INCLINOMETERS AND PRECISION LEVELS

Irrespective of whether they are spirit or electronic inclinometers, all precision levels are based on the same perfectly reliable reference but also cost-free: the centre of the earth’s gravity.

Under the force of gravity, the gas bubble in the liquid or the pendulum inclines itself according to this natural physical principle.

The position of the pendulum with respect to the measuring faces of the instrument body can then be measured. Based on this perfect principle, these instruments offer a great number of measuring applications of high precision. The horizontal and vertical positioning of the measuring faces enable the detection of form errors in the geometrical elements on the workpiece to be measured. These errors often result from deviations in straightness, flatness, position, parallelism and squareness.

Indication of values may vary depending on the type of level, the values typically displayed are:
- inclination (mm/m or in/10 in);
- radian in mrad;
- decimal angle (e.g. 12.37°);
- sexagesimal angle in degrees (°), minutes (‘) and seconds (") e.g. 15° 30’ 45".

TESA MICROBEVEL 1  TESA CLINOBIEVEL 1 USB  TESA CLINOBIEVEL 2  TESA NIVELTRONIC  Spirit clinometers with angle protractor
INCLINOMETERS AND LEVELS

The TESA inclinometers and levels meet the most demanding applications not only in the machine building sector but also in the civil construction sector.

Electronic Inclinometer - TESA CLINOBEVEL 1 USB

Compact universal instrument for direct and differential measurements – Measuring range ± 45° with display of measured angles or inclinations – Reinforced aluminium housing, eloxide surface – Large digital display for error free interpretation of readings.

Supplied with CLINOSOFT software permitting the visualisation and storage of measurements as well as the USB cable to host computer.

Multiple applications are possible, notably the measurement of 2 flat surfaces by comparing the measured values with the help of 2 instruments. Automatic generation of inspection reports using Microsoft EXCEL spreadsheet software.

CLINOBEVEL 1-USB, can be used on its 4 faces.
**TESA CLINOBEVEL 2 Electronic Inclinometer**

Portable precision inclinometer.

Measuring range ±45° with indication of angle or inclination. Integrated temperature compensation 2 prismatic measuring faces. Spirit level integrated in transverse direction to eliminate "twist" error. Simple and rapid calibration: correction of gain by the 3-point method and software integrated in the instrument. Microprocessor-based features for display setting and instrument adjustment.

The CLINOBEVEL 2 can be used on its two reference faces. It can also be connected to a second CLINOBEVEL 2 instrument for a differential measurement (Comparative): one of the two instruments operates as a reference without the need to connect to a computer. The integrated RS 232 interface enables the connection of the instrument to a computer. Magnetic inserts can be integrated on the measuring faces on request as a special execution.

**Specifications:**
- Measuring range: ±45°
- Spirit level integrated in transverse direction
- Simple and rapid calibration: 3-point method
- Microprocessor-based features for display setting and instrument adjustment
- Integrated RS 232 interface
- Magnetic inserts can be integrated on the measuring faces

**Accessories:**
- 04768002: 4 batteries LRC 6 AA, 1.5 V for CLINOBEVEL 1 USB, CLINOBEVEL 2, MICROBEVEL,
- 05360004: Connecting cable between 2 CLINOBEVEL 2, L = 2.5 m
- SS3070174: Câble USB pour CLINOBEVEL 2, L=2.5 m

**Dimensions:**
- 100 x 150 x 35 mm

**Technical Details:**
- Capacitive measuring system with gravity pendulum
- 10° + 0.03 % of the readout
- 2 flat measuring faces with V-slot for diameters from Ø 17 to 94 mm
- Rust inhibiting housing
- Response time: < 5 s
- Automatic shut down after 8 min
- RS 232 asynchronous, 7 bits, 2 stop bits, no parity, 9600 bauds
- 2 batteries 1.5 V, type LRC 6, AA
- 40 to 60 hours
- EN 50081-1 / -2
- EN 50082-1 / -2
- 3 kg
**TESA MICROBEVEL 1 Inclinometer**

TESA MICROBEVEL 1 is particularly suited for measuring slightly inclined surfaces such as the measuring of flatness of surfaces or the geometrical characteristics (deviation, rotation etc.) of a machine tool.

