User Manual: (Draft Version)

Measuring Wheel

1. INTRODUCTION:

The Measuring Wheel is a measurement tool, which measures the diameter of slow rotating cylinders during operation; for example on support rollers or tires on rotary kilns or dryers. These components are typically subject to a certain amount of wear and have to be re-machined or replaced after some time of operation. In order keep the kiln or drier axis aligned; it is essential to know the changes of the diameters and to compensate them by adjusting the roller positions.

By measuring the diameter at various positions along the width of a support roller or tire, its cylindricity gets known, which helps to define the corrective action in case of deviations.

The Measuring Wheel can be considered as a caliper to measure diameters of huge rotating cylinders.

Typical applications:

Diameter measurement of:
- Support rollers, tires and shell on rotary kilns and rotary dryers
- Trunnions or tires and shell on ball mills (measured in barring mode)

1.1 Safety:

Rotary kilns, dryers and mills, where this tool typically is used, are huge rotating equipment with many pinch points, they can cause serious injuries. Therefore only specialized and trained personnel shall work close to these machines. To use the tool, follow strictly the local safety rules given by the respective plant / factory / local authorities and discuss the application with the safety engineer in charge.

The tools provided by TomTom-Tools GmbH have proven their functionality in various applications; nevertheless TomTom-Tools GmbH does not take any responsibility for the application on site regarding safety. The plant is responsible for the safety, according to the local law, in a way that nobody can be hurt or injured. The application and safety instructions below are guidelines and not exhausted which include the experience from previous measurement campaigns and might need to be adapted to the local safety requirements.
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Caution:

**Pinch Points:**
Do not put your hands nor any items close or into pinch points (e.g. girth gear / pinion, kiln tires / support rollers,…)
Keep safe distance to avoid getting caught by moving parts.

*Never place the Measuring Wheel on the side of the pinch point between support roller and tire* ; place it always on the out running side, to avoid the items get caught between

**Magnet Fields:**
Be aware of the strong magnet field of the magnet stands.
Keep the tool away from people with pace makers or any other sensitive item as credit cards or magnetic data carrier.

**Clamping:**
Do not put fingers between the magnets and magnetic surface. There is the risk for clamping or pinching, due to the strong magnetic force.

**Gloves:**
Wear proper gloves to protect your hands from hot and rough surfaces and sharp edges.

**Hot Surface:**
After using the tool, some components might be very hot; especially the switch flag and the light barrier sensor
Let them cool down before stowage. Otherwise the box may get damaged.

**Radio Waves:**
Be aware of the radio waves (Bluetooth) which are emitted from the tool as well from the Bluetooth adapter on the computer.
Do not keep the tool unnecessary in operation; switch it off, after usage.
1.2 **Measuring Principle:**

The Measuring Wheel kit consists of three main components, the wheel itself with the integrated rotation encoder, the heat resistant light barrier sensor to indicate the rotation of the item to be measured and the controller which calculates and displays the diameter.

The wheel with the diameter of 176mm is running without slippage on the surface to be measured (e.g. support roller). During each wheel revolution 1760 electrical impulse are sent to the Wheel Controller which is counting them.

With the help of a magnetic switch flag attached to the side face of the support roller or tire, the light barrier sensor provides each revolution an electrical impulse to the Wheel Controller. This revolution impulse starts the counting of the impulses coming from the wheel encoder. After one revolution of the support roller or tire, a new impulse coming from the barrier sensor is stopping the counting, the diameter value is displayed and immediately the next measuring cycle is started.

With each revolution the diameter value is refreshed whereupon the last reading appears at the lowest of the three rows in the display. The second and the third row show the previous readings.
Measurement of kiln tire diameter

Measurement of support roller diameter
1.3 Tool Kit includes:

The Measuring Wheel is coming as a tool kit in a strong and tight transport case, which includes the following items:

1. **Measuring Wheel** with integrated rotation encoder and spring loaded wheel suspension
2. **Wheel Controller** with graphic display
3. **Light Barrier Sensor** with opening 80mm, heat resistant up to 180°C
4. **Light Converter** for Light Barrier Sensor
5. **Sensor Cables** with 2 and 5m length
6. **Magnetic Stand** for Measuring Wheel
   Including base plate with 8 magnets, connectors and 4 extension rods
7. **Magnetic Stand** for Light Barrier Sensor
   Including magnetic base, connectors and extension rod
8. **Battery Charger** with different plug adapters (100…240VAC)
9. **Magnetic switch flag** with heat resistant magnet (up to 300°C) and extension rods
10. **Transport Case** with foam cushioning, extra tough, water and dust seal (suitable for air cargo)
11. **Allen Key** for assembly
12. **Manual** (in lid)
2. **MAIN COMPONENTS**

2.1 **Short Support:**
Wheel directly mounted to the base plate

- Adjustmen handle
- Clamping handle
- Base plate
- Connector (M12 4 pole)
- Magnet (max 8 pieces)

2.2 **Long Support:**
Wheel mounted on extended support to reach further. To give the necessary hold in case of extending with more than 2 rods, it is recommended to use 8 magnets on the base plate.

