Safety Guidelines

Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

Qualified Personnel

This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

Warning: This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

Note: Always use product in accordance with specifications.

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Disclaimer of Liability

While we have verified the contents of this manual for agreement with the instrumentation described, variations remain possible. Thus we cannot guarantee full agreement. The contents of this manual are regularly reviewed and corrections are included in subsequent editions. We welcome all suggestions for improvement.

Technical data subject to change.

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Contact SMPI Technical Publications at the following address:

Technical Publications
Siemens Milltronics Process Instruments Inc.
1954 Technology Drive, P.O. Box 4225
Peterborough, Ontario, Canada, K9J 7B1
Email: techpubs@siemens-milltronics.com

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Introduction

Safety Notes
Special attention must be paid to warnings and notes highlighted from the rest of the text by grey boxes.

WARNING: means that failure to observe the necessary precautions can result in death, serious injury, and/or considerable material damage.

CAUTION: means that failure to observe the necessary precautions can result in considerable material damage.

Note: means important information about the product or that part of the operating manual.

Safety marking symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code> </code></td>
<td>Alternating Current</td>
</tr>
<tr>
<td><code> </code></td>
<td>Direct Current</td>
</tr>
<tr>
<td></td>
<td>Earth (ground) Terminal</td>
</tr>
<tr>
<td></td>
<td>Protective Conductor Terminal</td>
</tr>
</tbody>
</table>

Product Warnings

WARNINGS:

- Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable Codes of Practice.
- If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to use suitable precautions that prevent it from being adversely affected.
- The M D–36 Speed Sensors are to be used only in the manner outlined in this manual or protection provided to the equipment may be impaired.
MD-36 Speed Sensors

The MD-series speed sensors monitor the speed of a belt conveyor. The sensor, coupled to the motor or pulley shaft, converts the rotation of its input shaft into an encoded speed signal. The speed signal is transmitted to the integrating electronics for use in calculating the rate of material flow.

Siemens Milltronics provides a full range of electronic integrators:

- Compuscale III
- BW100
- BW500

The MD-36 sensors can also be used with older model Siemens Milltronics integrators:

- Compuscale
- Compuscale II
- Compuscale IIA
- Compu-IIA
- Compu-M
- BW500
- BW100

For further information about Siemens Milltronics products, go to www siemens-milltronics.com.

The Manual

Notes

- Please follow the installation and operating procedures for a quick, trouble-free installation and to ensure the maximum accuracy and reliability of your Siemens Milltronics weighing system.
- This manual applies to the MD-36 Speed Sensors only. Please consult the separate integrator and belt scale manuals for operating instructions.

This manual will help you set up your MD-36 Speed Sensor for optimum performance. We always welcome suggestions and comments about manual content, design, and accessibility.

Please direct your comments to techpubs@siemens-milltronics.com.
Specifications

Power

- MD-36/MD-36A/MD-36SS: +15 V dc, 25 mA from integrator
- MD-36 IS: +5, - 25Vdc from IS Switch Isolator

Temperature

- –40°C to 55°C (-40°F to 130°F)

Input

- Shaft rotation 0 to 2,000 rpm, bi-directional

Output

MD-36/MD-36A/MD-36SS:
- open collector sinking output, max. 25 mA at 15 V dc
- 36 pulses / revolution
- 0 to 2,000 rpm = 0 to 1200 Hz

MD-36 IS:
- Load current: 0 – 15mA
- 36 pulses per revolution
- 0 to 2000 rpm = 0 to 1200 Hz

Input: Output

- 1:1 (speed ratio)

Enclosure

- MD-36 and MD-36 IS: aluminum rating – Type 4/NEMA 4/IP 65
- MD-36A: aluminum
- MD-36SS: 304 Stainless Steel
Approvals

