

# AUTOFOCUS

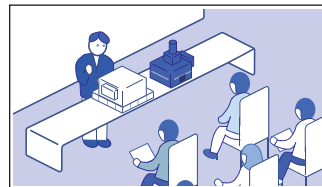
Autofocus System for Microscopes

# AUTO FOCUS



Autofocus System for Microscopes

## Demo Room



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- Safety precautions: To ensure the safe use of the product, please be sure to check the instruction manual before use.

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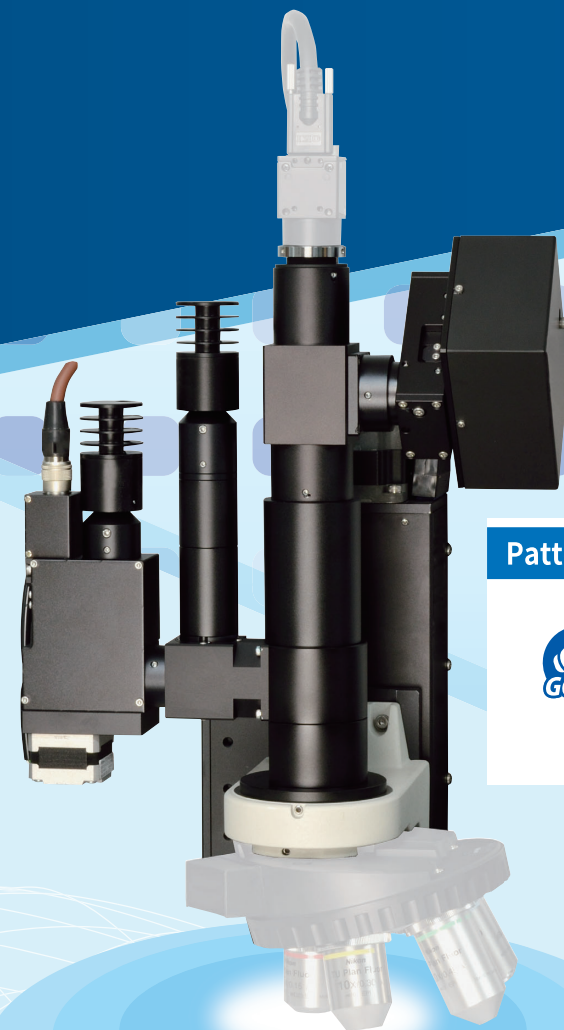
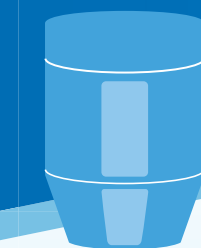
Our company obtained the ISO9001 Quality Management System certification.

# - Continuously Chosen for Every Analysis and Inspection Scenarios – CHUO SEIKI Autofocus System

CHUO SEIKI, which has been manufacturing and selling autofocus systems for microscopes for many years, now has two new products in its lineup. These systems significantly shorten the time required for analysis and inspection, enabling efficient equipment design and introduction of inspection facilities. We promise to meet the needs of our customers as “The autofocus system can be selected to meet the specific needs of the customer's application.”

# AUTOFOCUS

Autofocus System for Microscopes



## Pattern Projection Line Sensor Autofocus System



CHUO SEIKI's standard autofocus system, trusted and proven, utilizing the pattern projection and line sensor method

### Related products

Objective Slider  
For details, please refer to pages 16-17



NEW



Laser

## Point Autofocus System



High-Precision Autofocus system Equipped with a Position Detection Sensor, Also usable as a Non-Contact Probe for Surface Texture Measurement

## POINT The reason why CHUO SEIKI is chosen.



Pattern Projection and Line Sensor Autofocus System,  
Combining Experience and Technology

High-Performance Autofocus system with Pattern Projection and Line Sensors



Excellent versatility for microscope

Our Autofocus system compatible with objective lenses from leading manufacturer's microscopes



Combination with Various Z-Axis Drive Units

Reliable autofocus system because we are a precision stage manufacturer



Suitable for a various range of samples

Autofocus system that can handle a various range of samples

Laser

## Line Autofocus System



CHUO SEIKI's new autofocus system using laser diode as AF light source while maintaining the extensibility of pattern projection and line autofocus systems

### Related products

Objective Slider  
For details, please refer to pages 16-17



NEW



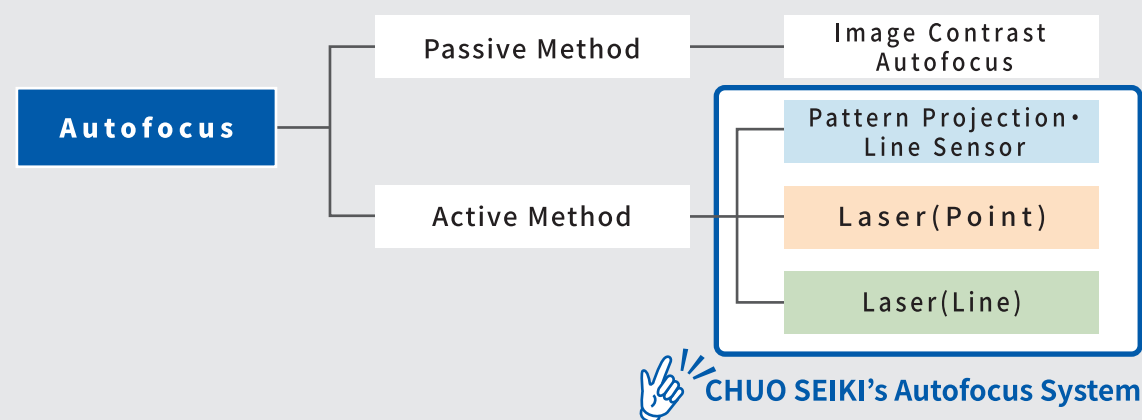
# Supports efficiency of analysis and inspection work

## High-precision, high-speed active autofocus system

### What is active autofocus?

There are mainly two types of focusing methods for microscope autofocus systems, and the method we provide is exclusively active autofocus. This has earned us praise from customers for superior focusing speed and tracking performance compared to passive methods. Furthermore, our recently introduced autofocus system, featuring a laser diode, has significantly improved focusing accuracy in small areas as well as expanding the AF sensor's capture range. As a result, our system is compatible with a broader variety of samples.

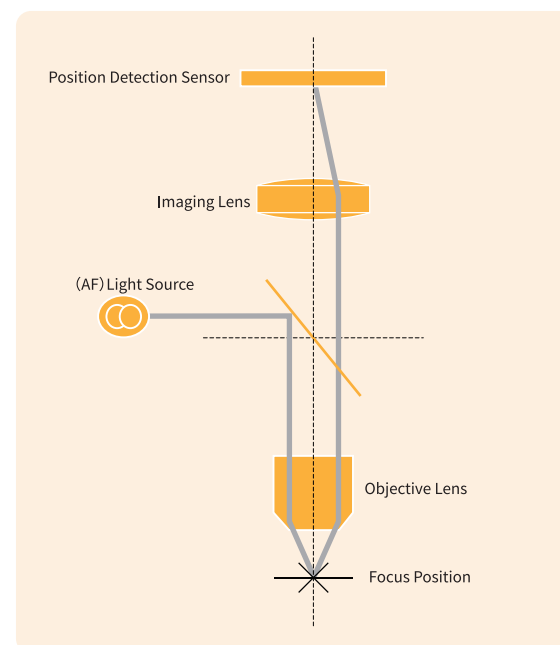
#### ● Classification of Autofocus for Microscopes



### Schematic diagram

### Laser

### Point Autofocus



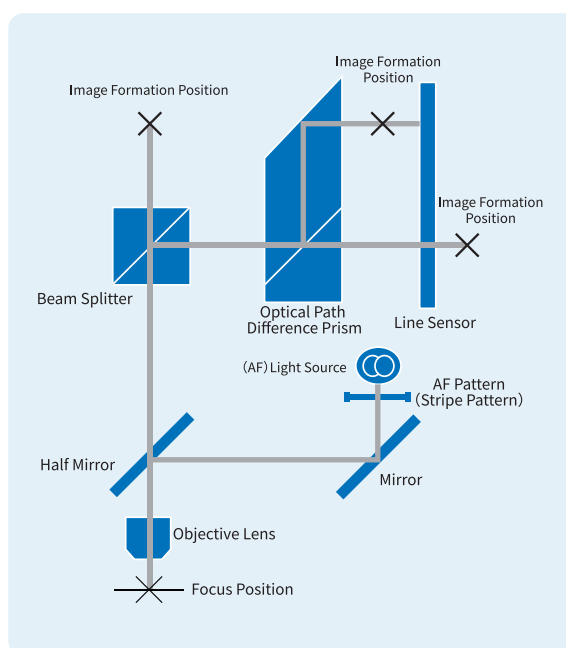
#### ● Point Autofocus

Using a laser beam as the autofocus (AF) light source, the beam is injected at a position offset from the center of the objective lens. The reflected light, focused on the center of the optical axis, is then captured by an AF sensor through an imaging lens. When the lens is defocused, the position of the reflected laser spot shifts away from the center. This shift is measured and fed back to the system to adjust the lens position, ensuring it remains in focus. Additionally, this method serves as a non-contact probe for roughness measurement, enabling high-speed autofocus that is unaffected by the sample's shape or reflectance.

### Schematic diagram

### Pattern Projection

### Line Autofocus System



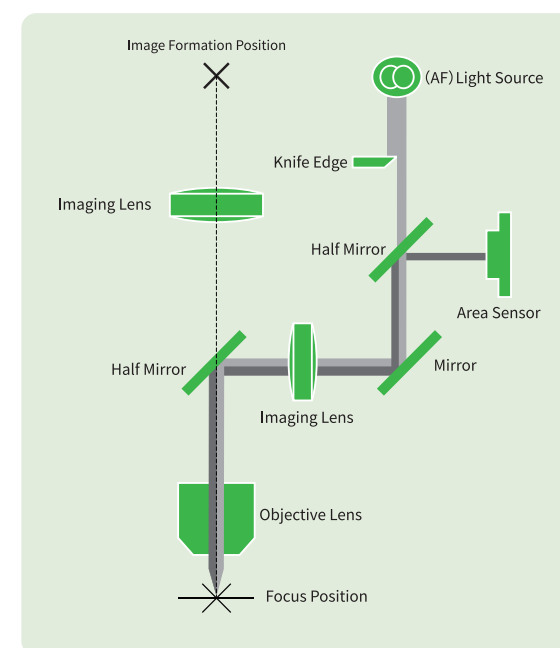
#### ● Pattern Projection and Line Autofocus System

Our autofocus system is reliable and proven. An LED light source is used for the stripe pattern, and the pattern is projected onto the sample. The projected stripe pattern is split into two images by an optical path difference prism. These two images are received by line sensors positioned equidistantly from their respective image formation positions. The position at which the two electrical signals obtained by the line sensors most closely approximate each other is determined to be the in-focus position. This unique method enables high-performance autofocusing.

