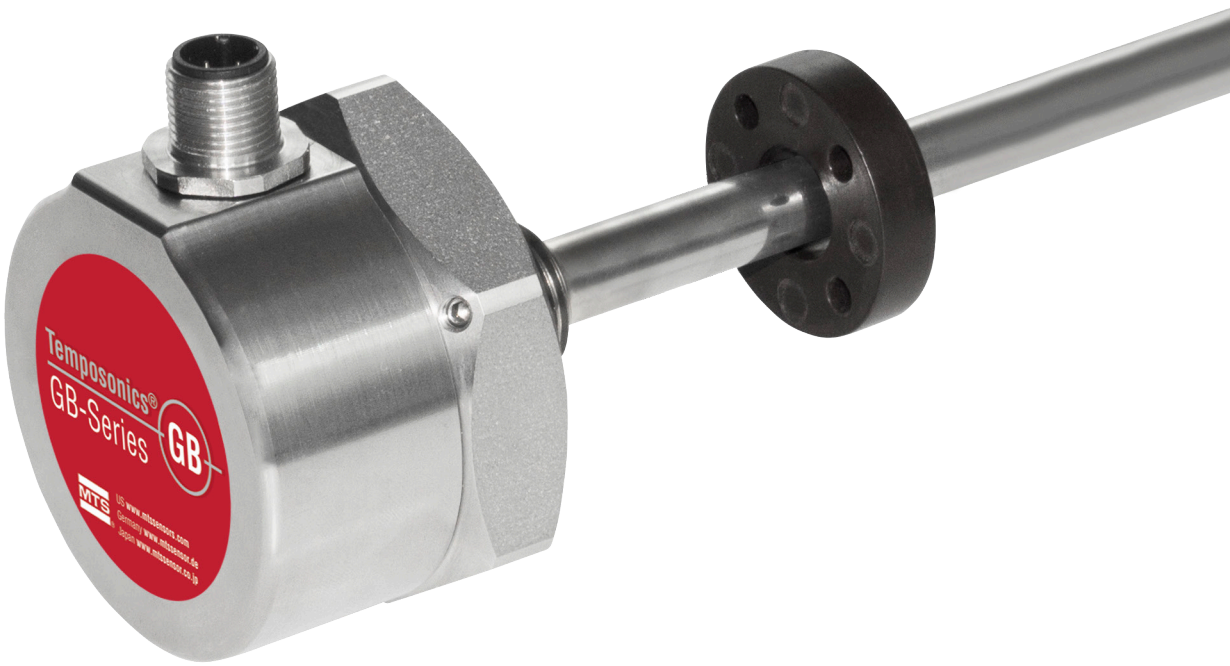
MTS SENSORS

Temposonics®

Magnetostrictive Linear Position Sensors

GB-M / GB-T SSI
Data Sheet

– Sensor element and electronics can be changed
– Flat & compact sensor electronics housing
– Electrical connection is freely rotatable



MEASURING TECHNOLOGY

The absolute, linear position sensors provided by MTS Sensors 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.

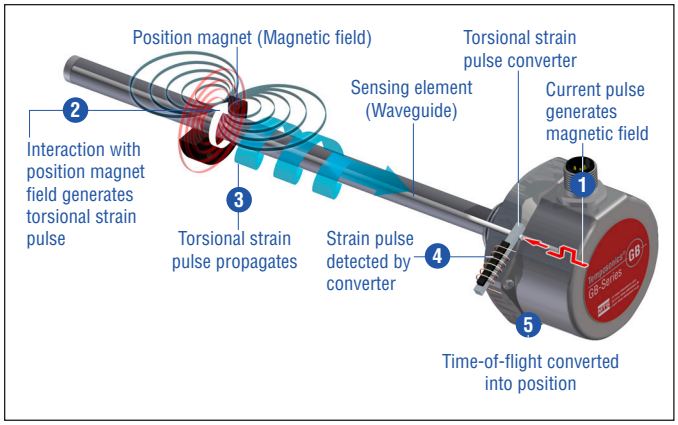


Fig. 1: Time-of-flight based magnetostrictive position sensing principle

GB-M / GB-T SENSOR

Robust, non-contact and wear free, the Temposonics® linear position sensors provide the best durability and accurate position measurement solutions in harsh industrial environments. The position measurement accuracy is tightly controlled by the quality of the waveguide which is manufactured by MTS Sensors. The position magnet is mounted on the moving machine part and travels non-contact over the sensor rod with the built-in waveguide.

