



**MAGTROL**

# **Rotary transmitters**

## **RS Series**



**User's manual**

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# The recycling of mercury

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According to the directive 2002/95/CE, relating to the limitation of the use of certain dangerous substances in electrical equipment and electronic, starting from July 1st, 2006, the Member States of the European Union must take care that the new electrical equipment and electronic put on the market does not contain lead, nor of mercury, cadmium, hexavalent chromium, polybromobiphenyls (PBB) or polybromodiphenylethers (PBDE).

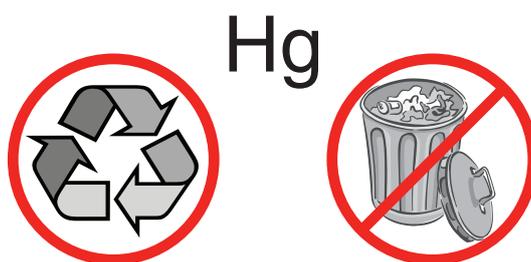
It is stipulated, in the Field of application of this Directive, which it applies to electrical equipment and electronic concerned with categories 1,2,3,4,5,6,7, and 10 enumerated with appendix IA of the Directive 2002/96/CE (DEEE) like to the electric bulbs and the domestic luminaries.

**The Magtrol products are included in category 9 (instruments of monitoring and control of appendix IA of the Directive 2002/96/CE) and are thus excluded from the requirements of the Directive 2002/95/CE.**

**On the other hand Magtrol must be in accordance with the Directive 2002/96/CE relating to the DEEE (scrap electrical equipment and electronic).**

**As for any producer of electricals appliance or electronic put on the market after August 13th, 2005, the Magtrol products must be clearly identifiable thanks to the label which corresponds to each apparatus. In the same way, the date of marketing must appear on each product.**

Indeed, according to appendix IA of the European directive 2002/96/CE, Magtrol, as a manufacturer of instruments of monitoring and control, must take account of the requirements as regards repair, possible improvement, re-use, disassembling and recycling of the products containing of mercury.



Magtrol is committed ensuring information for the users. Magtrol thus has the obligation to mark in a suitable way the products which would be likely to be thrown among ordinary waste. This obligation to make appear the symbol of recycling extends to packing, the note of use and the certificate of guarantee of the equipment concerned.

Magtrol must ensure the collection of waste and the recycling of mercury by electing specialized companies.

Magtrol attests that the financing of the costs of the collection, the treatment, the valorization and the nonpolluting elimination of the DEEE are with its load.

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# Revisions To This Manual

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The contents of this manual are subject to change without prior notice. Should revisions be necessary, updates to all Magtrol User's Manuals can be found at Magtrol's web site at [www.magtrol.com/support/manuals.htm](http://www.magtrol.com/support/manuals.htm).

Please compare the date of this manual with the revision date on the web site, then refer to the manual's Table of Revisions for any changes/updates that have been made since this edition..

## TABLE OF REVISIONS

| <b>DATE</b>  | <b>EDITION</b>      | <b>CHANGES</b>                | <b>SECTION</b> |
|--------------|---------------------|-------------------------------|----------------|
| October 2009 | First Edition Rev.A | Add CE conformity Declaration | appendix A     |
| May 2009     | First Edition       | -                             | -              |

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# Preface

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## PURPOSE OF THIS MANUAL

This manual contains the necessary information regarding the use of the RS series transmitters. It must be attentively read by the user and placed in a sure place for later consultations.

## WHO SHOULD USE THIS MANUAL

This handbook is addressed to any user of RS series transmitters.

## MANUAL ORGANIZATION

This section gives an overview of the structure of the manual and the information contained in it. Some information has been deliberately repeated in different sections of the document to minimize cross-referencing and to facilitate understanding through reiteration.

Summary of the different chapters :

- Chapter 1: INTRODUCTION - Contains the technical data sheet of the rotary transmitter RS serie and gives its technical characteristics as well as a brief overview of the application fields.
- Chapter 2: INSTALLATION - Inform of the precautions to be taken at the time of the installation of a transmitter.
- Chapter 3: MAINTENANCE - Indicates the procedures of maintenance for the transmitters.
- Appendix A: CE CONFORMITY DECLARATION - Contains the CE conformity declaration of the MAGTROL Rotary transmitters RS series

# 1. Introduction

## 1.1 DESCRIPTION

Magtrol Rotary Transmitters are used for signal transmission of transducers on a rotating part (e.g. engine shaft) to a stationary system (measuring instrument or PC). They are exceptionally well-suited for the transmission of low level electrical signals, such as those from thermocouples, extensometer gauges and strain gauges, as well as transducers to measure oscillation and acceleration. RS Transmitters can also provide the power supply signal to each transducer.