### Schematic diagram

### Laser

### Line Autofocus



#### ● Laser Line Autofocus

A laser diode is used as the AF light source. A portion of the emitted laser beam that is intercepted by a knife edge placed in the optical path will then be incident on the objective lens. The area sensor receives the light reflected from the sample, and the AF determines the focal point. This is a multipoint AF that combines the conventional line method and the laser method. By using a laser beam, the AF sensor capture range has been greatly improved, which was not possible with pattern projection methods.

# Pattern Projection & Line Sensor Autofocus System

## Pattern Projection and Line Autofocus

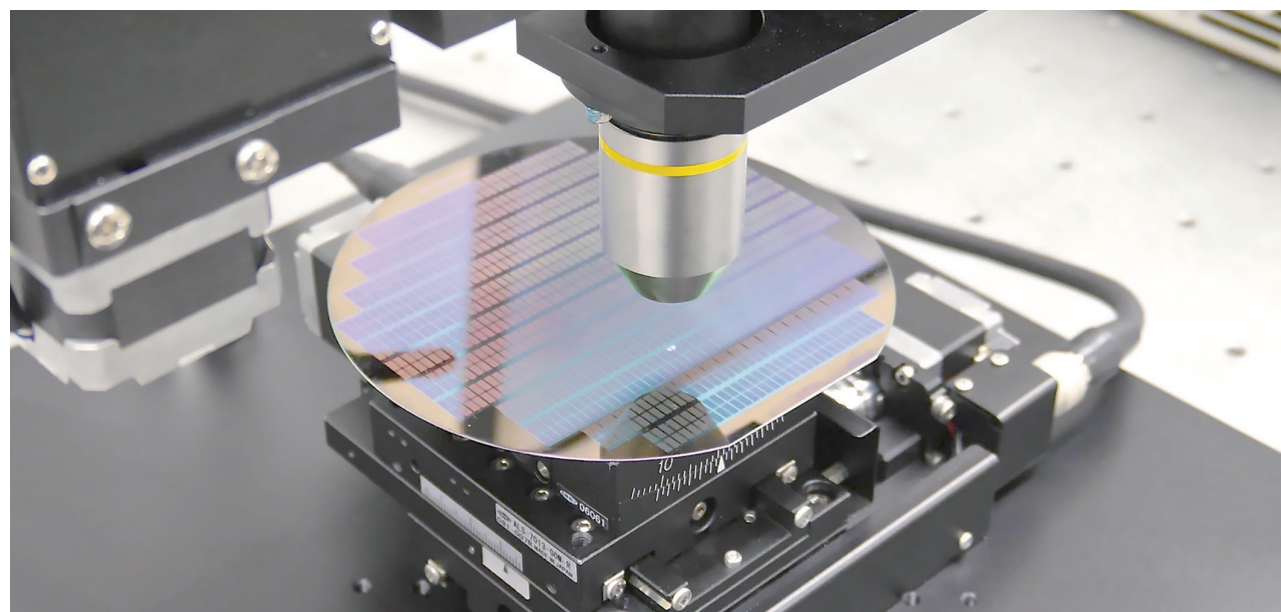
Focusing Method		Pattern Projection and Line Autofocus method
Objective Lens	※1	Compatible with Major Microscope Manufacturers
Camera Mount	※2	C-Mount
Repeatability	※3	Within ±1/4 of Depth of Focus
AF Light Source		LED Light Source (780 or 550nm)
Detector		Line Sensor
Z-Axis Drive Unit	※4	This can be combined with various drive units. Please refer to the table below for details
Control Equipment	※5	Dedicated Controller (AFC-6)

- ※1 For details, please refer to the objective lens compatibility table on page9.
- ※2 Some models are compatible with F-mount (φ28mm or less)
- ※3 Evaluation (repeatability) is based on our specified objective lens and sample (mirror).
- ※4 Other manufacturer's drive unit can be combined with AF system. Please contact our sales representative for details.
- ※5 For details of the dedicated controller, please refer to page13.

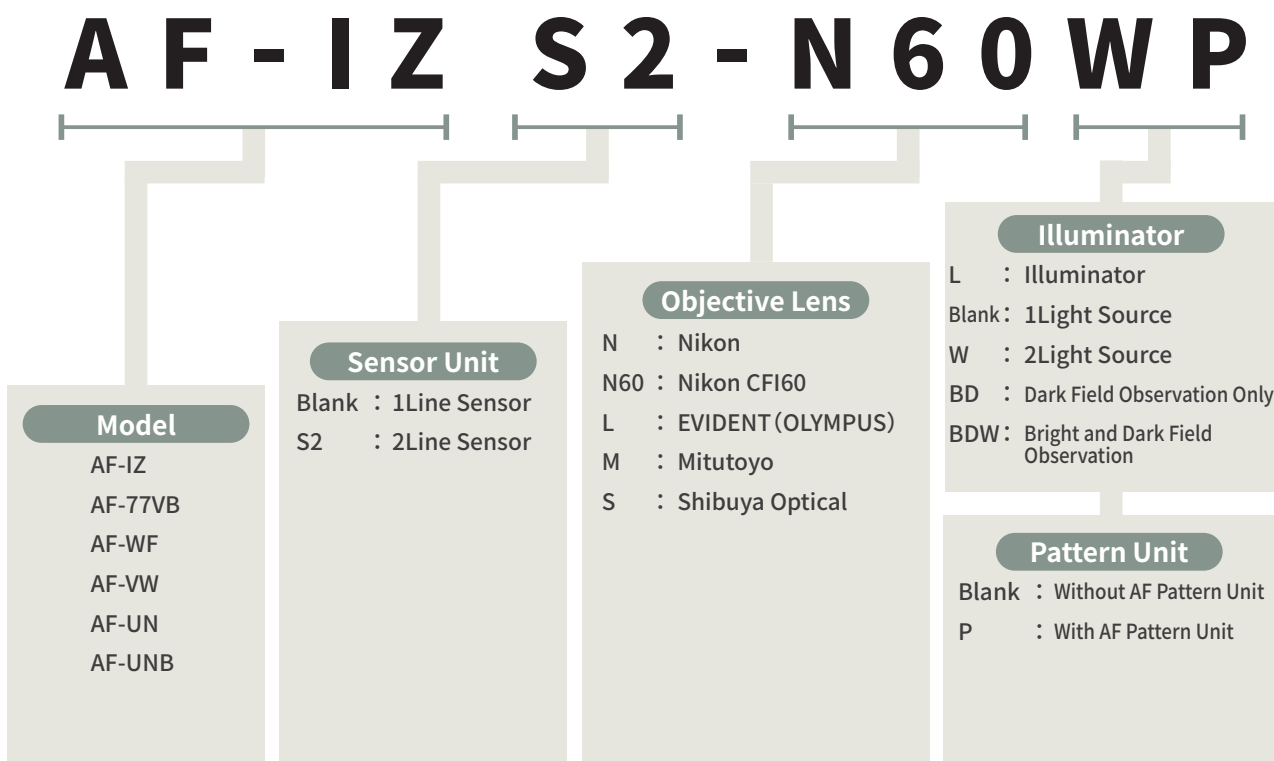
## Z-Axis Drive Unit

Model	AF-61ZA	AF-161ZA	AF-261ZA	AF-361ZA	AF-461ZA
Travel Amount(nomal)	4mm	4mm	2mm	4mm	4mm
Minimum Resolution	0.078μm	0.078μm	0.039μm	0.078μm	0.078μm
Main Materials	Steel	Aluminium	Aluminium	Aluminium	Steel
Compatible AF Type	AF-WF AF-77VB	AF-77VB	AF-RF	AF-IZ	AF-WM

- ※ Dedicated cable (normally 3 m) is required between the AF sensor unit, AF pattern unit, drive unit, and controller.
- ※ The travel of the drive unit and the length of each connecting cable can be extended.
- ※ Please contact our sales representative for details.



## Pattern Projection and Line Sensor Autofocus Model Designation



### MEMO

## Laser Autofocus System

## Comon Items for Autofocus System

### Point Autofocus NEW PAF Series

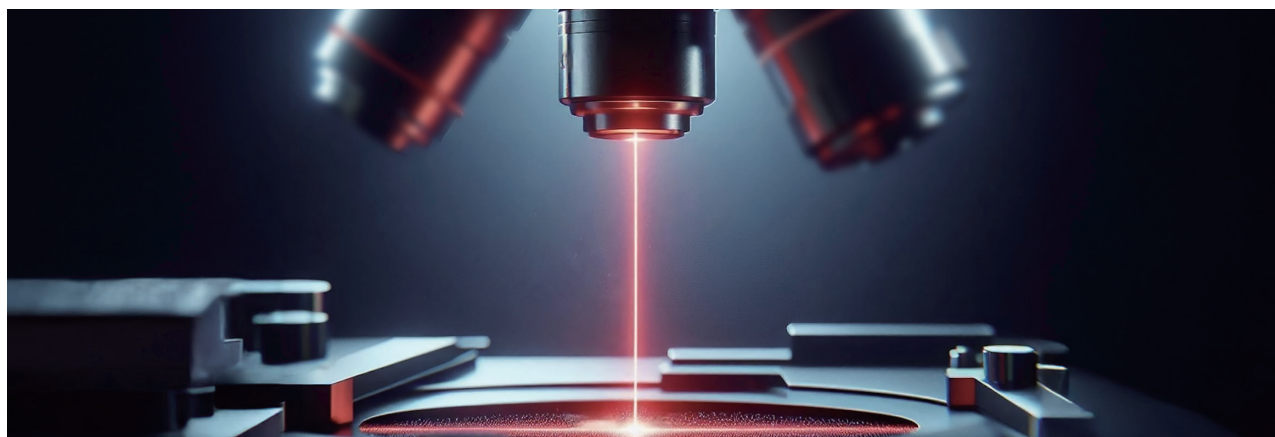
Focusing Method	Point Autofocus Method (ISO-25178-605)
Objective Lens ※1	Compatible with Major Microscope Manufacturers
Camera Mount	C-Mount
Repeatability ※2	Within ±1/20 of Depth of Focus
Capture Range ※3	5X: ≥±5000μm 10X: ±2300μm 20X: ±1000μm 50X: ±250μm
AF Light Source (Oscillation Wavelength)	Laser Diode (PAF-1:785nm PAFC-1:520nm)
Detector	Position Detection Sensor
Laser Power	1mW or less Class 2
Z-Axis Drive Unit (Travel Amount)	Drive Unit Integrated PAF-1:50mm PAFC-1:12mm
Control Equipment	Dedicated Controller

- ※1 For details, please refer to the "Objective lens compatibility table" on page 9.
- ※2 This is an evaluation (repeatability) using our specified objective lens and sample (mirror).
- ※3 The capture range depends on the objective lens and the sample. The measured values are based on our specified conditions (reference values).