The GB-M / GB-T is an extension of the GB-Series. Its compact housing can be easily mounted, even if there is only limited space. Due to the high temperature resistance, no measures for cooling the sensor have to be taken – saving you time and work. Further advantages of the GB-M / GB-T sensor are:

TURN ME.

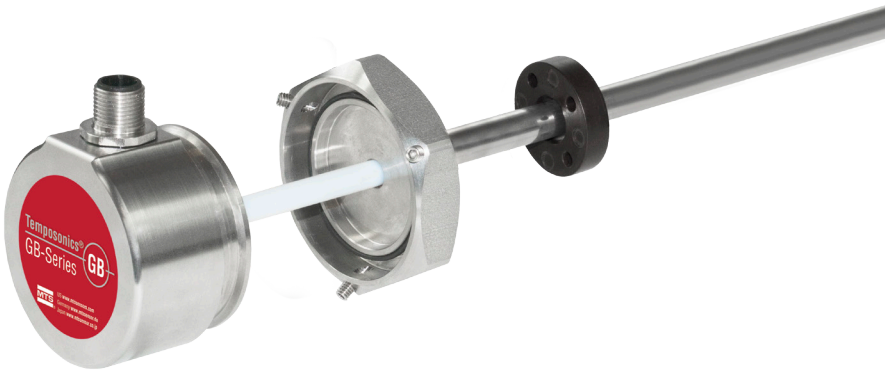
The sensor electronics housing with its electrical connection can be rotated 360 degrees after mounting to easily achieve the necessary connection orientation.

REPLACE ME.

If needed, the sensor element and electronics can be replaced without interrupting the hydraulic circuit – resulting in lower maintenance costs and reduced downtime.

PROGRAM ME.

The start position and end position of the measurement range are programmable, e.g. via programming kit, allowing users to adjust to meet the application requirements.