RS Series Rotary Transmitters provide a low transfer resistance and a high insulation resistance. They also significantly reduce the EMF noise generated at the cell connections. These transmitters do not use slip rings and are therefore arc-free, making them superior to all other rotary transmitters that use rings, brushes, wire loops and similar devices.

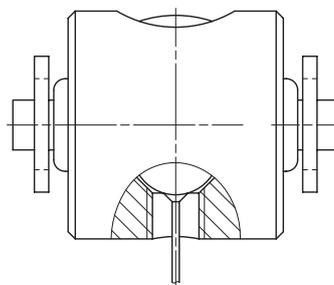
Magtrol Rotary Signal Transmitters are used wherever measurement of rotating items is needed—in research and development laboratories, as well as in duration tests on objects under working conditions. Through high-performance data transmission, Magtrol RS Transmitters enable the measurement of pressure, acceleration, oscillation, vibration, shock, force, torque, temperature and displacement of rotating parts such as: turbines, jet engines, turbocompressors, propellers, motors, machine tools, bearings, tilting pads, molding machine screws and other machines, as well as for running tests on all types of road and rail vehicles.

## 1.2 OPERATING PRINCIPLES

RS Series Rotary Transmitters contain small reservoirs of mercury to make the connection between the stationary system and the rotating part. Each cell in the transmitter contains a reservoir of mercury (see Figure 1-1) into which a hollow shaft, 2 mm in diameter, dips as a contact. Each cell of the transmitter provides one transmission channel.

Within each cell, the reservoir remains fixed while the axis is driven by the rotating part. The cells are electrically insulated from each other and the outside by plastic couplings. The low friction surface between the reservoir and the axis guarantees a minimum heating of the device. This avoids the generation of an EMF due to the Peltier effect, which would be induced by the heating of the contact point between the two metals.

In addition, the insulation resistance between the cells remains intact since there is no formation of vapor that would cause the appearance of leakage currents.



*Figure 1-1 Mercury Cell*

The rotary transmitter produces a small EMF at high-speeds. To avoid increasing the EMF it is necessary to prevent the rotating part from overheating the transmitter. Increasing the EMF can cause the vaporization of mercury within the cells.

To ensure a long lifetime, it is recommended that the RS Series Rotary Transmitters are operated only within the specified temperature range.

The small amount of mercury contained within the transmitter is only a minimum health risk because of the confinement of the liquid metal within a hermetically sealed cell. The seal is guaranteed by PTFE seals even at high speeds. Only extremely pure mercury is used in the manufacture of the RS Series Rotary Transducers to provide maximum conductivity.

These transmitters should not be stored for periods longer than one year. When not in use deposits of mercury oxide can form within the cell causing increased resistance.

**1.3 DATA SHEETS**



**RS Data Sheet**

**RS Series Rotary Transmitters**

*NOTE: Not available in U.S.*

**FEATURES**

- 1, 4, 8 or 12 channels
- Speed: up to 40000 rpm
- Contact Resistance of Cells: < 0,2 mΩ
- Noise: 25 μV
- Signal: up to 0,3 A per cell; 60 V AC/DC
- Very low inertia
- No slippings
- Insensitive to electromagnetic disturbance
- Long lifetime

**DESCRIPTION**

Magtrol Rotary Transmitters are used for signal transmission of transducers on a rotating part (e.g. engine shaft) to a stationary system (measuring instrument or PC). They are exceptionally well-suited for the transmission of low level electrical signals, such as those from thermocouples, extensometer gauges and strain gauges, as well as transducers to measure oscillation and acceleration. RS Transmitters can also provide the power supply signal to each transducer.

Magtrol's RS Series Rotary Transmitters do not use slippings and are therefore arc-free, making them superior to all other rotary transmitters that use rings, brushes, wire loops and similar devices. Easy to use, installing RS Transmitters is as simple as connecting a cable. They require no power supply, batteries, software or parameter setup in order to operate. Standard models have a speed range of 0 to 20000 rpm and a high-speed version (up to 40000 rpm) is available.

