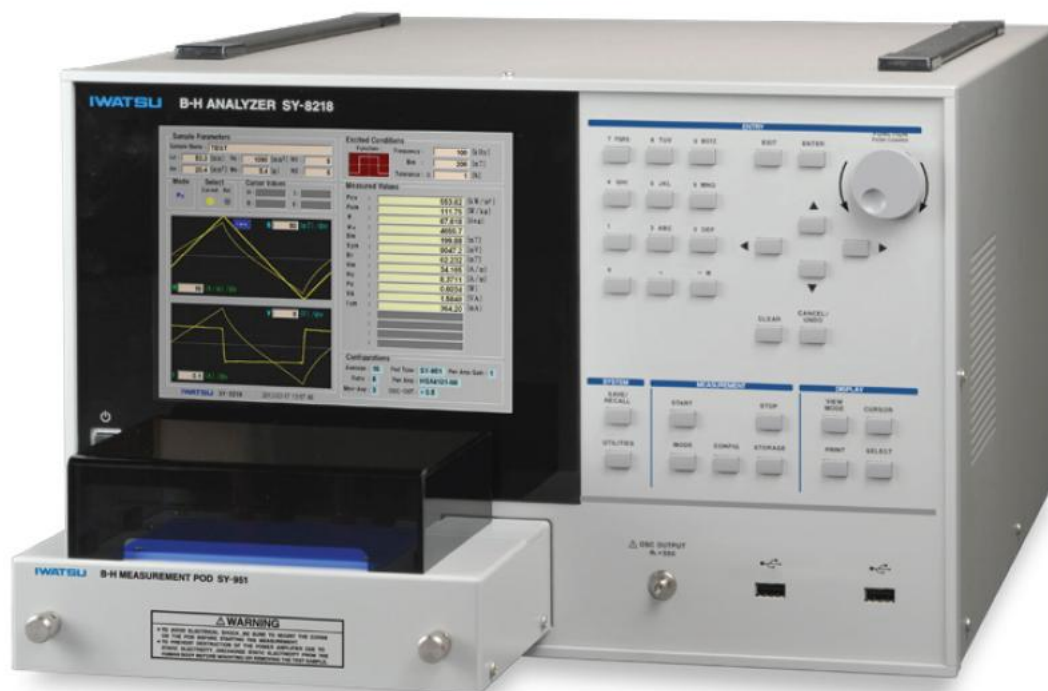


IWATSU B-H Analyzer

FAQ



SY-8218 / SY-8219

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Common questions

i. What is the difference between B-H analyzer and a DC curve tracer?

The measurement principle is the same. The difference is the excitation method. The DC curve tracer excites the sample by changing the output of the DC power supply into a sinusoidal waveform or a triangular waveform very gently over several tens of seconds, and obtains a B-H waveform for one cycle. On the other hand, the B-H analyzer generates a sine wave or a square wave of a set frequency instead of DC from the built-in signal generator, amplifies it with an AC power amplifier, excites the sample, and obtains a B-H waveform for one cycle. The DC curve tracer is suitable for measuring the static characteristics of the magnetic properties of the sample. On the other hand, the B-H analyzer is suitable for measuring high-frequency characteristics, which are dynamic characteristics of magnetic properties.

ii. What is the difference between a B-H analyzer and an impedance analyzer?

An impedance analyzer is a parameter measuring device for electronic components at small signals (tens of mA), and for magnetic parts, it can measure parameters such as L, Q, R, Z. On the other hand, the B-H analyzer can measure the magnetic properties of soft magnetic objects such as the B-H curve, core loss, and magnetic permeability of magnetic parts from small signals to large signals (5mA to 6A). The B-H analyzer is suitable for measuring magnetic parts under actual driving conditions.

iii. Some oscilloscopes can also measure magnetic properties such as core loss, but what is the difference with the B-H analyzer?

The function of determining the magnetic field (strength), magnetic flux density, and other magnetic characteristic values from the measured excitation current and induced voltage is the same, but measurement using an oscilloscope and measurement using a B-H analyzer differ greatly in the following two points.

1. Measurement resolution of excitation current and induced voltage
2. Phase difference correction method between excitation current and induced voltage

First of all, in terms of the measurement resolution ①, the measurement resolution of a typical oscilloscope is 8 bits. On the other hand, the B-H analyzer is equipped with 16 bits for SY-8218/SY-8219. The B-H analyzer can capture waveforms with high resolution, so magnetic characteristic values can be obtained with high measurement accuracy.

Next, in terms of phase difference correction ②, the phase difference between the excitation current and the induced voltage is an important parameter that has a great impact on the core loss. In

measurement with an oscilloscope, the time difference between the measurement channels is canceled (deskewed) by skew adjustment, and this phase difference correction is performed. However, due to the fact that the frequency-phase characteristics of the current probe are not linear (the group delay characteristics are not flat), precise phase correction cannot be performed by deskew alone. Some power analyzers have a deskew function, but similarly precise phase correction is not possible.

