OPTICAL LOSS TEST SET
MS9020D

The MS9020D is a handy optical measuring instrument which incorporates an LD or an LED light source and an optical power meter. It can also be used for return loss measurements. Every unit of the LD light source (4 types), LED source (7 types), the sensors (9 types) and the return loss measurement unit (1 type) is a plug-in type, for easy exchange and highest suitability for field use.
The MS9020D covers 0.66 µm, 0.85 µm, 1.3 µm and 1.55 µm bands for optical loss measurement. In addition to the CW mode, it provides a modulated light mode with 270 Hz, 1 kHz and 2 kHz modulation signals. Therefore, it is possible to measure optical loss over a wide dynamic range without stray light effect. This is the most suitable for single mode fiber measurement. For return loss, 1.3 µm band single mode fibers can be measured in the 0 to 40 dB range. As a power meter, every sensor has a wavelength calibration function of 5 nm steps at three wavelengths, so absolute values can be read directly.

Features
- Measures optical loss up to 67 dB
- Measures CW and modulated light
- Provides calibration function of 5 nm steps at three wavelengths
- Also measures optical return loss (0 to 40 dB)
- Operates in three modes; AC, rechargeable battery and dry cells
- Various connectors

Applications
- **Optical fiber loss measurement**

When measuring optical fibers, it is convenient to provide one MS9020D each at both the near and far ends. By using switchable light source units (MS0904A/B, MS0909A), one-touch measurement of 0.85/1.3 µm and 1.3/1.55 µm can be accomplished.
More accurate loss measurement is possible by using the modulated light function. When an LD light source is used, it is possible to measure optical loss up to 67 dB.

- **Optical parts performance check**

A light source and optical power meter are provided, and an optical parts performance check is possible at low cost.

- **Optical return loss measurement**

Return loss of connectors or optical devices can be measured easily using return loss measuring units.

Specifications
- **MS9020D (mainframe)**

Unit display	W, W (REL), dBm, dB (REL) selectable, 4 digits
Measurement resolution	W/W (REL) display: 0.1 to 1%, dBm/dB (REL) display: 0.01/0.1 dB, Blanking is possible.
Auto power off	Power turns off automatically after 5 minutes of no adjustment
Recorder output	1 V (on full-scale display), 0.316 V (on –5 dB from full-scale)
Battery alarm	Down-side part flickers when battery voltage goes down.
Auto offset	Sensor zero point is adjusted automatically.
Back light	Display section back light can be set on and off.
Averaging	On and off selectable
Range hold	Range can be specified and set to be on and off.
Reference value input	Used to input the loss point reference value
Buzzer	Sound when input level is higher than set reference level in 1 dB steps
Wavelength sensitivity characteristics compensation	Deviation of optical power sensor is compensated automatically in 5 nm steps.

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Resume function	At power on, the state when the power is just turned off is restored.
Backup	Setting condition is backed up for 30 minutes, when the line voltage is zero at exchanging batteries for example.
Modulation	CW, 270 Hz, 1 kHz, 2 kHz (2 kHz is for MA9621A only)
Power	Operation is possible using AC adapter, Ni-Cd battery [Operation hour: 4-hour for outputting light, No operation hour: 9-hour for light is turned off (when fully charged after new battery fully discharged), Charge time: 6-hour], UM-3 Alkali/Manganese battery*1 (Require 4 pcs. Operation hour is equivalent with Ni-Cd battery at 25˚C.)
Temperature range	0˚ to 50˚C (use), 10˚ to 45˚C (at charging), –30˚ to +50˚C (storage)
Dimensions and mass	90 (W) x 190 (H) x 38 (D) mm, ≤700 g
EMC*2	EN55011: 1991, Group 1, Class A EN50082-1: 1992