- Extension rod
- Light Barrier Sensor
- Wheel Controller
- Light Converter
2.3 **Wheel Controller:**

The Wheel Controller supplies the power and processes the acquired values. It consists mainly of the following components:

- **Switch board** with impulse counter, graphical display and battery management.
- **Re-chargeable batteries** 4 pieces, size AA, type NiMH (1.2V, >1900mAh)
- **Tough housing** with two plugs to connect the wheel and the light barrier sensor

**Note:** The two magnets on the back of the housing can be removed if not required, (by turning magnets counter-clockwise)

2.4 **Light Barrier Sensor:**

Light Barrier Sensor provides each revolution precisely an electrical impulse to start and stop the measurement. It consists mainly of the following components:

- **Light Converter** which sends and receives the light passing through the optical cables (Attention: max. temp. 60°C)
- **Light Barrier Fork** with optical cables (heat resistant up to 180°C)
- **Magnet Stand** with different extension rods
- **Magnetic Switch Flag** with different extension rods
3. INSTALLATION OF THE TOOL:

3.1 Place the Light Barrier Sensor

Place the Magnet Stand of the Light Barrier Sensor onto a magnetic surface near the side face of the support roller or tire, which has to be measured. Try to minimize the exposure to heat.

Attach the magnetic switch flag to the side face of the roller or tire. Make sure there is sufficient clearance and the surface does not have thick dust build up to prevent the magnet from falling. Special attention has to be given on kiln tires that the switch flag is not interfering with the thrust roller.

Adjust the Light Barrier Fork in a way that the switch flag is passing through the fork and interrupts the light beam. The light beam is not visible but the two lenses where the light is passing can be found on the two ends of the fork.

The signal is indicated later by a light in the Light Converter and with a symbol in the display of the Wheel Controller.

Caution Hot! Wear Gloves!
The tire and afterwards the Switch Flag might be very hot.
3.2 Place the Measuring Wheel

Place the Magnet Stand of the wheel onto a magnetic surface near the support roller or the tire. Assure sufficient cleanliness of the contact surfaces to have sufficient stability. By adding the extension rods, the range can be increased to more than 2m. In this case it is required to attach additional magnets to the baseplate, they can be found in the case under the wheel.

For safety, hold the base plate not directly but on the Extension Rod. To avoid shocks, get first contact with only two magnets as shown in the following picture.

Depending on the purpose to measure the roller or tire diameter the wheel can be placed on different positions along the width.

For the purpose of kiln axis alignment or general wear measurement, typically only one reading in the middle is taken.

To get information about the cylindricity various measurements along the width are taken. It provides a clear base for decisions about possible required re-machining of the roller or tire surface.
The following sketch provides recommendations for placing the Measuring Wheel. Place the wheel only in safe areas. Keep distance to the pinch point between support roller and tire. Never place the Measuring Wheel or the Light Barrier Sensor on the side of the pinch point; place it always on the out running side, to avoid the items get caught between. Please note also the orientation of the wheel suspension in relation to the sense of rotation.

To avoid slippage it is important that the wheel is adjusted in line with the running surface and some pressure is applied. The pressure can be adjusted by loosening the clamping handle on the hub of the lever arm and pushing the wheel against the surface. Tighten the lever arm again, after adjustment. To fine tune the straightness use the tilt screw as shown in the picture below.
3.3 **Connect the electrical cables**

Connect the Measuring Wheel and the Light Barrier Sensor with the two cables to the Wheel Controller. It does not matter, which plug is used for which sensor; the controller is detecting the devices and allocates the signals accordingly.

4. **TAKE MEASUREMENT**

Start the Wheel Controller. As soon the wheel is turning it is recognized by the wheel controller and the icon appears in the display next to the respective plug.

Also the icon for the Light Barrie Sensor appears and indicates when the switch flag passes through. To protect the wheel, its temperature is measured and displayed on the screen. In case of high temperature, an alarm message will appear and the wheel has to be removed from the kiln.

The diameter values are shown in stack mode with three rows. The latest value is displayed in the lowest row and pushes the previous values up. This makes the fine tuning of the wheel easy, where the highest diameter value has to be found; the value with no wheel slippage.
5. MAIN DIMENSIONS

5.1 Short Support
5.2 **Long Support**
6. **SPARE PART LIST**

<table>
<thead>
<tr>
<th>Pcs.:</th>
<th>Item</th>
<th>Specification</th>
<th>Item Number</th>
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<tbody>
<tr>
<td>1</td>
<td>Controller</td>
<td></td>
<td>MW.01.000</td>
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<tr>
<td>4</td>
<td>Rechargeable battery</td>
<td>AA (1.2VDC / 2000mAh)</td>
<td>17860</td>
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<td>2</td>
<td>Electrical Socket</td>
<td>M12x1-M16x1.5</td>
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<td>Protection plug for electrical socket</td>
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<td>2</td>
<td>Magnet with outer thread</td>
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<td>Bluetooth USB-Adapter</td>
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<td>12V - 10W (90-264VAC)</td>
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<td>1</td>
<td>Measuring wheel</td>
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<td>Wheel disc</td>
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<td>Magnet for base plate (400N)</td>
<td>D=32mm M6</td>
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<td>Knurled nut</td>
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<td>Adjustable clamp joint</td>
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<td>Adjustable handle (high clamping force)</td>
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<td>Rod adapter</td>
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<td>Extension rod</td>
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<td>Transport case</td>
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<td>Adapter cable</td>
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<tr>
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