



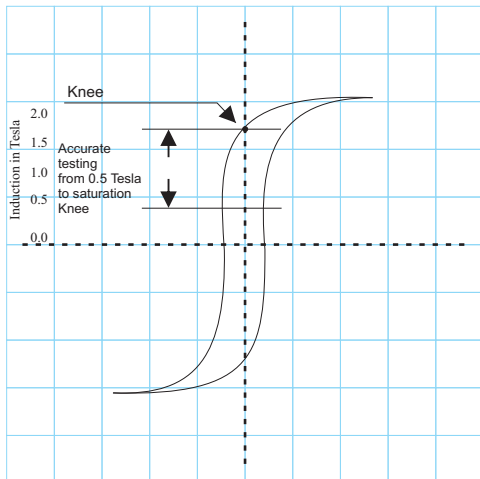
GOPAL ELECTRONICS

DW-21

Digital Iron Loss Tester

Accurate testing of single sheet

35 to 125 Hz
Source & Measure



Operation Manual



TABLE OF CONTAIN

Chapter 1. Identification -----	1
1.1 DW-21 Main unit-----	1
1.2 Probe-----	1
1.3 Standard Accessories-----	1
Chapter 2. -----	2
2.1 Introduction-----	2
2.2 Operation Theory-----	2
2.3 Specification-----	2
2.3.1 General-----	2
2.3.2 Dimension and weight-----	2
2.3.3 Accuracy-----	2
2.3.4 Specimen-----	2
2.4 Precaution-----	3
2.5 Measuring instruction-----	3
Chapter 3. Working -----	4
3.1 Demagnetizing-----	4
3.2 Non oriented sheet measurement-----	4
3.3 Grain oriented sheet measurement-----	4
3.4 Operation Mode-----	4
3.4.1 Weight mode-----	4
3.4.2 Dimension mode-----	4
3.4.3 User mode-----	4
3.5 Function of key-----	5
3.6 Standard method to place the probe-----	6
Chapter 4 Step by step procedure -----	7
4.1 Step by step procedure for testing in WEIGHT MODE-----	7
4.2 Step by step procedure for testing in DIMENSION MODE-----	7
4.3 Step by step procedure of USER MODE-----	7

Chapter 1

Congratulation and thanking you for purchasing Gopal make Digital Iron Loss Tester DW-21 advance tool for magnetic measurement. Please read manual throughly before operating instrument.

1.1 DW-21

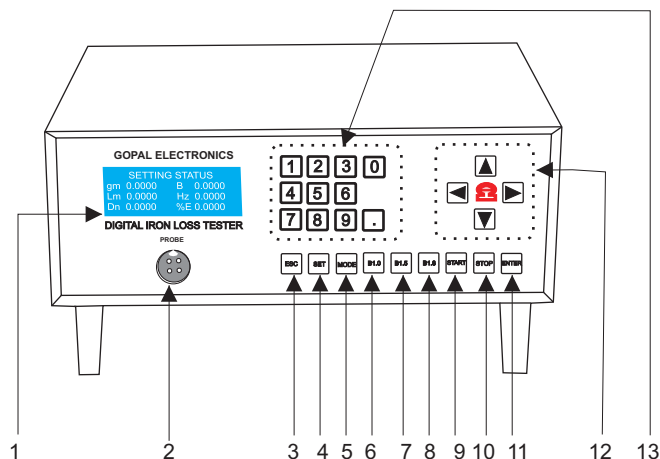


Fig. 1

- | | |
|-----------------------------|---------------------------|
| [1] LCD display | [8] B1.8 Key |
| [2] Probe connection socket | [9] START Key |
| [3] ESC Key | [10] STOP Key |
| [4] SET Key | [11] ENTER Key |
| [5] MODE Key | [12] Up-down-shift keys |
| [6] B1.0 Key | [13] Input numbering keys |
| [7] B1.5 Key | |