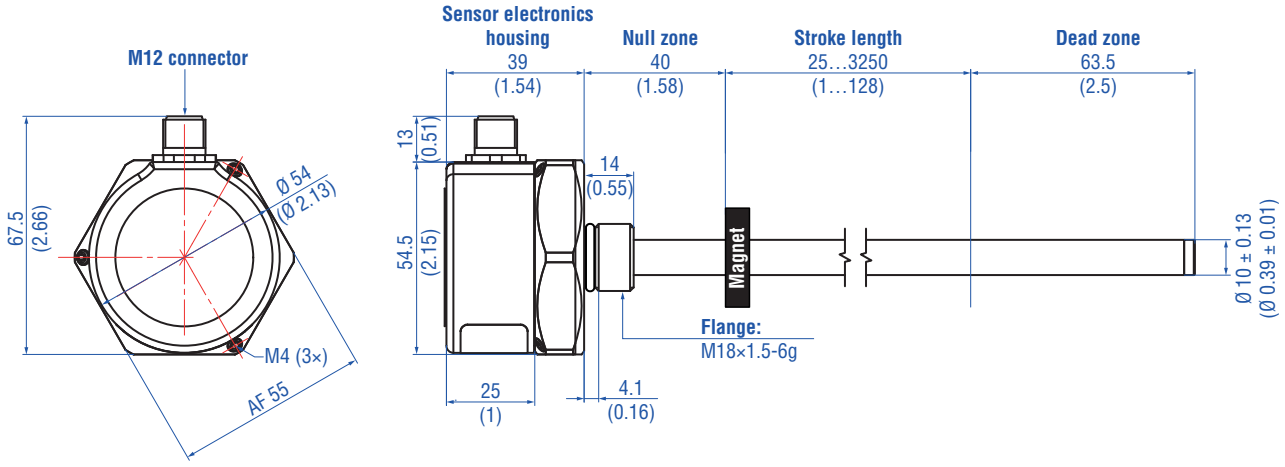
TECHNICAL DATA

Output	
Interface	SSI (Synchronous Serial Interface) – Differential signal in SSI standard
Data format	Binary, gray
Programming	Programming of set points using optional accessories [1]
Bluetooth® version	2.1
Measured value	Position
Measurement parameters	
Resolution	Min. resolution 5 µm
Cycle time	Up to 3.7 kHz depending on stroke length
Linearity	≤ ±0.02 % F.S. (minimum ±60 µm) typically
Repeatability	≤ ±0.005 % F.S. (minimum ±20 µm) typically
Operating conditions	
Operating temperature	–40…+90 °C (–40…+194 °F), option: –40…+100 °C (–40…+212 °F)
Ingress protection	IP67 with proper mating connector IP68 for cable outlet
Shock test	100 g (single shock) IEC standard 60068-2-27
Vibration test	15 g / 10…2000 Hz IEC standard 60068-2-6 (resonance frequencies excluded)
EMC test	Electromagnetic emission according to EN 61000-6-4 Electromagnetic immunity according to EN 61000-6-2 The sensor meets the requirements of the EC directives and is marked with CE.
Magnet movement velocity	Any
Design/Material	
Sensor electronics housing [2]	Stainless steel 1.4305 (AISI 303)
Sensor rod	Stainless steel 1.4306; 1.4307 (AISI 304L)
Stroke length	25…3250 mm (1…128 in.)
Operating pressure	350 bar (5076 psi), 700 bar (10153 psi) peak (at 10 × 1 min)
Mechanical mounting	
Mounting position	Any
Mounting instruction	Please consult the technical drawings and the operation manual (document number: 551631)
Electrical connection	
Connection type	M12 (8 pin) male connector A-coded M16 (7 pin) male connector Cable outlet
Operating voltage	+24 VDC (–15 / +20 %)
Ripple	≤ 0.28 V_{pp}
Current consumption	90 mA typically
Dielectric strength	500 VDC (DC ground to machine ground)
Polarity protection	Up to –30 VDC
Overvoltage protection	Up to 36 VDC

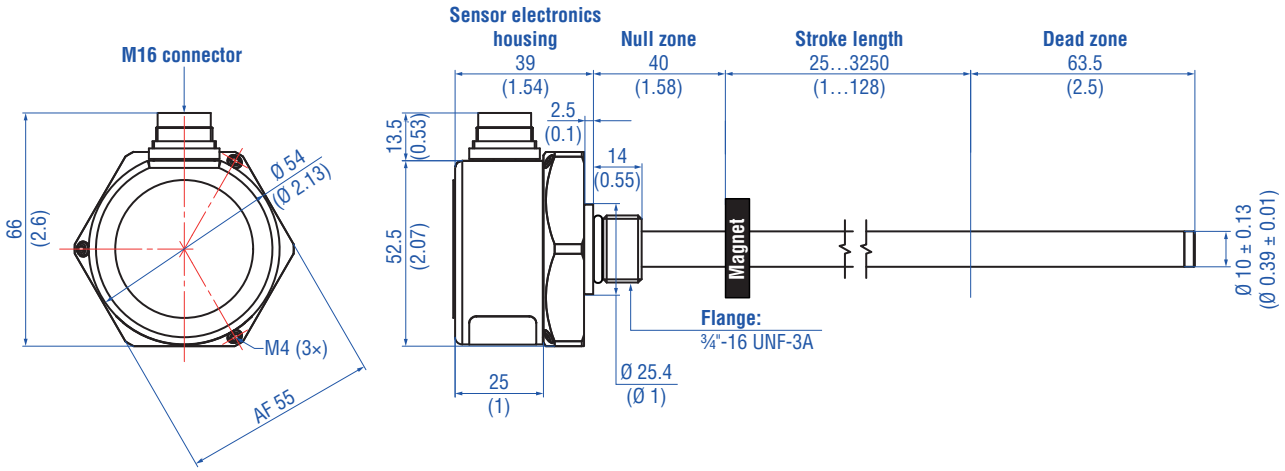
1/ Programming via Bluetooth wireless technology is disabled from operating temperature typically > +55 °C (> +131 °F)
2/ For option H (–40…+100 °C / –40…+212 °F) and option W (programming via Bluetooth wireless technology) an aluminum cover plate is used