### Laser Line Autofocus NEW AF-L Series

Focusing Method	Multi-Point Autofocus Method (Can be changed to single point)
Objective Lens ※1	Compatible with Major Microscope Manufacturers
Camera Mount ※2	C-Mount
Repeatability ※3	Within ±1/2 of Depth of Focus
Capture Range ※4	5X: ≥±5000μm 10X: ≥±5000μm 20X: ±1500μm 50X: ±350μm
AF Light Source (Oscillation Wavelength)	Laser Diode (780nm)
Detector	Area Sensor
Laser Power	1mW or less Class1
Z-Axis Drive Unit	This can be combined with various drive units. Please refer to page6 List Z-Axis Drive Unit
Control Equipment ※5	Built into the AF Box

- ※1 For details, please refer to the "Objective Lens Compatibility Table" on page 9.
- ※2 Some models are compatible with F-mount (φ 28mm or less)
- ※3 This is an evaluation (repeatability) using our specified objective lens and sample (mirror).
- ※4 The capture range depends on the objective lens and the sample. The measured values are based on our specified conditions (reference values).
- ※5 The AF-L series features a built-in control unit within the AF box, enabling direct external control from a PC via software.

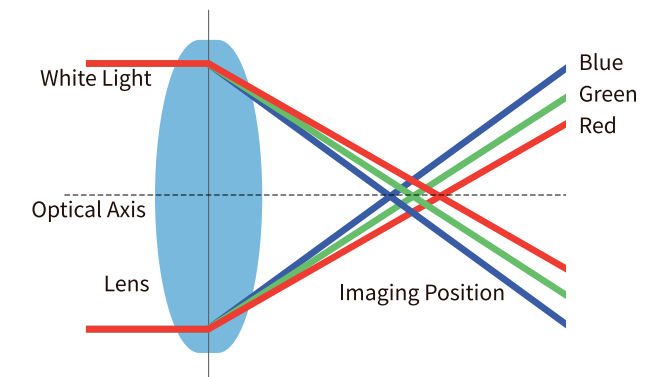


### Objective Lens Compatibility Table

AF Model	Pattern Projection-Line Sensor Method / Laser Line Method					Point Autofocus Method
	AF-IZ	AF-WF	AF77VB	AF-UN AF-UNB	AF-VW	
Microscope Manufacture						
Nikon	●	●	●	●	-	●
Mitutoyo	●	●	●	-	●	●
Evident	●	●	●	●	-	●
Others	●	●	●	-	●	■

- ※ Microscopes, objective lenses, and image cameras are to be provided by the customer.
- ※ Please note that some types of objective lenses may not be compatible with our AF system. To ensure compatibility, please inform us in advance about the specific models and magnifications of the objective lenses you plan to use.
- :Supported ■ :Not verified - :Not supported

### Autofocus and Axial Chromatic Aberration



#### What is Axial Chromatic Aberration?

In optics, aberration is a deviation from the ideal image formation in an optical system. Axial chromatic aberration is a phenomenon in which the refractive index differs depending on the wavelength (color) of light, resulting in a different image formation position. Since autofocus systems mainly use AF light sources in the near-infrared region (780 nm), there is a slight discrepancy(gap) from visible light (the position of focus by humans). CHUO SEIKI has incorporated a precision AF sensor position adjustment mechanism across its entire line of AF systems to mitigate focus position discrepancies induced by chromatic aberration.

## Continuously Preferred Pattern Projection & Line Sensor Autofocus

### Compact | Compact model featuring vertical drive and a single objective lens

**Model** AF-IZ

**Observation Method** Bright Field Observation Only

**Camera Mount** C-Mount : Imaging Sensor Size 2/3 or less



**Advantages**

- Analysis and inspection are possible with a simple configuration using a single interchangeable objective lens.
- Integrated objective lens drive unit and lens barrel. Compact observation optical system for space efficiency.



**Customer Voices**

Electronic Component Manufacturer A

By implementing the autofocus system, we were able to significantly reduce the costs associated with evaluating inspection equipment.



AF-IZ Series

### Wide | Wide-Field observation model compatible with Image Sensor Sizes up to Φ28mm

**Model** AF-WF

**Observation Method** Bright Field, Polarization, and Differential Interference Observation

**Camera Mount** C-Mount : Image Sensor Size 1 inch or less  
F-mount : Image Sensor Size Φ 28mm or less



**Advantages**

- Enables wide field view observation and observation with combined revolving nosepiece.
- Brightfield, polarization, and differential interference observation. Multiple observation method supported.



**Customer Voices**

Image Processing Manufacturer C

Thanks to the wide-field AF system, we have been able to streamline the analysis during full-sample inspections.



AF-WF Series

### Standard | Revolving nosepiece model with multiple objective lenses for versatile use

**Model** AF-77VB

**Observation Method** Bright Field Observation  
Dark Field and Differential Interference Observation also supported

**Camera Mount** C-Mount : Imaging Sensor Size 2/3 or less



**Advantages**

- Combination of microscope revolving nosepiece (manual and motorized) enables observation at low to high magnifications.
- The compact design allows for easy integration into inspection equipment, reducing installation costs.



**Customer Voices**

Semiconductor Inspection Equipment Manufacturer B

High-precision autofocus systems are essential for wafer inspection equipment.



**Proposed Case Study**

BD type (AF-BD) AF system that has built-in ring-type fiber optic illumination for dark field observation in the AF-77VB

※ Only Nikon objective lenses are supported.



Ring fiber illumination for dark field observation is built into the light illuminator.



AF-77VB Series

### Repair | Laser repair compatible model with built-in slider-type objective lens switching unit

**Model** AF-VW (for laser repair)

**Observation Method** Bright Field Observation and for Laser repair

**Camera Mount** C-Mount : Imaging Sensor Size 2/3 or less



**Advantages**

- Objective lenses for laser repair can be combined at four wavelengths: 266 nm, 355 nm, 532 nm, and 1064 nm
- Objective slider (AF-OLS) series that can be attached to multiple objective lenses.



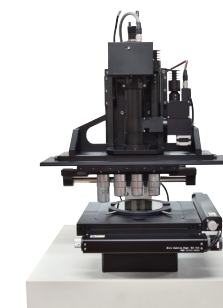
**Customer Voices**

Laser Repair Company D

Thanks to this AF system, using multiple objective lenses for laser processing has saved us time, and we're delighted.



**Proposed Case Study**



The Expanded laser repair processing machine system that combined AF-VW system with an objective slider.



AF-VW Series

# Continuously Preferred Pattern Projection & Line Sensor Autofocus

## Microscope | Compact unit model compatible with a microscope illuminator for system integration

**Model** AF-UN / AF-UNB

**Observation Method** Depends on the used microscope light illuminator

**Camera Mount** C-Mount : Imaging Sensor Size 2/3 or less



- The combination with a light illuminator enables both versatile observation and AF system.
- The compact unit design is optimized for mounting on microscopes and other instruments.

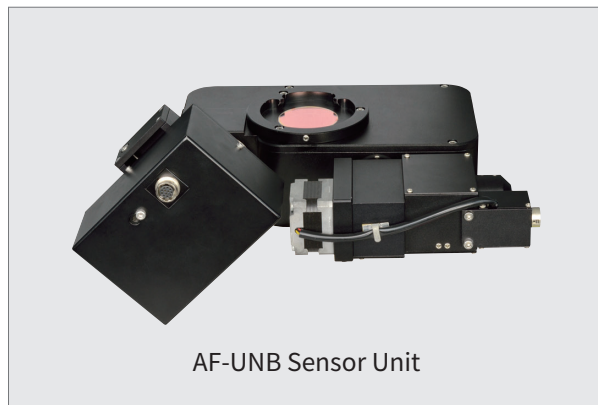


**Wafer Inspection Equipment Manufacturer E**  
This system facilitated a smooth transition to a high-performance visual inspection system, which was highly beneficial.

**Research and Development Facility F**  
Adding the AF function to our microscope has made the analysis work much more enjoyable.



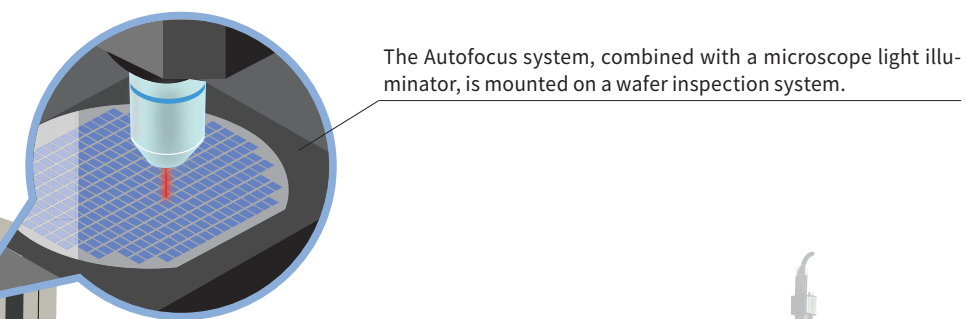
AF-UN Sensor Unit



AF-UNB Sensor Unit



Proposed Case Study



The Autofocus system, combined with a microscope light illuminator, is mounted on a wafer inspection system.



The Autofocus system integrates a microscope frame with an automatic stage to reduce analysis and inspection time.

※ Nikon and Evident microscopes only

## Unit | Dedicated controller that enables remote control of AF from host PC

**Model** AFC-6

**Observation Method** Dedicated controller that can register up to various 30 AF parameters set for each objective lens



- In addition to remote control from the host PC, manual control is available via the operation box.
- AFC adjustment software quickly supports the development of an autofocus system.