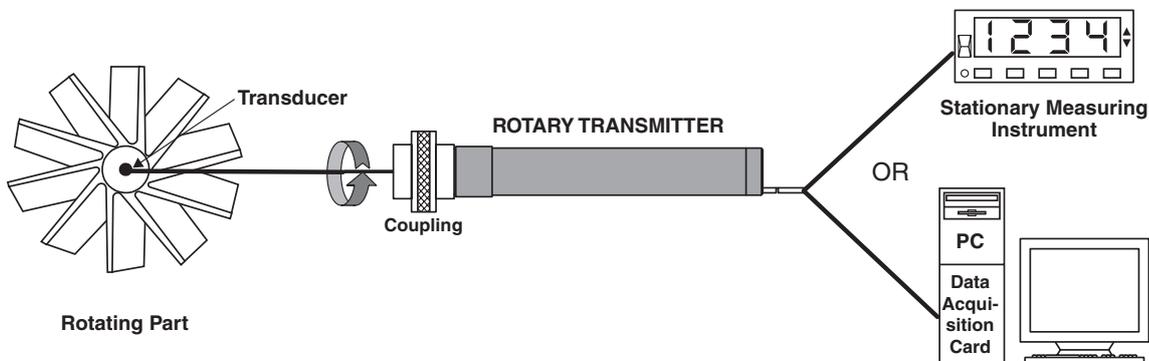


*RS 208 and RS 212 (open) Rotary Transmitters*

**APPLICATIONS**

Magtrol Rotary Signal Transmitters are used wherever measurement of rotating items is needed—in research and development laboratories, as well as in duration tests on objects under working conditions. Through high-performance data transmission, Magtrol RS Transmitters enable the measurement of pressure, acceleration, oscillation, vibration, shock, force, torque, temperature and displacement of rotating parts such as: turbines, jet engines, turbocompressors, propellers, motors, machine tools, bearings, tilting pads, molding machine screws and other machines, as well as for running tests on all types of road and rail vehicles.

**SYSTEM CONFIGURATION**



# Specifications

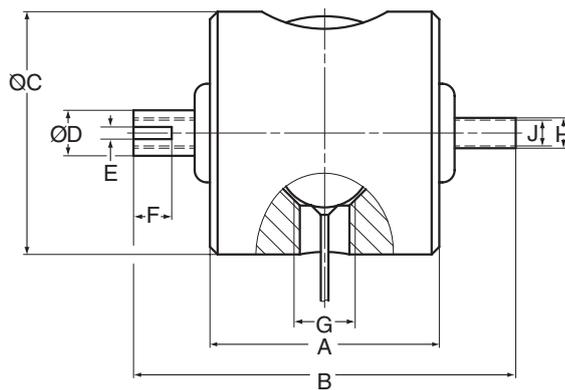
RS

## RATINGS

|                            | Cell  | RS 204 | RS 208 | RS 212 |
|----------------------------|---|--------|--------|--------|
| Number of Channels         | 1   | 4      | 8      | 12     |
| Speed Ranges               | standard version : 0 to 20000 rpm<br>high-speed version : 0 to 40000 rpm  |        |        |        |
| Total Noise                | Typically 25 $\mu$ V (max. 50 $\mu$ V) with two cells in series at speeds from 0 to 20000 rpm   |        |        |        |
| Contact Resistance of Cell | Max. 0,2 m $\Omega$ for 2 cells in series with an instantaneous variation from 0 to 5000 rpm  |        |        |        |
| Load Resistance of cells   | Cell alone: max. 50m $\Omega$<br>Cells mounted in RS transmitter: 30 to 150 m $\Omega$ depending of the lengths of the lead of each individual cell. Variation of resistance: about 2 m $\Omega$ / 5 $^{\circ}$ C |        |        |        |
| Insulation Resistance      | More than 10 G $\Omega$ for two adjacent cells  |        |        |        |
| Load Current               | Max. 0,3 A per cell   |        |        |        |
| Load Voltage               | 60 V AC or DC between two cells or between cell and transmitter housing   |        |        |        |
| Temperature Range          | -25 $^{\circ}$ C to +60 $^{\circ}$ C  |        |        |        |

