**B-H Analyzer**

**SY-8218**
10Hz～10MHz

**SY-8219**
10Hz～1MHz

Precise fully automatic core loss measurement at high frequency

De facto standard equipment for research & development of soft magnetic materials.
Precise automatic core loss measurement in higher frequency

Precise and accurate core loss measurement
Iwatsu’s B-H analyzers which hiring CROSS-POWER method (IEC62044-3) enable precise and highly accurate measurement embedded minimized phase error integration on frequency spectrum with current detecting resisters and compensation on detecting circuit with full compensation on amplitude and phase characteristics. Third generation models from year 1984 are available now to contribute leading-edge development on future power management.

Feature
- Wide band frequency range from 10Hz to 10MHz (SY-8218)
- Voltage : ±140V, max. / Current : ±5.2A, max. DC to 3MHz High power amplifier (IE-1125B)
- 41pcs., max. specimen for temperature range of -30°C to 150°C automatic scanner system (SY-321A)
- 36mm(L),min. 35mm(W),max. single sheet test (SY-956)
- DC30A, max. DC-bias superposing test (SY-960/961/962)

Power amplifier
- HSA4101-IW
- HSA4014-IW
- IE-1125B

Single sheet test system
- SY-956

Temperature scanner system
- SY-320A

Remote control software
- SY-810

IE-1125B Power amplifier
SY-8218 B-H analyzer
SY-320A Temperature scanner system
Various types of soft magnetic material property test

Types of shape:
- Toroidal
- EE core
- Sheet
- Powder

Soft magnetic materials:
- Ferrite
- Permalloy
- Amorphous
- Silicon steel sheet
- Dust core

Full automatic test

Sample parameters (Effective magnetic length, Effective cross section, number of turns of windings, etc.) and test conditions (Frequency, Maximum field strength: $H_m$, Maximum flux density: $B_m$, Maximum induced voltage: $V_{2m}$, Maximum exciting current: $I_{1m}$) inputs enable obtaining BH hysteresis curve and magnetic properties in value automatically.

Full automatic test with options

Temperature scanner system, Single sheet test system and DC biasing system are able to control with the SY-810 Remote control software.
**B-H analyzer : SY-8218/8219 (Mainframes)**

**Precise test in higher frequency**

**B-H analyzer**

SY-8218 10Hz-10MHz  
SY-8219 10Hz-1MHz

- Test freq.: 10Hz to 10MHz (SY-8218) / 10Hz to 1MHz (SY-8219)
- Applying signal waveform: Sinusoidal or Pulse (10Hz to 1MHz)
- Input current: ±6A, maximum
- Input voltage: ±200V, maximum
- Excitation method: Automatic excitation  
  (at fixed Hm, Bm 11m or V2m)

Residual flux can be eliminated by degaussing with applying AC magnetic field

### Measurement table

<table>
<thead>
<tr>
<th>Measurement method</th>
<th>Measurement Item (Symbol)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CROSS-POWER</td>
<td>Max. Magnetic flux density(Bm), Residual magnetic flux density(Br), Max.Magnetic field strength(Hm), Coersive force(Hc), Rectangular ratio(Br/Bm), Relative amplitude permeability(μa), Core loss(Pc, Pm-Pom), Primary excitation current(I1m), Secondary induced voltage(V2m), Phase(δ), Total magnetic flux linkage(2φm), Apparent power(VA), Impedence permeability(μμ), Complex permeability(μμ'), Loss coefficient(αδ), Inductance(L), Resistance(R), Impedance(Z), Quality factor(Q), Total harmonic distortion(THD)</td>
<td></td>
</tr>
</tbody>
</table>

### Waveform display

- B-H curve, Excitation current, Induced voltage, Magnetic field, Magnetic flux density

- Test frequency
  - Sinusoidal: 10Hz to 10MHz (SY-8218)  
  - Square: 10Hz to 1MHz (SY-8219)

- Magnetic field signal detection
  - Voltage drop at Non-inductive resistor, Maximum current at ±6A

- Magnetic flux density signal detection
  - Voltage detection at induced voltage detection coil, Maximum signal detection voltage at ±200V

- Digitizer
  - 16bits (8192points/cycle)

- Sample connection method
  - 2 or 1 coil (winding) method selectable

- Display
  - 8.4” TFT-LCD SVGA 800×600pixels

- Power
  - AC100V to AC240V, 50/60Hz, Approx. 130VA (MAX.)