*1: Optional accessories
*2: Electromagnetic Compatibility

• Light sources

Model	MS0901A*1	MS0902A*1	MS0903A*1	MS0904A*1	MS0904B*1	MS0905A*1
Applicable fiber	GI	SM, GI			SM	Plastics
Element	LED				EE-LED	LED
Wavelength (µm)	0.85±0.03	1.3±0.03	1.55±0.035	1.3±0.03 1.55±0.035	1.31±0.02 1.55±0.035	0.66±0.03
Spectral half-width (nm)	≤60	≤140	≤210	≤140 (1.3 µm) ≤210 (1.55 µm)	≤25	≤50
Optical output level: CW mode (dBm)*2	≥–20*3	≥–20*3 ≥–40*4	≥–25*3 ≥–45*4	≥–22 (1.3 µm)*3 ≥–27 (1.55 µm)*3 ≥–42 (1.3 µm)*4 ≥–47 (1.55 µm)*4	≥–36 (1.3 µm)*4 ≥–42 (1.55µm)*4	≥–10*5
Stability*2,*6	≤0.3 dB				≤2 dB	≤0.4 dB
Short-term stability*2,*7	≤0.04 dB				≤0.05 dB	
Internal modulation	Frequency: 270 Hz/1 kHz/2 kHz±1.5%, Square wave (duty factor: 45 to 55%)					
Optical connector*8	FC, ST, DIN, HMS-10/A, SC type connector adapter				FC, ST, DIN, HMS-10/A, SC type integrated with connector	Amphenol 905, FC type connector adapter
Temperature range	0˚ to 50˚C (use), –40˚ to +70˚C (storage)					
Dimensions and mass	30 (W) x 30 (H) x 37 (D) mm, ≤200 g					

Model	MS0906A*9	MS0902D*10,*11	MS0903D*10,*11	MS0908A*12,*13	MS0909A*10,*12
Applicable fiber	GI, SM	SM		SM (ITU-T G.625)	
Element	LED	LD		FP-LD	
Wavelength (µm)	0.85±0.03 1.30±0.03	1.31±0.025*14	1.55±0.025*14	0.635±0.010*14	1.31±0.02*14 1.55±0.02*14
Spectral half-width (nm)	≤60 (0.85 µm) ≤140 (1.30 µm)	≤5*14	≤10*14	≤5*14	≤5 (1.31 µm)*14 ≤10 (1.55 µm)*14
Optical output level: CW mode (dBm)*2	≥22 (0.85/1.3 µm)*3 ≥–42 (1.3 µm)*4	–3±1*4,*14		–3±1*14,*15	≥–3*14,*15
Stability*2,*6	≤0.3 dB	±0.5 dB*4		±2 dB*2,*15,*16	±0.5 dB*2,*6,*15
Short-term stability*2,*7	≤0.04 dB	±0.05 dB*4		–	±0.05 dB*2,*7,*15
Internal modulation	Frequency: 270 Hz/1 kHz/2 kHz±1.5%, Square wave (duty factor: 45 to 55%)			Flickering light function (3 steps)	Frequency: 270 Hz/ 1 kHz/2 kHz ±1.5% Duty: 45 to 55%
Optical connector*8	FC, ST, DIN, HMS-10/A, SC type connector adapter	FC or SC type integrated with connector*17		Replaceable connector, PC polish (FC, ST, DIN, HMS-10A, SC)	
Temperature range	0˚ to 50˚C (use), –40˚ to +70˚C (storage)			0˚ to 40˚C (use), –40˚ to +70˚C (storage)	0˚ to 50˚C (use), –40˚ to +70˚C (storage)
Dimensions and mass	30 (W) x 30 (H) x 37 (D) mm, ≤200 g			90 (W) x 133 (H) x 38 (D) mm, ≤300 g	90 (W) x 133 (H) x 38 (D) mm, ≤500 g

