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.

V-20B configured with PS 10x6B Stage

**SYSTEM DIAGRAM**

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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.
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.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>Vertical optical axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image</td>
<td>Inverted and reversed</td>
</tr>
<tr>
<td>Screen</td>
<td>ø500 mm with protractor screen</td>
</tr>
<tr>
<td>Projection lens</td>
<td>5×, 10×, 20×, 50×, 100×</td>
</tr>
<tr>
<td>3-lens turret mount</td>
<td></td>
</tr>
<tr>
<td>Magnification accuracy</td>
<td>Diascopic: 0.1 %</td>
</tr>
<tr>
<td></td>
<td>Reflected: 0.15 %</td>
</tr>
<tr>
<td>Stages</td>
<td>PS 10×6B, PS 8×6B directly mountable</td>
</tr>
<tr>
<td></td>
<td>PS 6×4B, PS 4×4B, PS 2×2B mountable via adapter</td>
</tr>
<tr>
<td>Illumination</td>
<td>Diascopic and reflected</td>
</tr>
<tr>
<td></td>
<td>(both 24 V-150 W halogen lamp)</td>
</tr>
<tr>
<td>Maximum sample height</td>
<td>150 mm</td>
</tr>
<tr>
<td>Power source</td>
<td>AC 100-120 V (CSA), 220-240 V (CEE), 240 V (SAA)</td>
</tr>
<tr>
<td>Dimensions (W×D×H)</td>
<td>570×1200×1900 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 260 kg</td>
</tr>
</tbody>
</table>

PROJECTION LENSES

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

A= working distance
D= maximum diameter of a measurable cylindrical sample

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

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

<table>
<thead>
<tr>
<th>Built-in digital protractor</th>
<th>Built-in digital counter</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-12BDC</td>
<td>●</td>
</tr>
<tr>
<td>V-12BD</td>
<td>●</td>
</tr>
<tr>
<td>V-12BSC</td>
<td><em>Fixed screen</em></td>
</tr>
<tr>
<td>V-12BS</td>
<td><em>Fixed screen</em></td>
</tr>
</tbody>
</table>

Deluxe (D): built-in digital protractor

Standard (S): no digital protractor included

Counter (C): built-in X-Y digital counter

V-12BSC and V-12BS have a fixed screen, thus angular measurement by rotating the screen is not possible.

**Large stage mountable**

Adapts a focusing mechanism that achieves focus by moving the objective head up and down, allowing stages with longer cross travel to be mounted. When the PS 10×6B 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.

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**SYSTEM DIAGRAM**

*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.
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.

Built-in digital counter and protractor
V-12BDC and V-12BSC come with a digital XY counter, while V-12BDC and V-12BD 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 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.

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.

### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>Vertical optical axis bench type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image</td>
<td>Erect and unreversed</td>
</tr>
<tr>
<td>Screen</td>
<td>Ø305 mm with etched center crossline</td>
</tr>
<tr>
<td>V-12BDC/V-12BD: 360°rotatable screen with knob for digital protractor</td>
<td></td>
</tr>
<tr>
<td>V-12BSC/V-12BS: fixed screen</td>
<td></td>
</tr>
<tr>
<td>Projection lens</td>
<td>5x, 10x, 20x, 25x, 50x, 100x, 200x</td>
</tr>
<tr>
<td>3-lens turret mount; clamping type</td>
<td></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>Stages</td>
<td>PS 10x6B, PS 8x6B, PS 6x4B, PS 4x4B, PS 2x2B directly mountable</td>
</tr>
<tr>
<td>Illumination</td>
<td>Diascopic and reflected</td>
</tr>
<tr>
<td>(both 24 V-150 W halogen lamp)</td>
<td></td>
</tr>
<tr>
<td>Maximum sample height</td>
<td>100 mm (70 mm: with PS 10x6B, PS 8x6B Stage)</td>
</tr>
<tr>
<td>Power source</td>
<td>AC 100/120V (50/60 Hz), AC 220/230/240V (50/60 Hz)</td>
</tr>
<tr>
<td>Dimensions (WxDxH)</td>
<td>410x650x938-1038 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 80 kg</td>
</tr>
</tbody>
</table>
ACCESSORIES

Stages

PS 10x6B
(Stroke: 250×150 mm)

PS 8x6B
(Stroke: 200×150 mm)

PS 6x4B
(Stroke: 150×100 mm)

PS 4x4B
(Stroke: 100×100 mm)

PS 2x2B
(Stroke: 50×50 mm)

Stage Operation
- Lever control allows for smooth changeover of coarse and fine movement.
- Swivel plate comes as standard for PS 10x6B and PS 8x6B stages.
- The course/fine changeover lever and the RESET and SEND buttons are located near the X- and Y- axis knobs.
*Not available for PS 2x2B stage

