

# *Soft magnetic materials' property tests*



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

*Highly accurate  
automatic measurement  
at high frequency*

## Wide temperature range scanner system SY-330



## Scanner system SY-321A/320A



## DC bias test system SY-960, 961, 962



## Single sheet test system SY-956



## B-H Analyzer

# Precise magnetic property measurement at high 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 resistors and compensation on detecting circuit with full compensation on amplitude and phase characteristics. Third generation models are available now to contribute leading-edge development on future power management.

SY-810 Remote control software



SY-5001 amplifier

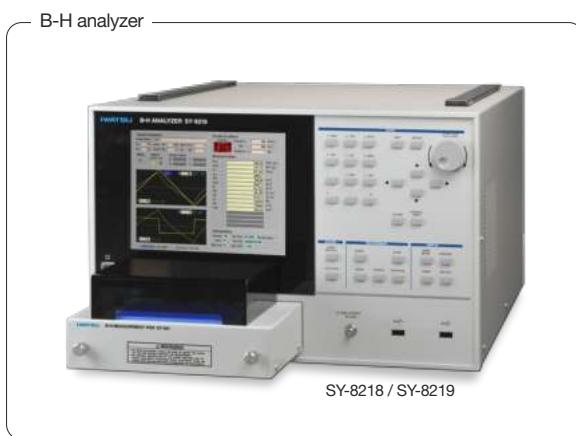


SY-8218 B-H analyzer



SY-320A Temperature scanner system

- Wide band frequency range from 10Hz to 10MHz (SY-8218)
- 41pcs., Max. specimen for temperature range of -30°C to 150°C automatic scanner system (SY-321A)
- Voltage : ±150V, Max. / Current : ±6A, Max. DC to 3MHz High power amplifier (SY-5001)
- 36mm(L), Min. 35mm(W), Max. single sheet test (SY-956)
- DC30A, Max. DC-bias superposition test (SY-960, 961, 962)



## B-H Analyzer

# Various types of soft magnetic material property test

**Soft Materials**

- Ferrite**
- Permalloy**
- Amorphous**
- Si steel sheet**
- Powder Core**

**Shape**

- Troidal**
- EE core**
- EI conre**
- Sheet**
- Powder**

**Troidal**

Windings

**Powder**

SY-513

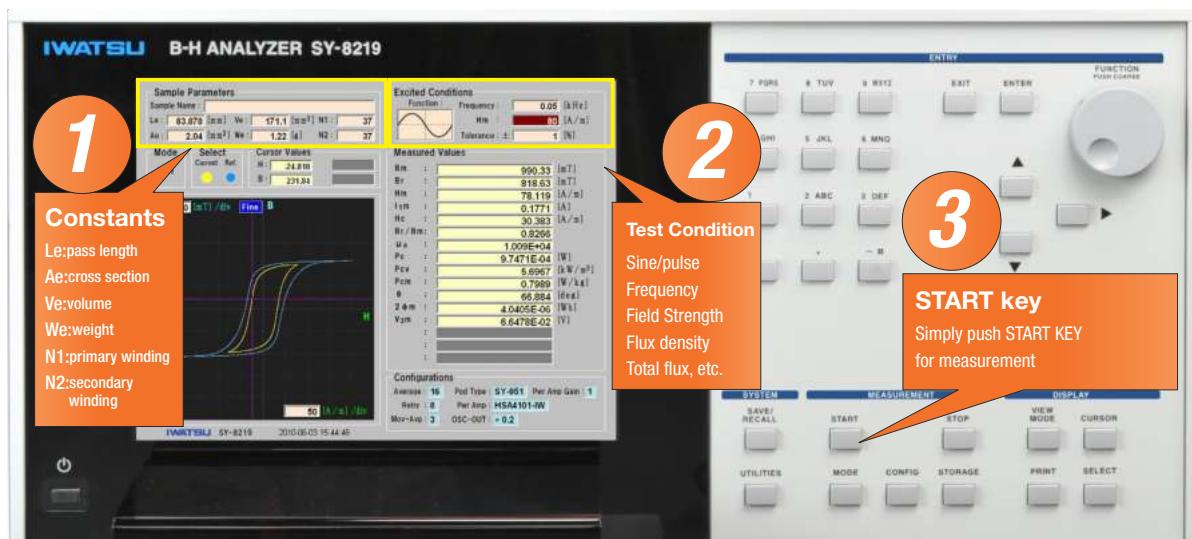
**EE Core**

Windings

**Sheet**

## Fully automatic test

Sample parameters (Le: magnetic pass, Ae: cross section, N1 and N2, etc.) and test conditions(Frequency, Hm, Bm, V2m or I1m) inputs enable obtaining B-H hysteresis curve and magnetic properties in value automatically.