*1: Installed in MS9020A/B/C/D
*2: Used with FC-type connectors
*3: When connected with Anritsu GI fiber (50/125 µm, NA 0.2, 2 m)
*4: When connected with Anritsu SM fiber (10/125 µm, NA 0.1, 2 m)
*5: When connected with Anritsu plastic fiber (1 mmø, NA 0.5, 2 m)
*6: CW, 0˚ to 50˚C (5 hour)
*7: CW, at ±1˚C (1 minute) within 0˚ to 50˚C
*8: Specify one connector among those shown in the specification table. When no connector and manufacturer's name are specified, FC-type (Amphenol 905 type for MS0905A) will be mounted and supplied. Other than the connectors indicated in the table are dealt in special connectors of custom-made. The ordering method of optical connectors are indicated in the table on page 34.
*9: Installed in MS9020B/C/D
*10: Laser Product Safety Standards: Class-1 (IEC Pub. 825, FDA 21CFR)
*11: Installed in MS9020C/D
*12: Installed in MS9020D
*13: Laser Product Safety Standards: Class-2 (IEC Pub. 825, FDA 21CFR)
*14: CW, 25˚C
*15: Connected with SM fiber (ITU-T G.625), 2 m
*16: CW, at 0˚ to 40˚C ambient temperature, 5 hour
*17: Use the conversion cord (see ordering information) for other optical connectors

• Optical sensors

Model		MA9421A*1	MA9422A*1	MA9423A*1	MA9621A*1	MA9622A*2,*14
Wavelength range		0.38 to 1.15 µm			0.75 to 1.7 µm	1.2 to 1.7 µm
Element		Si diode			InGaAs diode	
Active area diameter		ø9.5 mm	ø9 mm	ø9.5 mm	ø1 mm	–
Input		Direct			FC, ST, DIN, HMS-10/A, SC type connector adapter*10	FC, SC, ST, DIN, HMS-10/A, replaceable connector, PC polishing
Measurement range	CW (dBm)	–60 to +20 (0.85 µm)	–50 to +20 (0.85 µm)	–70 to +10 (0.85 µm)	–70 to +3 (1.3 µm)	–50 to +23 (1.3/1.55 µm)
	MOD (dBm)	–65 to +17 (0.85 µm)	–50 to +17 (0.85 µm)	–75 to +7 (0.85 µm)	–75 to 0 (1.3 µm)	–55 to +20 (1.3/1.55 µm)
Measurement accuracy*3		±5%*4		±5%*5	±5%*6	±5%*7
Temperature range		0˚ to 50˚C (use), –40˚ to +70˚C (storage)				
Dimensions and mass		30 (W) x 30 (H) x 37 (D) mm, ≤100 g	15 (W) x 16 (H) x 140 (D) mm, ≤200 g	30 (W) x 30 (H) x 37 (D) mm, ≤100 g		

Model		MA9721A*1	MA9722A*1	MA9723A*1	MA9724A*8
Wavelength range		0.75 to 1.8 µm			
Element		Ge diode			
Active area diameter		ø5 mm	ø3 mm	ø1 mm	ø9 mm
Input		Direct	Direct*9	FC, ST, DIN, HMS-10/A, SC type connector adapter*10	Direct
Measurement range	CW (dBm)	–40 to +10 (1.3 µm)	–60 to 0*11 (1.3 µm)	–60 to +3*11 (1.3 µm)	–30 to +10 (1.3 µm)
	MOD (dBm)	–50 to +7 (1.3 µm)	–65 to –3*11 (1.3 µm)	–65 to 0 *11 (1.3 µm)	–40 to +7 (1.3 µm)
Measurement accuracy*3		±5%*6,*12	–	±5%*6,*12	±5%*13 ±8.5%*12
Temperature range		0˚ to 50˚C (use), –40˚ to +70˚C (storage)			15˚ to 35˚C (use), –40˚ to +70˚C (storage)
Dimensions and mass		30 (W) x 30 (H) x 37 (D) mm, ≤100 g	20 (W) x 20 (H) x 128 (D) mm, ≤300 g	30 (W) x 30 (H) x 37 (D) mm, ≤100 g	15 (W) x 16 (H) x 140 (D) mm, ≤200 g