TECHNICAL DRAWING

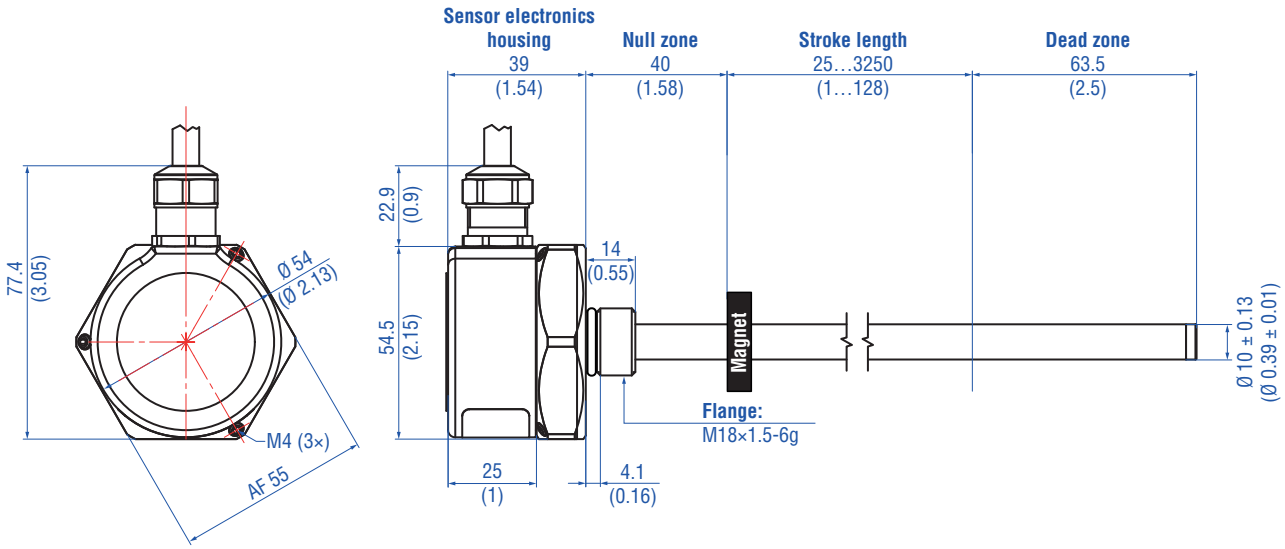
M12 connector (Example: With flat-faced flange)



M16 connector (Example: With raised-faced flange)



Cable outlet (Example: With flat-faced flange)



Controlling design dimensions are in millimeters and measurements in ( ) are in inches
Unless otherwise stated, apply to the general tolerances according to DIN ISO 2768-m

CONNECTOR WIRING

M12 connector

D84	Pin	Function
	1	Clock (+)
	2	Clock (–)
	3	Data (+)
	4	Data (–)
	5	Not connected
	6	Not connected
	7	+24 VDC (–15 / +20 %)
	8	DC Ground (0 V)

M16 connector

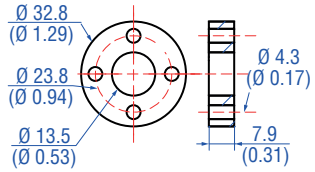
D70	Pin	Function
	1	Data (–)
	2	Data (+)
	3	Clock (+)
	4	Clock (–)
	5	+24 VDC (–15 / +20 %)
	6	DC Ground (0 V)
	7	Not connected

Cable outlet

Cable	Function
GY	Data (–)
PK	Data (+)
YE	Clock (+)
GN	Clock (–)
BN	+24 VDC (–15 / +20 %)
WH	DC Ground (0 V)

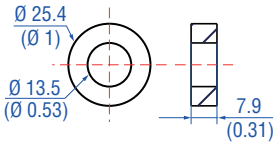
FREQUENTLY ORDERED ACCESSORIES – Additional options available in our Accessories Guide 551444

Position magnets



Standard ring magnet
Part no. 201 542-2

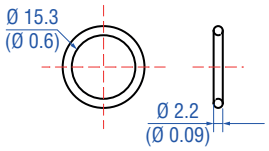
Material: PA ferrite GF20
Weight: Ca. 14 g
Operating temperature:
–40…+105 °C (–40…+221 °F)
Surface pressure: Max. 40 N/mm²
Fastening torque for M4 screws: 1 Nm