Suited for operation under the most rugged conditions., protected by an aluminium case.

Power supplied by a single standard battery AA 1,5 V for at least 100 hours of operation.

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**Models with steps 0,05 to 0,005 mm/m available on request**

<table>
<thead>
<tr>
<th>No.</th>
<th>Range 1 or Range 2, mm/m</th>
<th>Base width, mm</th>
<th>Base height, mm</th>
<th>kg (with transport case)</th>
</tr>
</thead>
<tbody>
<tr>
<td>05330003</td>
<td>TESA MICROBEVEL 1 horizontal base 110 x 45 mm</td>
<td>0,01 ou 0,001</td>
<td>110</td>
<td>45</td>
</tr>
<tr>
<td>05330004</td>
<td>TESA MICROBEVEL 1 horizontal base 150 x 45 mm</td>
<td>0,01 ou 0,001</td>
<td>150</td>
<td>45</td>
</tr>
<tr>
<td>05330005</td>
<td>TESA MICROBEVEL 1 square base 150 x 45 mm</td>
<td>0,01 ou 0,001</td>
<td>150</td>
<td>45</td>
</tr>
</tbody>
</table>

**OPTIONAL ACCESSORY:**

04768002 4 batteries LRC 6 AA, 1,5 V for CLINOBEVEL 1 USB, CLINOBEVEL 2, MICROBEVEL, D IN 2276 Part 2 (Style G)

See table for max. perm. errors

LCD display according to table

Fully encapsulated measuring system with gravity pendulum

See table for max. perm. errors

2 flat measuring faces with V-slot for diameters from 20 to 120 mm

Cast iron base, Chromium plated side faces, Aluminum housing, lacquered

Response time < 3 s

Automatic shut down after 55 min

1 mV per unit (100 kΩ)

1,5 V battery, type LRC 6, AA

100 to 140 hours

≤ 0,1 %/°C based on the measuring range at 20 ± 5°C

EN 50081-1 / -2 En 50082-1 / -2

**STRAIGHTNESS, ANGLE AND INCLINATION MEASUREMENT**
**TESA NIVELTRONIC Electronic Levels with Analogue Display and Integrated Galvanometer**

Electronic levels with analogue display and integrated galvanometer. These instruments are known for a remarkable stability at zero point. They are used for the inspection and alignment of horizontal and vertical surfaces. They are also suitable for the measurement of slight inclinations, especially for the inspection of flatness of granite surface plates.

The square model is particularly suited for the measurement of flat or cylindrical parts thanks to its prismatic base.

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<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>mm/m</th>
<th>Base length mm</th>
<th>Base width mm</th>
<th>kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>03130063</td>
<td>TESA NIVELTRONIC electronic level, horizontal, analogue display</td>
<td>0,05 / 0,01</td>
<td>150</td>
<td>45</td>
<td>6,0 / 3,7 *</td>
</tr>
<tr>
<td>03130060</td>
<td>TESA NIVELTRONIC electronic level, square, analogue display</td>
<td>0,05 / 0,01</td>
<td>200</td>
<td>45</td>
<td>6,5 / 4,4 *</td>
</tr>
</tbody>
</table>

* With/without wooden case

**OPTIONAL ACCESSORIES:**

- 03160007 Granite base 200 x 50 mm for horizontal NIVELTRONIC**
- 03160008 Granite base 250 x 50 mm for horizontal NIVELTRONIC**
- 03160009 Granite base 500 x 50 mm for horizontal NIVELTRONIC**
- 03160048 Holder with voltage regulator (4,65 V) and 4x LR03 AAA for NIVELTRONIC
- 04761059 4 batteries LR03 AAA, 1,5 V for NIVELTRONIC

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**Range mm/m " mm/m **

<table>
<thead>
<tr>
<th>Range</th>
<th>mm/m</th>
<th>** mm/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>± 0,75</td>
<td>± 150&quot;</td>
</tr>
<tr>
<td>2</td>
<td>± 0,15</td>
<td>± 30&quot;</td>
</tr>
</tbody>
</table>
TESA Crossed Spirit Levels – for Assembly
For the inspection and alignment of flat surfaces.