*1: Installed in MS9020A/B/C/D
*2: Installed in MS9020D, applicable connector: SM fiber (ITU-T G.625)
Return loss: ≥40 dB (1.55 ±0.2 µm, only when return loss of optical connector: ≥45 dB)
Polarization dependency: ≤0.1 dB (1.55 ±0.02 µm)
*3: Used with FC-type connectors
*4: At –10 dBm, 0.633/0.78/0.85 µm CW light mode
*5: At –10 dBm, 0.66/0.78/0.85 µm CW light mode
*6: At –10 dBm, 0.85/1.3/1.55 µm CW light mode
*7: At –10 dBm, 1.3/1.55 µm CW light mode
*8: Installed in MS9020B/C/D
*9: Used with UV coated SM fiber with a jacket diam. 0.25 mm
*10: Specify one connector among those shown in the specification table.
When no connector and manufacturer's name are specified, FC-type (Amphenol 905 type for MS0905A) will be mounted and supplied.
Other than the connectors indicated in the table are dealt in special connectors of custom-made. The ordering method of optical connectors are indicated in the table on page 34.
*11: 0˚ to 40˚C
*12: At –10 dBm, 1.55 µm CW light mode, 18˚ to 28˚C
*13: At –10 dBm, 0.85/1.3 µm CW light mode, 18˚ to 28˚C
*14: Installed in MS9020D

• MS0907A Return Loss Measurement Unit*1

Applicable fiber	SM (10/125 µm, NA 0.1)
Wavelength	1.31 ±0.03 µm (25˚C)
Measurement range	0 to 40 dB (relative to total internal reflection cord, including output connector reflection)
Measured data display range	0 to 60 dB (relative to total internal reflection cord, excluding output connector reflection)
Measurement accuracy	±1 dB (relative to the reflection, constant temperature)
Optical output connector*2	FC, ST, DIN, HMS-10/A, SC: PC-type
Temperature range	0˚ to 50˚C (use), –40˚ to +70˚C (storage)
Dimensions and mass	90 (W) x 93 (H) x 36 (D) mm, ≤300 g

*1: Installed in MS9020B/C/D; Laser Product Safety Standards: Class-1 (IEC Pub. 825, FDA 21CFR)
*2: Specify one connector among those shown in the specification table.
When no connector and manufacturer's name are specified, FC-type (Amphenol 905 type for MS0905A) will be mounted and supplied.
Other than the connectors indicated in the table are dealt in special connectors of custom-made. The ordering method of optical connectors are indicated in the table on page 34.

MA9722A Optical Sensor

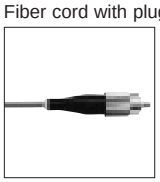
MS9020D

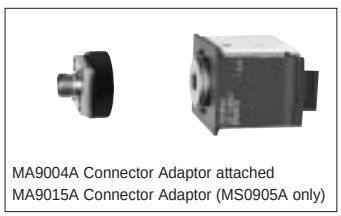
Optical Sensor
(MA9421A/9422A/9423A/
9621A/9622A/9721A/
9722A/9723A/9724A)

LED Source
(MS0901A/0902A/0903A/
0904A/0904B/0905A/0906A)
LD Source
(MS0902D/0903D)

LD Source
(MS0908A/0909A)

Fiber cord with plug





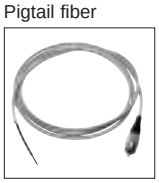
MA9004A Connector Adaptor attached
MA9015A Connector Adaptor (MS0905A only)

LED Source
(MS0901A/0902A/0903A/0904A/
0904B/0905A/0906A)
LD Source
(MS0902D/0903D)