- M D-36: CSA, FM - Class II, Gr. E, F&G, class III, CE
- M D-36 IS:
  - ATEX: II 2 G, EEx ia IIC T6 (with suitable IS Switch Isolator)
  - CSA/FM (with suitable IS Switch Isolator or Switch Amplifier): Class I, Div. 1, Groups A,B,C, and D. Also Class II, Div. 1, Groups E,F, and G system approval
  - CE
- M D-36A, M D-36SS: CE

Switch and Isolator Approvals

Proximity Switch Approval Ratings (Pepperl+Fuchs #J 3.5-N)

- ATEX: II 2 G, EEx ia IIC T6 (with suitable IS Switch Isolator)¹
- CSA/FM (with suitable IS Switch Isolator or Switch Amplifier): Class I, Div. 1, Groups A,B,C, and D. Also Class II, Div. 1, Groups E,F, and G system approval

IS Switch Isolator (Pepperl+Fuchs #KFA5-SOT2-Ex2 and #KFA6-SOT2-Ex2)

- ATEX: II (1) G, [EEx ia] IIC
- CSA/FM: Class I, Div. 1, Groups A,B,C, and D. Also Class II, Div. 1, Groups E,F, and G.

Cable (optional)

- Belden 8770, 3 wire shielded, 18 AWG or equivalent
- max. run 305m (1000 ft)

¹ Based on the ATEX rating of the NAM UR slotted sensor and CSA/FM system approvals.

Note: The Approval Ratings for the Proximity Switch and the IS Switch Isolator are the property of Pepperl+Fuchs. Copies of these Approval Certificates may be obtained at www.siemens-milltronics.com.
**Operation**

The speed sensor consists of a main shaft rotating in a bearing assembly fixed to the enclosure. The shaft turns a toothed disk divided into 36 teeth, each separated by a gap equal to the tooth width. In the MD-36/MD-36A/MD-36SS, the encoder card is mounted so that the two optocouplers straddle the disk's teeth.

**MD-36/MD-36A/MD-36SS Operation**

Power from the integrating device energizes the two optocoupler LEDs and feeds the 5Vdc regulator. The 5Vdc bus powers the logic circuitry and the output driver transistors.

As the shaft rotates, the 36-tooth wheel modulates the light crossing within each optocoupler. The resulting outputs are two 50% duty cycle square waves that are phase shifted by 90 degrees electrical or 1/4 cycle (one cycle of 360 degrees electrical corresponds to the width of one tooth and one gap). This configuration provides directional discrimination.

The optocouplers' square wave outputs are converted into clockwise (CW) and counterclockwise (CCW) square wave output signals by the intermediate logic. When the shaft rotates in a CW direction, the logic produces pulses at the CW output and the CCW output is disabled. When the shaft rotates in a CCW direction, the logic produces pulses at the CCW output and the CW output is disabled.

The speed sensor is immune to any external vibration that would cause the toothed wheel to oscillate 1/4 cycle (1/2 tooth width or 5° of shaft rotation) or less.

**MD-36 IS Operation**

The MD-36 IS Speed Sensor contains a Pepperl + Fuchs, NAMUR rated, inductive proximity sensor, model # SJ3.5-N, consisting of an oscillator and a coil. The oscillator creates a frequency which is emitted from the coil and out the face of the sensor.

When a metal target enters this radiated field, eddy currents are indicated on this target. As the target moves closer to the sensor, the energy required from the oscillator increases. The IS switch isolator monitors the change in the oscillator load, triggering the output when a predetermined level is reached.
Dimensions

M D-36, M D-36A, M D-36 IS

Front View

1/2" NPT plug (two places)

71 mm (2.8")

142 mm (5.6")

218 mm (8.6")

56 mm (2.2")

112 mm (4.4")
Mounting

The MD-36 speed sensor models can be coupled to a tail pulley, bend pulley, or motor shaft.

There are two methods of attaching the sensor: floating and fixed.

Floating Pulley Mount

The input shaft and bearing assembly bear the weight of the speed sensor. The unit's arresting bracket stops the speed sensor from rotating with the shaft.

