PROFILE PROJECTORS
V-20B / V-12B
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.

Parfocal 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</th>
<th>Half mirror</th>
<th>A</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>5×</td>
<td>100</td>
<td>Built-in; feed</td>
<td>73</td>
<td>149</td>
</tr>
<tr>
<td>10×</td>
<td>50</td>
<td>Built-in; switchable</td>
<td>79</td>
<td>215</td>
</tr>
<tr>
<td>20×</td>
<td>25</td>
<td>Built-in; switchable</td>
<td>85</td>
<td>313</td>
</tr>
<tr>
<td>50×</td>
<td>10</td>
<td>Built-in; switchable</td>
<td>50.5</td>
<td>130</td>
</tr>
<tr>
<td>100×</td>
<td></td>
<td>Built-in; switchable</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

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

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.

System Diagram

**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 4×4B, PS 6×4B, PS 8×6B, PS 10×6B 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 (CEK), 240 V (SAA)
- **Dimensions**: 570×1200×1900 mm
- **Weight**: Approx. 260 kg
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.

### Built-in digital counter and protractor

- V-12BDC and V-12BSC come with a digital XY counter, while V-12BD and V-12BS have a built-in digital protractor for greater ease of use.

### Erect images

Projection images are erect and unreversed 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 dioscopic 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 dioscopic illumination.

---

**SYSTEM DIAGRAM**

**SPECIFICATIONS**

- **Type**: Vertical optical axis bench type
- **Screen**: g305 mm with etched center crossline
- **Projection lens**: 5x, 10x, 20x, 25x, 50x, 100x, 200x
- **Magnification accuracy**: Oblique reflected/dioscopic: 0.1 %
- **Stages**: PS 10x, 6B, PS 6x, 4B, PS 4x, 4B, PS 2x, 2B directly mountable
- **Illumination**: Dioscopic and reflected
- **Maximum sample height**: 100 mm
- **Dimensions (WxHxD)**: 410×650×938-1038 mm
- **Weight**: Approx. 80 kg

---

**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.

---

- **Increased maximum sample height**
  Samples as tall as 100 mm can be loaded because the rigidity of the projector is increased by its CAE design.
- **Large stage mountable**
  Adapts a focusing mechanism that achieves focus by moving the objective head up and down, allowing stages with longer stroke to be mounted. When the PS 10x, 6B Stage is used, the projector can measure areas as wide as 250×150 mm.
- **Adjustable base feet**
  Less affected by irregularities in the installation surface and external vibrations because the base is 2 mm away from the installation surface and the base feet are adjustable.

---

**Built-in digital protractor**

- Deluxe (D): built-in digital protractor
- Standard (S): no digital protractor included

---

*Part of the FOV is vignetted when 5x or 10x projection lens are used under dioscopic illumination.

---

**PROJECTION LENSES**

<table>
<thead>
<tr>
<th>Magnification</th>
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<th>Half mirror</th>
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<td>1.5</td>
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</table>

---

**FOV diameter**

- **D**: maximum diameter of a measurable cylindrical sample
- **A**: working distance

---

**FOV diameter (mm)**

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*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 for simultaneous use (PXA20224)” is required.

---

**V-12BDC configured with PS 10x, 6B Stage**

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<td>24</td>
<td>49</td>
</tr>
</tbody>
</table>
Stages

PS 10x6B  
(Stroke: 250×150 mm)

PS 8x6B  
(Stroke: 200×150 mm)

PS 6x4B  
(Stroke: 150×100 mm)

Stage Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Surface Diameter</th>
<th>Stage Glass Diameter</th>
<th>Stroke</th>
<th>Min. reading</th>
<th>Reading Range</th>
<th>Tool Installation</th>
<th>Loading Capacity</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS 10x6B</td>
<td>ø368x260</td>
<td>ø305x190</td>
<td>250x150</td>
<td>0.1</td>
<td>Linear encoder</td>
<td>12-M6 depth 10</td>
<td>20</td>
<td>51.5</td>
</tr>
<tr>
<td>PS 8x6B</td>
<td>ø348x260</td>
<td>ø255x150</td>
<td>200x150</td>
<td>0.1</td>
<td>Linear encoder</td>
<td>10-M6 depth 10</td>
<td>15</td>
<td>48.5</td>
</tr>
<tr>
<td>PS 4x4B</td>
<td>ø254x230</td>
<td>ø160x100</td>
<td>100x150</td>
<td>0.1</td>
<td>Linear encoder</td>
<td>8-M6 depth 10</td>
<td>10</td>
<td>21.5</td>
</tr>
<tr>
<td>PS 4x2B</td>
<td>ø174</td>
<td>ø107</td>
<td>50x50</td>
<td>0.1</td>
<td>Linear encoder</td>
<td>6-M6 depth 7</td>
<td>5</td>
<td>15.5</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>Rotating Table Type</th>
<th>Diameter (mm)</th>
<th>Stroke (mm)</th>
<th>Reading Range</th>
<th>Tool Installation</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotating Table 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>Rotating Table 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>

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>Minimum sample size</th>
<th>Center Height</th>
<th>Tilt Angle</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø6x120</td>
<td>45</td>
<td>10°</td>
<td>2.2</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.
Nikon has a complete lineup of measurement support system/data processing systems for specific purposes and applications that support data utilization.