## Fully automatic test with options

SY-810 Remote control software is Temperature scanner system, Single sheet test system and DC biasing system.

Schedule menu

Condition menu

Semi-manual menu

Auto test menu

## B-H Analyzer SY-8218 / SY-8219

### Precise test in higher frequency

#### B-H Analyzers

**SY-8218** 10Hz ~ 10MHz

**SY-8219** 10Hz ~ 1MHz



SY-8218



[Test example]  
Measurement POD  
(without POD cover)

- Test Freq. 10Hz to 10MHz(SY-8218), 10Hz to 1MHz(SY-8219)
- Signal waveform SINE or PULSE(10Hz to 1MHz)
- Max. Input current  $\pm 6A$
- Max. Input voltage  $\pm 200V$
- Excitation method Automatic excitation (Target : Hm, Bm, I1m or V2m)  
Automatically degaussing after excitation to avoid magnetization

Measurement method		CROSS-POWER method (Compatible to IEC62044-3 standard)
Measurement item (Symbol)		Max. Magnetic flux density(Bm), Residual magnetic flux density(Br), Max.Magnetic field strength(Hm), Coercive force(Hc), Rectangular ratio(Br/Bm), Relative amplitude permeability( $\mu_a$ ), Core loss(Pc,Pcv,Pcm), Primary excitation current(I1m), Secondary induced voltage(V2m), Phase( $\theta$ ), Total magnetic flux linkage( $2\phi$ m), Apparent power(VA), Impedance permeability( $\mu_Z$ ), Complex permeability( $\mu'$ , $\mu''$ ), Loss coefficient(tan $\delta$ ), Inductance(L), Resistance(R), Impedance( Z ), Quality factor(Q), Total harmonic distortion(THD)
Waveform display		B-H curve, Primary current, Secondary voltage, Magnetic field, Flux density
Test Frequency	SINE	10Hz~10MHz(SY-8218), 10Hz~1MHz(SY-8219)
	PULSE	10Hz~1MHz(Duty50% fixed)
Magnetic field detection		Voltage detection on non-inductive shunt, Max. current at $\pm 6A$
Flux density detection		Voltage at detection coil, Max. voltage at $\pm 200V$
Digitizer		Resolution : 16bits (8192points/cycle)
Coil method		Two winding method or single winding method selectable
Display		8.4 inch TFT-LCD SVGA 800 x 600pixel
Weight, Dimensions		Approx. 12.5kg, Approx. 420W x 266H x 480D(mm)
External output		USB(storage)
Accessories		POD cover, SY-504 : AC coupler, Power amplifier cable (BNC-BNC), OSC Cable(BNC-SMA), Power cable, Users guide, Instruction manual(CD-ROM)

### Hi-Speed Bipolar Power Supply (Power Amplifier)

#### Wide frequency bandwidth High-power Bipolar Power Supply

##### Bipolar power amplifier for B-H analyzers

	Frequency Bandwidth	Max. output current	Max. output voltage
<b>SY-5001</b>	5MHz	$\pm 6A$ peak	$\pm 150V$ peak
<b>SY-5002</b>	5MHz	$\pm 6A$ peak	$\pm 75V$ peak



CE



CE

Model		SY-5001
Frequency		DC - 5MHz
Gain		1, 5, 10, 30, 60 $\pm 2\%$ ( $\pm 100ppm/^{\circ}C$ )
Output Voltage	HIGH mode	$\pm 150V$ peak (f<750kHz)
	LOW mode	$\pm 75V$ peak (f<1.4MHz)
Output Current	HIGH mode	$\pm 5A$ peak (f>10Hz)
	LOW mode	$\pm 6A$ peak (f>10Hz)
Output Impedance		30m $\Omega$ +0.33 $\mu$ H
Size (mm)/Weight		Approx. 449Wx178Hx435.5D/19kg