1.2 Probe

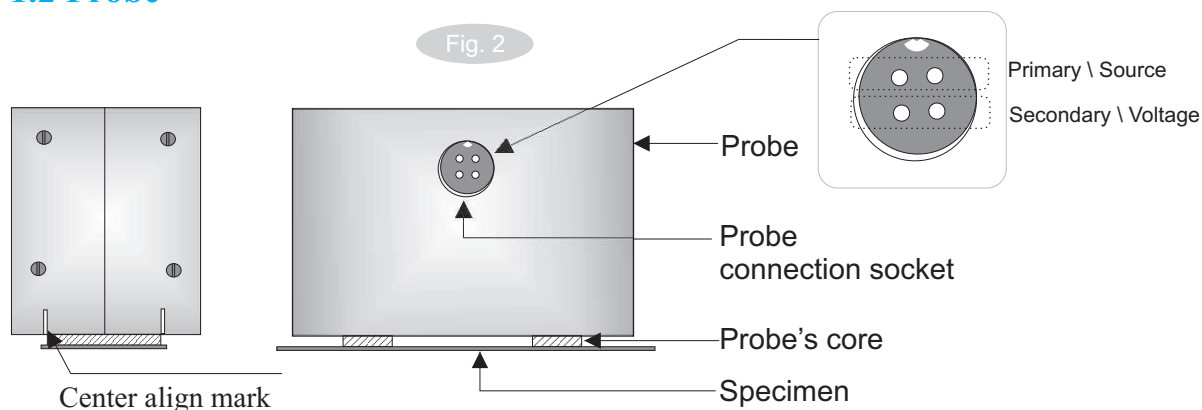


Fig. 2

1.3 Standard Accessories

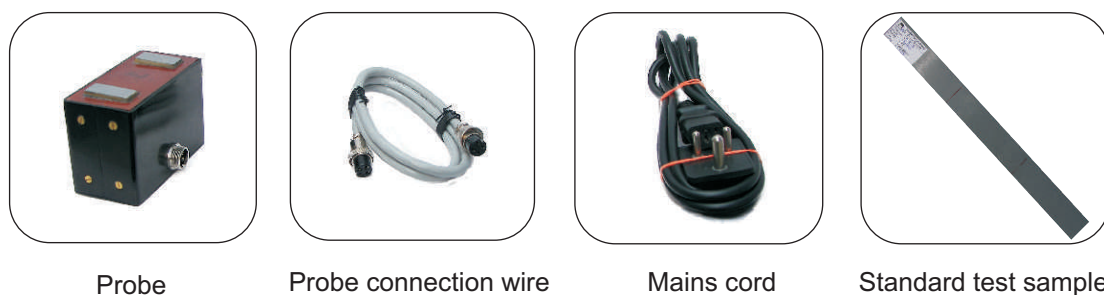


Fig. 3

Chapter 2

2.1 Introduction

This is most comfortable Instrument to test electrical steel sheet at site. Due to advance digital technology it became feasible to make it portable and light weight tool, for testing of CRGO, CRNO, CRNGO and semi process sheet. While measuring iron loss (Watt/Kg), standard size of 30 x 305 mm single strip to be tested, and more accuracy required more sample to average. Big size of sample can used to compare with known material. It is also used to find rolling direction of CRGO sheet by using user mode function. This handy tool is very useful for manufacturer of Electrical items like Transformer, Motor, Stamping, Lamination and core.

2.2 Operation Theory

DW-21 is provided with a stroboscopic probe when placed on specimen closes the magnetic path between probe and specimen. Probe has two coils one is primary and second is secondary (like transformer). When power applied to primary coil and detected by secondary coil appropriate to specimen data and measure voltage, current and power. Then measured data calculated by microcontroller appropriate to specimen's data (core area and weight) and directly displayed on LCD Watt/Kg and Watt/lb.

2.3 Specification

General

Power Supply	AC 230 V / 110 V- 50/60 Hz (any one) 20 VA
Source capacity	1.5 Volt x 300 mA sine wave
Frequency range	35 to 125 Hz
Measuring range	0.1 to 22 Watt per Kg. and 10 Watt per lb
Magnetic flux density range	0.2 to 1.8 Tesla (Weber / square meter) or limited to source capacity

Weight and Dimension

Dimension of main unit	H 110 mm + leg, L 280 mm , W 230 mm Appx.
Dimension of probe	H 72 mm, 50mm, 113mm Appx.
Weight of main unit	3.870 kg. Appx.
Weight of probe	872 gm Appx.
Dimension of final carton	H 390mm, L 390mm, W 240mm Appx.
Weight of final carton	5 kg. Appx.