Bare fiber

MA9014A
Bare Fiber Connector

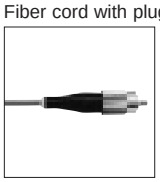
Pigtail fiber



Bare fiber

MA9013A Fiber Adaptor

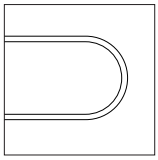
Fiber cord with plug



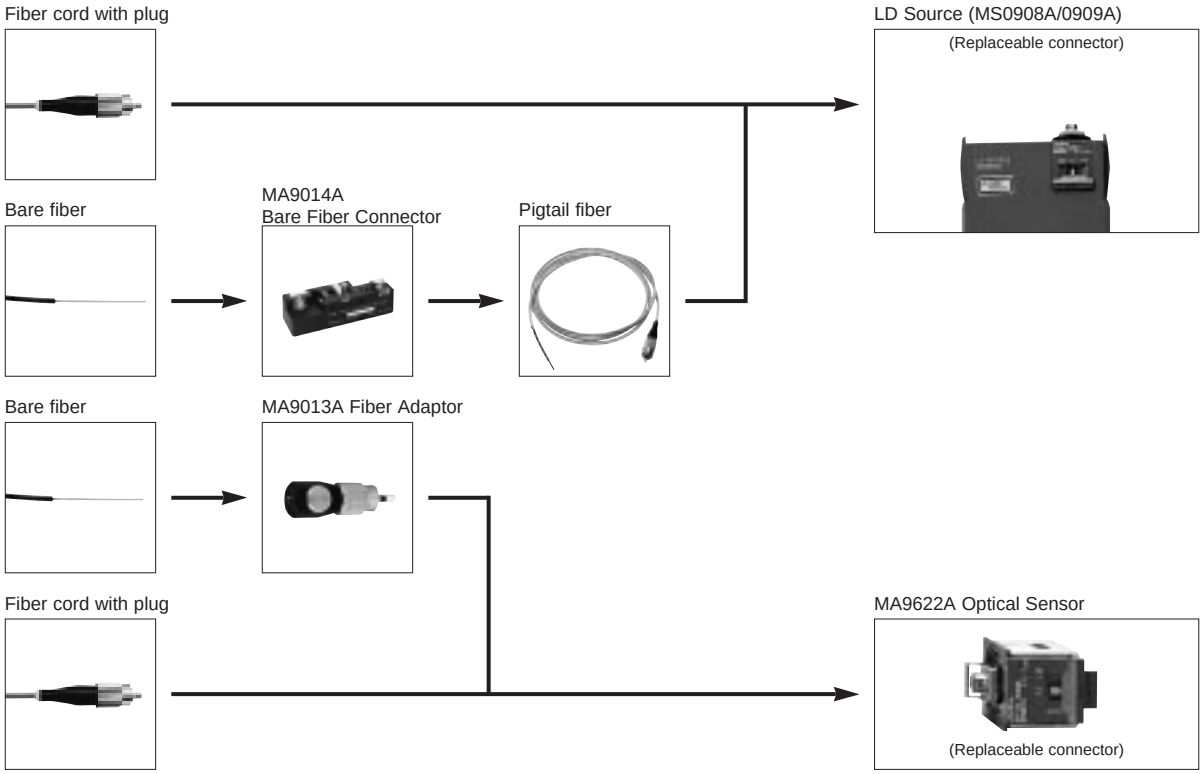
Optical Sensor
(MA9421A/9423A/9621A/9721A/9723A)

MA9005A Connector Adaptor

UV coated SM fiber (with a jacket diam. 0.25 mm)



MA9722A Optical Sensor



Ordering information

Please specify model/order number, name and quantity when ordering.