Model		SY-5002
Frequency		DC - 5MHz
Gain		30 $\pm 1\%$ ( $\pm 100ppm/^{\circ}C$ )
Output Voltage	HIGH mode	$\pm 75V$ peak (f<900kHz)
	LOW mode	$\pm 37.5V$ peak (f<1.8MHz)
Output Current	HIGH mode	$\pm 5A$ peak (f>10Hz)
	LOW mode	$\pm 6A$ peak (f>10Hz)
Output Impedance		50m $\Omega$ +0.30 $\mu$ H
Size (mm)/Weight		Approx. 449Wx133Hx435.5D/14kg

## Wide temp. range scanner SY-330, Scanner system SY-320A / 321A

**Temp. range from -55°C to +180°C  
Large size samples : Max. 4pcs.**

### Wide temperature scanner SY-330 4pcs.

Autovehicle std. AEC-Q200 Grade0 compatible



SY-330	
Chamber	Power supply
	AC200V 3φ 3W 50/60Hz
	Max. current 14A, Max.
Scanner Unit	Temp. range -55°C~+180°C
	Power supply AC 100V to AC240V 50/60Hz
	Max. power 21VA, Max.
	Frequency range 10Hz~3MHz(SY-8218) 10Hz~1MHz(SY-8219)
	Sample 4pcs., Max.
	Max. current ±6A
Size(mm), Weight	Max. voltage ±200V
	1,023W x 607L x 1,200H, Approx. 190kg
Accessories Chamber cable(SY-912), RS232C cable, Pushing jig(SY-512), Power cable, Manual	

Options	
Model NI GPIB-USB-HS+	
Model NI USB-232	

※ NATIONAL INSTRUMENTS Corp.

**Temp. range from -30°C to +150°C  
Automatic test for Max. 41pcs. samples**

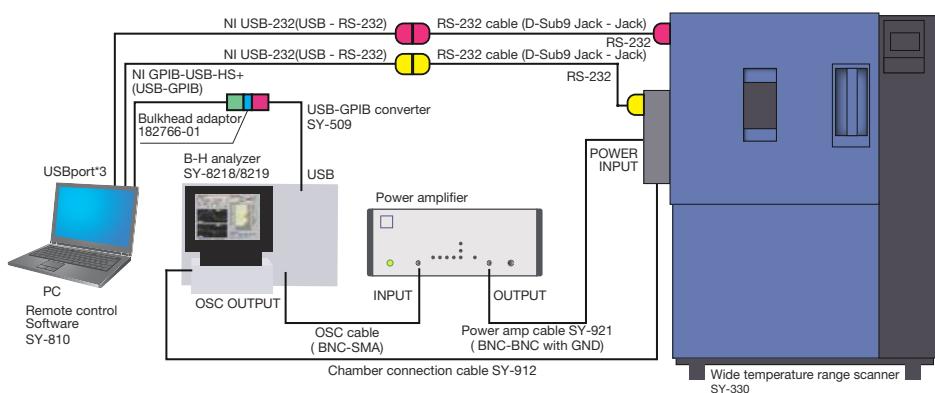
### Temperature scanner system SY-320A 20pcs. / SY-321A 41pcs.



SY-320A		SY-321A
Chamber	Power supply AC100V 50/60Hz	
	Max. current 12.5A, Max.	21.0A, Max.
	Temp. range -30°C~+150°C	
Scanner Unit	Power supply AC 100V to AC120V 50/60Hz	
	Max. power 28VA, Max.	
	Frequency range 10Hz~5MHz(SY-8218) 10Hz~1MHz(SY-8219)	
	Sample 20pcs., Max.	41pcs., Max.
	Max. current ±6A	
	Max. voltage ±200V	
Size(mm), Weight	543W x 695L x 620H Approx. 85kg	640W x 920L x 660H Approx. 135kg
Accessories Chamber cable(SY-910), GPIB cable(1m), Power cable, Instruction manual, Turntable SY-510 (for SY-320A) or Turntable SY-511 (for SY-321A)		