On the other hand, with the B-H analyzer, frequency-phase characteristics between measurement channels are measured in advance, and this phase difference is precisely corrected for each frequency and for each measurement range. Therefore, the B-H analyzer can measure core loss with extremely high measurement accuracy. The B-H analyzer can measure extremely small core losses of pressed powder-based materials that are difficult to measure with an oscilloscope or power analyzer.

iv. What materials and shapes can be measured with the B-H analyzer?

It is possible to measure soft magnetic samples with a windable closed magnetic circuit shape, such as a toroidal, EI, EE core, etc. In addition, by combining with the small single-plate magnetic measurement device [SY-956](#), you can also measure plates and sheet-like samples.

Example of measurement sample shape:



EI core



Dust core



Motor stator



Motor rotor



Amorphous core



Stator laminate

v. Can the B-H analyzer measure magnetic permeability?

The amplitude specific magnetic permeability and complex magnetic permeability can be measured with the SY-8218/SY-8219. You can also measure the amplitude specific magnetic permeability at any point of the B-H curve by using the curve measurement function.

vi. What range of magnetic flux densities can be measured with the B-H analyzer?

In the region where the B-H curve is unsaturated due to sine wave excitation, the relationship between the maximum magnetic flux density B_m and the induced voltage V_2 is expressed by the following equation.

f : Measurement frequency A_e : Effective cross-sectional area of the sample N_2 : Number of secondary windings

$$V_2 = 2 \pi f N_2 A_e B_m$$

Therefore, in the unsaturated region, it is possible to measure up to B_m corresponding to V_2 within the detected voltage range of the B-H analyzer used. For SY-8218 and SY-8219, the maximum permissible value of V_2 is 200V. Note that this equation does not apply to non-sinusoidal excitation or saturated regions.

vii. What magnetic field (strength) can be excited by the B-H analyzer?

The maximum magnetic field H_m that can be excited is determined by the following equation.

I : Excitation current N_1 : Number of primary windings L_e : Average magnetic path length

$$H_m = \frac{I}{L_e} N_1$$

The excitation current I depends on the power amplifier used.

viii. What frequencies can be measured with the B-H analyzer?

It depends on the options combined with the B-H analyzer model. The measurement frequencies for each model of the B-H analyzer are shown in the table below. For the measurement frequency based on the combined option, see the explanation of each option.

Model name	Measurement frequency
SY-8218	10Hz - 10MHz
SY-8219	10Hz - 1MHz

The B-H analyzer can measure up to the above frequencies in terms of performance, but it is necessary to pay attention to the inductance L of the sample for the upper limit frequency.

Since the input capacitance C of the B-H analyzer and the inductance L of the sample form an LC parallel resonance circuit, it is necessary to ensure that the measurement frequency is 1/10 or less of the resonance frequency. Please also take this into account when selecting the model. Note that the resonance frequency f_c can be calculated from the following equation:

L: Inductance of sample

C: Input capacitance of measurement device (SY-8218/SY-8219 is approx. 18.5pF)

N1: Number of primary windings

N2: Number of secondary windings

$$f_c = \frac{1}{2\pi \frac{N_2}{N_1} \sqrt{LC}}$$

The effect of resonance is greater in samples with even high phase angles ($\geq$ approx. 87°), so when measuring samples with high phase angles, it is recommended to measure at a frequency less than 1/20 of the resonance frequency.

ix. Can the B-H analyzer measure DC superposition?

You can measure by combining SY-8218/SY-8219 with the optional DC bias tester SY-960 (SY-961, SY-962). Since it is not necessary to apply a tertiary winding for DC excitation to the sample, measurements can be made much more easily than in the past.

x. Can the B-H analyzer measure pulse excitation?

SY-8218/SY-8219 is limited to Duty 50%, but measurements can be made at 10Hz to 1MHz as standard. In addition, measurements can be made at 10kHz to 1MHz with variable Duty 10 to 90% by combining with the optional DC bias tester SY-960 (SY-961, SY-962).

xi. Can the B-H analyzer perform arbitrary waveform excitation measurements?

Although it is not supported by the B-H analyzer main unit only, if you prepare a signal generator separately and use the built-in signal synchronization output from the SYNC OUT terminal of the B-H analyzer, you can excite and measure an arbitrary waveform from the signal generator.

xii. Can the B-H analyzer measure saturated flux density?

If the magnetic field (strength) and induced voltage corresponding to the saturated magnetic flux density are within the measurement range of the B-H analyzer, measurements can be made.

xiii. Can the B-H analyzer measure temperature characteristics?

You can make measurements by combining with the optional thermostatic chamber scanner system. The following table shows the main specifications of the thermostatic chamber scanner system.

		Thermostatic chamber scanner system	
		SY-320A	SY-321A
Compatible models	SY-8218	○	
	SY-8219	○	
Maximum number of measurement samples		20 pieces	41 pieces
Temperature control range		-30[°C] up to +150[°C]	
Maximum measurement current		±6[A]	
Maximum measurement voltage		±200[V]	

When combined with the thermostatic chamber scanner system, the upper limit for measurement frequency is 5MHz. If the upper limit of measurement frequency of the combined B-H analyzer or power amplifier used is less than this, this limit will be the upper limit of measurement frequency.

xiv. Can I measure the change over time in magnetic properties?

