



宁波经济技术开发区凯诺仪器有限公司

# The Operation Manual of Direct Reading Iron Loss Tester

Model: SK-IR-3C

(新型)

直读式铁损测试仪

使用说明书

(附品质保证书)

**CERTIFICATE OF QUALITY ATTACHED**



# ZOYAN

宁波经济技术开发区凯诺仪器有限公司

# 目 录

## 铁损测试仪 SK-IR-3C

### 使用说明书

第一章 设备概要.....	1
第二章 技术规格.....	1
第三章 操作面板.....	2
第四章 测试准备.....	3
第五章 测试方法.....	3
第六章 测试说明.....	4
第七章 校准计量.....	5
品质保证书.....	6

**【在使用本设备前请仔细阅读本说明书】**

# CONTENTS

## THE OPERATION MANUAL

### OF DIRECT READING IRON LOSS TESTER

#### MODEL: SK-IR-3C

COVER.....	7
1. INTRODUCTION.....	8
2. SPECIFICATION.....	8
3. EXPLANATION OF FRONT AND REAR PANE.....	9
4. PREPARATION.....	10
5. MEASURING PROCEDURE.....	10
6. SPECIAL ATTENTION.....	10
7. CALIBRATION PROCEDURES.....	11
8. SUPPLEMENTARY EXPLANATTON.....	12
CERTIFICATE OF QUALITY .....	6

***【Please read the Operation Manual carefully before using this***

## Tester

### 第一章 设备概要

本装置是用于电气铁板（硅钢片）的铁损测试，是直读式铁损测试仪 DAC-IR-2C 的改进型新产品，增加了打印功能。具有携带方便、测试简便、重复性好等特点。只要将探头置于被测试片上，便能以 W/kg 的形式测得该试片之铁损值，并以数字方式显示。成品/材料均可使用。对热处理或冲压前的整张硅钢片，可以裁下 20 x 20mm 以上面积的单片局部或将卷板放置平整测试；硅钢片成品（如图 1 所示）则按不同形状的有效宽度或有效面积测试。

仪器的校准简单方便。

#### (1) 主要应用：

- 硅钢片的进、出料试验。
- 锻烧过程中的品质控制。
- 矽钢片的品质管理等。

#### (2) 设备特点：

- \* 非破坏性的测量方式，且能直接读取其铁损值。
- \* 铁损值以 W/kg 显示方式。
- \* 采用触摸式数码设定开关，操作方便、明了。
- \* 探头离开试样时自动停止测试，避免长时间工作。
- \* 利用标准铁板利于探头的校准。
- \* 自动控制磁通密度。
- \* 抗电源杂讯功能强，无须使用 AC 稳定电源。
- \* 只需要一个测试探头，可适应各种试样的厚度和宽度。

#### (3) 测试原理：

将绕有激磁线圈和磁束检出线 U 型磁铁置于被测试样上即形成闭合磁路。如果该 U 型磁铁的磁路断面面积比试片内磁路断面面积大许多时，则激磁线圈加电压时所产生的激磁电流与磁通检出线圈上产生的电压乘积即为试片内之损耗。本测定器备有试片厚度和测定用磁能密度选择开关，选择、设定后，试片的铁损值便可立即读出。铁损值可由此式得知： $\text{铁损} = \text{试片内损耗} / \text{试片内磁路部分的有效重量}$ 。

试片内磁路部分的有效重量为试片厚度、试片内磁路面积与试片密度的算术乘积。而本装置的内置磁路宽度与长度已固定，只需设定板厚与磁通密度即可测定铁损。

#### (4) 主机及附属品构成：

测试仪主机 SK-IR-3C .....	1 台
微型打印机 SPRT-T .....	1 台
校正用标准铁芯 (S 和 G) .....	各 1 片 (S 无取向 Non Oriented 和 G 取向 Grain Oriented)
标准探头 .....	1 个
电源线 (带地线的三路电线) .....	1 条
探头连接线 .....	1 条
铝合金收容箱 .....	1 只



图 1 各种成品硅钢片示意图

### 第二章 技术规格

测量范围：0.10-19.99 W/kg.