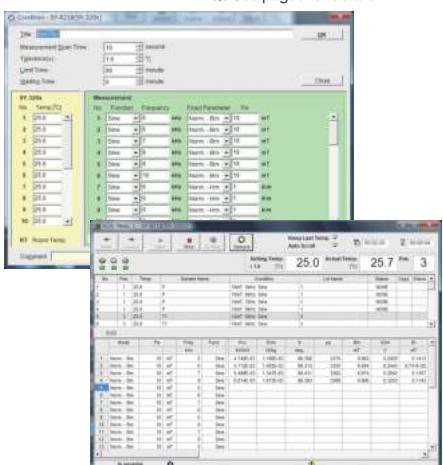
#### Remote control system configuration

##### ■ Remote control system with Wide temp. range scanner : SY-330

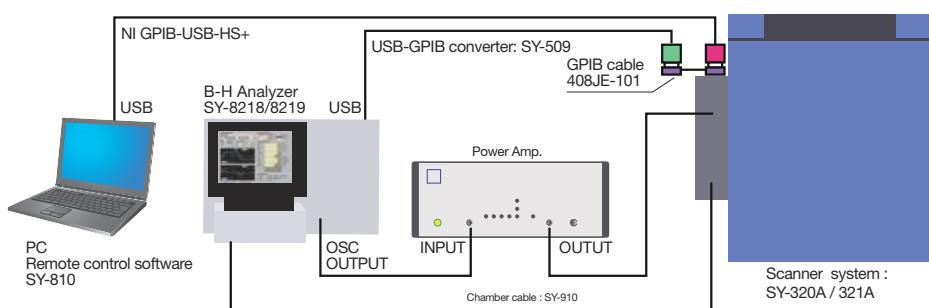


#### Remote control software : SY-810

※ See page8 for details



##### ■ Remote control system with scanner system : SY-320A / SY-321A



#### Optional consumable parts (for SY-320A/321A)

Spare turntable(for setting samples)  
SY-510(for SY-320A)  
SY-511(for SY-321A)



Spare contact pin set  
SY-512(for SY-320A/321A)



## **Single sheet test system : SY-956**

## AC B-H Analysis on single sheet / ribbon

# Single sheet test system

## SY-956



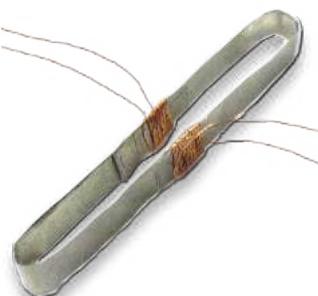
■ Test frequency : 10Hz to 20kHz	
■ Max. Magnetic field strength : 10,000A/m	
■ Sample size : 36mm(L) or longer, 35mm(W)Max., 3mm(Thickness)Max.	
■ Vertical single yoke test method	
■ Core loss in yoke cancelling compensation (Patent pending : No. 5885646)	
■ Controlable pressing pressure on specimen for test reproducitvity	
Test method	Vertical single yoke single sheet magnetic property test method (IEC 60404-3 compatible)(with yoke core loss compensation)
Max. Magnetic field	Approx. 10,000A/m(with excitation current at 5A)
Test frequency	SINE : 10Hz to 20kHz
Available sample size	36mm(L) or longer, 35mm(W)Max., 3mm(Thickness)Max.
Max. excitation current	±6A
Max. voltage	±200V
Power supply	AC100V to AC240V, 50Hz/60Hz, 27VA Max.
Temp. range	+18°C to +28°C for test specification gurantee
Size(mm), Weight	Approx. 330W x 200H x 320D, Approx. 8.5kg
Accessories	Connection cable(SY-957), B coil(2types), Terminal screws, Pincer, Blowing brush, Accessory case, Power cable, Instruction manual

## B coil for voltage detection

Model	B coil 01	B coil 02
Outer look		
Sample size	Max. 1mm(Thickness), Max. 10mm(W), 35turns	Max. 1mm(Thickness), Max. 30mm(W), 100turns

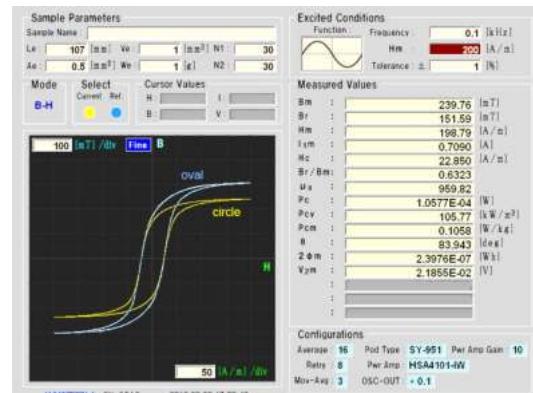
※ B coil can be wound for preferable turns.