You can measure it by adding the optional software SY-811 continuous measurement function to the B-H analyzer. The sample can be maintained in an excited state, measured at 1-minute intervals, and the change over time in magnetic properties can be measured for up to 99,999 minutes (approx. 70 days).

xv. Can the b-h analyzer measure automatic programs?

If you incorporate the optional remote control software SY-810 into your PC, you can perform automatic program measurement with the B-H analyzer alone or in combination with optional equipment such as the thermostatic chamber scanner system. For the main specifications of the SY-810, see the following. Since the communication command for the remote control is not published, the customer cannot make a program and independently measure using remote control with the B-H analyzer.

Equipment that allows automatic measurements	B-H AnalyzerSY-8218/8219
	Thermostatic chamber scanner system SY-320A/321A
	Compact Single-Plate Magnetic Measurement Device SY-956
	DC bias testerSY-960/961/962
Number of measurement condition settings (per sample)	40 (* For SY-320A/321A)
Number of temperature condition settings (per sample)	20 (* For SY-320A/321A)
Measurement data save format	CSV
Measurement screen save format	JPEG / PNG
SupportedOS	Windows 8.1 / 8 / 7 / Vista

xvi. Can the b-h analyzer measure automatic programs?

We offer a dedicated power amplifier with 4 quadrant output. Select the desired model by referring to the compatibility table below.

xvii. Can I measure without using a dedicated power amplifier?

You can measure with a 4-quadrant output power amplifier, even if you do not use the dedicated power amplifier. The dedicated power amplifier is designed to fine-tune the DC offset adjustment to a range of $\pm 1V$ and to bring the DC offset to zero without limit. If there is a DC offset, the magnetic characteristics of the unintended DC superposition are measured and an asymmetric B-H curve is drawn. If you do not use the dedicated power amplifier, you should pay close attention to this point. If the DC offset cannot be zeroed, the optional SY-514 LF AC coupler can be used to completely zero the DC offset at a measurement frequency of 300Hz or higher.

Measurement questions

i. Why do core loss measurements differ when the number of windings is changed during high-frequency measurements?

The first cause of the difference may be the effect of the LC parallel resonance phenomenon. The resonance frequency varies depending on the number of windings. Core loss measurement can be measured if the detected voltage and current are within the measurable range of the B-H analyzer. However, caution is required during high-frequency measurement because the input capacitance C of the B-H analyzer and the inductance L of the sample form an LC parallel resonance circuit. Use the device with a measurement frequency that is less than 1/10 of the resonance frequency. The resonance frequency f_c can be calculated from the following equation.

L: Inductance of sample C: Input capacitance of B-H analyzer (SY-8218/SY-8219 is approx. 18.5pF) N1: Number of primary windings N2: Number of secondary windings

$$f_c = \frac{1}{2\pi \frac{N_2}{N_1} \sqrt{LC}}$$

The effect of resonance is greater in samples with even high phase angles ($\geq$ approx. 87°), so when measuring samples with high phase angles, it is recommended to measure at a frequency less than 1/20 of the resonance frequency.

The second reason may be the influence of the magnetic field (strength) H inside the sample, or the inhomogeneity of the magnetic flux density B. If the magnetic permeability of the sample is low, the shape is not toroidal, or the winding is not uniform, the size of H, B inside the sample often differs depending on the position of the sample. If the number of windings is changed, the average excitation position of H or the average detection position of B may change, resulting in a difference in core loss.

ii. If you increase the value of Bm with sine wave excitation, the measured current or voltage waveform will no longer be in the form of a sine wave and will be distorted. What is the reason for this?

Waveform distortion occurs due to the sample characteristics. This is because the magnitude of the magnetic flux density B changes non-linearly with respect to the magnetic field (strength) H. The waveform distortion is especially more pronounced when approaching the saturated magnetic flux density of the sample

iii. What number of windings are suitable for measurement?

The recommended number of windings is as follows:

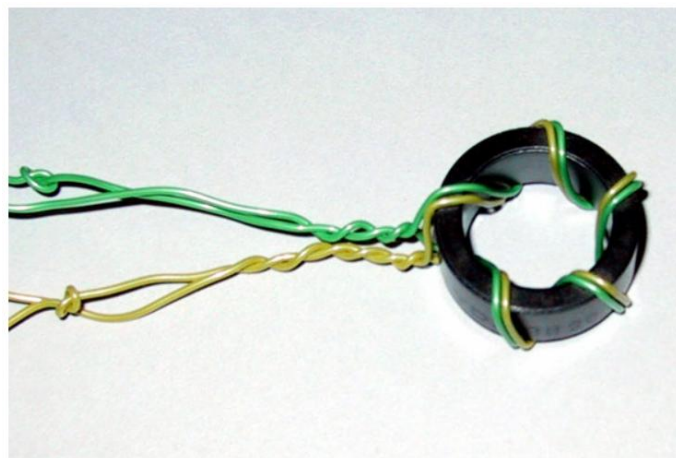
Excitation coil N1: 3 or more turns

Detection coil N2: $N1 \geq N2$ with 1 turn or more

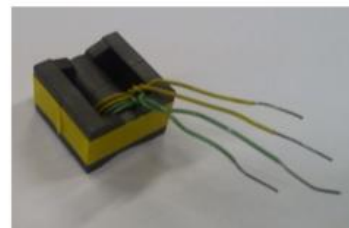
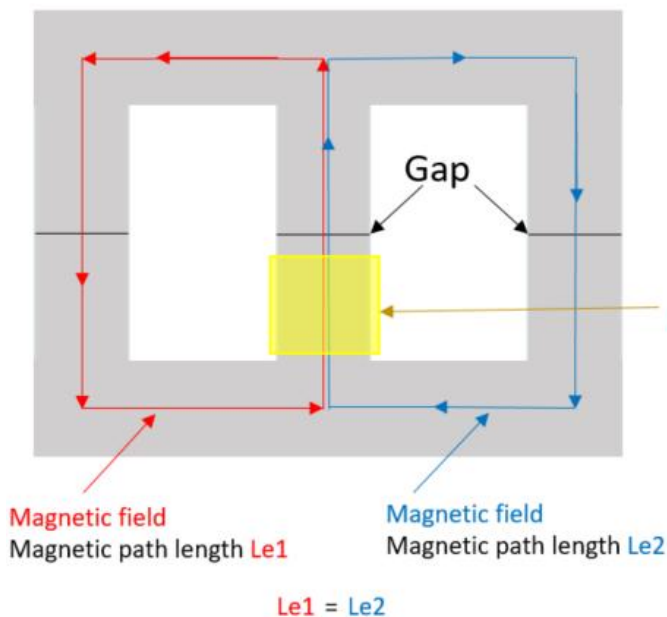
If N1 is low, a large current is required for the required magnetic field (strength), and if N2 is high, the induced voltage detected increases. In addition, if $N1 < N2$, the input capacitance of the B-H analyzer from the perspective of the excitation system will be doubled to the square of $(N2/N1)$, and the parallel resonance frequency f_c will drop to $N1/N2$ so caution is required.

iv. What is the appropriate way to wind the sample coil?

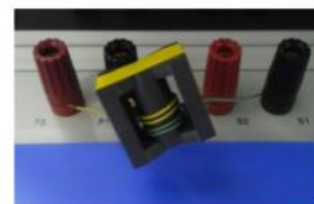
Whenever possible, the coil should be wound at equal intervals on the sample to ensure that the magnetic field (strength) in the core is uniform and that the magnetic flux density detection site is not skewed. In particular, the detection coil should be wound so as to adhere to the sample to prevent the invalid magnetic flux from interlinking in the void between the detection coil and the core. If the excitation coil and the detection coil overlap, the detection coil should be wound first and attached to the sample. If the number of windings of the excitation coil and the detection coil is the same, bifilar winding is recommended. With bifilar winding, the primary winding (excitation coil) and secondary winding (detection coil) are paired, which can reduce the leakage magnetic flux and improve the coupling coefficient between the primary and secondary windings compared to winding separately.



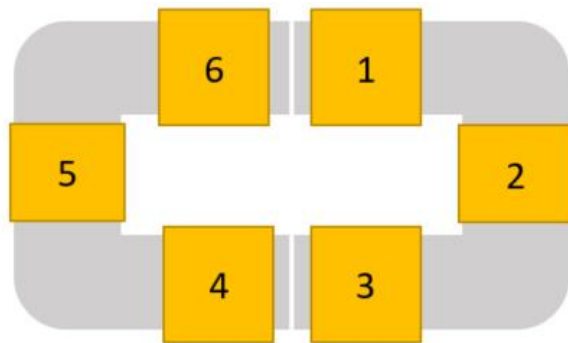
v. What is the appropriate way to wind EE Core?



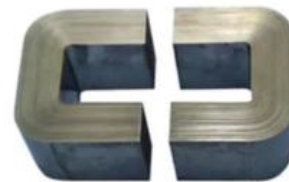
N1 coil, N2 coil
Wind it so that not straddle the GAP part



vi. What is the appropriate way to wind C Core?



N2:	Wrap it around only one location from 1 to 6
N1:	You can evenly wrap it around the N2 winding side of the C core. But considering the coupling between N2 and N1, it is better to wind it above the N2 winding



vii. In the manual there is the mark you should apply at least 3 windings? What is the reason behind? Why is it not possible to apply only 2 windings?

■ 4.4 Turns of a sample

- The following is the example of applying turns to a sample.

■ No. of turns

No. of turns is the important factor deciding Max. magnetic field H_m and Max. magnetic flux density B_m . Basically, Iwatsu recommends that:

- No. of primary turns N_1 should be 3 turns or more, No. of secondary turns N_2 should be 1 turns or more, and N_1 is equal to N_2 as much as possible.

No. of turns should be determined considering above and referring to Section 4.3 while taking notice of below:

In the above, the following is said to be recommended, but measurement is possible even if the primary winding is set to 1 turn.