- Weight
  - Approx. 12.8kg

- Dimensions
  - Approx. 238H×350W×140D(mm)

- External memory
  - USB port for data storage

- Accessories
  - Reference sample, POD cover, AC coupler module, Power amplifier cable (BNC-BNC), Osc scope cable (5M-k-BNC), Power cable, Operation manual(CD-ROM), Users guide

**Power amplifier**

**Wide band and High power**

**Best fit with B-H analyzer**

<table>
<thead>
<tr>
<th>Model</th>
<th>Frequency</th>
<th>Output current (peak)</th>
<th>Output voltage (peak)</th>
<th>Output power</th>
<th>Input power</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSA4101-IW</td>
<td>10Hz, 1A, 71V</td>
<td>±1A, max.</td>
<td>±71V, max.</td>
<td>50VA</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>HSA4014-IW</td>
<td>1MHz, 5.6A, 75V</td>
<td>±5.6A, max.</td>
<td>±75V, max.</td>
<td>200VA</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>IE-1125B</td>
<td>3MHz, 5.2A, 140V</td>
<td>±5.2A, max.</td>
<td>±140V, max.</td>
<td>350VA</td>
<td>50/60Hz</td>
</tr>
</tbody>
</table>

**HSA4014-IW**

- Max. output current: 5.6A
- Max. output voltage: 500kHz

**IE-1125B**

- Max. output current: 5.2A
- Max. output voltage: 500kHz

**HSA4101-IW**

- Max. output current: 5.0A
- Max. output voltage: 500kHz

**SY-911 connection cable option has to be required for IE-1125B.**
Temperature scanner system SY-320A / SY-321A

Temperature range : -30°C to 150°C, Sample 41pcs, max.

Temperature scanner system
SY-320A sample 20pcs., max.
SY-321A sample 41pcs., max.

- Test freq. : 10Hz～5MHz (with SY-8218 mainframe)
  - 10Hz～1MHz (with SY-8219 mainframe)
- Input current : ±6A, max.
- Input Voltage : ±200V, max.
- Temp. range : -30°C to 150°C

<table>
<thead>
<tr>
<th></th>
<th>SY-320A</th>
<th>SY-321A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanner chamber unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage</td>
<td>AC100V 50/60Hz</td>
<td></td>
</tr>
<tr>
<td>Input current</td>
<td>12.5A, max.</td>
<td>21.0A, max.</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-30°C to 150°C</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>SY-320A</th>
<th>SY-321A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanner mechanism unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input power</td>
<td>AC100V to 120V, 50/60Hz</td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>28VA</td>
<td></td>
</tr>
<tr>
<td>Test frequency range</td>
<td>10Hz to 5MHz with SY-8218</td>
<td>10Hz to 1MHz with SY-8219</td>
</tr>
<tr>
<td>Samples</td>
<td>20pcs., max.</td>
<td>41pcs., max.</td>
</tr>
<tr>
<td>Input current</td>
<td>±6A, max.</td>
<td></td>
</tr>
<tr>
<td>Input voltage</td>
<td>±200V, max.</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>85kg</td>
<td>135kg</td>
</tr>
<tr>
<td>Outer Dimensions</td>
<td>543W×695L×620H (mm)</td>
<td>640W×920L×660H (mm)</td>
</tr>
<tr>
<td>Accessories</td>
<td>Reference sample, Chamber cable(SY901), Turn table*, GPIB cable(1meter), Power cable, Operation manual *SY-510(SY-320A) or SY-511(SY-321A)</td>
<td></td>
</tr>
</tbody>
</table>

Remote control system configurations

REMOTE CONTROL SOFTWARE : SY-810

- Test freq. : 10Hz～5MHz (with SY-8218 mainframe)
  - 10Hz～1MHz (with SY-8219 mainframe)
- Input current : ±6A, max.
- Input Voltage : ±200V, max.
- Temp. range : -30°C to 150°C

Spare parts for temperature scanner system

- Turntable (for setting samples on scanner mechanism)
  - SY-510 (for SY-320A)
  - SY-511 (for SY-321A)
- Spare connection pin set
  - SY-512 (for SY-320A/321A)
Single Sheet Test system : SY-956

Full automatic accurate test for single sheet shape samples such as Silicon-steel sheets, etc.

Test frequency: 10Hz to 20kHz
Applicable magnetic field strength : 10,000A/m, max
Sample dimensions : Single sheet samples at:
36mm(L), min. / 35mm(W), max. and 3mm(t), max.
Introducing vertical single yoke current excitation type single sheet magnetic property characteristics test method
Yoke compensation function cancelling loss and other affection in Yoke (patent pending)

Constant pressing force on specimen (selectable from 16 kinds of force settings)

Measurement method
vertical single yoke current excitation type single sheet magnetic property characteristics test method
(IEC 60404-3 compatible)
Yoke compensation : available

Applicable magnetic field strength
Approx. 10,000A/m (Max.) with excitation level at 5A

Test frequency
Sinusoidal 10Hz to 20kHz

Sample dimension
35mm(W), max., 36mm(L), min. 3mm(thickness), max.

Detection current
±6A, max.

Detection voltage
±200V, max.

Power
AC100V to AC240V, 50Hz/60Hz, Approx. 27VA(Max.)

Performance guarantee temperature
18℃ to 28℃

Dimension
330W×200H×320D(mm)

Weight
Approx. 8.5kg

Accessories
Single sheet test system connection cable SY-957, B coil (2kinds), Connection terminal screw, Pincer, Blowing blush, Accessory case, Power cable, Operation manual

Hint:
Steel sheet will show different magnetic properties between the different shapes even exactly the same material. It is important to test magnetic property as a single sheet prior to machining.