Magnetic sheet can be varied of it's magnetic characteristics according to it's shape and before/after shaping process.



## Example of Permalloy

Hc	Circle = Oval
Br	Circle < Oval
Bs	Circle < Oval
Core loss	Circle < Oval



# LF AC coupler SY-514

Best to eliminate offset voltage of power amplifier  
SY-514 enables measurement with cut-off frequency at 300Hz while SY-504 (std. accessory) offers cut-off frequency at 10kHz.



Cut-off freq. : Approx. 300Hz, Max. input voltage :  $\pm 200V$   
Max. input current :  $\pm 6A$ , BNC cable (0.6m/std. accessory)

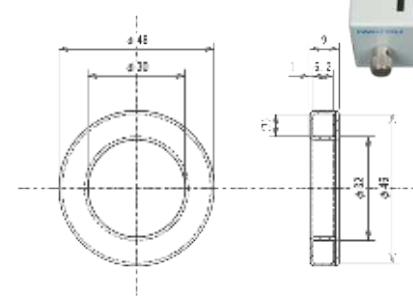
# 10kHz AC coupler SY-504



※ Standard accessory for B-H analyzer

## Toroid shape case SY-513

Best for sheet toroids and/or powder material measurement



## DC bias tester(SY-960, SY-961, SY-962)

### AC B-H Analysis with DC biasing

## DC bias tester SY-960,961,962

AC blocker : SY-962



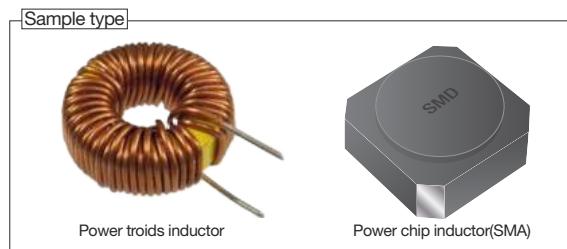
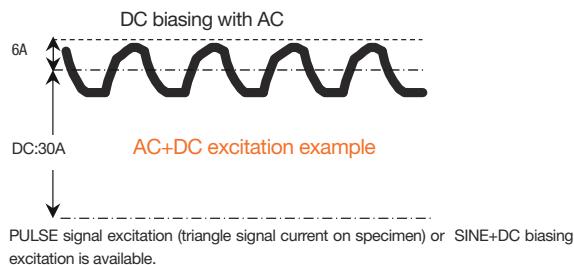
DC bias source : SY-961



B-H Analyzer and DC+AC test system configuration

DC test fixture : SY-960

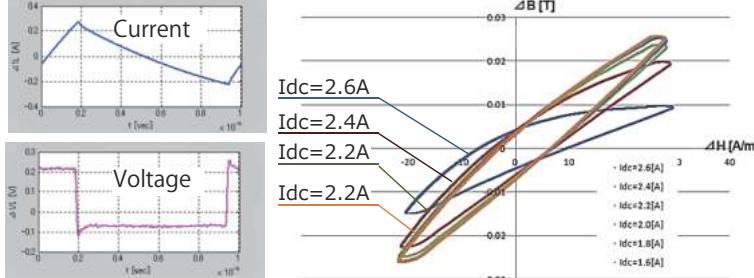
- Max. DC biasing 30A ±6A
- Max. AC ripple 10kHz~3MHz
- Test freq.(SINE) (Lowest frequency can be 10kHz or higher according to inductance value of specimen)
- Test freq. (PULSE) 10kHz~1MHz (Duty10%-90%)



### Example of chip inductor test (Chopper excitation)

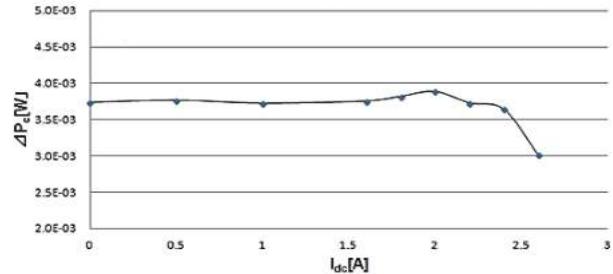
Magnetic characteristics by increasing DC bias at fixed  $\Delta I$