Primary winding: 3 turns or more

Secondary winding: 1 turns or more

The reason for recommending 3 turns or more for the primary winding is as follows. In the primary winding, the flowing current creates a magnetic field inside the coil. As know-how for measurement, it is necessary to uniformly apply a magnetic field to the measurement sample in order to perform accurate measurement. This is because if the magnetic field is not uniformly applied, differences in characteristics will occur depending on the part.

The situation when the sample is actually wound with 1 turn, 2 turns, and 3 turns is shown below.



A single turn results in concentrated winding at one point, and a magnetic field cannot be uniformly applied to the entire sample.

By winding 2 turns, the magnetic field can be applied to the opposing sides, so the magnetic field distribution is better than with 1 turn. However, since the center position of the wound coil and the center position of the sample do not match, the magnetic field distribution becomes uneven.

By winding 3 turns, the center position of the wound coil and the center position of the sample are close to each other, and the magnetic field distribution becomes nearly uniform.

viii. What range of magnetic flux densities can be measured with the B-H analyzer?

In the region where the B-H curve is unsaturated due to sine wave excitation, the relationship between the maximum magnetic flux density B_m and the induced voltage V_2 is expressed by the following equation.

$$V_2 = 2 \pi f N_2 A_e B_m$$

f: Measurement frequency

A_e : Effective cross-sectional area of the sample

N_2 : Number of secondary windings

Therefore, in the unsaturated region, it is possible to measure up to B_m corresponding to V_2 within the detected voltage range of the B-H analyzer used. For SY-8218 and SY-8219, the maximum permissible value of V_2 is 200V. Note that this equation does not apply to non-sinusoidal excitation or saturated regions.

When calculating the value of the induced voltage V_2 by determining the value of the target maximum magnetic flux density B_m first, note that the peak value of the actual induced voltage V_2 will be 3 to 10 times the above calculated value depending on the saturation state. In order to

prevent the destruction of the sample or equipment, you should start the initial measurement at 50-75% of the target maximum magnetic flux density B_m and gradually increase the excitation level.

ix. What magnetic field (strength) can be excited by the B-H analyzer?

The maximum magnetic field (strength) H_m that can be excited is determined by the following equation.

$$H_m = \frac{I}{L_e} N_1$$

I: Excitation current

N_1 : Number of primary windings

L_e : RMS magnetic path length

The excitation current I depends on the power amplifier used.

x. Can I measure not only the iron loss of the material, but also the loss including the copper loss of the coil winding?

If you measure using the single winding method without the detection coil on the secondary side, the loss including the copper loss of the primary side excitation coil winding can be measured. The B-H analyzer can also perform single winding method measurements.

xi. What should I be aware of when measuring with the thermostatic chamber scanner system SY-320A/321A?

When measuring samples with low magnetic permeability and low iron loss, such as pressed powder, it is recommended that the sample be placed at least 15mm away from the attached turntable SY-510/511 on which the sample is placed. The base material of SY-510/511 is aluminum. If a leakage magnetic flux is generated from the sample, and it interlinks to the SY-510/511, an eddy current loss will occur there, resulting in an error in the measurement of the iron loss and correct measurement will not be possible.

If the sample is a conductor, it is recommended to further separate the sample by at least 15mm. Likewise, if a leakage magnetic flux is generated from the sample and it interlinks to an adjacent sample, an eddy current loss will occur and correct measurement will not be possible.

xii. What should I pay attention to when measuring with the small single-plate magnetic measuring device SY-956?

One caution is not to create a gap between the measurement yoke and the sample. If there is a gap, a leakage magnetic flux will be generated, and correct measurement will not be possible. Before the

measurement, always check to make sure that there is no foreign material on the sample or the measurement yoke.

The second is to minimize the void between the B coil, which is the detection coil, and the sample. If unwanted magnetic fluxes such as geomagnetism and leakage magnetic flux interlink in the air gap, correct measurement will not be possible. Particular care should be taken when measuring samples with low magnetic permeability.

xiii. What is the inductance L of the sample that can be measured by DC superposition on the DC bias tester SY-960?

The upper limit of the inductance L of the sample that can be measured with SY-960 is several tens of μH . If you measure a sample with more inductance L, some of the AC supplied by the power amplifier will flow into the DC bias source SY-961 instead of the sample, and correct measurement will not be possible.

xiv. Each time I measure, the measured value such as core loss changes greatly. What could be the cause of this?

In general, soft magnetic bodies have temperature characteristics. In particular, the magnetic properties of ferrite are unstable near room temperature. When making accurate magnetic property measurements of soft magnetic materials, it is necessary to take the measurements while holding the sample at a constant temperature in a thermostatic chamber.

In addition, depending on the material, the magnetic properties may change depending on the excitation time and excitation history independent of the sample temperature. By adding the optional continuous measurement function SY-811, you can observe a change over time of up to 99,999 minutes (about 70 days) of magnetic properties every 1 [min]. If the magnetic characteristics change greatly with each measurement, it is recommended to take continuous measurements with SY-811 to check whether the magnetic characteristics change over time due to the excitation time.

xv. The measurement results of magnetic properties vary depending on the shape of the core, even though they are the same material. What could be the cause of this?