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.**
- **A built-in navigation function improves measurement efficiency by displaying the current position and the next measurement position during replays.**
- **Specialized for processing measurement data**
- **Enhanced 2D data processing functions**
- **Can be installed on notebook PCs (D Set only)**

### Measurement Processing
- **Actual measurement + recall measurement**
  - 1. Distance between two points (X, Y, Z)
  - 2. Distance between a point and a line (X, Y, Z, L)
  - 3. Intersection of two lines (X, Y, Z, A)
  - 4. Distance between two points (X1, Y1, Z1, X2, Y2, Z2)
  - 5. Minimum point (X, Y, Z)
  - 6. Maximum point (X, Y, Z)
  - 7. Midpoint (X, Y, Z)
  - 8. Key input circle
  - 9. Key input point

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

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

### 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.

### Measurement Support Application (Option)

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

- **For E-MAX**
  - Codevelopment: Aria Co., Ltd.
  - Operating environment: Windows® 7 or Windows® 10 / Microsoft Excel 2003 or later
  - Required memory: 512MB (min)
  - Name of output element: X, Y, Z, Diameter, Radius, Distance, Length, Width, Height, Depth, Angular deviation

- **For DP-E1A and Counter**
  - Codevelopment: Aria Co., Ltd.
  - Operating environment: Windows® or Windows® 10 / Microsoft Excel 2003 or later
  - Required memory: 1GB (min)
  - Name of output element: X, Y, Z, Diameter, Radius, Distance, Length, Width, Height, Depth, Angular deviation

- **For Custom Create**
  - Codevelopment: Aria Co., Ltd.
  - Operating environment: Windows® or Windows® 10 / Microsoft Excel 2003 or later
  - Required memory: 1GB (min)

- **For Custom Fit QC**
  - Codevelopment: Aria Co., Ltd.
  - Operating environment: Windows® or Windows® 10 / Microsoft Excel 2003 or later
  - Required memory: 1GB (min)
ACCESSORIES

Digital Thermal Printer DPU-414
Thermal Printer TSP654II2

<table>
<thead>
<tr>
<th></th>
<th>DPU-414</th>
<th>TSP654II2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper width</td>
<td>112 mm</td>
<td>58 mm or 80 mm</td>
</tr>
</tbody>
</table>

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)

Foot Switch 4

Used to send load command to DP-E1A and DPU-414. Frees both hands to enhance measurement efficiency.

Retrofit Counter/DP Unit

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

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.

Green Filter, ND Filter, DIA Adapter A

For V-12B only

3rd Party Solutions: Data Processor

Image provided by HEIDENHAIN CORPORATION

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

QUADRA-CHEK 2000

Display

• 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
**ISO/IEC 17025 Certified**

Nikon Corporation Industrial Metrology Business Unit is certified as an ISO/IEC 17025 accredited calibration laboratory for measuring projectors (profile projectors) and measuring microscopes by the Japan Accreditation Board for Conformity Assessment.

**ISO/IEC 17025**: International standard, which specifies the general requirements to ensure that a laboratory is competent to carry out specific tests and/or calibrations

**Date of initial accreditation**: September 8, 2006

**Scope of accreditation**: Measuring projectors

**Accredited section**: CS 1st Engineering Section Engineering Department
Industrial Metrology Business Unit

**Calibration site**: Customer’s laboratory (field service)

**Expanded Uncertainty**

<table>
<thead>
<tr>
<th>Magnification Accuracy</th>
<th>5x</th>
<th>(0.006x(100/L)x2.8)%</th>
</tr>
</thead>
<tbody>
<tr>
<td>10x, 20x</td>
<td>(0.006x(100/L)x2.8)%</td>
<td></td>
</tr>
<tr>
<td>50x</td>
<td>(0.006x(100/L)x2.8)%</td>
<td></td>
</tr>
<tr>
<td>100x</td>
<td>(0.013x(100/L)x2.8)%</td>
<td></td>
</tr>
</tbody>
</table>

**X/Y-axis Indication Accuracy**

- Linear scale up to 250 mm: (0.70 + 5.0x10^-3xL) µm
- Micrometer up to 50 mm: 0.70 µm

Specifications and equipment are subject to change without any notice or obligation on the part of the manufacturer. September 2018 ©2006-2018 NIKON CORPORATION

N.B. Export of the products* in this catalog is controlled under the Japanese Foreign Exchange and Foreign Trade Law. Appropriate export procedures shall be required in case of export from Japan.

*Products: Hardware and its technical information (including software)

WARNING TO ENSURE CORRECT USAGE, READ THE CORRESPONDING MANUALS CAREFULLY BEFORE USING THE EQUIPMENT.