Ring magnet OD25.4
Part no. 400 533

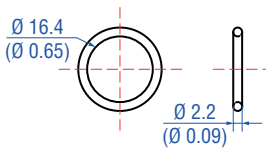
Material: PA ferrite
Weight: Ca. 10 g
Operating temperature:
–40…+105 °C (–40…+221 °F)
Surface pressure: Max. 40 N/mm²

Optional installation hardware



O-ring
Part no. 401 133

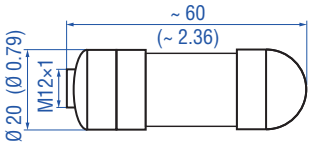
Material: Fluoroelastomer
75 ± 5 durometer
Application: Flange M18×1.5



O-ring
Part no. 560 315

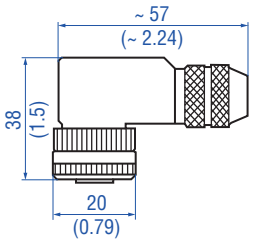
Material: Fluoroelastomer
75 ± 5 durometer
Application: Flange ¾"-16 UNF

Cable connectors [3]



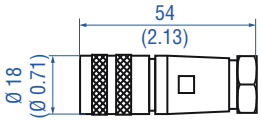
M12 (8 pin) female straight
Part no. 370 694

Housing: GD-ZnAL / IP67
Termination: Screw; 0.75 mm²
Contact insert: CuZn
Cable Ø: 4…9 mm (0.16…0.35 in.)
Fastening torque: 0.6 Nm



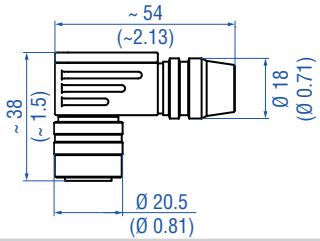
M12 (8 pin) female angled
Part no. 370 699

Housing: GD-ZnAL / IP67
Termination: Screw; max. 0.5 mm²
Contact insert: CuZn
Cable Ø: 6…8 mm (0.24…0.31 in.)
Fastening torque: 0.6 Nm



M16 (7 pin) female straight
Part no. 370 624

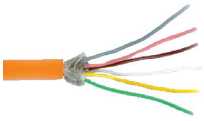
Housing: Zinc nickel plated
Termination: Solder
Contact insert: Silver plated
Cable clamp: PG9
Cable Ø: 6…8 mm (0.24…0.31 in.)
Fastening torque: 0.6 Nm



M16 (7 pin) female angled
Part no. 560 779

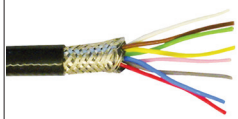
Housing: Zinc nickel plated
Termination: Solder
Contact insert: Silver plated
Cable Ø: 6…8 mm (0.24…0.31 in.)
Fastening torque: 0.6 Nm

Cables



Cable
Part no. 530 052

Dimensions: 3 × 2 × 0.25 mm²
Cable Ø: 6.4 mm (0.25 in.)
Material: PUR jacket; orange
Operating temperature:
–30…+80 °C (–22…+176 °F)
Twisted pair shielded



Cable
Part no. 530 112

Dimensions: 4 × 2 × 0.25 mm²
Cable Ø: 7.6 mm (0.3 in.)
Material: Teflon® jacket; black
Operating temperature:
–100…+180 °C (–148…+356 °F)
Twisted pair shielded

Cable
Part no. 530 113

Dimensions: 3 × 2 × 0.25 mm²
Cable Ø: 7.2 mm (0.28 in.)
Material: Silicone jacket; red
Operating temperature:
–50…+180 °C (–58…+356 °F)
Twisted pair shielded

Programming tools

Programming kit
Part no. 254 590

Controlling design dimensions are in millimeters and measurements in ( ) are in inches
3/ Follow the manufacturer's mounting instructions when connecting the connectors

ORDER CODE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
G	B										1	S								
a		b	c					d			e	f							g	h

a	Sensor model
G	B	Rod

b	Design
B	Base unit for flange »M« and flange »T«
M	Flat-faced flange, M18×1.5-6g
T	Raised-faced flange, ¾"-16 UNF-3A

c	Stroke length	
X	X	X	X	M	0025…3250 mm
X	X	X	X	U	001.0…128.0 in.