## AF Controller Specifications

Model	AFC-6
External Dimensions (Excluding Protrusions)	W250mm×D280mm×H90mm
Weight	3.3kg
Input Power	AC100-240V 40VA 50/60Hz
Current Consumption	1A
Communication Interface	RS-232C, I/O, Operation Box (AFC-K)
Control Function	Autofocus ON/OFF, Step Movement, Return to Home Position, AF Parameter Setting
Functions for Safe Operation	Soft Limit (Set for NEAR Side Only)

※ If the customer requests control of the Z-stage drive unit provided by them, please contact our sales representative for further details.

## AFC-6

AFC-6

Rear Side of the Controller

AFC-6 Adjustment Software Screen

① Line Sensor  
② I/O Port  
③ RS-232C  
④ AF Pattern Drive  
⑤ AF Drive  
⑥ AC Input

## Laser Autofocus Series Available for Various Applications

### Spot

Point autofocus that works effectively as a non-contact probe for surface texture measurement

**Model**

PAF Series

**NEW**

**Observation Method**

Bright Field Observation Only

**Camera Mount**

C-Mount : Image Sensor Size 1 inch or less

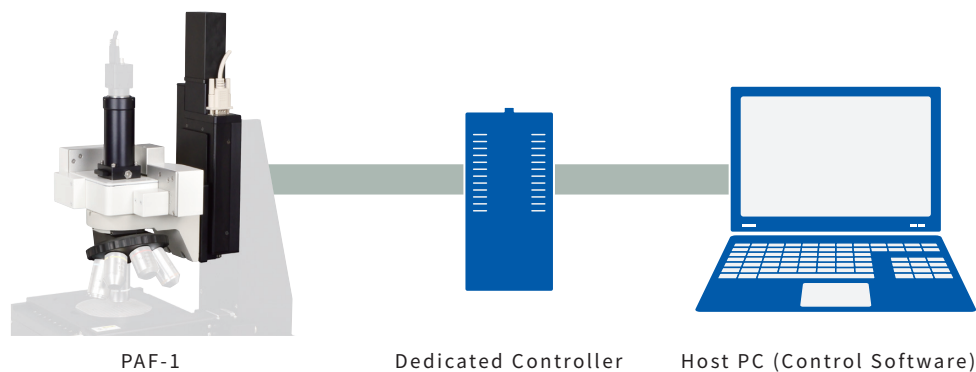


- PAF-1 : Vertical Movement Microscopes PAF-1 : Vertical Movement objective lenses
- High precision point autofocus that eliminates the need for sample selection enhances inspection efficiency.

### PAF Controller Specifications

External Dimensions (Excluding Protrusions)	W280mm×D300mm×H80mm
Weight	3kg
Input Power	AC100-240V, 50/60Hz
Current Consumption	1A
Communication Interface	RS-232C, I/O
Control Function	Manual Control from PC Autofocus ON/OFF, Step Movement, Return to Home Position, AF Parameter Setting, Objective Lens Switching, Dimming of Microscope Illumination
Functions for Safe Operation	Objective Lens Contact Prevention Sensor, Soft Limit

### PAF System Configuration Example



- Non-contact probe application for height measurement of electronic devices, etc. (acquisition of height information)
- It is possible to focus on small areas such as Inspection of processed products with steep angles and needle-like samples.

### Line

Smart Multipoint Autofocus Equipped with Laser Diode

**Model**

AF-L Series

**NEW**

**Observation Method**

Bright Field Observation Only

**Camera Mount**

C-Mount : Image Sensor Size 1 inch or less

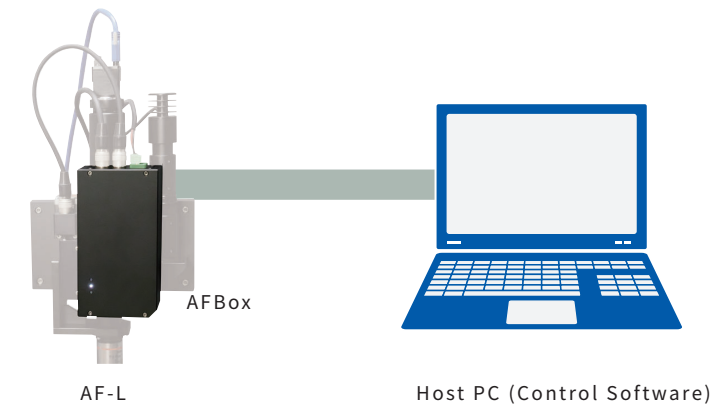


- Simple autofocus system with integrated controller and AF sensor unit.
- Can be mounted on a microscope illuminator without the need for various observation methods.

### AF-L AF Box Specifications

External Dimensions (Excluding Protrusions)	W80mm×D60mm×H150mm (AF-IZ Type)
Weight	0.9kg
Input Power	DC24V
Maximum Power Consumption	120W
Communication Interface	USB2.0 Type-A, RS-232C, I/O
Control Function	Autofocus ON/OFF, Step Movement, Return to Home Position, AF Parameter Setting
Functions for Safe Operation	Soft Limit (Set for NEAR Side Only)

### AF-L System Configuration Example



The AF-L series can be combined with the drive unit of the pattern-projecting AF series, allowing for the exploration of identical specification changes and customization.



AF-L-UN : This unit can be mounted on a microscope light illuminator.



## Objective Slider Series with High Precision and High Durability

### Unit | Slide-type high-performance objective lens switching unit

**Model** AF-OLS-XX-MS

**Observation Method** Bright Field Observation, Near Ultraviolet, Visible, and Near Infrared for Laser Processing

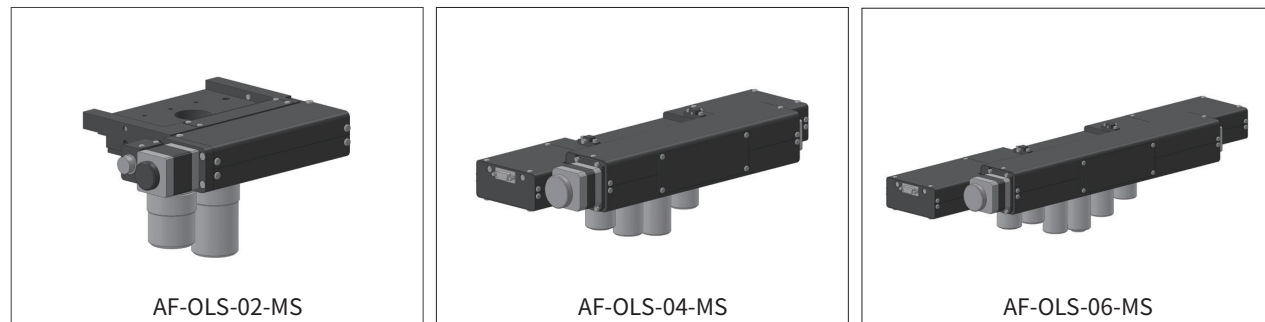


- Stepper motor-driven objective lens switching unit designed for high precision and exceptional durability.
- Can be combined with our autofocus systems (AF-XXX series, AF-L series)

#### Objective Slider Specifications

Stepper Motor Type

Model	AF-OLS-02-MS	AF-OLS-04-MS	AF-OLS-06-MS
Objective Lens	Compatible with Major Microscope Manufacturers		
Direction of Movement	1 Direction		
Nosepiece	Number of Holes	2	4
	Distance to the Next Lens	42mm	
	Switching Time(max)	about 1s	about 3s
	Switching Time(min)	about 1s	
Repeatability	±1μm		
Drive Method	5-phase Stepper Motor (Controlled by Dedicated Controller)		



#### Controller for Stepper Motor Type

Model	QT-BDL1(K)AC
Input Power (AC Adapter)	AC100-240V 50/60Hz
External dimensions (excluding protrusions)	W165mm×D142mm×H60mm
Weight	about 1.6kg
Communication interface	RS-232C

- ※ Operation box and AC adapter are included.
- ※ Motor cable and RS-232C cable are optional.



### Unit | High performance objective lens switching unit by sliding type

**Model** AF-OLS-XXL-MS **NEW**

**Observation Method** Bright Field Observation, Near Ultraviolet, Visible, and Near Infrared for Laser Processing

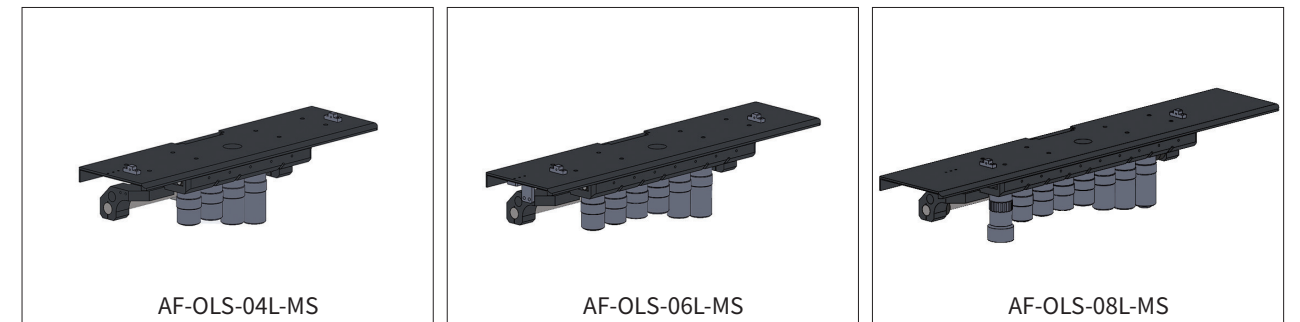


- Linear shaft motor driven objective lens switching unit achieving high speed, high precision, and high durability.
- Can be combined with our autofocus system (AF-XXX series, AF-L series).

#### Objective Slider Specifications

Linear Shaft Motor Type

Model	AF-OLS-04L-MS	AF-OLS-06L-MS	AF-OLS-08L-MS
Objective Lens	Compatible with Major Microscope Manufacturers		
Direction of Movement	1direction		
Nosepiece	Number of Holes	4	6
	Distance to the Next Lens	42mm	
	Switching Time(max)	0.7s	0.8s
	Switching Time(min)	0.4s	
Repeatability	±0.2μm		
Drive Method	Linear Shaft Motor (Controlled by Dedicated Controller, Feedback Control by Linear Encoder)		



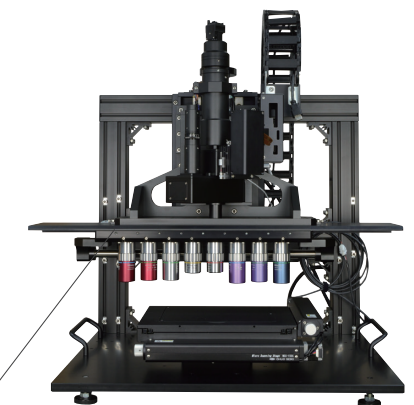
#### Controller for Linear Shaft Motor Type

Model	AF-OLS-LC
Input Power (AC Adapter)	DC 24V (Current Consumption max2A)
External Dimensions (Excluding protrusions)	W112mm×D210mm×H51.2mm
Weight	1.2kg
Communication Interface	USB(Type-B) 3m or less recommended

- ※ Motor cable and encoder cable (3m each) are included.
- ※ AC adapter and USB cable are optional.