磁通密度：按国家标准 1.5 Tesla (无取向)、1.7 Tesla (取向)。

试片厚度：0.10mm-0.99mm

试片宽度：5mm 以上(保证精度). 最小可测试 2mm 宽度。

测量对象：电气钢板及硅钢片铁芯，包括无取向 (Non Oriented) 和有取向 (Grain Oriented)。

测量精度：±5%（和标准的叠片电流爱泼斯坦方法比较）。

测量频率：50Hz（与电源频率同步）

使用电源：220V ±10%。最大消耗电力 15VA。

尺寸重量：尺寸 W240mm x H130mm x D350 mm；重量约 6.0 公斤

### 第三章操作面板

如图 2 所示，前后面板各部分说明如下：

- ① **POWER** Switch 电源开关，按下后打开电源，此时面板上部②③④显示数据如下：  
铁损值：**0.00**；宽度：**20.00**；厚度：**0.50**
- ② **IRON LOSS** Display 铁损值读数显示器，以 W/kg 表示。
- ③ **WIDTH** 测试试样的宽度显示器，以 mm 单位表示。通过⑤⑥⑦按键设定。
- ④ **THICKNESS** 测试试样的厚度显示器，以 mm 单位表示。通过⑤⑥⑦按键设定。
- ⑤ **SETTING** 宽度和厚度设定时各位数选择按键。每按下 **●** 一次，对应的位数下方二极管灯亮。
- ⑥ **UP** 每按下 **▲** 键一次，二极管灯亮的对应数字上调一位。
- ⑦ **DOWN** 每按下 **▼** 键一次，二极管灯亮的对应数字下调一位。
- ⑧ **NON ORIENTED** 测试试样为无取向钢板时的选择按钮和指示灯。按下 **1.5T**，灯亮时处于对无取向钢板的测试状态。测试标准磁通密度为 1.5 Tesla（1500 高斯）。
- ⑨ **GRAIN ORIENTED** 测试试样为取向钢板时的选择按钮和指示灯。按下 **1.7T**，灯亮时处于对取向钢板的测试状态。测试标准磁通密度为 1.7 Tesla（1700 高斯）。
- ⑩ **MEASURE** 测试按键及指示灯。按下 **●** 键时，测试开始。上方指示灯亮表示处于测试状态。
- (1) **Power Supply** 电源输入接口。使用带接地线的三线插孔（内置备用 2A 保险丝一个）。（后面板）
- (2) **Measuring Head** 测试探头接口。使用专用的探头接线。（后面板）
- (3) **Grain-Oriented** (G) 取向标准铁板校准口。（后面板）
- (4) **Non-Oriented** (S) 无取向标准铁板校准口。（后面板）
- (5) **Scutcheon Sheet** 产品标签，表明生产标号和生产日期。（后面板）
- (6) **RR1** 打印测试数据的按钮。
- (7) **RS232C RRINTER** 微型打印机接口。使用专用的串口线。



图 1 测试仪的前面板示意图





(12)

(17)

图 2 测试仪的后面板示意图

## 第四章 测试准备

-2-

- (1) 试样应当用包括 5mm x 20mm 以上有效面积的、无弯曲和凹凸、平整的钢板。
- (2) 测试试样应放在无磁感应的木板或橡胶平板上，周围 30cm 以内无磁性物体。
- (3) 测试探头的两个磁头，和钢板的压延方向成垂直方向放置，如图 3 所示，特别是对有取向钢板。
- (4) 最终的测试值应为多块试样测试后的平均值。这样，和材料本身的数据接近。

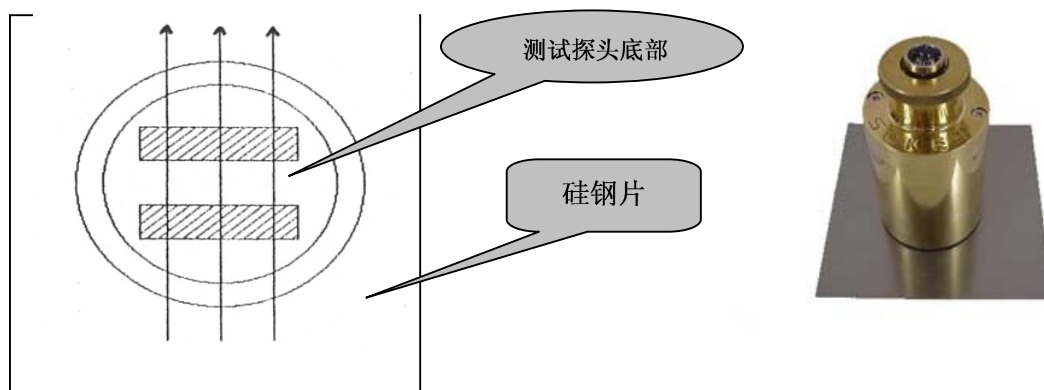


图 3 测试探头和硅钢片压延方向示意图

## 第五章 测试方法（操作步骤）

- (1) 在连接电源线以前，请务必确认输入电压和测试仪后部的输入电源选择开关的设定是否一致。
- (2) 在 **Power Supply** 处连接电源线。（后面板）
- (3) 在 **Measuring Head** 处连接探头。（后面板）
- (4) 在 **RS232C RRINTER** 处连接微型打印机（后面板）
- (5) 按下 **POWER** 键，处于 ON，打开电源。保持 10-20 分钟安定化处理，以提高读取质量。  
通常，打开电源后，**IRON LOSS Display** 铁损值读数显示器的值显示为 **0.00**，如果显示数值超出 **0.05**，则需要使仪器预热安定，或进行零位调节。（零位调节方法详见第七章说明）
- (6) 用 **SETTING** 设定键以及 **UP** 键 和 **DOWN** 键设定测试试样有效部分的厚度和宽度。
- (7) 用 **NON ORIENTED** 按钮选择无取向硅钢片钢板种类的测试。按下后，指示灯亮。
- (8) 用 **GRAIN ORIENTED** 按钮选择有取向硅钢片钢板种类的测试。按下后，指示灯亮。
- (9) 将探头置于试样上，按下 **MEASURE** 测试按钮键，保持 10 分钟左右的安定测试，以提高读取质量。一般情况下，如果电源环境稳定，按下测试键后几秒钟即可读取安定测试数据。数据稳定后，按下 **RRT** 按钮即可通过微型打印机将数据打印出来。
- (10) 测试位置的选择：
  - 无取向硅钢片的测试：一般，钢厂出厂的测试值为压延方向 **ROLL** 和垂直方向 **CROSS** 的平均值，因此，本测试仪也最好在两个方向测试后取其平均值。
  - 取向硅钢片的测试：一般，钢厂出厂的测试值为压延方向 **ROLL** 的测得数据，本测试仪在测试压延方向的铁损值时，轻轻转动探头，取其最小的读出值。
- (11) 测试结束后，关闭电源。