Model/Order No.	Name	
	Mainframe	
MS9020D	Optical Loss Test Set (with Ni-Cd batteries)	
	Standard accessories	
Z0178	AC adaptor:	1 pc
J0017	Power cord, 2.5 m:	1 pc
J0599	AC operation adaptor:	1 pc
J0477	Continuant adaptor:	1 pc
J0597	Total internal reflection cord (for MS0907A only):	1 pc
W1306AE	MS9020D operation manual:	1 copy
W1306BE	MS9020D service manual:	1 copy
	LED Sources	
MS0901A	LED Source (MA9004A Connector Adaptor attached)	
MS0902A	LED Source (MA9004A Connector Adaptor attached)	
MS0903A	LED Source (MA9004A Connector Adaptor attached)	
MS0904A	LED Source (MA9004A Connector Adaptor attached)	
MS0904B	LED Source (integrated with connector)	
MS0905A	LED Source (MA9015A Connector Adaptor attached)	
MS0906A	LED Source (MA9004A Connector Adaptor attached)	
MS0902D	LD Source (integrated with connector)	
MS0903D	LD Source (integrated with connector)	
MS0908A	LD Source (replaceable connector attached)	
MS0909A	LD Source (replaceable connector attached)	
	Optical sensors	
MA9421A	Optical Sensor	
MA9422A	Optical Sensor (thin type)	
MA9423A	Optical Sensor	
MA9621A	Optical Sensor (MA9005A Connector Adaptor attached)	
MA9622A	Optical Sensor (for high power, replaceable optical connector attached)	
MA9721A	Optical Sensor	
MA9722A	Optical Sensor (for fiber identification)	
MA9723A	Optical Sensor (MA9005A Connector Adaptor attached)	
MA9724A	Optical Sensor (thin type)	
	Optical return loss measuring unit	
MS0907A	Optical Return Loss Measuring Unit	

Model/Order No.	Name
	Optional accessories
MA9004A	Connector Adaptor (for MS0901A/0902A/0903A/0904A/0906A)
MA9005A	Connector Adaptor (for MA9421A/9423A/9621A/9721A/9723A)
MA9006A	Sensor Adaptor (for optical sensors)
MA9013A	Fiber Adaptor (Clad diam. 125 µm; Jacket diam. 0.25 to 1 mm)
MA9014A	Bare Fiber Connector
MA9015A	Connector Adaptor (for MS0905A)
MP93A	Fiber Adaptor (Clad diam. ≤150 µm)
MP94D	Connector Adaptor (used with MP93A)
MZ8013A	Sensor Holder
J0436	Optical sensor cord S (for ML9002A, MS9020A/B/C/D)
J0438	Recorder output cord (mini-jack with clips)
J0200B	FC-FC-2M-GI (FC optical fiber cord, 2 m, GI)
J0056B	FC-FC-2M-SM (FC optical fiber cord, 2 m, SM)
Z0179	Carrying case
Z0180	Battery pack (for Alkali/Manganese cell, up to 4 pcs)
Z0181	Ni-Cd battery pack
Z0182	Soft case (MS0908A/0909A can not house)
J0206A	FC·PC-DIA·PC-1M-SM (FC·PC-DIAMOND·PC optical conversion cord, 1 m, SM)
J0208A	FC-BIC-1M-GI (FC-BICONIC optical conversion cord, 1 m, GI)
J0210A	FC-D4-1M-SM (FC-D4 optical conversion cord, 1 m, SM)
J0517A	FC-DIN-1M-SM (FC-DIN optical conversion cord, 1 m, SM)
J0519A	FC-ST-1M-SM (FC-ST optical conversion cord, 1 m, SM)
J0521A	FC-SC-1M-SM (FC-SC optical conversion cord, 1 m, SM)
J0617B	Replaceable connector (FC) ⁎For MA9622A, MS0908A/0909A
J0618D	Replaceable connector (ST) ⁎For MA9622A, MS0908A/0909A
J0618E	Replaceable connector (DIN) ⁎For MA9622A, MS0908A/0909A
J0618F	Replaceable connector (HMS-10/A) ⁎For MA9622A, MS0908A/0909A
J0619B	Replaceable connector (SC) ⁎For MA9622A, MS0908A/0909A
Z0333A	Wavelength selector ⁎For MS0904A/0904B/0906A/0909A
B0232	Blank panel