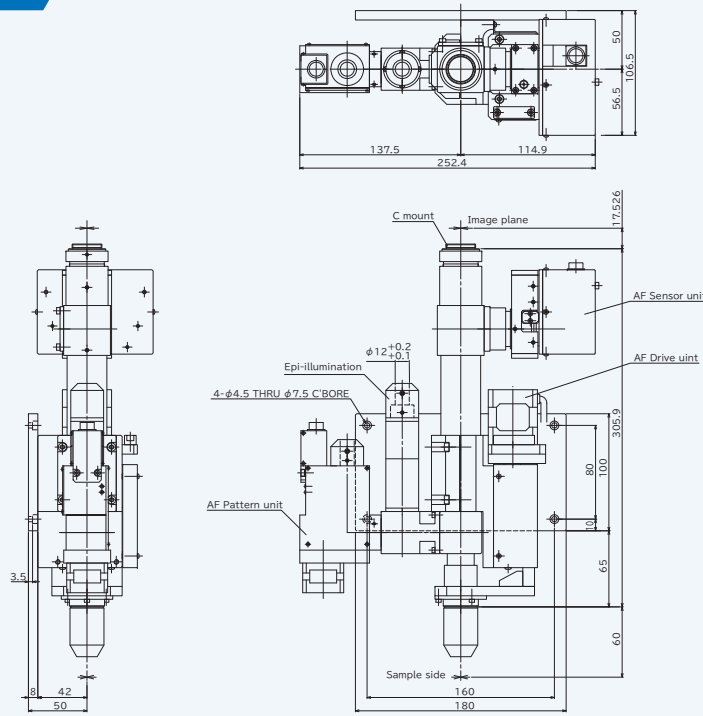


AF system with an objective slider that accommodates up to 8 objective lenses



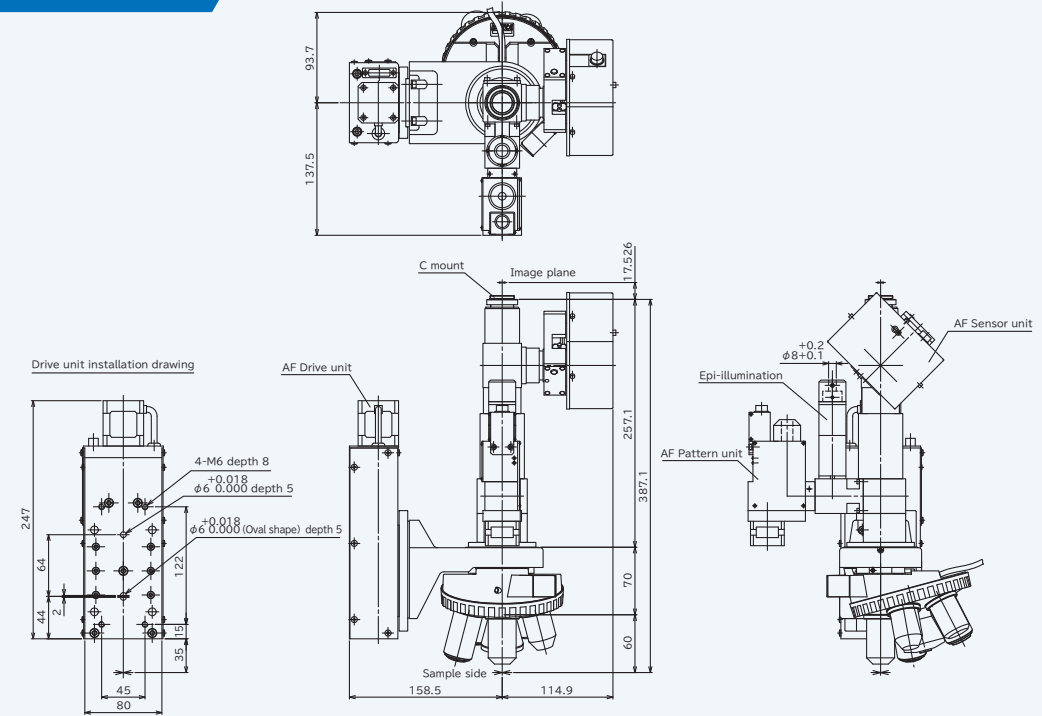
## External View

### AF-IZ S2-N60WP



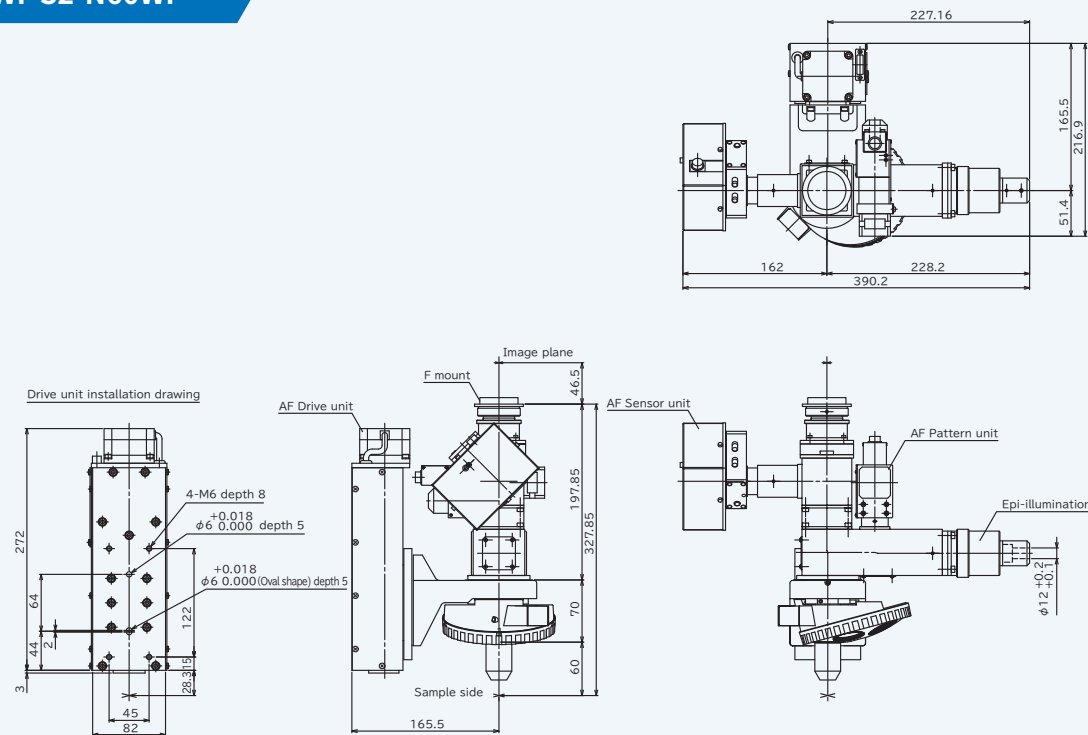
Weight : About 4.1kg

### AF-77VB S2-N60WP



Weight : About 7.2kg

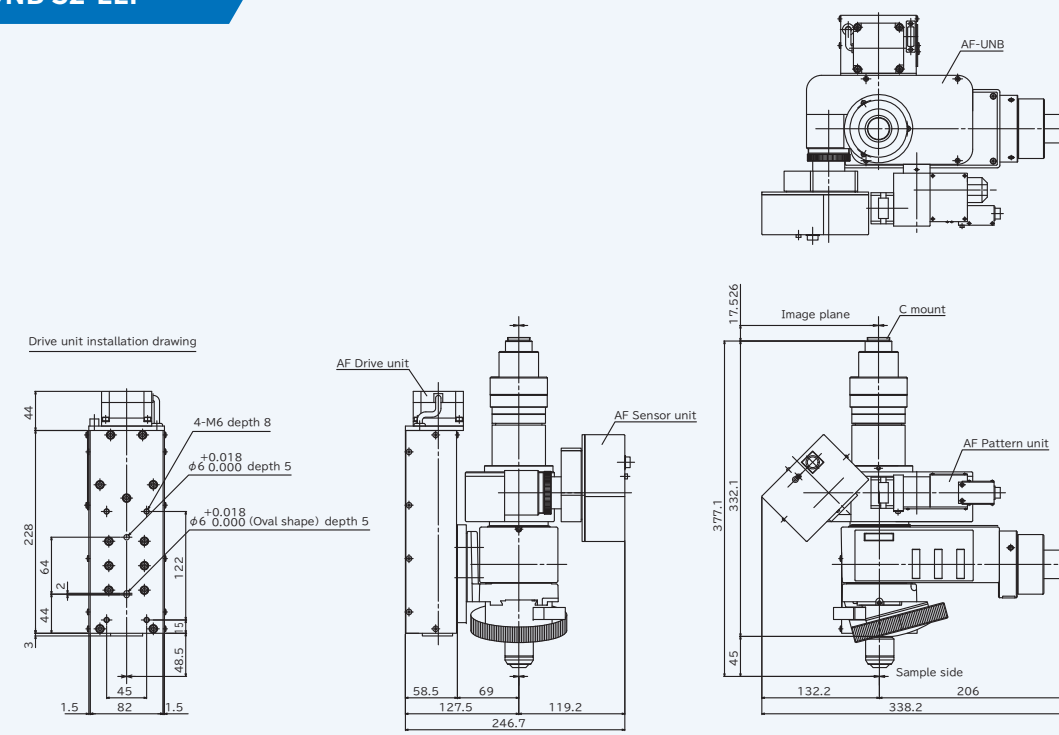
### AF-WF S2-N60WP



Weight : About 8.1kg

The weight does not include the objective lens, revolving nosepiece, focusing unit, light illuminator, or lighting device.