Accuracy

Volt meter	± 0.1% FSD True RMS Volt
Amp. meter	± 0.1% FSD True RMS
Power meter	± 0.1% FSD @1PF
Frequency	± 0.1% which Instrument can set
Watt/kg (Iron Loss)	Refer comparison table

Specimen

Standard Specimen size	30x305 mm to 30x280 mm
Non Standard Specimen size	More than 30x115 mm for comparisons
Specimen thickness range	0.1 to 0.75mm

Comparison with standard Epstein Test Method

Eight strips of each material tested by DW-21 and average of them is compared to standard Epstein Tester EP-350 as under

8 Strips of each material Tested at 50Hz								
Material			1.0 Tesla		1.5 Tesla		1.7 Tesla	
Type	ID	Thickness	Epstein	DW-21	Epstein	DW-21	Epstein	DW-21
CRGO	GP-10	0.3 mm	0.393	0.414	0.918	0.964	1.331	1.306
GRNO	GP-4	0.5 mm	2.336	2.307	5.108	4.96	6.699	6.571
CRNO	21SAMPLE	0.35 mm	0.863	0.855	2.249	2.001	----	----
CRGO	GPCRGO	0.23 mm	0.296	0.296	0.695	0.687	1.064	0.985

2.4 Precaution

- [1] Voltage supply should be within (230V @ 50Hz) or (110V @ 60Hz).
- [2] Warm up the instrument at least 30 minutes.
- [3] Please do not turn On and Off instantly (Duration should be at least 1 minute). Otherwise It hang up the equipment.
- [4] Magnetic material should be keep away from the probe.
- [5] Please do not open the instrument some critical component inside may be damage.

2.5 Measuring Instruction

- [1] Specimen should be 30 mm wide and 305 mm long for specific accuracy.
- [2] The specimen should be demagnetized before test. (Refer topic . 3.1)
- [3] CRGO is more sensitive for magnetization so it is required to demagnetize and annealing the specimen before test.
- [4] Measurement should be on single sheet, never on multiple (stacked) sheets.
- [5] Keep magnetic material away from the probe during the test perform.
- [6] Keep clean the surface of probe's core, rusty surface can create an error.
- [7] Make sure that you have properly placed the probe on specimen as standard method shown in fig. 4.
- [8] It is necessary to enter accurate weight and thickness of specimen. So it is recommended to use 20 miligram accurate weigh scale to weigh the specimen.
- [9] Specimen should not be deformed or mechanically stressed. Mechanical stress can change the watt loss of the specimen. In that condition single sheet tester always show the actual loss of the specimen.
- [10] Specimen of critical material like CRGO should handle with care.
- [11] Please enter correct thickness, density, weight etc.
- [12] Error in feeding parameter is directly proportional to error in Watt/Kg.
- [13] Please recheck the data you have entered on status page before test.

Chapte 3

3.1 Demagnetizing

Test the specimen at high induction two time to demagnetize the specimen for specific accuracy before your test.

3.2 Non oriented sheet measurement

Watt loss value guaranteed by manufacturers is usually mean value calculated from those measured both in rolling direction and cross rolling direction of the sheet. Hence, it is recommended to measure the value in the same way and calculated the mean value.

3.3 Grain oriented sheet measurement

Watt loss value guaranteed by manufacturers are usually mean value calculated from those measurement only in the rolling direction. Hence, it is recommended to measure the value only in the rolling direction.

3.4 Operation Mode

3.4.1 WEIGHT MODE :-

Weight mode is most accurate mode for testing. It is preferable mode if user have correct weight of the specimen. Error in specimen data like weight, size and density directly reflected in accuracy of measured watt per kg.

Note : Weight mode is only used for standard specimen size (* see. Specification for standard size*)

Input data for weight mode :- Weight, Induction, Length, Density and Frequency

3.4.2 DIMENSION MODE :-

Dimension mode may be use if weight mode is not possible to use. It is recommended to use micrometer to measure the thickness and Vernier calliper for width of the specimen. Following input data should be known to test sample in dimension mode.

Note : Dimension mode can be used for both standard and non standard size of specimen for testing.

Input data for Dimension mode :- Thickness, Density, Width, Induction, and Frequency

3.4.3 USER MODE :-

User mode is provided to verify calibration of the instrument. Frequency can be set by pressing the B1.0 key and voltage can be set by pressing the B1.5 key in this mode. User have to set only frequency and voltage. Frequency should be set within the limit of 35.00 Hz to 125.00 Hz. and voltage should be set within the limit up to 1.5000V. Press start key to start source and measurement then the result page will appear. It is appearing the V= Voltage, mA = milli Ampere, mW = milli Watt, PF = Power Factor.



Fig. 4

3.5 Function of key

1. ESC key (For weight mode):-

User will reach to 'SETTING STATUS' page when pressing ESC key.

gm =Weight of strip in gram
 Lm = length of strip in mm
 Dn =Specific Density of sample in gm per cm³
 B = Flux density
 Hz = frequency
 Weight = Indicating weight mode is active

ESC key (For Dimension mode):-

User will return to 'SETTING STATUS' page when pressing ESC key.

