Temposonics
AN AMPHENOL COMPANY

Data Sheet

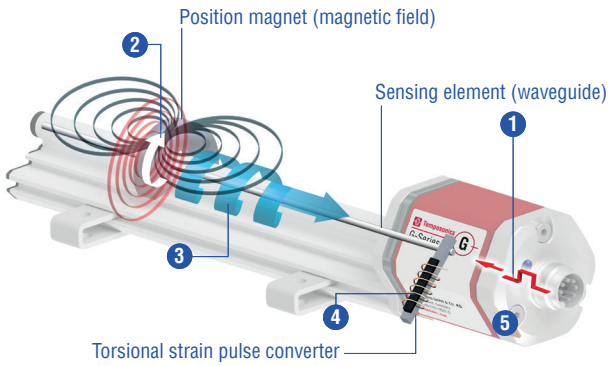
G-Series V GP5 Digital

Magnetostrictive Linear Position Sensors

- Digital-pulse output models: PWM or Start/Stop
- LED for visualization of the sensor status
- Field adjustments and diagnostics using the TempoLink® smart assistant

MEASURING TECHNOLOGY

The absolute, linear position sensors provided by Temposonics rely on the company's proprietary 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 beginning 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.



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

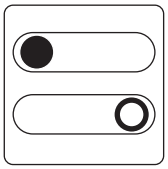
Fig. 1: Time-of-flight based magnetostrictive position sensing principle

G-SERIES V GP5 Digital

The Temposonics® G-Series V brings balanced sensor performance to meet the many demands of your application. The main advantages of the profile version GP5 with digital output PWM and Start/Stop are:

15 positions simultaneously
The G-Series V Digital can detect and report the position of up to 15 magnets simultaneously (controller dependent).

LED for sensor status
The LED in the housing cover visualizes the sensor status. This allows you to see the current status of the sensor at a glance.



Switching output
You can switch the digital output of the sensor from Start/Stop to Pulse Width Modulation (PWM) and vice versa on site.

All settings under control with the smart assistant for the G-Series V

The TempoLink® smart assistant supports you in setup and diagnostics of the G-Series V. Among other things, you can adjust the parameters of the sensor to your application on site or read out information about the current status of the sensor.
For more information of this assistant please see the data sheet:
• TempoLink® smart assistant
(Document part number: 552070)