### 【注意事项】

- (1) 本测试仪是对钢板的局部进行测试，和实际钢厂的出厂标准数据多少有些差异。为了能获取更准确的测试数据，最好实行多点测试，取其平均值。对于面积较小的样品测试时，采用多片测试取平均值。如图 4 所示。对同一种样品多次测试时，探头压下时用力应当均匀一致。

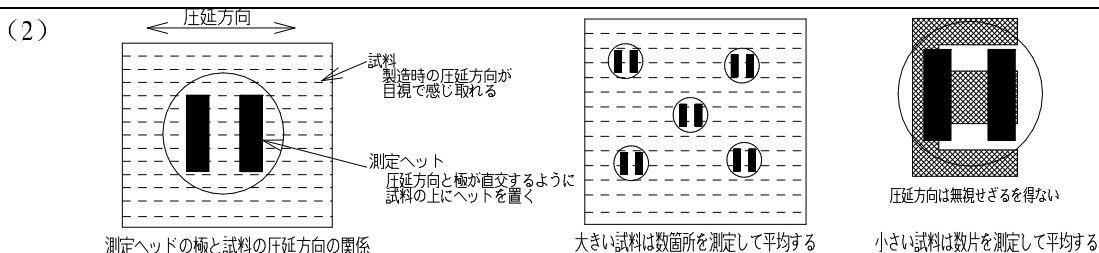


图 4 测试探头的位置选择

- (3) 在进行 10-20 分钟的安定化处理后，再放置探头，经过 1-2 秒钟后，磁通密度由测试仪内部自动控制即处于安定状态，此时读出的磁通密度为试样每公斤的铁损值。
- (4) 硅钢板的厚度依据钢板的加工，其公称尺寸和实际尺寸多少有差异，用精确测量仪对钢板厚度和宽度进行测试后，再用 **Thickness** 和 **Width** 设定其厚度和宽度，可以提高测试的精确度。
- (5) 在对磁通密度 B 进行调上、调下的过程中，由于磁滞现象，会出现若干差异。获得正确的磁通密度，应当提起探头后，再置于试样上，此时的磁通密度显示正常值。
- (6) 本测试仪带有自动跟踪测试功能。当探头离开试样一定距离时，自动停止测试。需重新按下测试按钮，再进入测试状态。
- (7) 有关复杂形状的冲压后的成品测试，其测试位置和宽度的计算方法等，详见第六章(3)的说明。
- (8) **【重要提示】**

本测试设备为防止过载测试和避免长时间无效工作，以保护仪器的使用寿命，内部设计了自动保护功能。遇到下列中止测试或设定错误时的对应操作方法：

	测试中止或设定错误 (铁损值不显示-宽度值出现乱码)	对应操作方法
①	所设定的测试试样的宽度、厚度不符合该试样的可测试铁损值(过大或过小)	①再次确认测量并调节试样的实际宽度或厚度，重新按下测试键； ②如果还是不能显示铁损值，可连续按住测试键，强行读出铁损值。但时间不宜超过 5 秒钟。
②	测试试样和探头未能保持紧密接触	重新放好探头位置，再按下测试键。
③	宽度设定 25mm,宽度显示乱码	重新启动 (关掉电源后再开机)

## 第六章测试说明

- (1) 对于表面有弯曲和凹凸的钢板，测试时请用力按下探头，使其和钢板表面紧密接触，显示安定数据。
- (2) 如果所测试的钢板，其有效面积未达到 5mm x 20mm 时，无法保证本仪器所规定的测试精度。如图 5 所示，包含 **abcd** 内的测试面积为有效测试面积。本测试仪最小有效测试面积为 2mm (宽度，图中的 ab 或 cd) x 20mm (长度，图中的 ac 或 bd)，对于宽度为 5 mm 以下的范围测试时，可以作为比较数据参考。  
对宽度(图中的 ab 或 cd)大于 20mm 的试样，宽度设定在 20mm 即可。

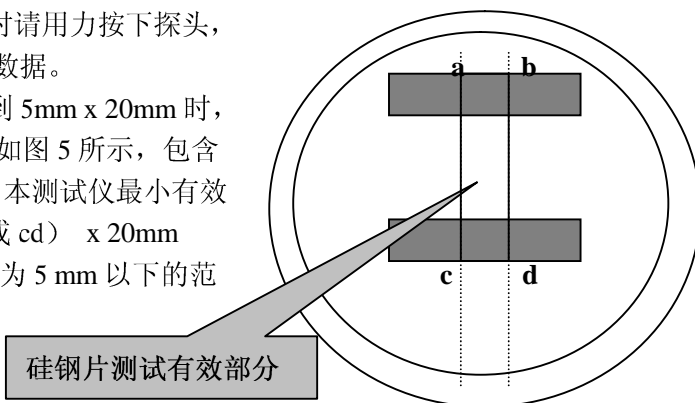


图 5 有效面积示意图

- (3) 复杂形状冲压板的测试位置选择

如图 6 所示，本测试设备作为产品品质管理的手段之一，对于不规则的硅钢片测试时，很难获得绝对值的情况下，以相同的有效部位测试获得相对值，或在测试过程中可以调节宽度使铁损值和未加工前一致，确定有效宽度，比较判断合格与否。尽量选择比较规则或长方形面积区域。