The 2 vials permit a simultaneous alignment in the X and Y axes.
The level can be screwed on to a surface.

Model B: Circular level with cross vials, 3-point mounting. Aluminium alloy protection case, anodised.
Model C: T-shaped level with cross vials, 2-point mounting. Manually lapped measuring base to ensure a much higher precision of the level.

<table>
<thead>
<tr>
<th>No.</th>
<th>mm/m</th>
<th>Modele type</th>
<th>L x mm</th>
<th>Ø mm</th>
<th>H mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>05331500</td>
<td>2 + 5</td>
<td>B, Circular level with 2 vials, 3x M2, 35 g (level only)</td>
<td>Ø 40</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>05331502</td>
<td>0,3</td>
<td>B, Circular level with 2 vials, 3x M4, 85 g (level only)</td>
<td>Ø 60</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>05331550</td>
<td>0,1</td>
<td>C, T-shaped level with 2 vials, 2x M5, 80 x 65 mm</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05331551</td>
<td>0,3</td>
<td>C, T-shaped level with 2 vials, 2x M5, 80 x 65 mm</td>
<td>17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**TESA Precision Spirit Levels**

For checking and aligning flat or cylindrical surfaces in the horizontal position.

With an adjustment system for zero point and "twist" error.

Prismatic measuring base, manually lapped finish, enabling a higher precision for the level.

Insulating grip in wood essential for reducing heat transfer due to manual handling.

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**TESA Precision Spirit Levels with a Frame**

For checking and aligning flat or cylindrical surfaces in horizontal and vertical positions.

Instrument features: 4 measuring faces, 2 prismatic faces (shafts Ø 17 to 135 mm) et 2 smooth flat faces.

With adjustment system for zero point and "twist" error.

Longitudinal vial with sensitivity of 0,02 to 0,1 mm/m, depending on the model.

Side viewing slots for an excellent visibility of the top and side of the main vial.

Cross vial with sensitivity of 2-5 mm/m for easy adjustment.

3 insulating grips to avoid any thermal transfer.
**TESA Precision Spirit Levels, Square Models with Magnetic Inserts**

For inspecting and aligning flat or cylindrical surfaces in horizontal and vertical positions.

Instrument features: 2 prismatic faces (shafts Ø 19 to 108 mm) with the vertical measuring face having magnetic inserts.

Equipped with an adjustment system for zero point and "twist" error.

Longitudinal vial with a sensitivity from 0,02 to 0,05 mm/m, depending on the model.

Cross vial with a sensitivity of 2-5 mm/m for an easy adjustment.

A quality wooden grip reduces thermal transfer during manual handling.

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>mm/m</th>
<th>For shafts Ø, mm</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>05331000</td>
<td>Magnetic square level 0,02/150 x 150 x 40 mm</td>
<td>0,02</td>
<td>19 ÷ 108</td>
<td>150 x 150 x 40</td>
</tr>
<tr>
<td>05331002</td>
<td>Magnetic square level 0,05/150 x 150 x 40 mm</td>
<td>0,05</td>
<td>19 ÷ 108</td>
<td>150 x 150 x 40</td>
</tr>
</tbody>
</table>

**TESA Precision Spirit Level with Micrometric Adjustment**

Precision spirit level with micrometer adjustment.

For the measurement of inclinations from -20 to +4 mm/m.

1 division = 0,02 mm/m

Instrument features:

+ 1 micrometer rotation = + 2 mm/m (100 divisions)
+ 2 micrometer rotations = + 4 mm/m
- 10 micrometer rotations = - 20 mm/m

Prismatic measuring face (shafts Ø 19 to 120 mm).

Longitudinal vial with sensitivity of 0,02 mm/m

Cross vial with sensitivity of 2-5 mm/m for easy horizontal adjustment.

With side thermal insulators to reduce heat transfers to the instrument during manual handling.

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>mm/m</th>
<th>For shafts Ø, mm</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>05331450</td>
<td>Precision spirit level with micrometer element 0,02 / 150 x 45 x 45 mm</td>
<td>0,02</td>
<td>19 ÷ 120</td>
<td>150 x 45 x 45</td>
</tr>
</tbody>
</table>
TESA Spirit Inclinometer with Protractor and Micrometer Element

Enables the measurement of angular deviations in any position of a cylindrical or flat surface.