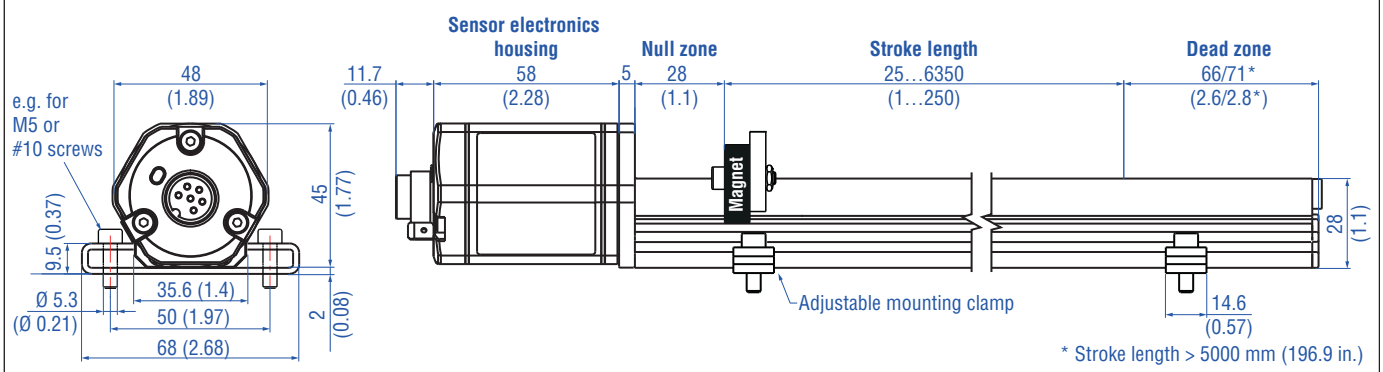
TECHNICAL DATA

Output						
Digital pulse outputs	Start/Stop and Pulse Width Modulation (PWM)					
Measured output variables	Position					
Measurement parameters						
Null/Span adjustment	100 % of electrical stroke					
Resolution	0.1, 0.01 and 0.005 mm (controller dependent)					
Update time	Stroke length	≤ 500 mm	≤ 1100 mm	≤ 3000 mm	≤ 6250 mm	≤ 6250 mm
	Update time	500 µs	1 ms	2 ms	4 ms	5 ms
Linearity deviation [1]	< ±0.02 % F.S. (minimum ±50 µm)					
Repeatability	< ±0.002% % F.S. (minimum ±5 µm)					
Hysteresis	< 4 µm typical					
Temperature coefficient	< 30 ppm/K typical					
Operating conditions						
Operating temperature	–40…+80 °C (–40…+176 °F)					
Humidity	90 % relative humidity, no condensation					
Ingress protection	IP67 (connectors correctly fitted)/IP68 (3 m/3 d) for cable outlet					
Shock test	100 g/11 ms, IEC standard 60068-2-27					
Vibration test	30 g/10…2000 Hz, IEC standard 60068-2-6 (excluding resonant frequencies)					
EMC test	Electromagnetic emission according to EN 61000-6-3 Electromagnetic immunity according to EN 61000-6-2 The GP5 sensors fulfill the requirements of the EMC directives 2014/30/EU, UKSI 2016 No. 1091 and TR CU 020/2011					
Magnet movement velocity	Magnet slider: Max. 10 m/s; U-magnet: Any; Block magnet: Any					
Design/Material						
Sensor electronics housing	Aluminum (painted), zinc die cast					
Sensor profile	Aluminum					
RoHS compliance	The used materials are compliant with the requirements of EU Directive 2011/65/EU and EU Regulation 2015/863 as well as UKSI 2022 No. 622 with amendments.					
Stroke length	25…6350 mm (1…250 in.)					
Mechanical mounting						
Mounting position	Any					
Mounting instruction	Please consult the technical drawings on page 4					
Electrical connection						
Connection type	1 × M16 male connectors (6 pin) or cable outlet					
Operating voltage	Standard: +24 VDC (-15/+20 %)/option: +9 VDC...+28.8 VDC; The GP5 sensors must be power supplied via an external Class 2 power source in accordance with the UL approval					
Power consumption	2.5 W typical (3.5 W maximum)					
Dielectric strength	500 VDC (DC ground to machine ground)					
Polarity protection	Up to –30 VDC					
Overvoltage protection	Up to 36 VDC					

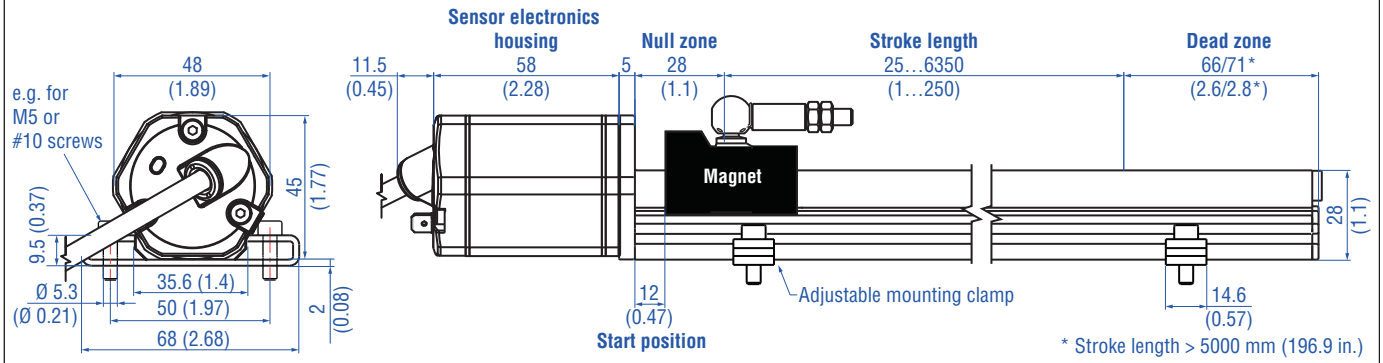
1/ With position magnet # 251 416-2

TECHNICAL DRAWING

GP5-M, example: Connection type D60 (connector outlet)



GP5-G/S, example: Connection type EXX/GXX/LXX (angled cable outlet)



Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Fig. 2: Temposonics® GP5 with U-magnet/magnet slider

CONNECTOR WIRING

D60

Signal + power supply

M16 male connector	Pin	Function
 View on sensor	1	Gate (–) for PWM Stop (–) for Start/Stop
	2	Gate (+) for PWM Stop (+) for Start/Stop
	3	Interrogation (+) for PWM Start (+) for Start/Stop
	4	Interrogation (–) for PWM Start (–) for Start/Stop
	5	+24 VDC (–15/+20 %)
	6	DC Ground (0 V)