DC Bias  $\Delta B$ - $\Delta H$  Curve (100kHz,Pulse,Duty25%, $\Delta I_0=0.5[A]$ )



DC bias vs  $\Delta P_c$

DC Bias Coreloss  $\Delta P_c$  (100kHz ,Pulse,Duty25%, $\Delta I_0=0.5[A]$ )

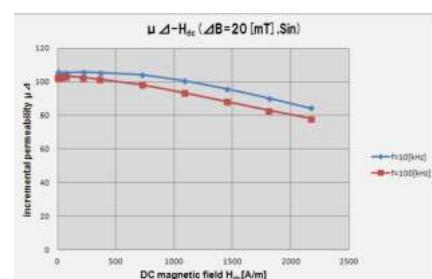
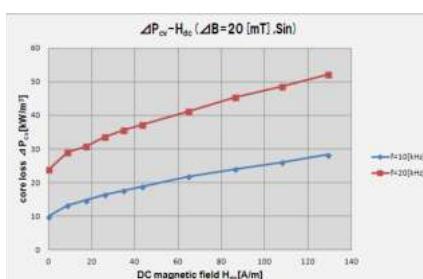
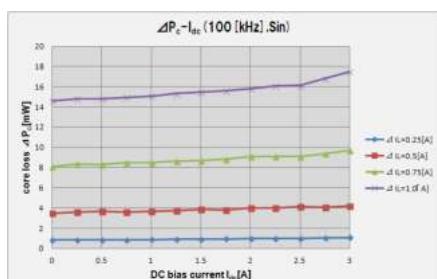
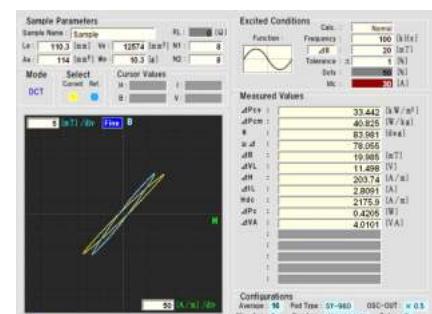
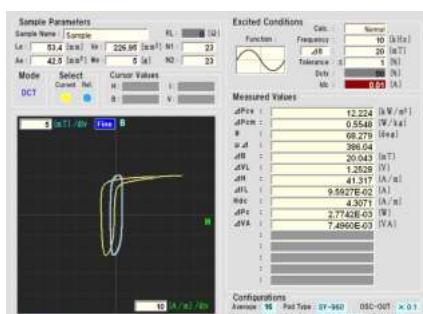
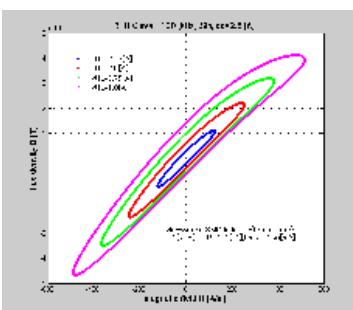


Examples of hysteresis curves of DC biasing. AC+DC excitation shows changes of hysteresis curve following DC bias level.