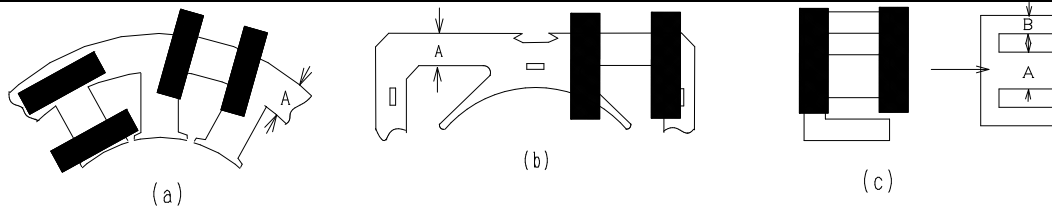


图 6 各种复杂形状测试的有效位置

图中(a)和(b)是电机定子冲压片的局部示意，宽度设定以通过探头中间部分为准，但其非长方形或弯曲形状，测试有效面积中的长度（测试探头最短间距 20mm）内，周围的弯角或突出部分也通过磁力线，这样测出的铁损值会和绝对值有所差异。

图中(c)为小型变压器等冲压片，由于长方形片间距离小，测试 A 部分时，A 和 B 同时被测试探头所覆盖。此时的宽度设定应当为 A 和 B 的相加值。或采用单独测试 B 部分的铁损值。

上述测试时所得的铁损值作为基本参照依据，对同一批产品，测试同一个位置，作相对值的比较。

- (4) 测试频率 60Hz 测试结果的换算：本测试设备以 50Hz 为实际测试基准，用 50Hz 基准测试后所得出的铁损值的三倍可作为 60Hz 测试的结果换算。
- (5) 低磁通密度条件下测试的换算：目前，国际标准一般是以 1.5T(1500 高斯)为测试无取向硅钢片、以 1.7T(1700 高斯)为测试有取向硅钢片的标准磁通密度。鉴于传统，当需要获得 1.0T 的无取向铁损值时，以  $0.44 \times 1.5T$  可以获得近似值；同样，以  $0.78 \times 1.7T$  作为 1.5T 磁通密度条件下有取向测试的近似值。（计算式中的 1.5T 和 1.7T 分别代表无取向和有取向的标准磁通密度下测试的铁损值）。

## 第七章 仪器的校准

本测试仪因长期使用，或由于运输途中震动、周围温度、湿度变化等客观原因，元器件的性能多少会发生变化。可以利用本仪器附属的标准铁板（无取向标准铁板(S)和取向标准铁板(G)各一块），通过对后面板的校准口，进行设备校准。如图 7 所示，利用一字形小型螺丝刀，轻轻旋转，对无取向标准铁板(S)和取向标准铁板(G)分别校准。



图 7 设备校准口示意图

该过程可以由用户按照下列方法进行。

### 1) 仪器校准

（对照附属标准铁板的规定值校准）

有取向标准铁板校准：按操作说明进行厚度和宽度（厚度 0.3mm，宽度 20mm）的设定后，如图所示，左右旋转标有 **GRAIN ORIENTED** 的小螺口，使其与标准铁板表示值相同。

无取向标准铁板校准：按操作说明进行厚度和宽度（厚度 0.5mm，宽度 20mm）的设定后，如图所示，左右旋转标有 **NON ORIENTED** 的小螺口，使其与标准铁板表示值相同。

### 2) 零位调节

本新型号通常无需零位调节。通过内部线路板标有 **VR5** 的可调电阻，用“一”字型小螺丝左右旋转，一般在出厂前铁损值显示已经调节至零点。

零位调节必须和生产厂家联系后才能打开仪器。擅自打开仪器将影响设备的保修和售后维修。

### 【注意事项】

上述校准方法作为用户日常校准的依据，由于标准铁板的保管使用等原因会引起标准值的变化，以厂家或计量机构的“标准计量”方法为准。

### 3) 标准计量

一般自购入后第二年起，每年定期由生产厂家或有关地方计量部门进行标准校准计量。

(2007-08-07 第四版)

-5-

## 品质保证书

本测试仪是在严格生产和精密检测条件下制造的产品，万一由于运输途中或其它原因造成质量不完善，敬请立即通知我公司在各地的代理机构、销售商或直接和我公司售后服务部取得联系。正常使用状态下发生故障，我公司保证自购买之日（合同规定或现场交货日）起一年的免费维修或更换。由于操作不当等人为因素或不可抗拒的灾害、事故等原因造成的故障，以及一年保修期以后，将按实际修理费用有偿修理。

代理销售商

(以上由经销代理商填写)