The arresting bracket straddles a section of angle iron installed by the customer. Make sure to fasten the anti-rotation spring.

Notes:
- When mounting the speed sensor, ensure that the shaft alignment is true to avoid stresses on the shaft bearing.
- For preferred mounting locations, refer to the associated belt scale or weigh feeder application drawings.
Pulley Shaft

M8 or 5/16-18 UNC set screw (customer supplied)

64mm (2.5")
25mm (1")
16mm (0.630") min.
16.07mm (0.633") max.

Arresting Bracket (B-B Cross Section)

127mm (5") (approx)

secure with hook or bolt

angle iron

arresting bracket

anti-rotation spring

Notes:

- When tail or bend pulley is not supplied by Siemens Milltronics, machining on tail/bend pulley shaft (see Pulley Shaft above) to accommodate Milltronics speed sensor is done by customer.
- Arresting bracket is an anti-rotation device only and must not secure or support the speed sensor. Bearing life is greatly reduced if speed sensor is not free to "float." Use anti-rotation spring to prevent mechanical oscillation of speed sensor.
- Grease mating surfaces to prevent seizing.
Fixed Shaft Mount

Side View

- Motor shaft
- Rubber hose
- Hose clamp (typ)
- 16mm (0.63") Ø shaft
- 13mm (0.5") optimum dimension
- 0.8mm (0.03") max. shaft offset
- Customer supplied mounting bracket (remove supplied arresting bracket)
- Guard (to suit)

Front View

- Shaft rotation
- 8mm (0.313") two places
Interconnection

**CAUTION:**
- All wiring must be done in accordance with approved conduit, boxes, and fittings, and to procedures in accordance with all governing regulations.
- Flexible conduit is recommended so excess stress is not applied to the shaft bearings.
- Interconnection between the speed sensor and the integrator should be made with 3-wire shielded, 18 AWG cable (Belden 8770 or equivalent).
- Ground the shield at the integrator ONLY!

### MD-36 Speed Sensor/Integrator Connection

<table>
<thead>
<tr>
<th>Description</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>+15 Vdc</td>
<td>1</td>
</tr>
<tr>
<td>Speed Out (CW)</td>
<td>2</td>
</tr>
<tr>
<td>Speed Out (CCW)</td>
<td>3</td>
</tr>
<tr>
<td>Common</td>
<td>4</td>
</tr>
<tr>
<td>Ground</td>
<td>G</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comp II</td>
<td>TB1</td>
</tr>
<tr>
<td>BW 100</td>
<td>TB1</td>
</tr>
<tr>
<td>BW 500</td>
<td>TB1</td>
</tr>
</tbody>
</table>

- **TB1:** 30 8 19
- **TB1:** (31) (7) (16)
- **TB1:** (31) (7) (16)
- **TB1:** 32 6 17
- **TB1:** N/C N/C N/C

1. To determine direction of rotation, see *Front View* mounting on page 14.
2. Terminal positions in brackets denote that only one signal may be connected at one time.
3. N/C = No Connection

### MD-36 IS Speed Sensor/Isolator/Integrator Connection

<table>
<thead>
<tr>
<th>Description</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD-36 IS</td>
<td>3 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS Switch Isolator (P&amp;F #KFA5-S0T2-Ex2)</td>
<td>1 3 7 8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW 100</td>
<td>TB1</td>
</tr>
<tr>
<td>BW 500</td>
<td>TB1</td>
</tr>
</tbody>
</table>

- **TB1:** 7 16
- **TB1:** 17 14
Wiring Diagram (M D-36 IS only)

Hazardous Area
Siemens Milltronics
M D-36 IS

Non-Hazardous Area
IS Switch Isolator
(Pepperl+Fuchs #KFA5-SOT2-Ex2)
(customer supplied)

Note: The 115V version is shown. If 230V is required, use isolation barrier Pepperl + Fuchs #KFA6-SOT2-Ex2.
## Parts Lists