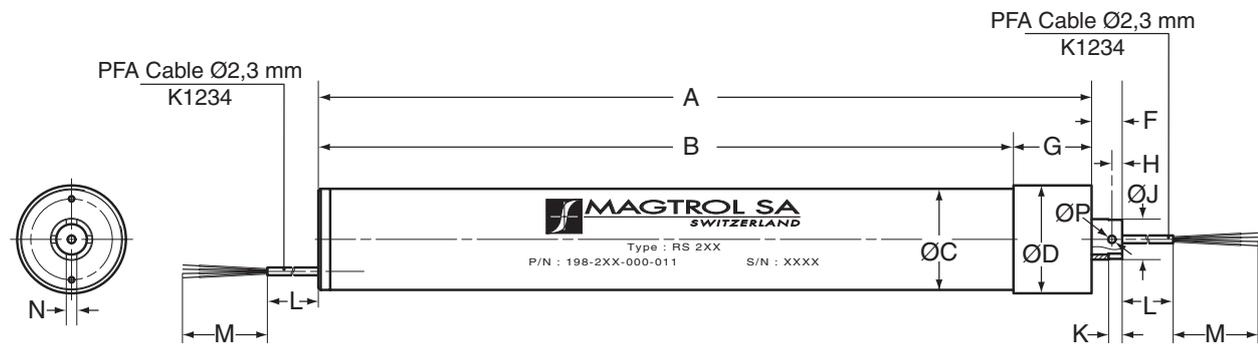
## DIMENSIONS

### Cell



|                 | mm   |
|-----------------|------|
| A               | 15   |
| B               | 25   |
| $\varnothing$ C | 16h9 |
| $\varnothing$ D | 3    |
| E               | 0,8  |
| F               | 2,5  |
| G               | M4   |
| $\varnothing$ H | 2h7  |
| $\varnothing$ J | 1,7  |

### Models RS 204, 208 and 212



| Model  | A     | B     | $\varnothing$ C | $\varnothing$ D | F | G  | H | $\varnothing$ J                     | K | L   | M  | N                                 | $\varnothing$ P |
|--------|-------|-------|-----------------|-----------------|---|----|---|-------------------------------------|---|-----|----|-----------------------------------|-----------------|
| RS 204 | 131,6 | 108,6 | 30              | 32h6            | 9 | 23 | 3 | 12 <sup>-0,05</sup> <sub>-0,1</sub> | 4 | 375 | 25 | 3,1 <sup>+0,01</sup> <sub>0</sub> | 2,2             |
| RS 208 | 227,6 | 204,6 | 30              | 32h6            | 9 | 23 | 3 | 12 <sup>-0,05</sup> <sub>-0,1</sub> | 4 | 375 | 25 | 3,1 <sup>+0,01</sup> <sub>0</sub> | 2,2             |
| RS 212 | 323,6 | 300,6 | 30              | 32h6            | 9 | 23 | 3 | 12 <sup>-0,05</sup> <sub>-0,1</sub> | 4 | 375 | 25 | 3,1 <sup>+0,01</sup> <sub>0</sub> | 2,2             |

# Ordering Information

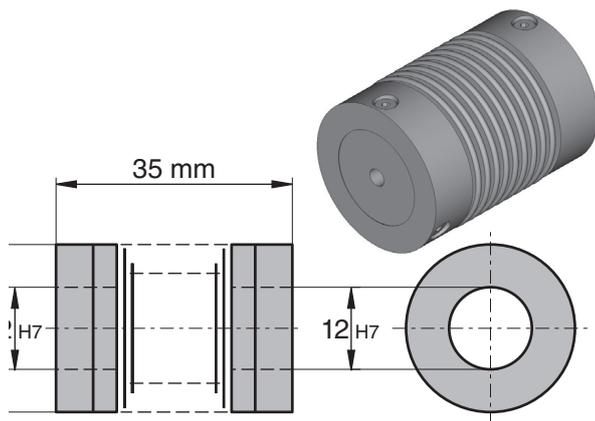
RS

## CONDITIONS AND ORDERING INFORMATION

|                                    |                      |
|------------------------------------|----------------------|
| <b>MODEL NUMBER:</b>               | RS 2□□ / □11         |
| <b>RS Rotary Transmitter with:</b> |                      |
| <b>NUMBER OF CHANNELS</b>          |                      |
| • 4 channels _____                 | 04                   |
| • 8 channels _____                 | 08                   |
| • 12 channels _____                | 12                   |
| <b>HIGH-SPEED CAPABILITY</b>       |                      |
| • without (standard) _____         | 0                    |
| • with (option) _____              | 1                    |
| <b>Rotary Transmitter Cell:</b>    | P/N 198-101-010-011V |