【在一年保修期内，本仪器出现故障需要服务时，请提供本品质保证书的传真件或复印件】

本测试仪自购入后七年以内，无论产品更新换代、或该型号产品生产中止与否，本公司将及时提供完善的售后服务。

<b>客户信息</b>	名称:	联系人:		
	地址:			
	电话:	传真:		
销售单位	直销 <input type="checkbox"/>	经销 <input type="checkbox"/>		
设备名称	直读式铁损测试仪 SK-IR-3C (新型)			
出厂日期	调试日期:      年    月	制造编号	A04-	
交货日期	年    月    日			

宁波经济技术开发区凯诺仪器有限公司

DATE:      年    月    日

**HANGZHOU SOKEN ELECTRIC CO., LTD.**

3F, Building No.9, Software Park, Bin-Jiang Hith-Tech District  
Hangzhou City, China 310053

TEL: 0086-571-86698056    FAX: 0086-571-86698057

Date:      /      /

## CERTIFICATE OF QUALITY

Dear Sir or Madam:

We, the manufacturer, hereby certify that product as specified hereunder, to the best of our knowledge, is manufactured in China, and in accordance with Soken Electric and with international acceptable standard in quality and materials.

Description

Quantity

**Direct Reading Iron Loss Tester Model SK-IR-3C (Improved Type)**      **One set**

Contract No.: (P/O No.)      (Date:      )

Series Number:	A04-
Standard sheets	S =            W/kg;        G =            W/kg

HANGZHOU SOKEN ELECTRIC CO., LTD.

\_\_\_\_\_  
*Authorized Signature*

## DIRECT READING IRON LOSS TESTER

-6-

### Model: SK-IR-3C

(IMPROVED TYPE)

# OPERATION MANUAL

-6-



The manufacturer reserves the right to change the specifications without prior notice.

## **! DANGER**

- *DO NOT TOUCH HAZARDOUS AC CORD when measuring.*
- *DO NOT TOUCH THE GROUND TERMINAL.*

## **! CAUTION**

- *Please read the Operation Manual carefully before using  
this Tester.*



## HANGZHOU SOKEN ELECTRIC CO., LTD. CHINA

### 1. INTRODUCTION

#### 1-1 SUMMARY

SK-IR-3C is the modified product of DAC-IR-2C .It increases a printer ,the printer can print data which you have tested.This instrument can measure the iron loss of electrical steel sheet. The Epstein Test is used extensively as the standard method for measuring iron loss. it requires, however, the preparation of special test samples and considerable time to make the required measurements.

The SK-IR-3C is a Yoke Type Iron Loss Tester and has a great advantage compared to the Epstein method in that it provides a direct reading of iron loss scaled in watts per kilogram or watts per pound from a single sheet sample. It has been designed compact in size and simple to operate, thus is greatly helpful for quality management of steel sheets on various job sites.

Superceding the former portable type Iron Loss Tester DAC-IR-2 made in Japan SOKEN,SK-IR-3C provides convenient and fast measurement of the core loss of Electrical Steel Sheet individual pieces and laminations of all sizes and shapes, simply by placing the probe. It measures the Iron Loss in W/kg indicating it on a large LED readout Display.

SK-IR-3C can test the Min 5 mm of Width and the Max 0.99 mm of Thickness for any shapes of Electrical Steel Sheet.

#### 1-2 APPLICATION

Acceptance testing by user and supplier of electrical steel for stamping,annealing and final assembly of laminated cores. The Tester can be used for identification of Electrical Steel Iron Loss grade or finished lamination cores refer to Fig 1.

#### 1-3 FEATURES

Portable, Light Tester with good reproducibility. Direct large LED readout of W/kg 50Hz. Simple front panel controls. Operation has been made more consistent with new Probe and Repeat Fixture. Magnetic flux density can be set at 1.5 or 1.7 Tesla selectable separately for Non Oriented or Oriented Grain Steel Sheet. The Power Supply AC Voltage is 100V or 220V/50Hz. The testing data can be printed by the small printer.

### 2. SPECIFICATION

#### 2-1 GENERAL DESCRIPTION

Measurable Watt Loss: 0.10—19.99 W/kg (4 digits)

Magnetic Flux Density: 1.5T and 1.7T (Tesla) for Non-Oriented(S) and Oriented Grain(G)

Thickness Selection: By Setting Button (3 digits)

Width Selection: By Setting Button (3 digits)

Possible to measure: 0.10—0.90mm (Thickness); Wider than 5mm(Width) and 20mm(Length)

Test Object: Electrical Steel Sheets for Non-Oriented or Oriented Grain.

Measuring Accuracy: Error less than  $\pm 5\%$ .

Measuring Frequency: 50Hz (synchronized to power supply frequency) .

Input Power Supply: 220V.

Size: 240(W) $\times$ 130(H) $\times$ 350(D)mm

Net Weight: About 6 KGS



**Fig 1 Steel Sheet Samples**

# ! CAUTION

- The error,  $\pm 5\%$  of reading, in this instrument may not be guaranteed when measuring High Grade Orient Cores..