Instrument features: prismatic measuring face (shafts Ø 17 to 80 mm) (DIN 877 + DIN 2276/1). Scale range: 2x 180°.

The adjustment is executed by disengaging the micrometer element by pressing in the direction indicated by the arrow. Afterwards the vial is oriented manually before engaging the micrometer element and executing the fine adjustment with the latter.

1 scale division = 1 degree.
1 division of the micrometer element = 1 Arcmin
Vial with sensitivity of 0,3 mm/m (= 1 Arcmin).
Error limit = 1,5 Arcmin

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Scale division of micrometer element</th>
<th>Scale division of level</th>
<th>For shafts Ø, mm</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>05331750</td>
<td>Spirit clinometer with angle protractor and micrometer element</td>
<td>1 Arcmin</td>
<td>1 Arcmin (0,30 mm/m)</td>
<td>2 x 180°</td>
<td>17 ÷ 80</td>
</tr>
</tbody>
</table>
## Accessories for Clinometers and Levels

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>04768002</td>
<td>4 batteries LRC 6 AA, 1,5 V for CLINOBEVEL 1 USB, CLINOBEVEL 2, MICROBEVEL,</td>
</tr>
<tr>
<td>05360006</td>
<td>External switch with cable, L = 2 m, for CLINOBEVEL 1 USB</td>
</tr>
<tr>
<td>05360014</td>
<td>External switch, wireless, for CLINOBEVEL 1 USB</td>
</tr>
<tr>
<td>05360004</td>
<td>Connecting cable between 2 CLINOBEVEL 2, L = 2,5 m</td>
</tr>
<tr>
<td>04761059</td>
<td>4 batteries LR03 AAA, 1,5 V for NIVELTRONIC</td>
</tr>
<tr>
<td>03160007</td>
<td>Granite base 200 x 50 mm for horizontal NIVELTRONIC</td>
</tr>
<tr>
<td>03160008</td>
<td>Granite base 250 x 50 mm for horizontal NIVELTRONIC</td>
</tr>
<tr>
<td>03160009</td>
<td>Granite base 500 x 50 mm for horizontal NIVELTRONIC</td>
</tr>
<tr>
<td>03160048</td>
<td>Holder with voltage regulator (4,65 V) and 4x LR03 AAA for NIVELTRONIC</td>
</tr>
</tbody>
</table>
**FLATNESS MEASUREMENT**

**ROCH Bevelled Straight Edges**
Models with 1 bevelled edge, with insulating grip to limit the transfer of thermal heat during manual handling for optimal precision.

![Bevelled edge](image)

Bevelled edge

<table>
<thead>
<tr>
<th>NO</th>
<th>Description</th>
<th>μm</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0951750002</td>
<td>Bevelled straight edge</td>
<td>2</td>
<td>75</td>
</tr>
<tr>
<td>0951750003</td>
<td>Bevelled straight edge</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>0951750005</td>
<td>Bevelled straight edge</td>
<td>3</td>
<td>150</td>
</tr>
<tr>
<td>0951750006</td>
<td>Bevelled straight edge</td>
<td>3</td>
<td>200</td>
</tr>
<tr>
<td>0951750007</td>
<td>Bevelled straight edge</td>
<td>3</td>
<td>300</td>
</tr>
</tbody>
</table>

**SQUARES**

**ROCH Flat and Try Squares in Steel – Accuracy Class 1**
Try square 90° flat in stainless steel, non-hardened

![Try square](image)

Try square 90° flat in stainless steel, non-hardened

<table>
<thead>
<tr>
<th>NO</th>
<th>Description</th>
<th>μm</th>
<th>Length of beams, mm</th>
<th>Section mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0951751605</td>
<td>Try-square steel</td>
<td>15</td>
<td>100 x 70</td>
<td>20 x 5</td>
</tr>
<tr>
<td>0951751607</td>
<td>Try-square steel</td>
<td>18</td>
<td>150 x 100</td>
<td>28 x 6</td>
</tr>
</tbody>
</table>
Brown & Sharpe Try Square Set