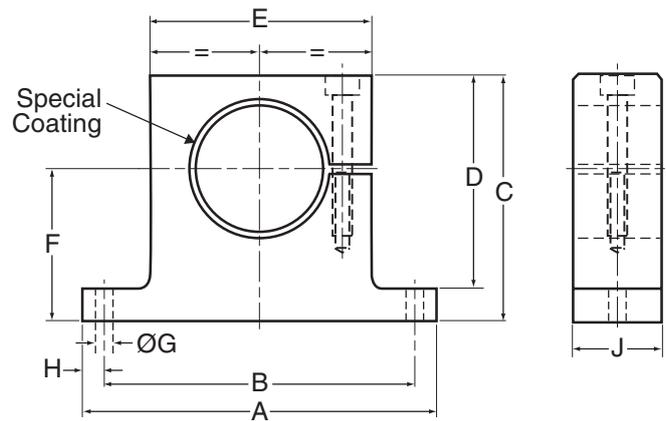
## ACCESSORIES

### Structure Flexible Couplings



| Coupling Model Number | Fits Rotary Transmitter |
|-----------------------|-------------------------|
| 20/35/12H7/12H7       | RS 2XX-011 (standard)   |
| 20/35/12H7/12H7/HS    | RS 2XX-111 (high-speed) |

### Mounting Bracket



| A    | B    | C    | D    | E    | F    | ØG  | H   | J    |
|------|------|------|------|------|------|-----|-----|------|
| 80,0 | 70,0 | 57,0 | 49,0 | 50,0 | 35,0 | 4,3 | 5,0 | 20,0 |

Part Number: 198-102-955-011



**CAUTION:** The RS Rotary Transmitters contain mercury. The cells are hermetically sealed and should not be opened. In lieu of disposing the transmitters/cells, please return them to Magtrol SA in Switzerland for recycling.

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## 2. Installation/Configuration

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### 2.1 MECHANICAL MOUNTING

To avoid subjecting the cells to vibration, the transmitter must be connected to the rotating part by a flexible coupling. This will increase the lifespan of the transmitters' cells.

There are two types of flexible couplings available:

- MK1/20/35/12H7/12H7 couplings are used in the standard rotary transmitter RS 2XX-011 with operating speeds of up to 20,000 tmin-1.
- MK1/20/35/12H7/12H7/HS couplings are used in the high speed rotary transmitter RS 2XX-111 with operating speeds of up to 40,000 tmin-1.

The coupling is attached to the transmitter by the included clamping screws.

For proper mounting of the transmitter, use of the original fixture support is recommended (part number 198-102-955-011). This support has a special coating which protects the transmitter housing and assures its electrical insulation. Proper alignment of the transmitter is necessary to avoid vibration or side loads to the flexible coupling.

In addition, at high rotation speeds the alignment of the transmitter must be very precise. For applications with speeds up to 40000 tmin-1, it is advised to have a precision of alignment of about 0.05 mm.

The rotary transmitter produces a small EMF at high-speeds. To avoid increasing the EMF it is necessary to prevent the rotating part from overheating the transmitter. Increasing the EMF can cause the vaporization of mercury within the cells.

To ensure a long lifetime, it is recommended that the RS Series Rotary Transmitters are operated only within the specified temperature range.

## 2.2 ELECTRICAL INSTALLATION

Each wire color corresponds to a cell of the transmitter according to the wiring diagram below:

| Cell | Wire Color  |
|------|-------------|
| 1    | green       |
| 2    | red         |
| 3    | blue        |
| 4    | black       |
| 5    | transparent |
| 6    | pink        |
| 7    | purple      |
| 8    | white       |
| 9    | brown       |
| 10   | gray        |
| 11   | yellow      |
| 12   | orange      |

The color code is the same as for the cables on both sides of the transmitter.

In order to reduce the electrical noise, the transmitter cables are insulated. Be sure that the wires are properly fixed to the part in rotation to prevent the connection from being damaged or broken by vibrations.

The wires can be shortened as needed. However, if the wires are cut too short, their replacement requires a complete disassembling of the transmitter. Replacement of the wires can only be carried out by the manufacturer and is quite complicated, thus it is inevitably expensive.