Fig. 3: Connector wiring D60

EXX/GXX/LXX

Signal + power supply

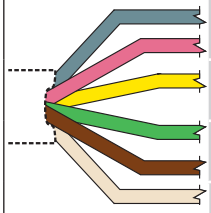
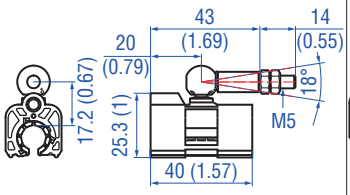
Cable	Color	Function
	GY	Gate (–) for PWM Stop (–) for Start/Stop
	PK	Gate (+) for PWM Stop (+) for Start/Stop
	YE	Interrogation (+) for PWM Start (+) for Start/Stop
	GN	Interrogation (–) for PWM Start (–) for Start/Stop
	BN	+24 VDC (–15/+20 %)
	WH	DC Ground (0 V)

Fig. 4: Connector wiring for cable outlet

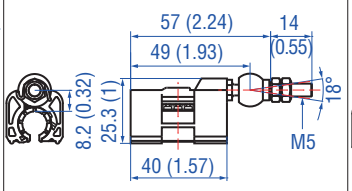
FREQUENTLY ORDERED ACCESSORIES – Additional options available in our Accessories Catalog 551444

Position magnets



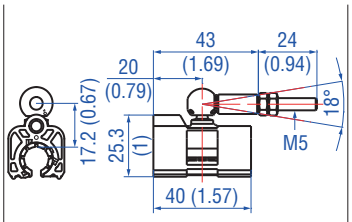
Magnet slider S,
joint at top
Part no. 252 182

Material: GRP, magnet hard ferrite
Weight: Approx. 35 g
Operating temperature:
–40…+85 °C (–40…+185 °F)



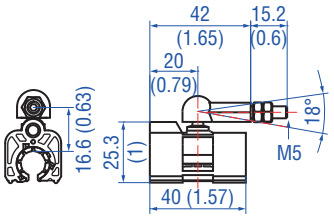
Magnet slider V,
joint at front
Part no. 252 184

Material: GRP, magnet hard ferrite
Weight: Approx. 35 g
Operating temperature:
–40…+85 °C (–40…+185 °F)



Magnet slider N
longer ball-joint arm
Part no. 252 183

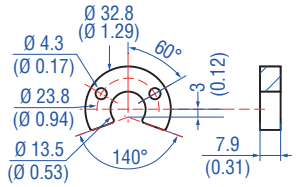
Material: GRP, magnet hard ferrite
Weight: Approx. 35 g
Operating temperature:
–40…+85 °C (–40…+185 °F)



Magnet slider G,
backlash free
Part no. 253 421

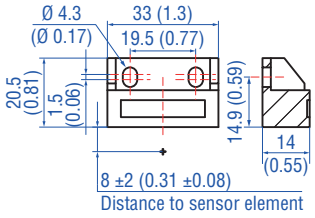
Material: GRP, magnet hard ferrite
Weight: Approx. 25 g
Operating temperature:
–40…+85 °C (–40…+185 °F)

Position magnets



U-magnet OD33
Part no. 251 416-2

Material: PA ferrite GF20
Weight: Approx. 11 g
Surface pressure: Max. 40 N/mm²
Fastening torque for M4 screws: 1 Nm
Operating temperature:
–40…+120 °C (–40…+248 °F)

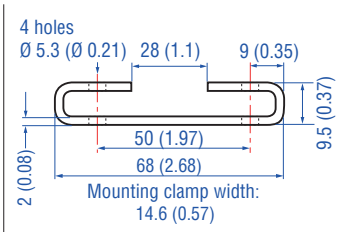


Block magnet L
Part no. 403 448

Material: Plastic carrier with neodymium magnet
Weight: Approx. 20 g
Fastening torque for M4 screws: 1 Nm
Operating temperature:
–40…+75 °C (–40…+167 °F)

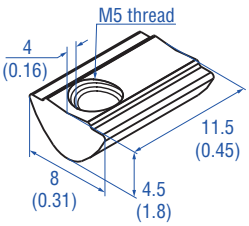
This magnet may influence the sensor performance specifications for some applications.