Th=Thickness of strip in mm
 Wd= Width of strip in mm
 Dn=Specific Density of sample in gm per cm³
 B = Flux density
 Hz = frequency
 Dimension = Indicating Dimension mode is active

ESC key (For User mode):-

User will return to 'SETTING STATUS' page when pressing ESC key.

V = Voltage
 mW = milli Watt
 mA = milli Ampere
 PF = Power Factor
 STOP = the source and measurement is stop.

2. SET key :-

SET key is used to set the input values one by one by using up down keys. Input parameters are as follows for different modes.

Weight mode :- Weight, Induction, Length, Density and Frequency

Dimension mode :- Thickness, Density, Width, Frequency, and Induction

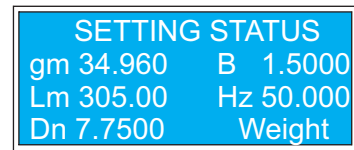
Procedure to Enter the data :-

When user press SET key, firstly the display will be seen as shown in figure-8 depend on the selected mode and user have to enter weight in gram, induction, length in mm and density, etc. by using numbering key and then press ENTER Key.

At last the display will appear "SAVE PARAMETERS" if user want to save entered data to be save for future use permanently then press ENTER key to save all values in the memory, if user press ESC key than the data will be not store in memory but work up-to switch off the instrument.

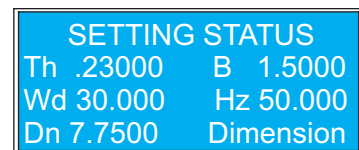
Note :- It is recommended to avoid unnecessary save in memory.

Fig. 5



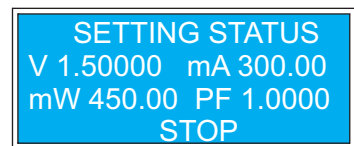
When pressing the ESC key the display will appear as same as the above. value is depend on setting.
For weight mode

Fig. 6



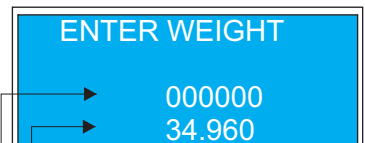
When pressing the ESC key the display will appear as same as the above. value is depend on setting.
For dimension mode

Fig. 7



When pressing the ESC key the display will appear as same as the above
For user mode

Fig. 8



last stored value

Value the user have to enter now

When pressing the SET key the display will appear as above depend on mode selected

3. MODE key :-

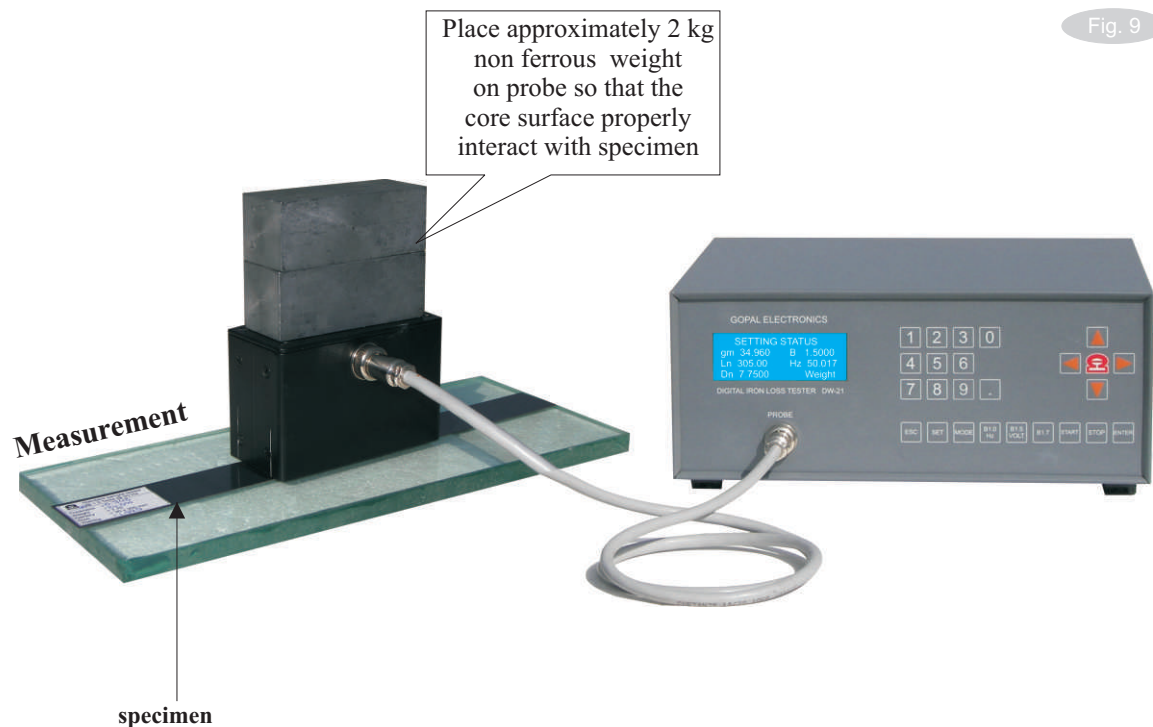
Mode key is used to change the mode.