Ferrite  
 $L=1.0\mu H$

Amorphous  
 $L=311\mu H$

Iron Powder  
 $L=8.4\mu H$

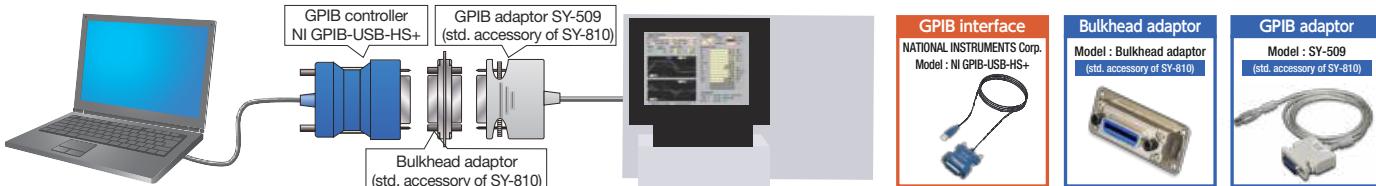
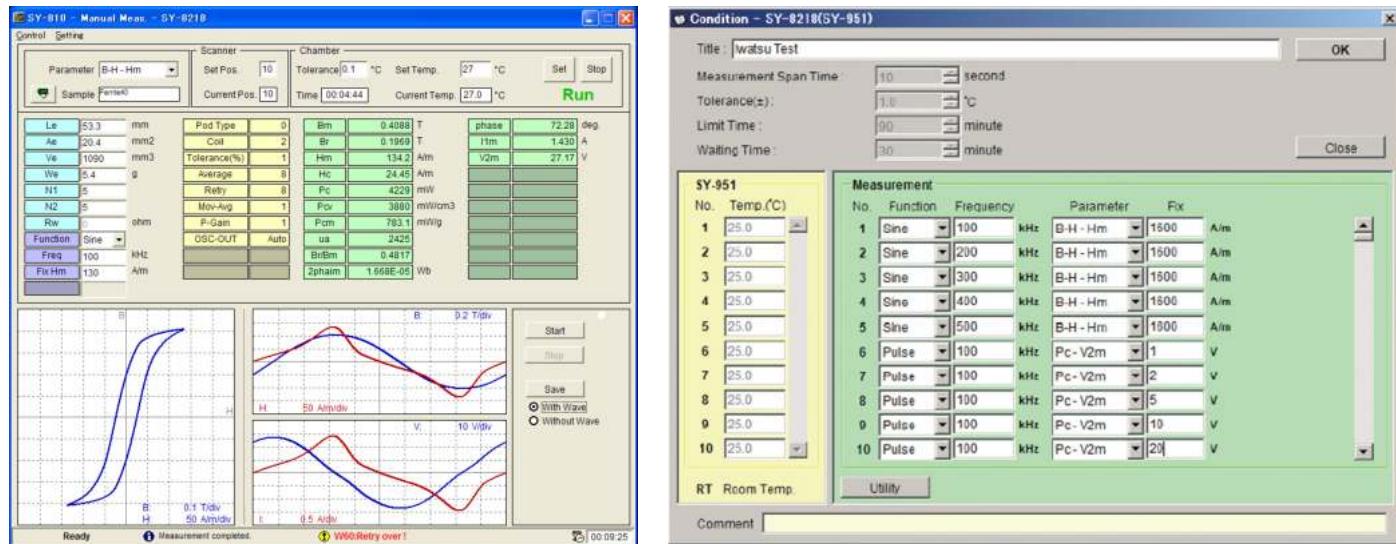


## Application software for B-H Analyzer

### Automation with various test conditions

# B-H Analyzer remote control software for PC SY-810

- Temperutre : 20 kinds, Excitation : 40 kinds of conditions can be set.
- Max. 800 kinds of test conditions are available for each sample.
- Test data (waveform at CSV basis) and display hardcopy (JPEG, PNG) are avaialble.
- SY-810 can control wide temp. range scanner(SY-330), scanner system(SY-320A/SY-321A), DC bias tester and single sheet test system for automatic tests.



SY-810 contains CD (software & operation manual at PDF), GP-IB converter SY-509, Bulkhead adaptor 182766-01 and software license agreement  
OS: Windows Vista SP2, Windows7 32bit/64bit, Windows8 32bit/64bit, Windows10 32bit/64bit  
NET Framework(packed), CPU Pentium133M or above, Memory at 64Mbyte or more, Display resolution at 1024x768 or above, USB port x3  
※ Contact our sales for the most recommended system configurations.  
※ NI GPIB-USB-HS+ (NATIONAL INSTRUMENTS) is required for PC interface with SY-8218/SY-8219. PC is not included with this system and supplied by customer.

### Built-in software function for B-H Analyzer (Optional)

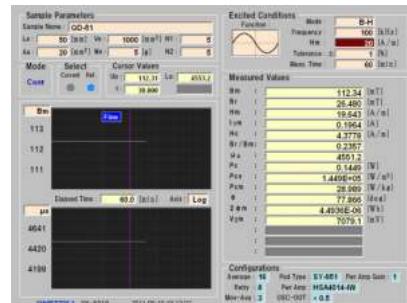
#### Continuous test function SY-811

Time-tendency property test can be performed at continuous excitation.

- Test timeframe at 99,999 minutes(Approx. 70 days), Max. 60 second/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.

※Built-in option for B-H 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.



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