## 2-2 COMPOSITION

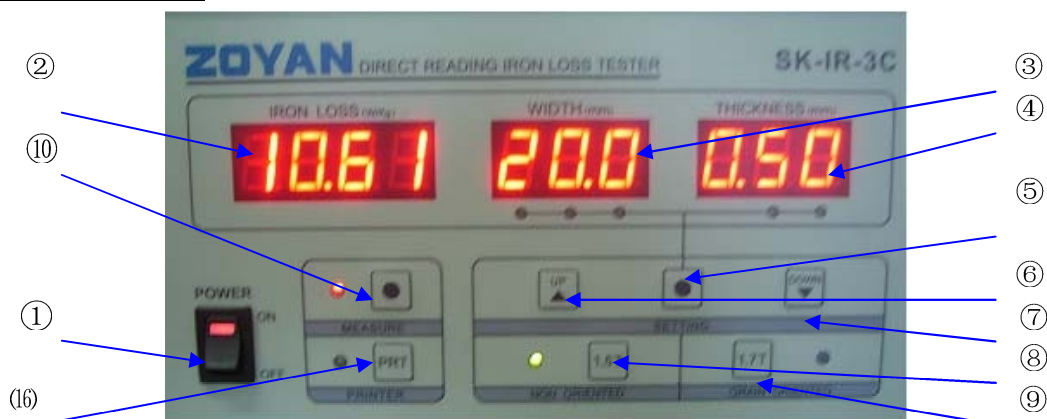
Measuring Unit SK-IR-3C .....	1 set
Small Printer.....	1 set
Standard Core (S & G) for Calibration .....	2 pc
Probe .....	1 pc
Probe Cord.....	1 pc
AC Mains Cord(with earth lead and 3P inlet) .....	1 pc
Aluminum Case.....	1 pc

-8-

## 3. EXPLANATION OF FRONT AND REAR PANEL

Fig 2 hereunder shows the Front and Rear Panels.

- ① **POWER** Switch ON and OFF. When switch is on the LED ②③④ will show as following  
 IRON LOSS **0.00** WIDTH **20.0** THICKNESS **0.50**
- ② **IRON LOSS** LED to Display Iron Loss Value with W/kg.
- ③ **WIDTH** LED to Width with mm, can be adjusted by ⑤⑥⑦ key press.
- ④ **Thickness** LED to Thickness with mm, can be adjust by ⑤⑥⑦ key press..
- ⑤ **SETTING** Key press  to Select the corresponding number of Width or Thickness for setting.
- ⑥ **UP** Key press ▲ to set the number. The number will be up by pressing.
- ⑦ **DOWN** Key press ▼ to set the number. The number will be down by pressing.
- ⑧ **1.5** Testing Lamp and button to select 1.5 Tesla for testing NON ORIENTED Steel Sheet.
- ⑨ **1.7** Testing Lamp and button to select 1.7 Tesla for testing GRAIN ORIENTED Steel Sheet.
- ⑩ **MEASURE** Measurement button and Lamp. The test will be started by pressing MEASURE .
- (1) **Power Supply** AC Cable inlet with Fuse Holder (Additional 1 piece of 2A Fuse enclosed).
- (2) **Measuring Head** Measurement Head connect Cable inlet.
- (3) **G Calibration Window** Grain-Oriented (G) Calibration via the corresponding potentiometer.
- (4) **S Calibration Window** Non-Oriented (S) Calibration via the corresponding potentiometer.
- (5) **Scutcheon Sheet** Showing the Series Nu mber and the Date of Production.
- (6) **RRT** Press it to pirnt the testing date.
- (7) **RS232C RRINTER** Printer connect Cable inlet.





**Fig 2. The Front Panel and Rear Panel of SK-IR-3C (IMPROVED TYPE)**

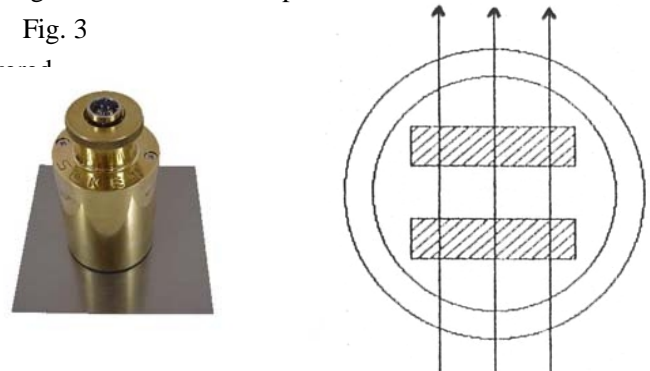
**4. PREPARATION**

4-1 The test sample should be larger than 5×20 mm and have a smooth, flat surface. -9-

4-2 Test sample should be placed on a flat wooden surface with no magnetic material within 300mm of the measured area.

4-3 MEASURING PROBE: Fig 3 hereunder shows the direction of the magnetic flux generated by the measuring probe. For most measurements this is set in the rolling direction of the sample under test. It should be kept in mind especially when Grain oriented core is measured. Fig. 3

4-4 This tester measures iron loss in the limited area defined by the probe. It is recommended that if measured results are to be compared against manufacturer’s guarantee specifications, several measurements are made at different points and a mean value calculated.



**Fig 3 Measuring Probe and Magnetic Flux**

**5. MEASURING PROCEDURE**

5-1 Check the AC Main Input Voltage and set “F”

5-2 Connect the instrument to AC Mains supply.

5-3 Connect the Printer to the interface “RS232C-PRINTER”.

5-4 Connect measuring probe and cable to the probe “HEAD”.

5-5 Turn the “POWER” switch on (most accurate measurements will be made after approximately 20 minutes warm-up time).