Procedure to change the MODE :-

User can select any one of three given mode by scrolling method by mode key and then press Enter key to activate it.

- [4] **B1.0 key:-** User can directly set flux density 1.0 tesla by simply pressing this key in “Weight and Dimension mode”. And in “USER MODE” this key is used to set frequency.
- [5] **B1.5 key:-** User can directly set flux density 1.5 tesla by simply pressing this key in “Weight and Dimension mode”. And in “USER MODE” this key is used to set voltage.
- [6] **B1.8 key:-** User can directly set flux density 1.8 tesla by simply pressing this key in “Weight and Dimension mode”.
- [7] **START key:-** To start the source and measurement in all mode.
- [8] **STOP key:-** To stop the source and measurement in all mode.
- [9] **ENTER key:-** To save the value of input parameters while user is setting the values of input parameters.

3.6 STANDARD METHOD TO PLACE THE PROBE



Chapter 4

4.1 STEP BY STEP PROCEDURE FOR TESTING IN WEIGHT MODE

- [1] Give the supply of (230V @ 50Hz) or (110V @ 60Hz) by mains cord to the instrument.
- [2] Connect the Probe to the instrument by probe connection wire.
- [3] Keep clean surface of probe's core.
- [4] Warm up the instrument at least 30 minutes for specified accuracy.
- [5] Put probe on the specimen. Probe should be Centralize with the specimen.
- [6] Press SET key.
- [7] Please enter the weight by numbering key and then press ENTER key.
- [8] Please enter the Density by numbering key and then press ENTER key.
- [9] Please enter the Length by numbering key and then press ENTER key.
- [10] Please set the Frequency (35.00Hz to 125.00 Hz) by numbering key and then press ENTER key.
- [11] Please enter the Induction by numbering key and then press ENTER key.
- [12] "Save Parameters" is appearing now. Press ENTER key if you wish to save the data in memory otherwise press ESC key.
- [13] Press START key to start the measurement and source.
- [14] Please wait while the display is appearing "Searching Iron Loss" and do not remove probe during the process.
- [15] Take the reading when display appear "Iron Loss".

4.2 STEP BY STEP PROCEDURE FOR TESTING IN DIMENSION MODE

- [1] Give the supply of (230V @ 50Hz) or (110V @ 60Hz) by mains cord to the instrument.
- [2] Connect the Probe to the instrument by probe connection wire.
- [3] Keep clean the surface of probe's core.
- [4] Warm up the instrument at least 30 minutes for specified accuracy.
- [5] Put probe on the specimen. Probe should be centralize with the specimen.
- [6] Press SET key
- [7] Please enter the Thickness by numbering key and then press ENTER key.
- [8] Please enter the Density by numbering key and then press ENTER key.
- [9] Please enter the Width by numbering key and then press ENTER key.
- [10] Please enter the Frequency (35.00Hz to 125.00 Hz) by numbering key and then press ENTER key.
- [11] Please enter the Induction by numbering key and then press ENTER key.
- [12] "Save Parameters" is appearing now. Press ENTER key if you wish to save the data in memory otherwise press ESC key.
- [13] Press START key to start the measurement and source.
- [14] Please wait while the display is appearing "Searching Iron Loss" and do not remove probe during the process.
- [15] Take the reading when display appear "Iron Loss".

4.3 STEP BY STEP PROCEDURE OF USER MODE

- [1] Give the supply of (230V @ 50Hz) or (110V @ 60Hz) by mains cord to the instrument.
- [2] Connect the ZIG-FIXURE to the instrument by zig-fixure connection wire.
- [3] Warm up the instrument at least 30 minutes.
- [4] Set frequency by pressing B1.0 key. Then press ENTER key.
- [5] Set Voltage by pressing B1.5 key. Then press ENTER key.
- [6] Press START key to start the measurement and source.
- [7] Take the reading.
This mode can be used to verify calibration of instrument by using special zig-fixure.



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