Mounting accessories



Mounting clamp
Part no. 400 802

Material: Stainless steel (AISI 304)

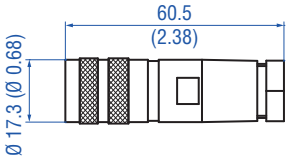


T-nut
Part no. 401 602

Fastening torque for M5 screw: 4.5 Nm

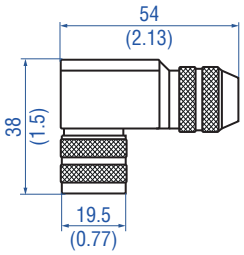
Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Cable connectors*



M16 female connector (6 pin), straight
Part no. 370 423

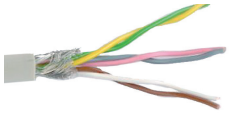
Material: Zinc nickel plated
Termination: Solder
Cable Ø: 6…8 mm (0.24…0.31 in.)
Operating temperature:
–40…+100 °C (–40…+212 °F)
Ingress protection: IP65/IP67
(correctly fitted)
Fastening torque: 0.6 Nm



M16 female connector (6 pin), angled
Part no. 370 460

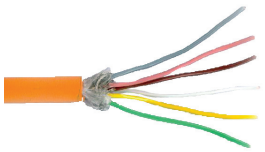
Material: Zinc nickel plated
Termination: Solder
Cable Ø: 6…8 mm (0.24…0.31 in.)
Wire: 0.75 mm² (20 AWG)
Operating temperature:
–40…+95 °C (–40…+203 °F)
Ingress protection: IP67 (correctly fitted)
Fastening torque: 0.6 Nm

Cables



PVC cable
Part no. 530 032

Material: PVC jacket; gray
Features: Twisted pair, shielded, flexible
Cable Ø: 6 mm (0.23 in.)
Cross section: 3 × 2 × 0.14 mm²
Bending radius: 10 × D
(fixed installation)
Operating temperature:
–40…+105 °C (–40…+221 °F)



PUR cable
Part no. 530 052

Material: PUR jacket; orange
Features: Twisted pair, shielded, highly flexible, halogen free, suitable for drag chains, mostly oil & flame resistant
Cable Ø: 6.4 mm (0.25 in.)
Cross section: 3 × 2 × 0.25 mm²
Bending radius: 5 × D
(fixed installation)
Operating temperature:
–20…+80 °C (–4…+176 °F)

Cable

FEP cable
Part no. 530 157

Material: FEP jacket; black
Features: Twisted pair, shielded
Cable Ø: 6.7 mm (0.26 in.)
Cross section: 3 × 2 × 0.14 mm²
Operating temperature: –40…+180 °C
(–40…+356 °F)

*/ Follow the manufacturer's mounting instructions
Color of connectors and cable jacket may change. Color codes for the individual wires and technical properties remain unchanged.
Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Extension cables M16

PVC cable with M16 female connector (6 pin), straight – pigtail

PVC cable (part no. 530 032) with M16 female connector, straight (part no. 370 423)

Order code:
K2-A-370423-xxxxyy-530032-0
(where xxxx = cable length and yy = unit in centimeters “CM” or feet “FT”)

PUR cable with M16 female connector (6 pin), straight – pigtail

PUR cable (part no. 530 052) with M16 female connector, straight (part no. 370 423)

Order code:
K2-A-370423-xxxxyy-530052-0
(where xxxx = cable length and yy = unit in centimeters “CM” or feet “FT”)

FEP cable with M16 female connector (6 pin), straight – pigtail

FEP cable (part no. 530 112) with M16 female connector, straight (part no. 370 423)

Order code:
K2-A-370423-xxxxyy-530112-0
(where xxxx = cable length and yy = unit in centimeters “CM” or feet “FT”)

Notice for extension cables M16

Standard cable lengths

Meters	Feet	Code
1.5	5.0	0150
2.0	6.6	0200
4.6	15.0	0460
5.0	16.4	0500
7.6	25.0	0760
10.0	32.8	1000
15.2	50.0	1520

For additional extension cables reference the accessories catalog for industrial sensors (document part no.: 551444).