### AF-UNB S2-LLP

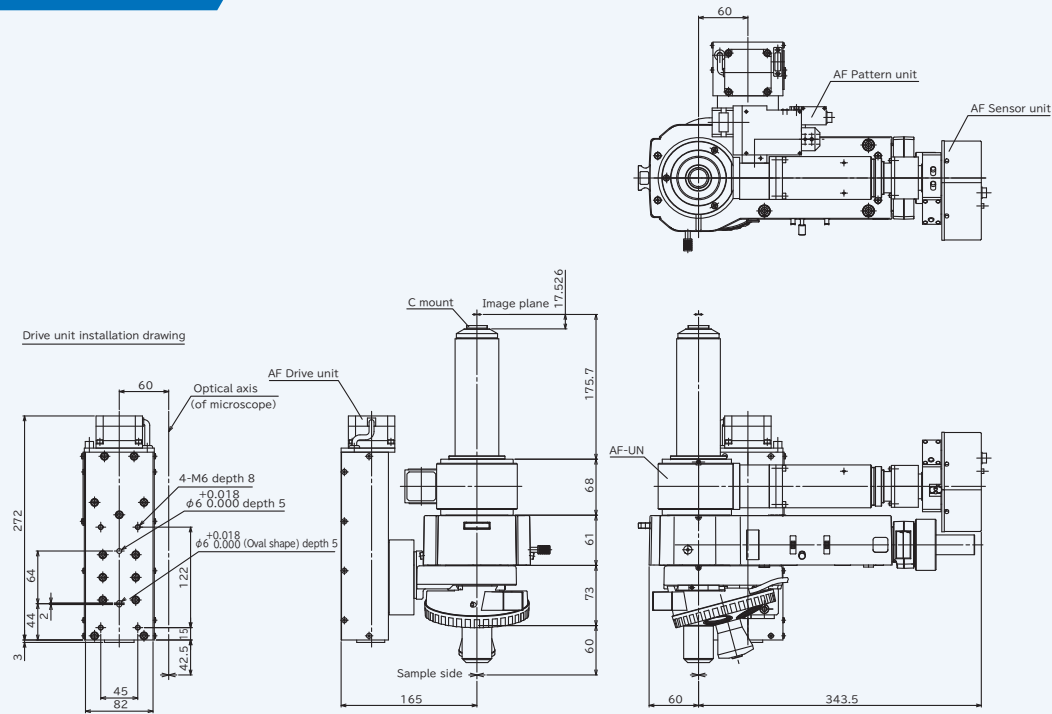


Weight : About 7.2kg

The weight does not include the objective lens, revolving nosepiece, focusing unit, light illuminator, or lighting device.

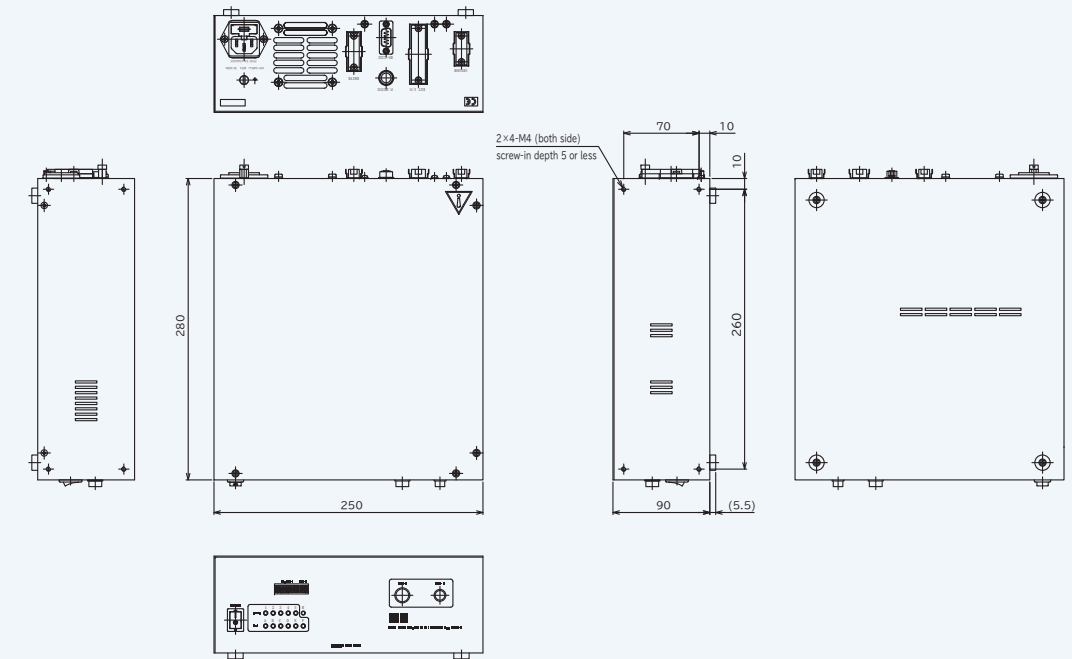
## External View

### AF-UN S2-N60LP



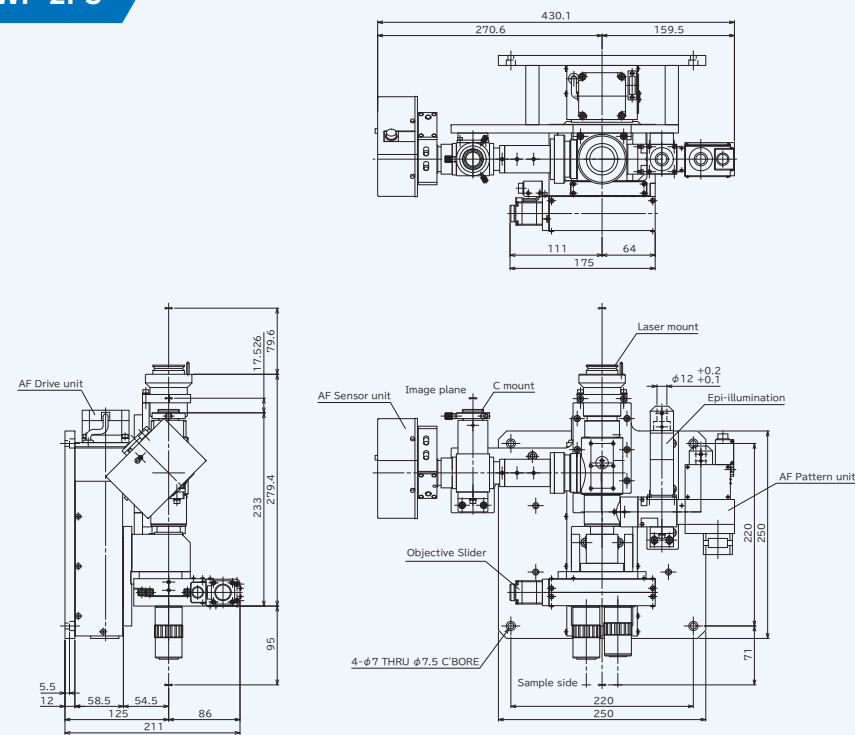
Weight : About 7.6kg

### AFC-6



Weight : About 3.3kg

### AF-VW S2-MWP-2PS



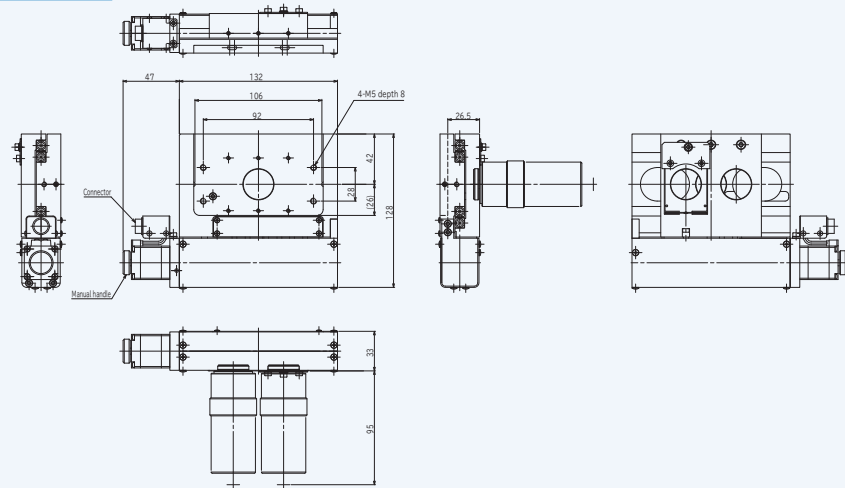
Weight : About 6.3kg

The weight does not include the objective lens, revolving nosepiece, focusing unit, light illuminator, or lighting device.