Example of Permalloy
Hc : Round=Oval
Br : Round<Oval
Bm : Round<Oval
Core loss : Round<Oval

LF AC coupler SY-514
AC coupler at fLc=300Hz(-3dB) to use in lower frequency than AC coupler SY-503 which provided as a standard accessory with BH analyzer mainframe.

fLc(cut-off freq.) : Approx. 300Hz
Input voltage : ±200V, max.
Input current : ±6A, max.
Connection cable : BNC cable(0.6m)

10kHz AC coupler SY-504
(standard accessory for B-H Analyzers)

Blank toroidal core SY-513
Blank toroidal shape casing for powder material or layered thin material donuts shape, etc.

Blank toroidal shape casing (mm)

DC biasing source SY-931
DC current : 10A, max.
Operation freq. : 1MHz, max.
DC-bias test system (SY-960, SY-961, SY-962)

**Automatic test on power inductor properties with DC biasing**

**DC-bias test system**

SY-960/961/962

- DC bias current: 30A, max
- AC Ripple current: ±6A, max
- Test frequency (Sinusoidal): 10kHz to 3MHz
- Test frequency (Pulse): 10kHz to 1MHz (Duty 10\%-90\%)

![DC bias test system](image)

**Test example on chip inductor (Chopper excitation)**

- **Current signal**
- **Voltage signal**

Different DC biasing conditions at constant $\Delta H$

- $I_{dc}=2.6A$
- $I_{dc}=2.4A$
- $I_{dc}=2.2A$
- $I_{dc}=2.2A$

DC bias vs $\Delta P_c$

![Graph showing DC bias vs $\Delta P_c$](image)

Ferrite (SMA)

- $L=1.0\mu H$

Fe-Based amorphous core

- $L=311\mu H$

Iron powder core

- $L=8.4\mu H$

Hint:

- In actual operation, both AC magnetic field and DC magnetic field may be applied at the same time usually.
- Magnetic property test with changing DC biasing level is considered important.

- **SMD Power inductor**
- **Toroidal coil inductor**

DC-bias test system is uniquely used as an option for SY-8218 or SY-8219 and not be used with other equipment. Adjustment and inspection as a system with BH analyzer is required. BH analyzers (SY-8218/SY-8219) at the customer end will be returned to our factory for adjustment and inspection when DC-bias test system can be configured as a system.

---

-7-
Remote control software SY-810

Automatic test can be performed such as property test vs frequency, etc.

- Temperature conditions up to 20 kinds, Excitation conditions up to 40 kinds for each DUT (device under test) are available. This means 20×40 (= 800) kinds of conditions can be programmed for each sample of DUT.
- Pulse excitation can be controlled with BH analyzer
- Hard copy of displayed results (JPEG, PNG) and signal waveform data at xxx.csv basis can be extracted to PC memory.

Contents of SY-810: CD (software and operation manual at PDF), GP-IB converter SY-509, Bulkhead adaptor 182766-01 and software license agreement
PC operation environment
- OS: Windows Vista SP2, Windows7 32bit/64bit
- .NET Framework (packed), CPU Pentium133M or above, Memory at 84Mbyte or more, Display resolution at 1024x768 or above, USB port x1
※ Contact our sales for the most recommended system configurations.
※ NI GPIB-USB+ (NATIONAL INSTRUMENTS Corp.) is required for PC interface with SY-8218/SY-8219. PC is not included with this system and supplied by customer.

Continuous test function SY-811

Time-tendency property test can be performed at continuous excitation.
- Test timeframe at 99,999 minutes (Approx. 70 days), max. 60 seconds/test
- 2 kinds of properties can be monitored on display and extracted to memory.
- Measurement item can be changed during test.
- Comparison between Reference and test result on the same display.
- Test data at CSV and display hardcopy at JPG/PNG are available.

※ Option for BH analyzer
※ Implementation of SY-811 on BH analyzers (SY-8218/SY-8219) at the customer end will be returned to our factory for installation and inspection.

Equipment wagon

Equipment wagon MT-600L

Table can be modified of it’s height.

Major items:
- Slide pull-out table
- Pull out for accessories
- 4 wheel casters with lock function
- Equipment tighten belt
- Mountable weight: 100kg, max.
- Height: Approx. 850mm
- Table: 590W×775D (mm) fixed
- Weight: Approx. 36kg

※ Supplied as each piece and assembled by customer

- The products shown in this catalogue are current models at the date of publication. Design and specification are subject to change without notice for improvement.
- All enterprises including National Instruments and Microsoft, etc., and product names mentioned are trademarks or registered trademarks of the respective owners.
- Some of the products are Regulated Products subject to the Foreign Exchange and Foreign Trade Control Law of Japan. Export should not be allowed without appropriate governmental authorization. Please ask our sales office whether the product concerned is a Regulated Product(s).