Standard stroke length (mm) *

Stroke length	Ordering steps
25… 500 mm	5 mm
500… 750 mm	10 mm
750…1000 mm	25 mm
1000…2500 mm	50 mm
2500…3250 mm	100 mm

Standard stroke length (in.) *

Stroke length	Ordering steps
1… 20 in.	0.2 in.
20… 30 in.	0.5 in.
30… 40 in.	1.0 in.
40…100 in.	2.0 in.
100…128 in.	4.0 in.

d	Connection type
D	8	4	M12 (8 pin) male connector
D	7	0	M16 (7 pin) male connector
H	X	X	PUR cable (part no. 530 052) (suitable for max. operating temperature of +80 °C (+176 °F)) H01…H10 (1…10 m / 3…33 ft) [4] **See "Frequently ordered accessories" for cable specifications**
T	X	X	Teflon® cable (part no. 530 112) T01…T10 (1…10 m / 3…33 ft) [4] **See "Frequently ordered accessories" for cable specifications**
V	X	X	Silicone cable (part no. 530 113) V01…V10 (1…10 m / 3…33 ft) [4] **See "Frequently ordered accessories" for cable specifications**

e	Operating voltage
1	+24 VDC (–15 / +20 %)

f	Output	
	S (14) (15) (16) (17) (18) (19) = Synchronous Serial Interface	
	Data length (box no. 14)	
1	25 bit	
2	24 bit	
	Output format (box no. 15)	
B	Binary	
G	Gray	
	Resolution (box no. 16)	
1	0.005 mm	
2	0.01 mm	
3	0.05 mm	
4	0.1 mm	
5	0.02 mm	
	Filter (box no. 17)	
1	No filter	
2	Average filter 2	
3	Average filter 4	
4	Average filter 8	
	Performance (box no. 18, 19)	
0	0	Measuring direction forward, asynchronous measurement
0	1	Measuring direction reverse, asynchronous measurement
0	2	Measuring direction forward, synchronous measurement
0	3	Measuring direction reverse, synchronous measurement

g	Operating temperature
H	–40…+100 °C (–40…+212 °F)
S	–40…+90 °C (–40…+194 °F)

h	Programming
C	Via cable
W	Via Bluetooth wireless technology

*/ Non standard stroke lengths are available; must be encoded in 5 mm / 0.1 in. increments
4/ Encode in meters if using metric stroke length. Encode in feet if using US customary stroke length.

DELIVERY

GB-B: Sensor

GB-M / GB-T: Sensor, O-ring

Accessories have to be ordered separately.

Operation manuals & software are available at:
www.mtssensors.com

MTS®
SENSORS

Document Part Number:
551839 Revision A (EN) 05/2016

LOCATIONS

USA
MTS Systems Corporation
Sensors Division
3001 Sheldon Drive
Cary, N.C. 27513, USA
Tel. +1 919 677-0100
Fax +1 919 677-0200
info.us@mtssensors.com
www.mtssensors.com

GERMANY
MTS Sensor Technologie
GmbH & Co. KG
Auf dem Schüffel 9
58513 Lüdenscheid, Germany
Tel. +49 2351 9587-0
Fax +49 2351 56491
info.de@mtssensors.com
www.mtssensors.com

JAPAN
MTS Sensors Technology Corp.
737 Aihara-machi,
Machida-shi,
Tokyo 194-0211, Japan
Tel. +81 42 775-3838
Fax +81 42 775-5512
info.jp@mtssensors.com
www.mtssensors.com

CHINA
MTS Sensors
Room 504, Huajing Commercial Center,
No. 188, North Qinzhou Road
200233 Shanghai, China
Tel. +86 21 6485 5800
Fax +86 21 6495 6329
info.cn@mtssensors.com
www.mtssensors.com

FRANCE
MTS Systems SAS
Zone EUROPARC Bâtiment EXA 16
16/18, rue Eugène Dupuis
94046 Creteil, France
Tel. +33 1 58 4390-28
Fax +33 1 58 4390-03
info.fr@mtssensors.com
www.mtssensors.com

ITALY
MTS Systems Srl
Sensor Division
Via Camillo Golgi, 5/7
25064 Gussago (BS), Italy
Tel. +39 030 988 3819
Fax +39 030 982 3359
info.it@mtssensors.com
www.mtssensors.com

LEGAL NOTICES

ISO 9001 CERTIFIED

Reg.-No. 003095-QM08