ≤ +75 °C (+167 °F) (Analog) -40 °C (-40 °F) ≤ Ta ≤ 85 °C (+185 °F) (Analog) -40 °C (-40 °F) ≤ Ta ≤ 105 °C (+221 °F) (Start/Stop) -40 °C (-40 °F) ≤ Ta ≤ 194 °C (+381 °F) (SSI)
IP ingress protection	IP66/IP68
Outputs	Analog, Start/Stop & SSI



ET Profile Sensor

GH Sensor

GTE Sensor

TH Sensor

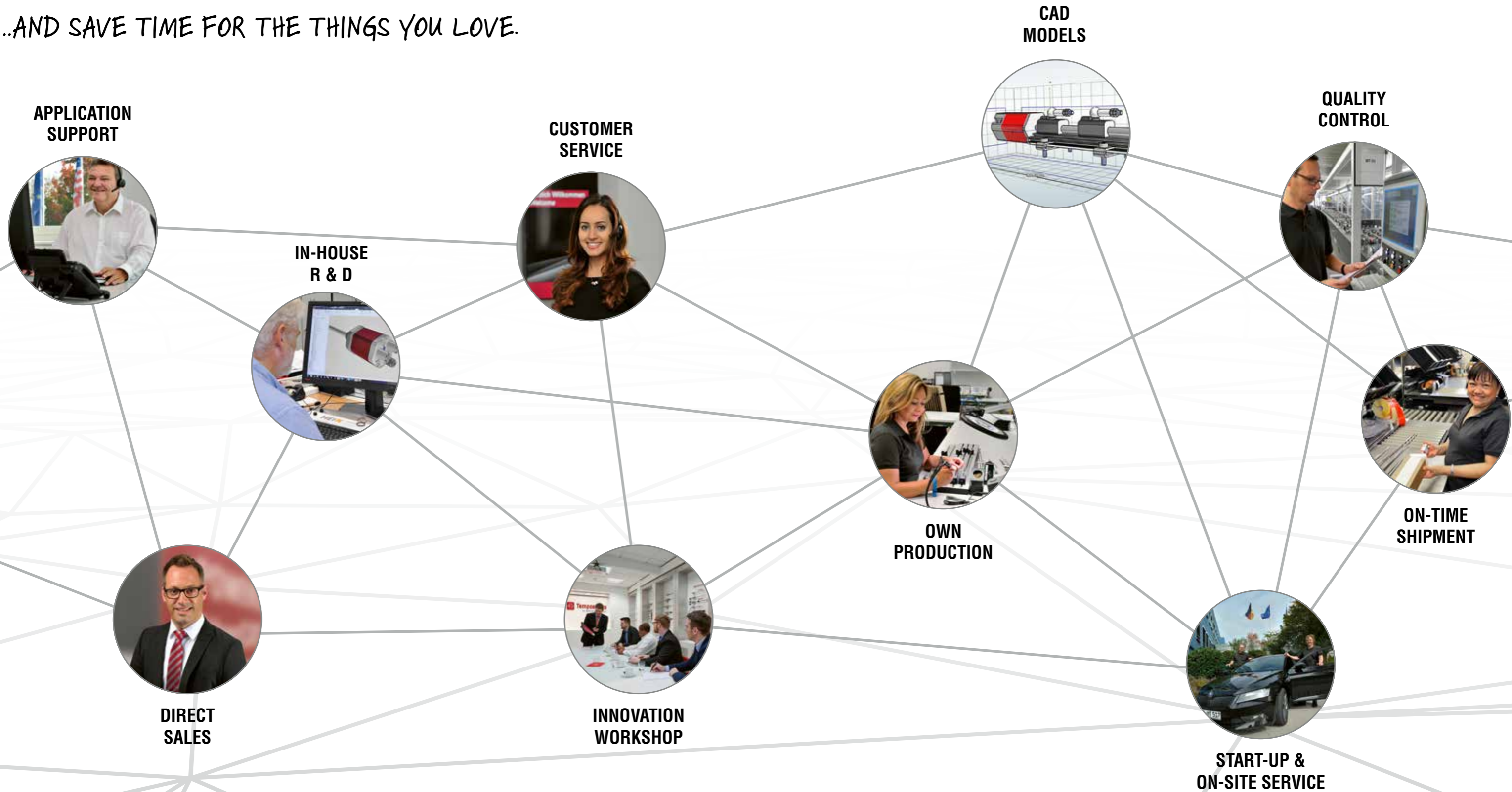
HPH Sensor

ET Rod Sensor



# TRUST THE EXPERTS

...AND SAVE TIME FOR THE THINGS YOU LOVE.



**UNITED STATES**  
**Temposonics, LLC**  
Americas & APAC Region  
3001 Sheldon Drive  
Cary, N.C. 27513  
Phone: +1 919 677-0100  
E-mail: info.us@temposonics.com

**GERMANY**  
**Temposonics**  
**GmbH & Co. KG**  
EMEA Region & India  
Auf dem Schüffel 9  
58513 Lüdenscheid  
Phone: +49 2351 9587-0  
E-mail: info.de@temposonics.com

**ITALY**  
Branch Office  
Phone: +39 030 988 3819  
E-mail: info.it@temposonics.com

**FRANCE**  
Branch Office  
Phone: +33 6 14 060 728  
E-mail: info.fr@temposonics.com

**UK**  
Branch Office  
Phone: +44 79 21 83 05 86  
E-mail: info.uk@temposonics.com

**SCANDINAVIA**  
Branch Office  
Phone: + 46 70 29 91 281  
E-mail: info.sca@temposonics.com

**CHINA**  
Branch Office  
Phone: +86 21 2415 1000 / 2415 1001  
E-mail: info.cn@temposonics.com

**JAPAN**  
Branch Office  
Phone: +81 3 6416 1063  
E-mail: info.jp@temposonics.com

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