### MD-36/MD-36A/MD-36 IS Parts List

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Enclosure</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Screw, 6-32 x 5/16</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>External Lockwasher #6</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Gasket, Bearing Assembly</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>MD-36 Bearing Assembly</td>
<td>1</td>
</tr>
<tr>
<td>5a</td>
<td>MD-36A Bearing Assembly</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>MD-36 Shroud</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Disc 36 Tooth</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Disc Hub</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Slot Round Head Screw 1/4&quot;</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Lockwasher Split 1/4&quot;</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>Enclosure Cover</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Extension Shaft</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Set Screw Socket, 8-32 x 5/16</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>External Lockwasher #4</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>Bushing</td>
<td>2</td>
</tr>
</tbody>
</table>

### Diagram

![Diagram of the MD-36 Speed Sensor](image-url)
Bearing Assembly Replacement

1. Turn off supply power from integrator and then remove speed sensor from mounting.
2. Remove cover (#11) and the four bearing assembly mounting screws (#18) located externally around shaft.
3. Pull out bearing assembly (#5) c/w card, disc hub, disc, and mounting brackets.
4. Remove screws (#17), bushing (#15), and card (#16).
5. Remove speed sensor shroud screws (#2).
6. Loosen hex screw in shaft and remove extension shaft, disc hub, and disc to free bearing assembly.
### MD-36SS Parts List

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Enclosure</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Screw, 6-32 x 5/16</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>External Lockwasher #6</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Gasket, Bearing Assembly</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Bearing Assembly</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>MD-36 Shroud</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Disc 36 Tooth</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Disc Hub</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Extension Shaft</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Set Screw Socket, 8-32 x 3/16</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>External Lockwasher #4</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>Bushing</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>Speed Pickup Card Ver.3</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Binding Screw, Slot, 6-32 x 5/8</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>SS Screw, Socket, 10 - 32</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>Lockwasher, Split D0 SS</td>
<td>4</td>
</tr>
<tr>
<td>17</td>
<td>Binding Screw, Slot, 4 - 40 x 3/8</td>
<td>3</td>
</tr>
<tr>
<td>18</td>
<td>Hex Nut, 6 - 32</td>
<td>2</td>
</tr>
<tr>
<td>19</td>
<td>Terminal Block</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>Cable Connector</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>Enclosure Arresting Bracket</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>Locknut 1/4 B 1/2 in #141</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>Spring Spnr. 8-604</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>Bolt, Hex 5/16 - 1/4 x 3/4 SS</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>Lockwasher Split 5/16 SS</td>
<td>2</td>
</tr>
<tr>
<td>26</td>
<td>Nut, Hex 5/16 - 1/8 NC SS</td>
<td>2</td>
</tr>
<tr>
<td>27</td>
<td>SS Screw, Socket, 10 - 32</td>
<td>2</td>
</tr>
</tbody>
</table>

**Side View**
Bearing Assembly Replacement

1. Turn off supply power from integrator and then remove speed sensor from mounting.
2. Open cover and remove the four bearing assembly mounting screws (#15) located externally around shaft.
3. Pull out bearing assembly (#5) c/w card, disc assembly, and MD-36 shroud
4. Remove screws (#14), bushing (#12), and card (#13).
5. Remove MD-36 shroud screws (#2) and MD-36 shroud c/w terminal block (#19) and card (#13).
6. Loosen hex screw in shaft and remove extension shaft, disc hub, and disc to free bearing assembly.

Note: Shown with cover removed.
Maintenance

The speed sensor electronics normally requires no maintenance; however, a program of periodic checks would be beneficial. The enclosure and circuit board, or NAMUR sensor should be cleaned if necessary, but only when the power is disconnected using a vacuum cleaner and a clean, dry paint brush. Check all electrical contacts for corrosion and arcing.

The speed sensor bearing should be periodically checked for corrosion, wear and seizing. The bearing's life is dependent upon the mounting, the severity of the application, and surrounding environment.