**PROFILE PROJECTOR**

**V-20B**

Large effective screen diameter of 500 mm. Permits mounting of a large stage and includes a built-in digital counter and digital protractor.

**Parfocal projection lenses**
All projection lenses have the same parfocal distance and feature long working distances. The built-in half mirror eliminates the need to adjust illumination each time the magnification is changed.

**Maximum sample weight**
Combined with the PS 10×6B stage, samples as heavy as 20 kg can be loaded.

**Parfocal projection lenses**

All projection lenses have the same parfocal distance and feature long working distances. The built-in half mirror eliminates the need to adjust illumination each time the magnification is changed.

**Maximum sample weight**
Combined with the PS 10×6B stage, samples as heavy as 20 kg can be loaded.

**Stage Adapter S**
For V-20B only

Used to mount a stage other than the PS 10×6B, PS 8×6B Stage to the V-20B profile projector.

**PROJECTION LENSES**

Five lenses are available, each featuring a different magnification, working distance, and field of view (FOV) diameter.

<table>
<thead>
<tr>
<th>Magnification</th>
<th>FOV diameter (mm)</th>
<th>Half mirror</th>
<th>A</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>5x</td>
<td>100</td>
<td>Built-in; fixed</td>
<td>73</td>
<td>149</td>
</tr>
<tr>
<td>10x</td>
<td>50</td>
<td>Built-in; switchable</td>
<td>79</td>
<td>215</td>
</tr>
<tr>
<td>20x</td>
<td>25</td>
<td>Built-in; switchable</td>
<td>85</td>
<td>313</td>
</tr>
<tr>
<td>50x</td>
<td>10</td>
<td>Built-in; switchable</td>
<td>50.5</td>
<td>130</td>
</tr>
<tr>
<td>100x</td>
<td>5</td>
<td>Built-in; switchable</td>
<td>50.5</td>
<td>130</td>
</tr>
</tbody>
</table>

*Part of the FOV is vignetted when 5× or 10× projection lenses are used under diascopic illumination.

**SPECIFICATIONS**

- **Type**: Vertical optical axis
- **Image**: Inverted and reversed
- **Screen**: ø500 mm with protractor screen
- **Projection lens**: 5×, 10×, 20×, 50×, 100×
- **3-lens turret mount (screw type)**
- **Magnification accuracy**: Diascopic: 0.1 % Reflected: 0.15 %
- **Stages**: PS 10×6B, PS 8×6B directly mountable; PS 6×4B, PS 4×4B, PS 2×2B mountable via adapter
- **Illumination**: Diascopic and reflected (both 24 V-150 W halogen lamp)
- **Maximum sample height**: 150 mm
- **Power source**: AC 100-120 V (CSA), 220-240 V (CEE), 240 V (SAA)
- **Dimensions (W×D×H)**: 570×1200×1900 mm
- **Weight**: Approx. 260 kg
- **Accuracy**: 3.0 ± 1.5 µm After calibration: weight capacity on stage not exceeding 1 kg 3.5 ± 1.5 µm With rotating stage after calibration *PS 2×2B will have this accuracy because of built-in rotating table

*1: Used to mount a stage other than the PS 10×6B, PS 8×6B Stage to the V-20B profile projector. *2: Alphabets above the stages represent accessories that can be mounted. *3: To use the Foot Switch and [Reset/Send] buttons simultaneously, the “MM cable (PX11242)” is required.

**SYSTEM DIAGRAM**

**PROFILE PROJECTOR**

**V-20B**

Large effective screen diameter of 500 mm. Permits mounting of a large stage and includes a built-in digital counter and digital protractor.

**Parfocal projection lenses**
All projection lenses have the same parfocal distance and feature long working distances. The built-in half mirror eliminates the need to adjust illumination each time the magnification is changed.

**Maximum sample weight**
Combined with the PS 10×6B stage, samples as heavy as 20 kg can be loaded.

**Stage Adapter S**
For V-20B only

Used to mount a stage other than the PS 10×6B, PS 8×6B Stage to the V-20B profile projector.
PROFILE PROJECTOR

V-12B Series

Benchtop projector with a wide measuring stroke up to 250×150 mm (cross travel). Models with a built-in digital counter and/or protractor are available.

- **Increased maximum sample height**
  Samples as tall as 100 mm can be measured because the rigidity of the projector is increased by its CAE design.

- **Built-in digital counter and protractor**
  V-12BDC and V-12BSC come with a digital XY counter, while V-12BDC has a built-in digital protractor for greater ease of use.