This is because the magnetic flux density distribution inside the core changes depending on the shape. Magnetic flux passes through areas with low magnetic resistance inside the core. Therefore, the magnetic flux density distribution may be uneven, and places with high magnetic flux density may occur locally, showing different behavior compared to when the magnetic flux density distribution is uniformly shaped.

xvi. Phase angle/deskew between primary and secondary side? How do we specify that? Is there a calibration behind making sure the phase angle is aligned?

Iwatsu's BH analyzer does not have a function to self-calibrate the phase angle of the current waveform on the primary side and the voltage waveform on the secondary side by the user.

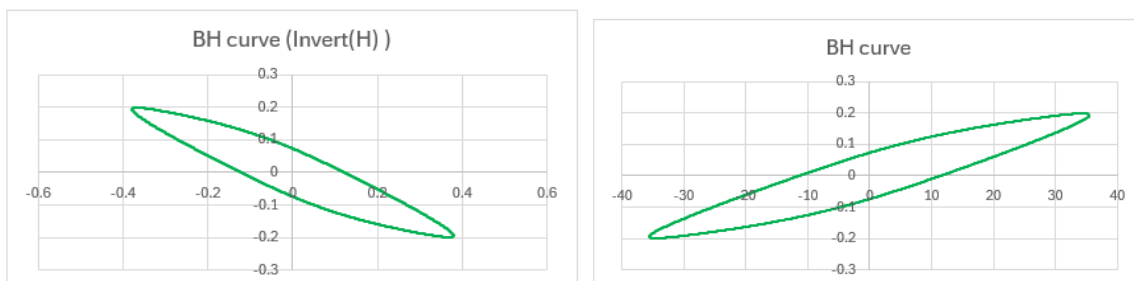
The reason is as follows.

- 1) There is no standard method for calibrating the phase angle, and Iwatsu uses its own method to adjust the phase angle with high precision.
- 2) Method 1) can only be carried out at the Iwatsu factory.
- 3) Iwatsu's BH analyzer has an excellent track record of phase stability. A standard periodic calibration period (one year) does not change performance much.
- 4) Phase stability is largely dependent on the ambient temperature. The performance guarantee temperature is $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$, but the best performance can be obtained around 23°C .

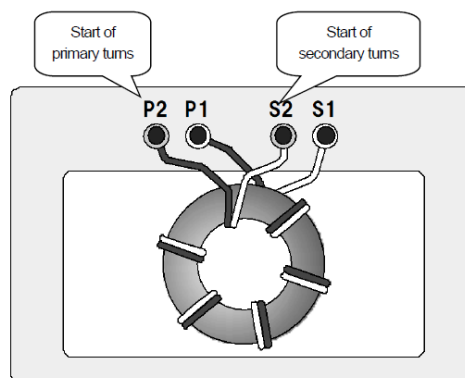
The only way to check the phase performance is to calibrate at the Iwatsu factory.

xvii. The BH curve is reversed. Right/left or top/bottom of B-H curve are reversed.

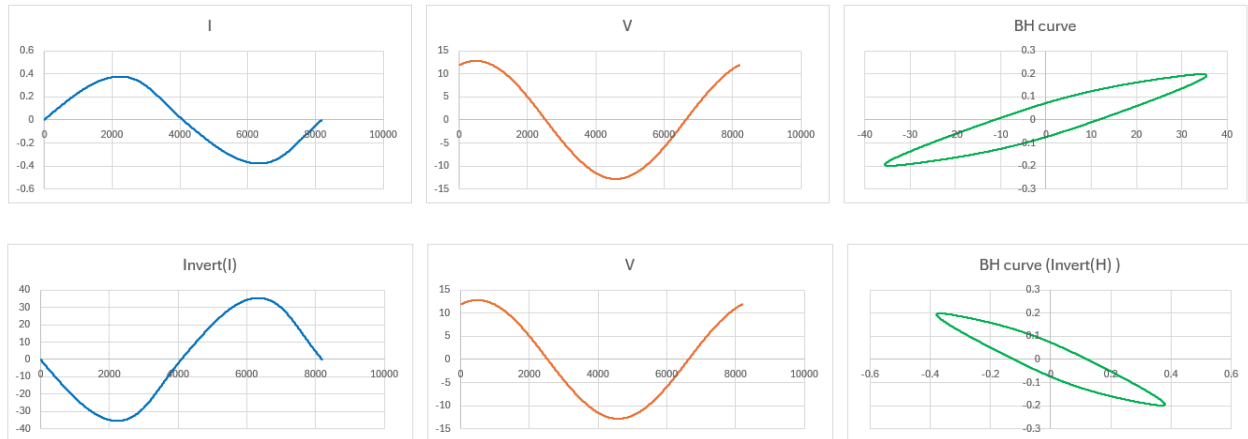
As example, please see the picture below. The left one is reversed, and the right one is the correct one:



The reason for that is the wrong apply of the turns:



The reason for that is the wrong polarity:



The voltage and current measured with a BH analyzer are AC signals.