ROCH Bevelled Edge Squares – Accuracy Class 00
Bevelled edge 90° squares in stainless steel, hardened

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>μm</th>
<th>Length of beams, mm</th>
<th>Section of beams, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0951751533</td>
<td>Bevelled edge square, stainless</td>
<td>3</td>
<td>50 x 40</td>
<td>14 x 4,5</td>
</tr>
<tr>
<td>0951751534</td>
<td>Bevelled edge square, stainless</td>
<td>3</td>
<td>75 x 50</td>
<td>16 x 4</td>
</tr>
<tr>
<td>0951751535</td>
<td>Bevelled edge square, stainless</td>
<td>3</td>
<td>100 x 70</td>
<td>20 x 5</td>
</tr>
</tbody>
</table>

DIN 875 NF E 11-103

Accuracy class 00

Stainless steel, hardened to ≥ 550 HV 30

Factory standard

Hardened steel
ANGLE PROTRACTORS

Angle Protractor with Digital Display
Measuring ranges 1x 360°, 2x 180°, 4x 90°
Large decimal or sexagesimal display
2 measuring directions
Fine setting with adjustment screw
Locking system
Scale L = 200 mm (300 or 500 mm available as options)
RS232 data output

00630010  Angle protractor with digital display. Supplied with a scale of L = 200 mm

OPTIONAL ACCESSORIES:
00660004  Scale 200 mm
00660005  Scale 300 mm
00660006  Scale 500 mm
00660007  Supporting base with 1 flat measuring face and 1 prismatic measuring face
00660008  Square for measuring sharp angles
01961000  Lithium battery, 3V, CR 2032
04761062  Opto-USB cable, duplex, bidirectional communication
**EAC Angle Protractor with Dial**
Circular scale with needle pointer
Easy reading on main and auxiliary scales
Very low hysteresis
Precision movement with compensation for mechanical play.

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>00630001</td>
<td>EAC angle protractor with dial</td>
<td>200</td>
</tr>
<tr>
<td>00630002</td>
<td>EAC angle protractor with dial</td>
<td>300</td>
</tr>
</tbody>
</table>

**OPTIONAL ACCESSORIES:**

- 00660002 Scale 200
- 00660003 Scale 300
- 00610102 Cast iron base with steel bottom surface, hardened

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**ETALON Angle Protractor with Vernier Scale**

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Auxiliary scale</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>076115566</td>
<td>ETALON angle protractor with vernier 200 mm</td>
<td>No</td>
<td>200</td>
</tr>
<tr>
<td>076115587</td>
<td>ETALON angle protractor with vernier 300 mm</td>
<td>No</td>
<td>300</td>
</tr>
</tbody>
</table>

**OPTIONAL ACCESSORIES:**

- 00660002 Scale 200
- 00660003 Scale 300
- 00610102 Cast iron base with steel bottom surface, hardened
Brown & Sharpe Angle Protractor - Multiple Combinations

This angle protractor combination set can be used as a scale, depth gauge, try square, centering tool, marker or even as a spirit level.

Consisting of:
- 1 Ruler graduated in millimetres, length 300 mm
- 1 Angle protractor with 2 x 90° graduations
- 1 Centering square
- 1 Square head with scriber

Brown & Sharpe Sine Bar

Suited for setting ranges from 0 to 60°

Sine function for establishing the angle that needs to be set on the basis of the length dimensions obtained from parallel gauge blocks.

Example for the calculation of an angle
Given:  \( H = \) height of combination gauge blocks in mm  \( L = \) length of B&S sine bar in mm

Formula:  \( H = L \times \sin(\alpha) \)
\( \sin(\alpha) = H/L \)
\( \text{angle} = \arcsin(\alpha) \)

Calculation for determining angle knowing \( H \) et \( L \) values:
\( \text{angle} = \arcsin\left(\frac{89.803}{127}\right) = \arcsin(0.70711) = 45° \)

Brown & Sharpe Sine Bar
Suited for setting ranges from 0 to 60°
Sine function for establishing the angle that needs to be set on the basis of the length dimensions obtained from parallel gauge blocks.

Example for the calculation of an angle
Given:  \( H = \) height of combination gauge blocks in mm  \( L = \) length of B&S sine bar in mm

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