Programming tools

TempoLink® kit for Temposonics® G-Series V
Part no. TL-1-0-AD60
Part no. TL-1-0-AS00

- Connect wirelessly via Wi-Fi enabled device or via USB with the diagnostic tool
- Simple connectivity to the sensor via 24 VDC power line (permissible cable length: 30 m)
- User friendly interface for mobile devices and desktop computers
- See data sheet “TempoLink® smart assistant” (document part no.: 552070) for further information

Color of connectors and cable jacket may change. Color codes for the individual wires and technical properties remain unchanged.
Controlling design dimensions are in millimeters and measurements in ( ) are in inches

ORDER CODE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
G	P	5																
a			b	c	d					e		f			g	h		

19 optional

a	Sensor model
G P 5	Profile

b	Design
G	Magnet slider backlash free (part no. 253 421)
L	Block magnet L (part no. 403 448)
M	U-magnet OD33 (part no. 251 416-2)
N	Magnet slider longer ball-jointed arm (part no. 252 183)
O	No position magnet
S	Magnet slider joint at top (part no. 252 182)
V	Magnet slider joint at front (part no. 252 184)

c	Mechanical options
A	Standard
V	Fluorelastomer seals for the sensor electronics housing

d	Stroke length
X X X X M	0025…6350 mm

Standard stroke length (mm)	Ordering steps
25… 500 mm	25 mm
500…2500 mm	50 mm
2500…5000 mm	100 mm
5000…6350 mm	250 mm

X X X . X U	001.0…250.0 in.

Standard stroke length (in.)	Ordering steps
1… 20 in.	1.0 in.
20…100 in.	2.0 in.
100…200 in.	4.0 in.
200…250 in.	10.0 in.

Non-standard stroke lengths are available;
must be encoded in 5 mm/0.1 in. increments.

e	Number of magnets
X X	01...15 Positions (1...15 magnets) (multi-position measurement* only for outputs »R0« & »RF«)

f	Connection type
Connector	
D 6 0	M16 male connector (6 pin)
Angled cable outlet	
E X X	XX m/ft. PVC cable (part no. 530 032) E01…E30 (1…30 m)/E03...E99 (3...99 ft.) See “Frequently ordered accessories” for cable specifications
G X X	XX m/ft. FEP cable (part no. 530 157) G01…G30 (1…30 m)/G03...G99 (3...99 ft.) See “Frequently ordered accessories” for cable specifications
L X X	XX m/ft. PUR cable (part no. 530 052) L01…L30 (1…30 m)/L03...L99 (3...99 ft.) See “Frequently ordered accessories” for cable specifications
Encode in meters if using metric stroke length. Encode in feet if using US customary stroke length.	

g	System
1	Standard
2	Operating voltage: +9...+28.8 VDC

h See next page

*Number of magnets ≥ 2 magnets

Continue to the next page

h			Output
R	O		Start/Stop
R	F		Start/Stop with closed error signal utility
D	I	X	PWM, internal interrogation X denotes the number of circulations (see table 1)
F	I	X	PWM, internal interrogation with closed error signal utility X denotes the number of circulations (see table 1)
D	E	X	PWM, external interrogation X denotes the number of circulations (see table 1)
F	E	X	PWM, external interrogation and closed error signal utility X denotes the number of circulations (see table 1)

»X« for output »DIX«, »FIX«, »DEX« and »FEX«										
Number of circulations	1	2	3	4	5	6	7	8	9	10
»X« in order code	1	2	3	4	5	6	7	8	9	A
Number of circulations	11	12	13	14	15	16	17	18	19	20
»X« in order code	B	C	D	E	F	G	H	I	J	K

Table 1: Number of circulations

NOTICE

- For GP5, the magnet selected in **b** "Design" is included in the scope of delivery. Specify the number of magnets for your application. For multi-position measurements with more than 1 magnet order the other magnets separately.
- The number of magnets is limited by the stroke length.
- The minimum allowed distance between magnets (i.e. of one to the front face of the next one) is 75 mm (3 in.).
- Use magnets of the same type for multi-position measurement.

DELIVERY

- Sensor
- Position magnet (not valid for GP5 with design »O«)
- 2 mounting clamps up to 1250 mm (50 in.) stroke length

Accessories have to be ordered separately.

Manuals, Software & 3D Models available at:
www.temposonics.com

GLOSSARY

C

Closed Error Signal Utility
At very high shock or vibration events, the magnet may no longer be detected properly. For these error events the closed error signal utility will produce an output signal waveform that corresponds to a value of just over the 100 % full stroke position. Therefore, the Closed Error Signal Utility should only be used with certain Allen Bradley and Digitron Electronics interface cards that are designed to process this sensor output appropriately. Contact Applications Engineering for more information.

E

External Interrogation
For a sensor that is configured for external interrogation, a signal is required from the controller or interface module to initiate every measurement cycle.

I

Internal Interrogation
For a sensor that is configured for internal interrogation, no signal is needed from the controller as the sensor itself initiates the next measurement cycle upon the completion of the current cycle.

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Document Part Number:
552224 Revision A (EN) 06/2025

UK CA CE ISO 9001 CERTIFIED c US EAC

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