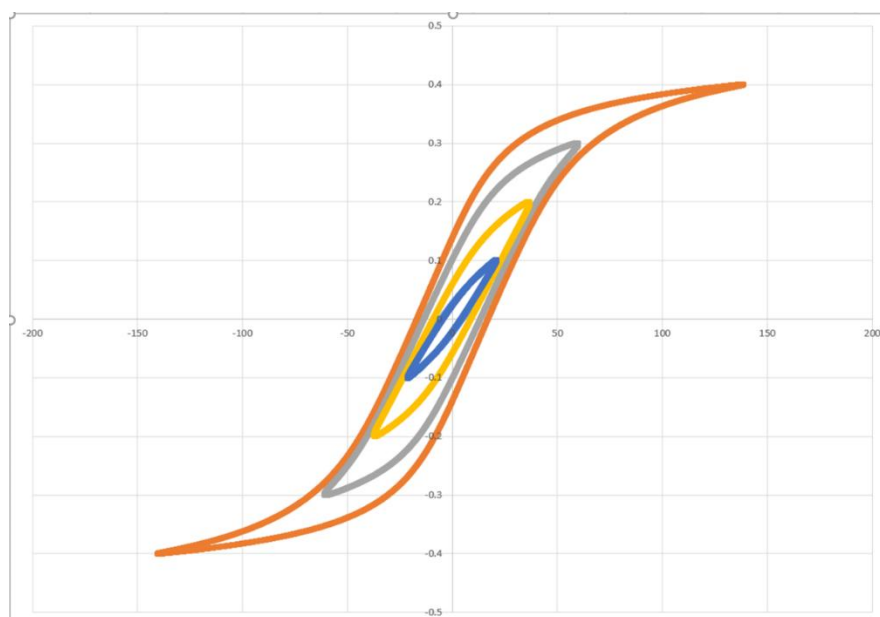
However, if the time axis of these waveforms is fixed, the current waveform will be observed with a phase angle θ delay relative to the voltage waveform.

The above example shows what happens if, for example, the polarity of the current waveform is reversed. There is no automatic correction on purpose because to perform highly accurate measurements, measurements with aligned polarity are necessary.

xviii. Is it possible to overlay different BH-curves from multiple measurements with the BH-Analyzer?

With the BH mainframe itself you can only 2 curves visible at the same time. But you can export all the BH curves points for each measurement so you can create such curves afterwards depending on the configured steps you did – for example using Microsoft Excel.

For example you see here a curve with a frequency from 50kHz up to 70kHz and 100mT up to 400mT.



xix. Do we recommend a calibration cycle for the BH-Analyzer + DC Bias system?

Iwatsu's recommended calibration cycle for the equipment is one year.

However, Iwatsu's BH analyzer has excellent long-term performance stability, and many customers use it without regular calibration when using it for research purposes.

xx. How to perform Chip inductor measurements?



Input of L_e , A_e values:

The magnetic field strength (H) and magnetic flux density (B) change depending on the values of L_e and A_e . Therefore, if you set a value that is significantly different from the L_e or A_e value of the measurement sample, the B-H curve will appear relatively significantly different. If the chip inductor manufacturer provides values for L_e and A_e , use those values.

If the manufacturer's values are unknown and you need to determine the values of L_e and A_e , please refer to the following. For example if the device is quite large, about 10mm square. Therefore, we would set L_e to 10mm and A_e to 10mm². If the chip size is about 1mm square, set L_e to 1mm and A_e to 1mm².

Chip inductor Cannot confirm " $L_e / A_e / V_e / N1 / N2$ ".

The " $L_e / A_e / V_e / N1 / N2$ " to be set is a temporary value.

Setting Example	L_e	10
	A_e	10
	V_e	100
	$N1$	1
	$N2$	By selecting 1coil in Config, it becomes unused.

Since $A_e / L_e / N$ cannot be determined, B and H are relative values. Therefore, it is impossible to compare the BH curves of samples with different shapes and coil structures. If the samples have the same shape and coil structure, it is possible to compare the BH curves of the samples.

Simulation sheet still usable for that devices?

Considering that the values of L_e and A_e are not accurate, and the number of turns is unknown, the simulation sheet is not very useful. For measurement, select 1coil in the Config menu and set $N1$ to 1. Please use as a target parameters only $i1m$ or $v2m$. H_m is not used because the value of L_e is not accurate. If $i1m$ is specified and measured, and this value is within the rated current of the chip inductor, the sample will not be damaged.

■ 1-coil method

If the secondary turns cannot be applied, measurement uses 1-coil method. In this case, Core loss P_c includes the copper loss of the primary turns, therefore P_{ov} , P_{om} , and θ include its influence. In addition, make sure to select 1-coil method in Configuration for measurement.
(For settings, see "5.4 Measuring Method".)

- ① Connect the start of turns to P2 terminal and the end to P1 terminal.
- ② Short-circuit P2 and S2 terminals.
- ③ Short-circuit P1 and S1 terminals.