5-6 Select core type: flux density **1.5T** for Non-Oriented materials and **1.7T** for Grain-Oriented materials.

5-7 Set thickness of test sample by pressing **SETTING** Key press **●** to Select the corresponding number of Width or Thickness and pressing **UP** Key press **▲** and **DOWN** Key press **▼**

5-8 Place the probe on test sample and press **MEASURE** **●**. The Measuring Lamp will be bright and the Iron Loss Value will be displayed with W/kg on LED. Press **PRT**, and the testing value can be printed by the print.

**5-9 Non-Oriented core measurement:**

Watts loss values guaranteed by manufacturers are usually mean values calculated from those measured both in rolling direction and cross rolling direction of sheet. It is recommended, therefore, to measure the values in the same way with this tester and calculate mean.

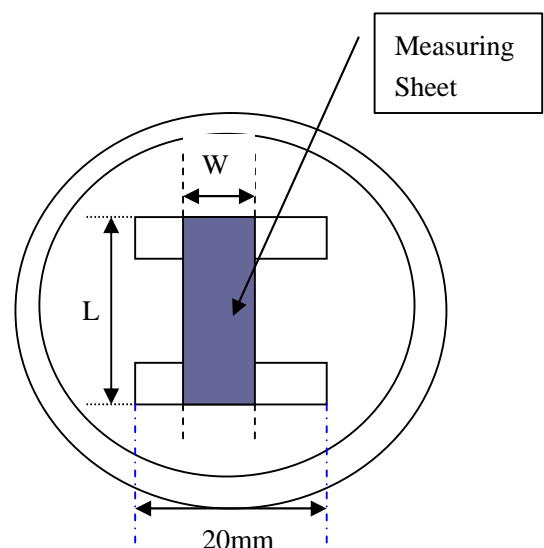
**5-10 Grain-Oriented core measurement:**

Watts loss values guaranteed by manufacturers are usually values calculated from those measured only in the rolling direction. When measuring with this tester, the measuring probe should be placed in the rolling direction and rotated to search for a minimum value.

5-11 Reading should stabilize within 2 seconds of the probe being placed on the test material, the flux density is now automatically controlled. Watts loss reading is per kilogram are taken directly on the digital meter provided on the front panel.

For most accurate measurement, the thickness of the sample should be measured with a micrometer prior to setting thickness value on instrument.

5-12 If flux density is changed during readings the measuring probe should be lifted from the test sample surface and



**Fig 4 Available Area for Measuring**

replaced in order to avoid Hysteresis errors.

## 6. SPECIAL ATTENTION

6-1 If test sample surfaces are not even and flat, measuring errors are likely to occur. In these circumstances it may assist to press the sample firmly against the measuring probe by hand.

6-2 Minimum sample sizes of  $W5 \times L20$  (mm) for the probe are required refer to Fig 4. If the Measuring Sheet is small setting (but L must be more than 20mm), measured values tend to be larger than actual values. If the Measuring Sheet is smaller than the area  $W5 \times L20$  (mm) of probe shown in Fig 4 no measurement may be made or the measuring precision will not be ensured.

**Don't set over 25mm for Width setting. If display has Error, Please restart from power.**

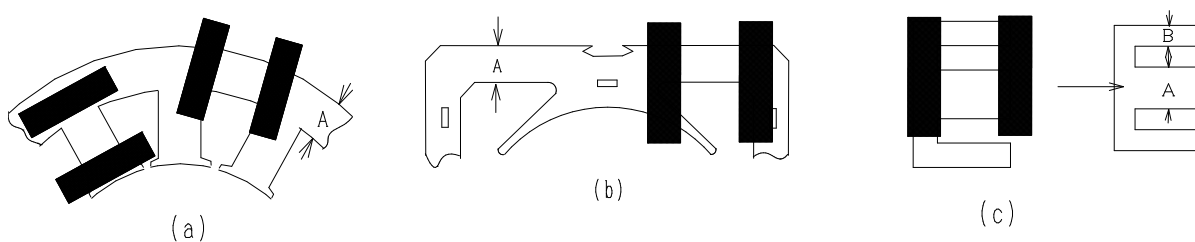
! CAUTION

- *The error,  $\pm 5\%$  of reading, in this instrument may not be guaranteed when measuring the available area less than  $5 \times 20$ mm..*

6-3 For complex shapes of Steel Sheet Measurement as Fig 5, (a) and (b) is the Stator Core Sheet Parts, (c) is a Transformer Sheet Sample. In case of (a) and (b), the measurement area within the Probe is less than 20mm Length (some circumference is covered by Probe) and the Iron Loss value will be influenced by these circumference; Also in case of (c), between the probe there will be two rectangle parts of Sheets to be measured. For above (a), (b) and (c) measurement, the Iron Loss value achieved will be a approximate data for comparing the same kind of Sheet at the same measuring position.

! CAUTION

- *The error,  $\pm 5\%$  of reading, in this instrument may not be guaranteed when measuring the complex shapes of Magnetic Sheets.*



**Fig 5 Complex shapes of completed Steel Sheet pressed**

6-4 If the **Width** or **Thickness** is not according with available volume (over or less than actual Width or Thickness), the **Iron Loss** will be not read. In this case please check and set the Width or Thickness again. You can also press the **MESURE** key incessantly for reading the volume of Iron Loss, but not over 5 Seconds.