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## 3. Maintenance

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### 3.1 GENERAL INFORMATION

Magtrol RS Series Rotary Transmitters contain maintenance free ball bearings. No additional lubrication is required.

When in use on a high speed system, it is recommended that the rotary transmitter undergo a routine maintenance check every two to three years. However, if the rotary transmitter is being used for a very high speed application, more frequent maintenance may be necessary.

Do not attempt to dismantle the rotary transmitter for any reason.

Please return the Magtrol RS Series Rotary Transmitter directly to the manufacturer for proper disposal and recycling.

If the rotary transmitter has not been in use for a long period of time the dynamic transfer resistance may increase above the specifications for the unit. This is caused by a clogging of the cells due to deposits of mercury oxide within the transmitter. The rotary transmitter should be returned to Magtrol for cleaning and maintenance.

# Appendix A : CE Conformity Declaration

|   |                                     |                             |
|---|-------------------------------------|-----------------------------|
|  | Formulaire - Q                      | Document No : <b>Do033E</b> |
|   | <b>Declaration of conformity CE</b> | Date : 16.03.2009           |
|   |                                     | Visa : nbur                 |

DEC No : 028

We,

**MAGTROL SA**  
Centre technologique Montena  
CH – 1728 ROSSENS / Fribourg (SWITZERLAND)

Herewith declare that the following products :

**Rotary signal transmitters 198-1xx-000-xxx et 198-2xx-000-xxx**

family types

**MT and RS**

which are mentioned in this declaration, meet all requirements defined in :

the directive 2002/95/CE relative to the restriction of use of certain hazardous substances in electrical and electronic equipments.

The field of application defined in the article 2, and which refers to the appendix 1A of the directive 2002/96/CE, exclude the category 9 to which our products belong.  
Consequently, the use of the Mercury (Hg) is allowed until 31.12.2016 in new products, and even beyond for repairs.

Aware of the impact on the environment, we have been setting up for several years, a procedure of management and recycling of the Mercury.

Rossens, 11.09.2009



J. Cattin  
General Manager



N. Buri  
QES System Manager

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# Magtrol Limited Warranty

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Magtrol, Inc. warrants its products to be free from defects in material and workmanship under normal use and service for a period of twelve (12) months from the date of shipment. Software is warranted to operate in accordance with its programmed instructions on appropriate Magtrol instruments. This warranty extends only to the original purchaser and shall not apply to fuses, computer media, or any other product which, in Magtrol's sole opinion, has been subject to misuse, alteration, abuse or abnormal conditions of operation or shipping.

Magtrol's obligation under this warranty is limited to repair or replacement of a product which is returned to the factory within the warranty period and is determined, upon examination by Magtrol, to be defective. If Magtrol determines that the defect or malfunction has been caused by misuse, alteration, abuse or abnormal conditions of operation or shipping, Magtrol will repair the product and bill the purchaser for the reasonable cost of repair. If the product is not covered by this warranty, Magtrol will, if requested by purchaser, submit an estimate of the repair costs before work is started.

To obtain repair service under this warranty, purchaser must forward the product (transportation prepaid) and a description of the malfunction to the factory. The instrument shall be repaired at the factory and returned to purchaser, transportation prepaid. **MAGTROL ASSUMES NO RISK FOR IN-TRANSIT DAMAGE.**

THE FOREGOING WARRANTY IS PURCHASER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY, OR FITNESS FOR ANY PARTICULAR PURPOSE OR USE. MAGTROL SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OR LOSS WHETHER IN CONTRACT, TORT, OR OTHERWISE.

## CLAIMS

Immediately upon arrival, purchaser shall check the packing container against the enclosed packing list and shall, within thirty (30) days of arrival, give Magtrol notice of shortages or any nonconformity with the terms of the order. If purchaser fails to give notice, the delivery shall be deemed to conform with the terms of the order.

The purchaser assumes all risk of loss or damage to products upon delivery by Magtrol to the carrier. If a product is damaged in transit, **PURCHASER MUST FILE ALL CLAIMS FOR DAMAGE WITH THE CARRIER** to obtain compensation. Upon request by purchaser, Magtrol will submit an estimate of the cost to repair shipment damage.



*Test, Measure and Control of Torque-Speed-Power • Load-Force-Weight • Tension • Displacement*

[www.magtrol.com](http://www.magtrol.com)

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