Large stage adjustment knob
- Enables fine adjustment of swivel plate rotation.
*Available for PS 10x6B and PS 8x6B stages
Stage Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Surface area (mm)</th>
<th>Stage glass dimensions (mm)</th>
<th>Stroke (mm)</th>
<th>Reading method</th>
<th>Min. reading (µm)</th>
<th>Rotation range</th>
<th>Tool installation screw hole</th>
<th>Loading capacity (kg)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS 10×6B</td>
<td>398×260</td>
<td>305×190</td>
<td>250×150</td>
<td>Linear encoder</td>
<td>0.1</td>
<td>±3° (swivel table)</td>
<td>12-M6 depth 10</td>
<td>20</td>
<td>51.5</td>
</tr>
<tr>
<td>PS 8×6B</td>
<td>348×260</td>
<td>255×190</td>
<td>200×150</td>
<td></td>
<td>-</td>
<td>10-M6 depth 10</td>
<td>10-M6 depth 10</td>
<td>48.5</td>
<td>20</td>
</tr>
<tr>
<td>PS 6×4B</td>
<td>354×230</td>
<td>210×160</td>
<td>150×100</td>
<td></td>
<td>-</td>
<td>8-M6 depth 10</td>
<td>8-M6 depth 10</td>
<td>27.5</td>
<td>23.5</td>
</tr>
<tr>
<td>PS 4×4B</td>
<td>284×230</td>
<td>160×160</td>
<td>100×100</td>
<td></td>
<td>360° (rotation table)</td>
<td>6-M6 depth 7</td>
<td>6-M6 depth 7</td>
<td>15</td>
<td>15.5</td>
</tr>
<tr>
<td>PS 2×2B</td>
<td>ø174</td>
<td>ø107</td>
<td>50×50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rotating Tables

Type 3
For PS 6×4B, PS 4×4B

Type 4
For PS 10×6B, PS 8×6B

Rotating Table Specifications

<table>
<thead>
<tr>
<th>Table diameter (mm)</th>
<th>Glass insert diameter (mm)</th>
<th>Reading range</th>
<th>Tool installation</th>
<th>Weight (Approx. 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>
</tr>
<tr>
<td>Rotating Table Type 4</td>
<td>282</td>
<td>262</td>
<td>360° (uncalibrated)</td>
<td>Screw hole 6-M6</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)

Tilting Center Fixture A2

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

<table>
<thead>
<tr>
<th>Maximum sample size (mm)</th>
<th>Center height (mm)</th>
<th>Tilt angle (in 1° increment)</th>
<th>Weight (Approx. kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø68×120</td>
<td>45</td>
<td>10°</td>
<td>2.2</td>
</tr>
</tbody>
</table>
ACCESSORIES

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.

1. Graphical window  4. List window
2. Counter window 5. Toolbar (measurement codes)
3. Results display window

*An output window, image window, and editing listing window can be displayed as necessary.

A built-in navigation function improves measurement efficiency by displaying the current position and the next measurement position during replays.

Number ① is the current position and number ② is the next measurement position.

E-MAX/D Set

Example combination with V-12B, E-MAX, and PC

- Specialized for processing measurement data
- Enhanced 2D data processing functions
- Can be installed on notebook PCs (D Set only)
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

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**Measurement Support Application (Option)**

**Custom Create**

For DP-E1A and Counter

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®7 or Windows®10 / Microsoft Excel 2003 or later
Required memory: 512MB (min)
Codevelopment: Aria Co., Ltd.

**Custom Fit QC**

For E-MAX

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

Operating environment: Windows®7 or Windows®10 / Microsoft Excel 2003 or later
Required memory: 512MB (min)
Codevelopment: Aria Co., Ltd.
**ACCESSORIES**

**Digital Thermal Printer DPU-414**
**Thermal Printer TSP654II2**

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

<table>
<thead>
<tr>
<th>DPU-414</th>
<th>TSP654II2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper width</td>
<td>112 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)

**Retrofit Counter/DP Unit**

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

**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.

**Foot Switch 4**

Used to send load command to DP-E1A and DPU-414. Frees both hands to enhance measurement efficiency.
Digital Thermal Printer DPU-414
Thermal Printer TSP654II2
Used to send load command to DP-E1A and DPU-414.
Frees both hands to enhance measurement efficiency.

2-Axis Counter Display
Retrofit Counter/DP Unit
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)
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)
• 6× magnifier
*L = measurement length

Green Filter, ND Filter, DIA Adapter A
For V-12B only
DIA Adapter A  ND Filter  Green Filter
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.

3rd Party Solutions: Data Processor
Image provided by HEIDENHAIN CORPORATION
QUADRA-CHEK 2000

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
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>
</tr>
</thead>
<tbody>
<tr>
<td>5×</td>
</tr>
<tr>
<td>10×, 20×</td>
</tr>
<tr>
<td>50×</td>
</tr>
<tr>
<td>100×</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Linear scale up to 250 mm (0.70 + 5.0×10⁻³×L) μm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micrometer up to 50 mm 0.70 μm</td>
</tr>
</tbody>
</table>

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.