- **Erect images**
  Projection images are erect and unversed for easy measurements, and their quality is as sharp as inverted images.

- **Switchable vertical/oblique illumination**
  Easier edge detection achieved with the switchable built-in reflection illuminator.

- **4-step zooming condenser lens with diascopic illumination**
  Delivers the right amount of light to suit the magnification of the projection lens. (DIA condenser needed for 200x magnification)

**DIA Condenser Lens**

Necessary when using 200x projection lens and diascopic illumination. *Cannot be removed when using PS 2xB stage.

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Type</th>
<th>Vertical optical axis bench type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image</td>
<td>Erect and unversed</td>
</tr>
<tr>
<td>Screen</td>
<td>ø305 mm with etched center crossline</td>
</tr>
<tr>
<td>Projection lens</td>
<td>5x, 10x, 20x, 25x, 50x, 100x, 200x</td>
</tr>
<tr>
<td>Magnification accuracy</td>
<td>Oblique reflected/diascopic: 0.1 %</td>
</tr>
<tr>
<td>Vertical reflected: 0.15 %</td>
<td></td>
</tr>
<tr>
<td>Oblique reflected/diascopic: 0.1 %</td>
<td></td>
</tr>
<tr>
<td>Stages</td>
<td>PS 10x6B, PS 8x6B, PS 6x6B, PS 4x6B, PS 2x2B directly mountable</td>
</tr>
<tr>
<td>Illumination</td>
<td>Diascopic and reflected (both 24 V-150 W halogen lamp)</td>
</tr>
<tr>
<td>Maximum sample height</td>
<td>100 mm (200 mm with PS 10x6B, PS 8x6B Stage)</td>
</tr>
<tr>
<td>Power source</td>
<td>AC 100/120V (50/60 Hz), AC 220/230V/240V (50/60 Hz)</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 80 kg</td>
</tr>
<tr>
<td>Accuracy</td>
<td>3.0 µm / 50 µm</td>
</tr>
</tbody>
</table>

*1: Standard accessory *2: Alphabets above the stages represent accessories that can be mounted.
*3: To use the foot switch and [Reset/Send] buttons simultaneously, the "MM cable (PXA20224)" is required.
*4: Cannot be used with PS 2xB stage

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**PROJECTION LENSES**

Three lenses can be mounted on the rotary turret at one time. All lenses boast high resolution and minimal distortion, with long working distances.

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**SYSTEM DIAGRAM**

- **FOV diameter**
- **Half mirror**
- **EFB51500**
- **DP-E1A**
- **Data Processor**
- **Printer**
- **Rotating Table**
- **Foot Switch**
- **Large stage adjustment knob**
- **Standard 300 mm Scale**
- **Lamp Verification Tool**
- **Profile Projector**
- **I/O Panel (V-12BDC/ V-12BSC)**
- **Chart Clip Type LL (30 pcs.)**
- **Proj. Lens**
- **Profile Projector**
- **Data Processing Software**
- **E-MAX series**

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**DATA PROCESSING SOFTWARE**

- **E-MAX**
- **Software**
- **Data Processing**
- **Image**
- **Data**
- **Processor**
- **Software**
- **E-MAX series**

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**V-12BDC configured with PS 10x6B Stage**

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**DATA PROCESSING SOFTWARE**

- **E-MAX**
- **Software**
- **Data Processing**
- **Image**
- **Data**
- **Processor**
- **Software**
- **E-MAX series**
ACCESSORIES

Stages

PS 10x6B
(Stroke: 250x150 mm)

PS 8x6B
(Stroke: 200x150 mm)

PS 6x4B
(Stroke: 150x100 mm)

Stage Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Surface diameter</th>
<th>Stage glass diameter</th>
<th>Stroke</th>
<th>Reading method</th>
<th>Min. reading</th>
<th>Rotation range</th>
<th>Tool installation</th>
<th>Loading capacity</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS 10x6B</td>
<td>398x260</td>
<td>395x190</td>
<td>250x150</td>
<td>Linear encoder</td>
<td>0.1</td>
<td>4.3° (swivel plate)</td>
<td>6-M6 depth 10</td>
<td>20</td>
<td>51.5</td>
</tr>
<tr>
<td>PS 8x6B</td>
<td>348x260</td>
<td>265x190</td>
<td>200x185</td>
<td></td>
<td></td>
<td>3°</td>
<td>6-M6 depth 10</td>
<td>15</td>
<td>48.5</td>
</tr>
<tr>
<td>PS 6x4B</td>
<td>254x230</td>
<td>210x160</td>
<td>100x150</td>
<td></td>
<td></td>
<td>3°</td>
<td>8-M6 depth 10</td>
<td>15</td>
<td>23.5</td>
</tr>
<tr>
<td>PS 2x2B</td>
<td>ø174</td>
<td>ø117</td>
<td>50x50</td>
<td></td>
<td></td>
<td>3°</td>
<td>8-M6 depth 7</td>
<td>5</td>
<td>16.5</td>
</tr>
</tbody>
</table>