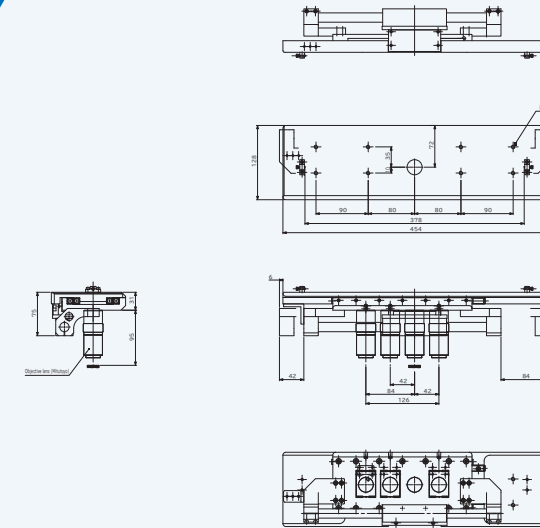
## M E M O

## External View

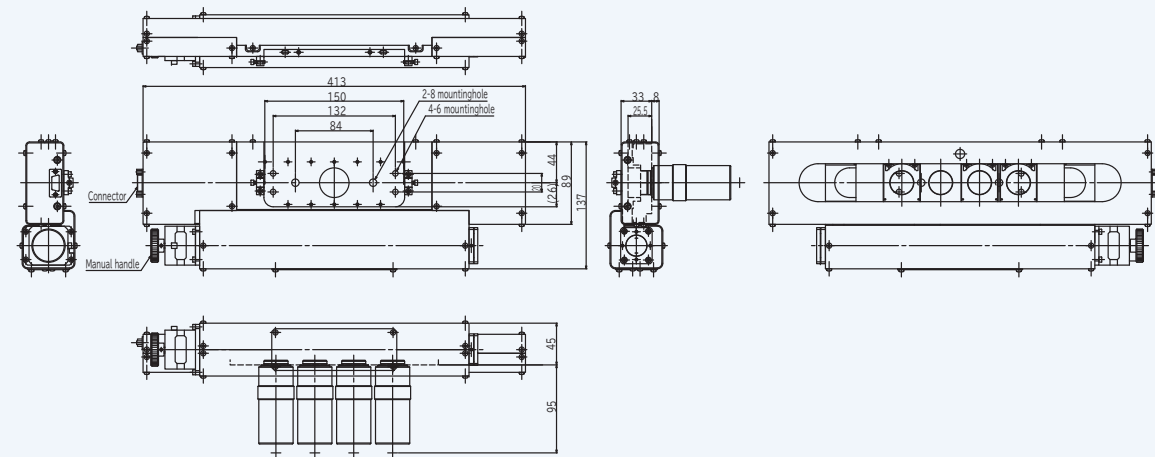
AF-OLS-02-MS



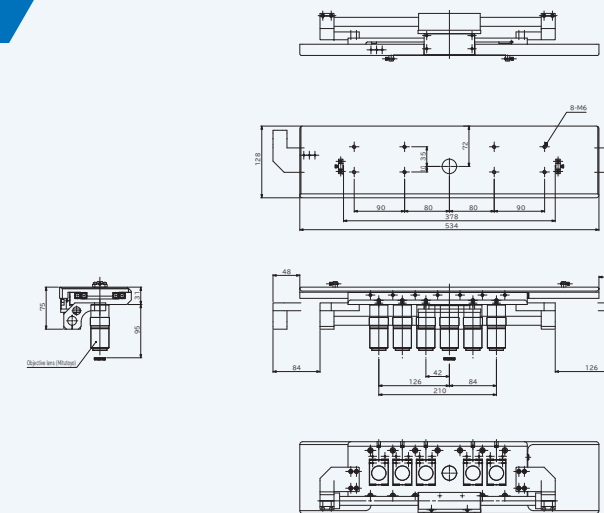
AF-OLS-04L-MS



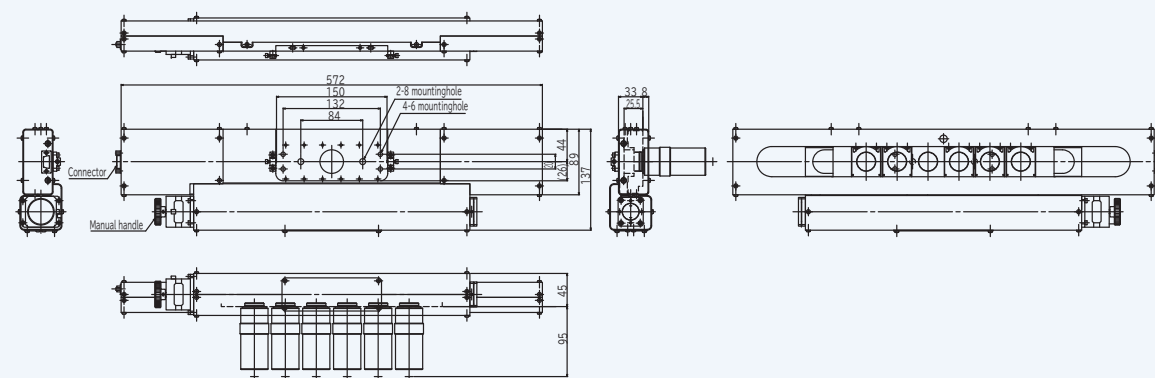
AF-OLS-04-MS



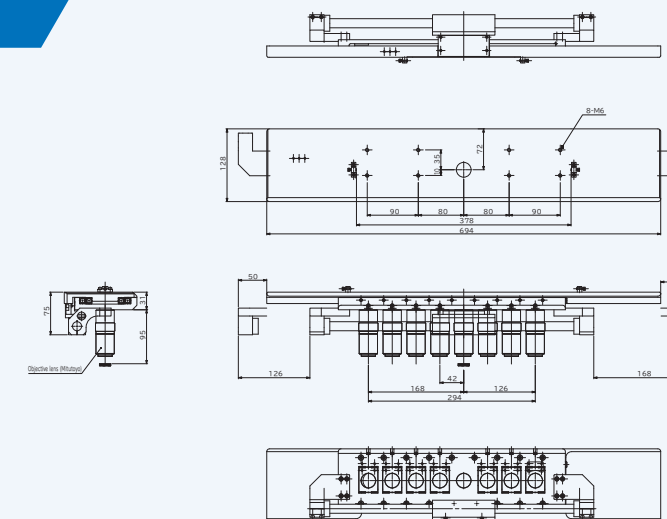
AF-OLS-06L-MS



AF-OLS-06-MS

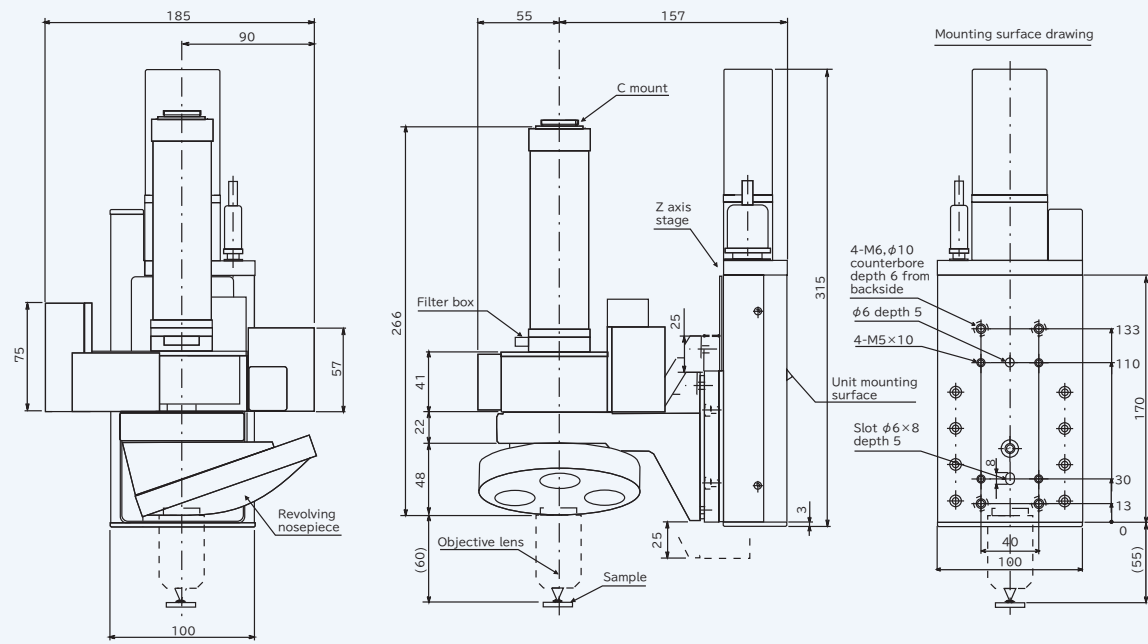


AF-OLS-08L-MS

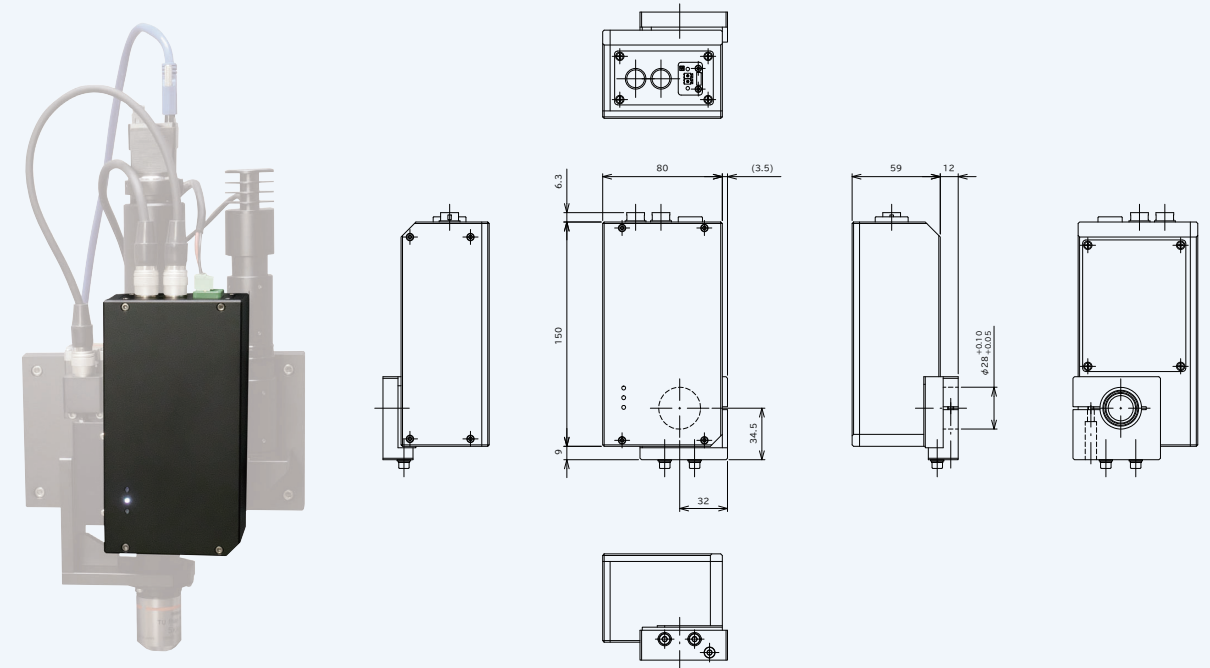


## External View

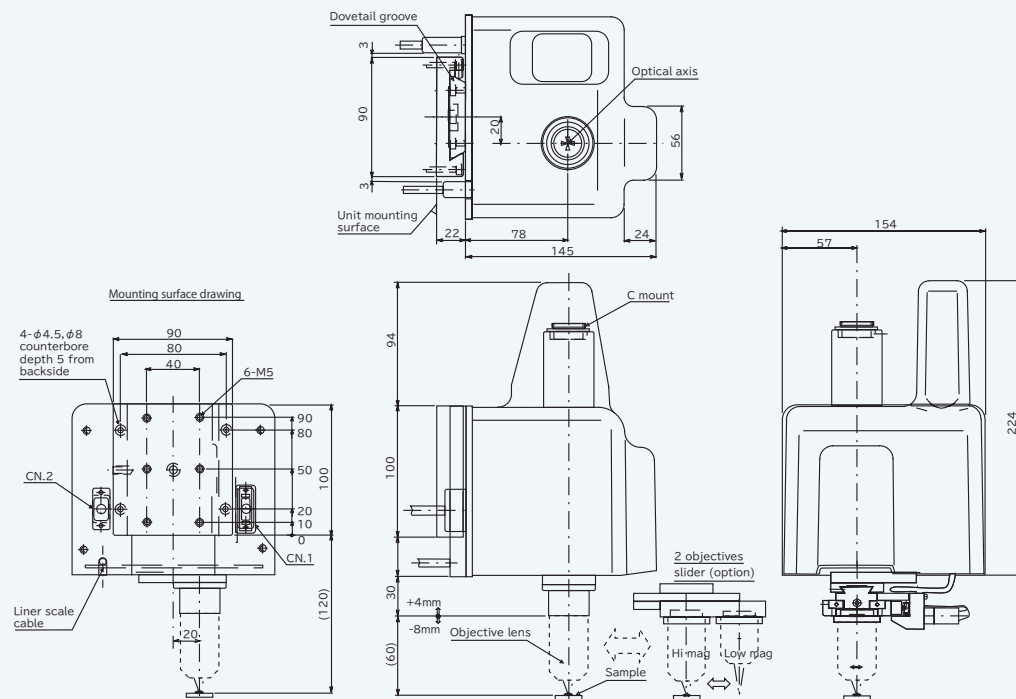
PAF-1



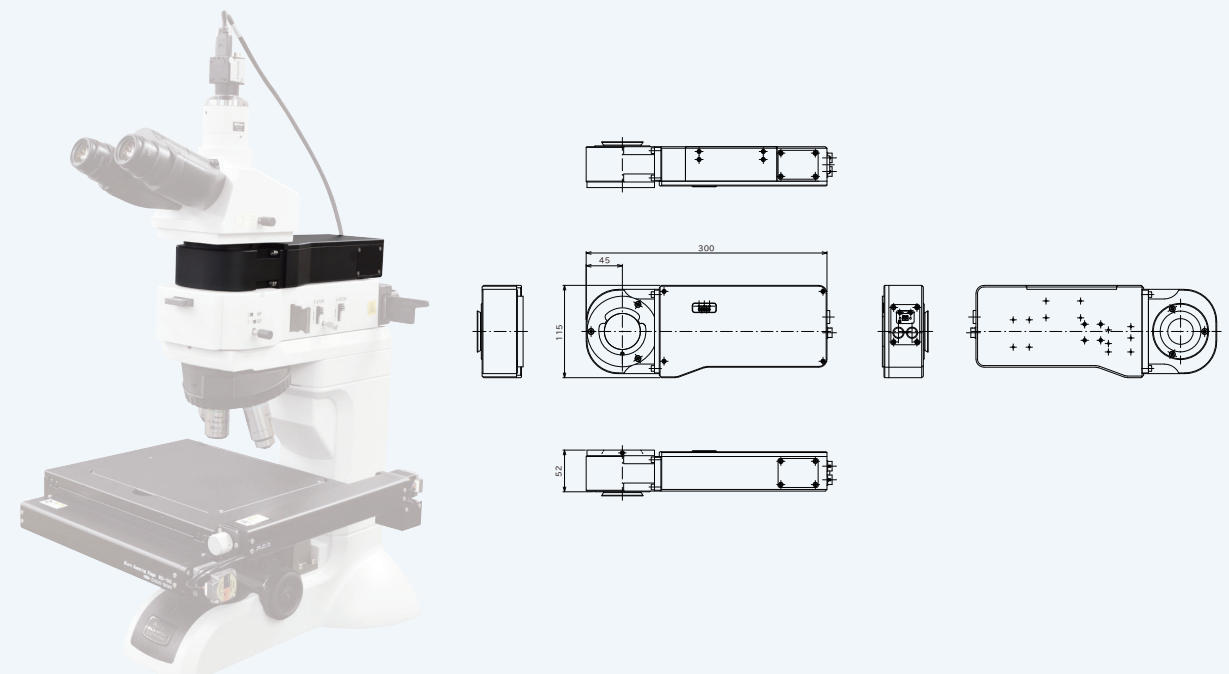
AF-L



PAFC-1

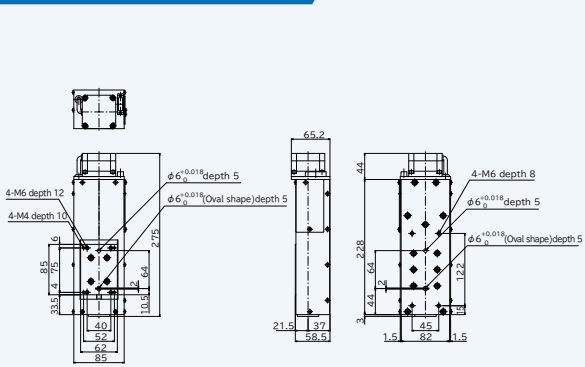


AF-L-UN



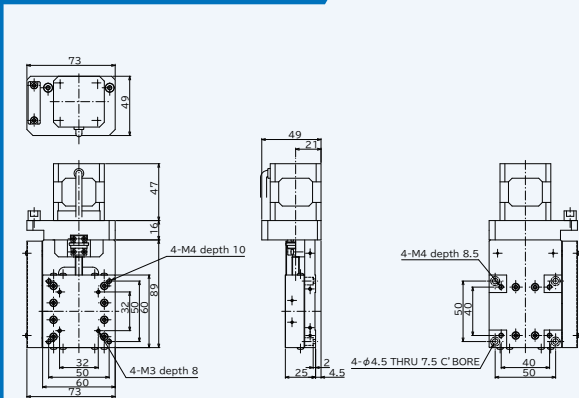
## External View

AF-61ZA



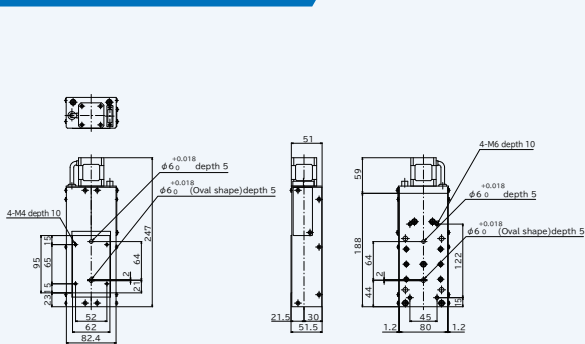
Weight : About 5.1kg

AF-361ZA



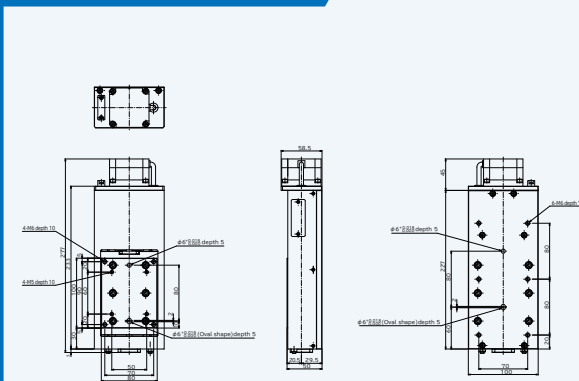
Weight : About 0.5kg

AF-161ZA



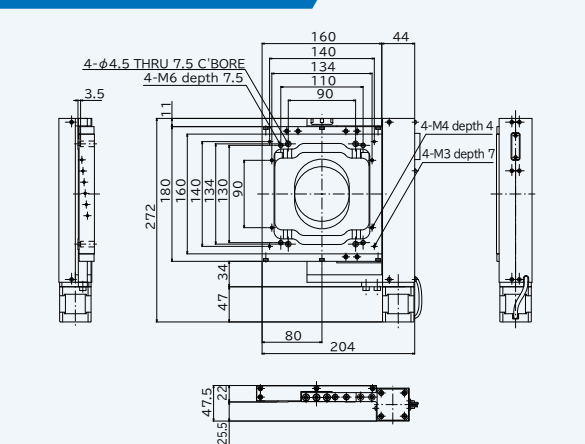
Weight : About 2.0kg

AF-461ZA



Weight : About 5.5kg

AF-261ZA

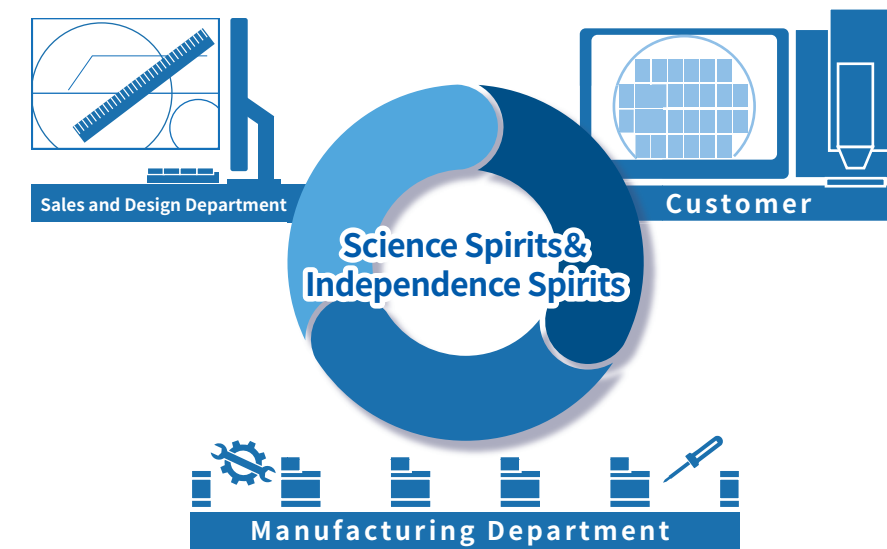


Weight : About 2.1kg

This weight refers to the Z-Axis Drive Unit only; the weight of other units are not included.

## Science Spirits & Independence Spirits

The history of CHUO SEIKI began in 1955 when our founder, Setsuo Hotta, introduced the first "Tool Scope" microscope to the market. As we approach our 70th anniversary in 2025, we remain committed to developing products from the perspective of the end user. Guided by our new corporate philosophy of "Science Spirits" and "Independence Spirits," our dedicated team is united in creating user-friendly products and is consistently proposing solutions that address our customers' challenges.



### Customization Examples : Gate System

Our gate system allows for the construction of customized products using a combination of three components: a desk-type vibration isolation table, a gantry frame, and an XY Motorized stage. This enables us to offer highly flexible and diverse combinations of analysis and inspection systems without worrying about the optical or drive systems that will be mounted.