## 7. CALIBRATION PROCEDURES

Periodic calibration checks against the standard samples provided with the instrument are recommended on at least an annual basis. Re-calibration may also be required if probes are accidentally subjected to severe mechanical shock. Standard Magnetic Sheets or Probe.

For insuring the precision, the calibration includes Non-Oriented and Grain-Oriented Adjustment by adjust the potentiometer refer to hereunder Fig 6.

If adjustment is required the outer

! CAUTION

Do not open outer cover unless the following cases:

- *The LED shows over 0.05 after Power ON and for 20 min stabilization.*
- *The measuring precision of Iron Loss value is over  $\pm 5\%$  error of reading.*

cover of the instrument need to be opened.

**! DANGER**

- *DO NOT OPEN THE TESTER CASE when AC cord is connected.*
- *DO NOT TOUCH THE TRANSFORMER CASE when tester case opened.*

-11-



**Fig 6 Calibration for two types of Magnetic Sheet via Rear Panel**

7-1 Adjustment for Grain-Oriented (G Type)Steel Sheet measurement

With ‘G’ type core (1.7T) selected, after setting the Thickness at 0.3mm (Width at 20mm) and potentiometer marked **Grain-Oriented (G)** according to Rear Panel (13) should be adjusted to give correct reading against the Value of the Standard Magnetic Sheet Sample with “-” type screwdriver.

7-2 Adjustment for Non-Oriented (S Type) Steel Sheet measurement

With ‘S’ type core (1.5T) selected, after setting the Thickness at 0.5mm (Width at 20mm) and potentiometer marked **Non-Oriented (S)** according to Rear Panel (14) should be adjusted to give correct reading against the Value of the Standard Magnetic Sheet Sample with “-” type screwdriver.

7-3 Zero Adjustment

The Zero adjustment is not needed for this improved type Tester ( In case of former type, after Power ON and 20 min stabilization treatment) the outer cover of the instrument should be removed to gain access to adjustment controls as indicated in the attached circuit diagram. The potentiometer marked m VR5 should be adjusted to give correct reading (0.00) with “-” type screwdriver from the adjustment circuit diagram of main board.(Please contact the maker if the Zero adjustment needed.)

**8. SUPPLEMENTARY EXPLANATION ON DIRECT READING IRON LOSS TESTER**  
*Calibration and Measurement*

**1) Calibration**

ZOYAN Direct Reading Iron loss Tester is so calibrated that measurement results have close correlation with those obtained by the Epstein method which is dominant inter-nationally. That is, the factory maintains the Standard Cores of different kinds (Non-Oriented and Grain-Oriented i.e. S core and G core), grades and thickness provided with watt loss data obtained by the Epstein method at mill’s laboratory. Each unit of the Iron Loss Tester is carefully calibrated with these Standard Cores so that readings are coincidental with the data of the Standard Cores.

Then 2 pcs. of sample steel sheets, ordinary 0.5mm thick Score and 0.3mm thick G core are arranged and measured by an already calibrated Tester, measurement results being shown on their surfaces.

This tester probe and measured sample sheets are combined each other and facilitate to check operating condition or re-calibrate the Tester later on Check the Tester periodically by measuring the attached sample sheets. If the readings on the Tester are coincidental with the data shown on the sample sheets, the Tester can be regarded



to maintain the original well calibrated conditions. If not, the Tester has to be re-calibrated as per the procedures explained in the operation manual.

### NOTES

\* When measuring the sample sheets, set the thickness by nominal value shown on the sheet instead of actual thickness.

\* Watt loss shown on the sample sheet is the measurement result obtained in the following way.

-12-

**Non-Oriented (S Type) Magnetic Steel Sheet:**

Probe has been placed in the rolling direction and about center of the sheet.

**Grain-Oriented (G Type) Magnetic Steel Sheet:**

Probe has been placed in the similar position as above and slightly rotated clock and counterclockwise so that reading become minimized.

\* Sample sheets have to be preserved free of bend or distortion, otherwise, watt loss will be changed.

\* The tester, its probe and sample sheets attached are aligned each other and cannot be substituted by corresponding part of other unit.

## 2) Measurement

Following matters should be kept in mind when using the Direct Reading Iron Loss Tester.

(1) Specimen to be measured should be single sheet, not stacked laminations.

(2) When making measurement, keep any magnetic materials away from the tester and specimen more than 30 cm.

(3) When repeating measurements with same specimen, it is necessary to remove the residual magnetism in the specimen after each measurement. Otherwise, reproducibility of test result will be reduced. The simple method to remove the Residual magnetism is to slant the Probe on the specimen and lift it up moderately.

(4) Some of the electronic components used in the tester have temperature characteristics. Therefore, the tester must be given warm-up for more than 15 minutes before actual use.

(5) When the tester has been left in relatively humid place so that surface of the Yoke of the probe has got rusty, then carefully grind the surface by means of fine sandpaper.

(6) When measuring small specimen by means of setting Width (5-20mm), it is suggested to hold the probe upside down and press the specimen flatly on the Yoke from above.

欢迎您光临宁波经济技术开发区凯诺仪器有限公司，为我们长久的合作关系做进一步了解。凯诺仪器真诚期待与您建立良好、长久的合作关系。

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-13-

-13-