Rotating Tables

Type 3
For PS 6x4B, PS 4x4B

Type 4
For PS 10x6B, PS 8x6B

Rotating Table Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke dimensions</th>
<th>Glass insert diameter</th>
<th>Reading range</th>
<th>Tool installation</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 3</td>
<td>204</td>
<td>165</td>
<td>360 (uncalibrated)</td>
<td>Screw hole 6-M6</td>
<td>5</td>
</tr>
<tr>
<td>Type 4</td>
<td>262</td>
<td>262</td>
<td>360 (uncalibrated)</td>
<td>Screw hole 6-M6</td>
<td>8</td>
</tr>
</tbody>
</table>

Tilting Center Fixture A2

Used to tilt samples around the center axis.
Type A2 is available for PS 2x2B with Rotating Table Type 3.

Standard 300 mm Scale

Gauges stage travel accuracy up to 300 mm.
Both 10 mm-interval sensor patterns and calibrations are provided. Made of low heat-expansion glass for minimizing influence of heat.
Pitch: 10 mm (attached with calibrated value)

<table>
<thead>
<tr>
<th>Maximum sample size</th>
<th>Center height</th>
<th>Tilt angle</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø18 x 120</td>
<td>49</td>
<td>10°</td>
<td>2.2</td>
</tr>
</tbody>
</table>
**Data Processing Software E-MAX Series**

E-MAX is a series of general-purpose measurement support systems with a common user interface for PCs. The software processes 2D data from manual measuring instruments. Data result can be saved as a csv file.

**User-friendly interface allows a host of measurement and processing functions to be easily controlled using multi windows and a mouse.**

1. Graphical window
2. List window
3. Tool bar (measurement codes)
4. Results display window
5. No output window, image window, and editing listing window can be displayed as necessary.

**Data Processor DP-E1A**

Effectively used in combination with a profile projector and/or measuring microscope, the DP-E1A quickly calculates geometrical features with simple and interactive operations. Measurement results are automatically memorized as teaching steps and can be easily used as a measurement routine.

- **User-friendly, small-footprint system**
  Includes a measurement counter function.

- **Easy-to-master control keys**
  Controlled using measurement code buttons and measurement result lists, enabling users to easily conduct measurement.

- **Saves measurement results on USB memory**
  Teaching files and measurement results files can be saved to a USB memory device for easy access.

* Retrofit Counter/DP unit is also required.

**Measurement Support Application (Option)**

**Custom Create**

For DP-E1A and Counter

- Suitable for lot control of inspection data.
- Customization of inspection result sheets are possible, in addition to the 10 standard sheets
- Displays are adjustable between degree/minute/second
- Easy to generate histograms, X-R control charts, and scatter diagrams

**Custom Fit QC**

For E-MAX

- Measurement data from counters and/or data processors can be transferred directly to Excel sheets.
- Compatible measuring instruments: V-20B, V-12B, MM-400/800 series, DP-E1A
- Allows data transfer to customized inspection-result sheet forms
- 3 standard inspection-result sheet forms are available

Operating environment: Windows® or Windows® 10 / Microsoft Excel 2003 or later

Required memory: 512MB (min)

Codvelopment: Aria Co., Ltd.

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**ACCESSORIES**

Nikon has a complete lineup of measurement support system/data processing systems for specific purposes and applications that support data utilization.