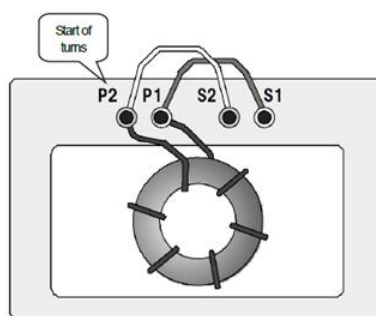


Fig.4-9 1-coil method

Note: It is recommended that Fixed Parameter by 1-coil method is set in I1m and Hm specification.

Because the secondary turns is not given as for 1-coil method, induced voltage $V_2(t)$ in the basic measurement principle chart of Fig.2-2 will directly measure the voltage between the primary turns. In this case, it differs from 2-coil method, and voltage drop in shunt resistance R_s by exciting current $i_1(t)$ and equivalent series resistance R_L of sample will be superimposed to $V_2(t)$.

Therefore, the measurement might not go well because of the superimposition when V_{2m} or B_m is specified for the target parameter. Especially, voltage drop in shunt resistance R_s and equivalent series resistance R_L grows when exciting current $i_1(t)$ grows, and, in addition, the measurement doesn't go well.

Is normal mode or μ -mode better to use?

Please use μ mode. The reason is that there are more measurable parameters. In particular, the L measurement results are useful for knowing whether you are measuring correctly. Please see table below μ mode - right side.

Which parameters can be measured?

The following parameters can be measured independent of L_e and A_e values.

Calculation modes	Normal mode			μ mode		
	Symbol	Typical unit	Meaning	Symbol	Typical unit	Meaning
Measurement values	θ	[deg]	Phase angle	V_{2m}	[V]	Max. induced voltage
	V_{2m}	[V]	Max. induced voltage	I_{1m}	[A]	Max. exciting current
	P_c	[W]	Core loss	*L	[H]	Inductance
	VA	[VA]	Apparent power	*R	[Ω]	Resistance
	I_{1m}	[A]	Max. exciting current	* Z	[Ω]	Impedance
				P_c	[W]	Core loss
				* θ	[deg]	Phase angle
				THD	[dB]	Total harmonic distortion

When measuring chip inductors, the following parameters are usually measured:

I2m: Current setting

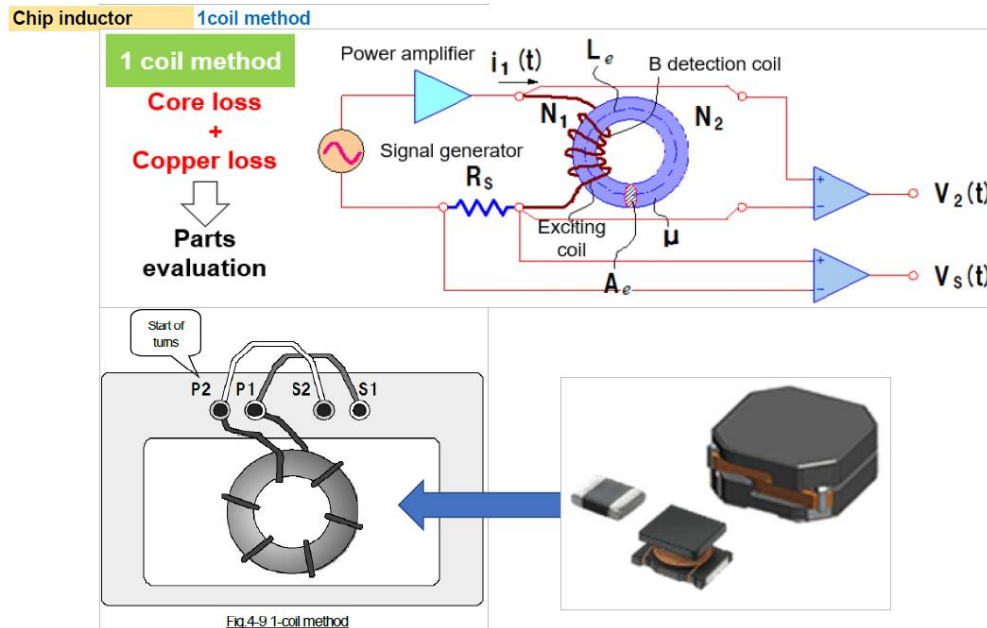
V2m: voltage setting

(V2m changes proportionally to frequency f)

$$V_{2m} = 2 \pi f N_2 B_m A_e$$

Therefore, when making measurements that change the frequency, the value of i_{1m} changes in inverse proportion to the frequency, so care must be taken.

When changing the frequency, it is more common to measure with fixed i_{1m} .



xxi. I am measuring the same sample twice and do have different results. What could be the error here?

- If there is a slight contact failure at the connection point between the sample winding and the BH analyzer. So please always check the right connection and also if the tip/cable is oxidized. If this is the case remove the oxidization before measuring. Since no current flows on the secondary side, a thin insulating film may affect the phase characteristics.
- Check if the screws on the measuring part are tightened enough. If this screw is not tightened properly, it will affect the phase characteristics at high frequencies. Check below:

