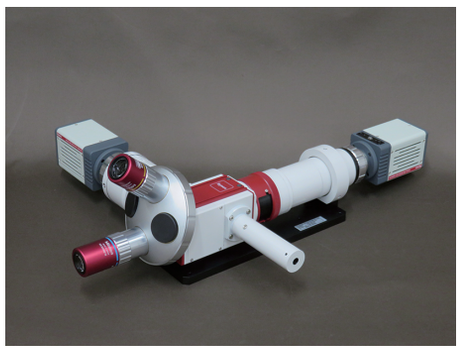
M-Scope type D　NFP/FFP SIMULTANEOUS MEASUREMENT OPTICS

Realize simultaneous observation and analysis of NFP and FFP by single optical unit.

M-Scope type D realizes simultaneous observation and analysis of NFP and FFP by a single optical unit. **M-Scope type D** has NFP measurement port and FFP measurement port in single optical base, and no need to switch the optics during each measurement.



【Features】
○Simultaneous analysis of NFP and FFP by a single optical unit.
○Specially designed optics for real-time observation and analsis of NFP/FFP
○Long working distance of approx. 17mm when measuring FFP
○Possible to measure in 400nm to 1700nm wavelength range by selecting detector.
○High-performance NFP/FFP simultaneous measurement system can be constructed by using Synos' optical beam analysis module **AP013** together.

【Summary of specifications】
○NFP/FFP measurement common specifications
- ●Objective lens:　M-Plan Apo NIR 50x (fixed)
- ●W.D.:　17mm
- ●Objective lens change: By manual revolver

＊Objective lenses with various magnifications can be used only during NFP measurement.

○NFP measurement port
- ●Intermediate lens:　1×
- ●Maximum optical magnification: 50×
- ●Epi-illumination:　Option
- ●Attenuate:　By neutral density filter
- ●Camera mount:　C mount

○FFP measurement port
- ●Measurement spectral range

Please specify the measurement wavelength because appropriate AR coating is required for optical path splitting half mirror of NFP/FFP port.
- ●Attenuate:　By neutral density filter
- ●Camera mount:　C mount

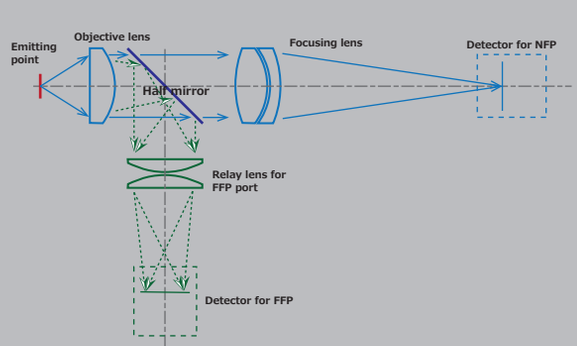
【Standard component】
○Main optics:　1
○Optics base:　1

【Option】
○Option for **M-Scope type D** optics
- ●2× intermediate lens port　**MS-OP011-RL2**
  Intermediate lens unit that doubles the overall magnification of the optical system. (up to 100× with 50× objective lens)
- ●1/2× intermediate lens port　**MS-OP011-RLH**
  Intermediate lens unit that halves the overall magnification of the optical system.
- ●Coaxial epi-illumination port　**MS-OP011-CEP**
  Coaxial epi-illumination port with removable half mirror.

○Accessories for optics
- ●Objective lens, ND filter, coaxial epi- illumination light source, optics bench, etc.

【Available detectors selection】
○for 400~1100nm: Hi-resolution CMOS detector **ISA071**, **ISA071GL**
○for 950~1700nm: InGaAs NIR detector **ISA041H2**
○for 400~1700nm: InGaAs NIR derector **ISA041HRA**
☞Regarding the field of view and pixel resolution during NFP measurement and the measurement angle coverage and pixel resolution during FFP measurement by the detector used, please refer to P50【Detector selection and NFP/FFP simultaneous measurement specifications】

☞Technical Information　【Principle of NFP/FFP simultaneous measurement】



In **M-Scope type D**, FFP is measured using objective lens. In the figure on the left, the luminous flux emitted from the emitting point is incident on the objective lens and then the optical path is split by the half mirror. The light flux that has passed through the half mirror advances to the NFP port side and is imaged on the NFP measurement detector via the focusing lens. On the other hand, the light flux reflected by the half mirror advances to the FFP port side and is imaged on the FFP measurement detector via the FFP relay lens. In this way, NFP and FFP images obtained from each port branched into two optical paths are analyzed by image processing, and NFP/FFP measurement are realized with a single optical unit. Since this optics uses objective lens to measure NFP/FFP, the diameter of the light flux to be measured is very narrow (about 100 μm), it is necessary to adjust the position and focus on the NFP image. Additionally, the measurement wavelength is limited because appropriate AR coating is required for optical path splitting half mirror of NFP/FFP port. These are major differences from the FFP measurement method using f-θ lens.

【Differences in methods and advantages and disadvantages of optical method FFP measurement】

Meas. Method	Optics	Advantage	Disadvantage
f -θ lens method	M-Scope type F M-Scope type FW etc.	○Basic method of FFP analysis by optics ○No need for strict focus adjustment ○Wide angle coverage of approx. ±40 °	●Cannot observe real image ●Short W.D. of approx. 6mm ●Possible to secure wide measurement spectral range
Objective lens method	M-Scope type D	○Enables NFP/FFP analysis in single optics ○Can observe real image by NFP image ○Long W.D. of approx. 17mm	●Strict focus & position adjustment is required ●Nallow angle coverage of approx. ±24.5° ●Accuracy on the wide-angle side deteriorates ●Measurement wavelength is limited due to the use of HM. Affected by interference due to half mirror.