**Measurement Processing**

- Actual measurement + recall measurement
  1. Distance between two points (X1, Y1, Z1, X2, Y2, Z2)
  2. Distance between a point and a line (X1, Y1, Z1, X, Y, Z)
  3. Intersection of a circle and a line (X1, Y1, Z1, X2, Y2, Z2)
  4. Intersection of two circles (X1, Y1, Z1, X2, Y2, Z2)
  5. Intersection of two lines (X, Y, Z, A)
  6. Distance between a point and a line (X, Y, Z, L)
  7. Distance between two points (L, Lx, Ly, Lz)
  8. Minimum point (X, Y, Z)
  9. Maximum point (X, Y, Z)
  10. Midpoint (X, Y, Z)
  11. Point (X, Y, Z, E)
  12. Minimum point of a circle and a line (X1, Y1, Z1, X2, Y2, Z2)
  13. Distance between a point and an ellipse (X1, Y1, Z1, X2, Y2, Z2, A)
  14. Intersection of two circles (X1, Y1, Z1, X2, Y2, Z2, A)

- Recall settings
  1. Reference axis setting
  2. XY origin setting
  3. Coordinate system recall 1
  4. Coordinate system recall 2

- Recall measurement (reference settings)
  1. Reference axis setting
  2. XY origin setting
  3. Coordinate system rotation 1
  4. Coordinate system rotation 2

- Name of output element
  1. X, Y, Z: Coordinate values
  2. Deviation: R: Radius
  3. Diameter: A: Intersection angle
  4. Longest diameter: L1: Longest diameter
  5. Shortest diameter: L2: Shortest diameter
  6. Inclination: Inclination
  7. Swing: Swing
  8. Phase: Phase
  9. Geometric deviation

**ACCESSORIES**

- Custom Create
  For E-MAX

- Custom Fit QC
  For For DP-E1A and Counter

**Operating environment:** Windows® or Windows® 10 / Microsoft Excel 2003 or later

**Required memory:** 512MB (min)

**Codvelopment:** Aria Co., Ltd.
**Thermal Printer TSP743 II**

- **Paper width**
  - 58 mm or 80 mm

**Applicable model/Counter**

**2-Axis Counter Display**

These displays show X and Y-axis coordinates with Retrofit Counter/DP Unit.

(Can be switched between 1 µm, 0.1 µm, and 0.01 µm)

**Retrofit Counter/DP Unit**

Needed to connect DP-E1A or 2-axis counter display to V-12BD and V-12BS.

**Foot Switch 4**

Used to send load command to DP-E1A. Frees both hands to enhance measurement efficiency.

**Glass Scale Set**

Used to check the magnifying accuracy of the projector being used. Equipped with:

- 50 mm standard scale in 1 mm increments (accuracy ± \(3+7L/100\) µm)
- 300 mm standard scale in 0.1 mm increments (accuracy ± \(6+L/50\) µm)
- 6x magnifier

\*L = measurement length

**Glass Reading Scale**

Used to measure projection images on the screen. 200 mm and 300 mm scales, both in 0.5 mm increments, are available.

Accuracy: ±(15+L/20) µm

\*L = measurement length

**Chart Clip Type LL**

Used to measure charts on the screen. Comes standard with V-12B.

**3rd Party Solutions: Data Processor**

- **Display**
  - 7-inch color wide screen (15:9 multi-touch screen)
  - Resolution: WVGA 800×480 pixels for dialogs, inputs, position values, and graphics functions

- **Functions**
  - Acquisition of 2D geometry features by measurement, design and definition of geometries
  - Measuring point acquisition via crosshairs
  - Creation of measuring programs (teach-in)
  - Tolerance input and graphic display of measurement results
  - Creation and output of measurement reports
  - User management
  - Measure Magic: automatic recognition of geometries

**QUADRA-CHEK 2000**

The green filter is used for black-and-white photography or for viewing edges of a workpiece with greater sharpness. The ND filter is used to adjust brightness. Both filters must be used with the DIA Adapter A.

**Green Filter, ND Filter, DIA Adapter A**

- **DIA Adapter A**
- **ND Filter**
- **Green Filter**

**Image provided by HEIDENHAIN CORPORATION**
Date of initial accreditation: September 8, 2006
Scope of accreditation: Measuring projectors
Accredited section: Industrial Metrology Business Unit
Calibration site: Customer’s laboratory (field service)

Expanded Uncertainty:

- **Magnification Accuracy**
  - 5×: \((0.006 \times \frac{100}{L} \times 2.8)\%
  - 10×, 20×: \((0.006 \times \frac{100}{L} \times 2.8)\%
  - 50×: \((0.006 \times \frac{100}{L} \times 2.8)\%
  - 100×: \((0.013 \times \frac{100}{L} \times 2.8)\%\%

**X/Y-axis Indication Accuracy**
Linear scale up to 250 mm \((0.70 + 5.0 \times 10^{-3} \times L)\) µm