SPS electronic
Steuerungs- und Prüfsysteme

Leakage current test device

AI 5000 series

Operating manual - table of contents

****
*
* The devices may only be put into operation by
* skilled workers or specially instructed persons.
*
* Safety regulations (VDE) must be observed !
*
****

SRS electronic
Steuerungs- und Prüfsysteme

General 1.0

After the insulation test has been carried out on the current-less device, safety tests on household appliances, lights, electrical tools, electro-medical devices, etc. must be completed by a leakage current measurement with increased rated voltage (VDE 0411).

Leakage current is the current, which can flow to the ground - in the most unfavourable case, via the user - from touchable metal parts or a metal foil (for insulating materials).

Due to safety reasons, the phase of the supply mains may not be applied to the testee's housing during testing. In the devices type AI 5000 P and AI 5001 P, this is achieved by means of an isolating transformer. In the devices AI 5000 A and AI 5001 A, a safety logic ensures recognition of the neutral wire; due to the high power (16 A at 220 V), there is no room available in the device for a safety disconnecting transformer.

Testing with the AI 5000 A and AI 5001 A can occur only when the following has been fulfilled:

1. The protective conductor must be available
2. Phase and neutral must be connected to the proper terminals

The types within the AI 5000 series are distinguished according to the following criteria:

1. Devices without isolating transformer, with a maximum current of 16 A (AI 5000 A and AI 5001 A)
2. Devices with isolating transformer, floating (AI 5000 P and AI 5001 P, denoted by the letter P)
3. Devices, whose supply isn't interrupted by the measurement (AI 5001 A and AI 5001 P, denoted by the number 1)
4. Devices for fully-automatic operation (AI 5000 L, denoted by the letter L)

The desired test procedure can be selected by actuating the corresponding pushbuttons or switches. Simultaneous actuation of several pushbuttons must be avoided.

SES electronic
Steuerungs- und Prüfsysteme

General 1.0

If the testee's supply voltage differs from that of the test device's, an external feed-in of test voltage can occur.

Please note:

```
**********************************************************
*                                                        *
*   If the operating mode "intern" (internal) has        *
*   been selected, supply voltage is available           *
*   from the laboratory sockets "extern" (external).     *
*                                                        *
*   In this case, voltage may not be fed-in !!!          *
*                                                        *
**********************************************************
```

SES electronic
Steuerungs- und Prüfsysteme

SES electronic
Steuerungs- und Prüfsysteme

General 2.1

The standard device is for a mains voltage of 220 V (50 Hz) (other voltages on request). The supply voltage is fed via a cold-appliance socket (for table housings) or via a multiple connector (plug-in housing).

Device fuses 2.2

a) Measuring instrument supply

The mains voltage for the supply of the measuring instrument is located on the back panel of the plug-in unit. This fuse is not for test voltage!
The fuse is designated with "Netz 2A" .

b) Test voltage (internal and external)

The circuit breaker located on the front panel fuses the test voltage. A max. of 16 A is available for the AI 5000 A and AI 5001 A devices, a max. of 2 A for the AI 5000 P and AI 5001 P devices.

SFS electronic
Steuerungs- und Prüfsysteme

SES electronic
Steuerungs- und Prüfsysteme

General 3.1

All devices of the AI 5000 series have an interface which enables remote-control operation of the device. All signals are floating with respect to mains and to test voltage.

Analog and digital signals are also floating.

All indications made are valid for the AI 5000 A, AI 5001 A and AI 5001 L devices. Any differing data for the AI 5000 P and AI 5001 P devices is indicated in brackets.

Test object connections for the AI 5000 L device are located on the back sheet, accessible via terminals. This only goes for this type !

SRS electronic
Steuerungs- und Prüfsysteme

AI 5000 series assignment 3.2

in accordance with DIN* 41 622

PE	<a0>	Protective wire
L1	<a9>	Phase of mains 220 VAC +/- 10 % 2 A max.
N	<a8>	Neutral wire of mains
Set	<b6>	In order to enable fully- automatic operation, the device can be put into readiness by means of a pulse at this input. This must occur after each error, however, it can also occur periodically. A signal may not be on hand here during the test procedure, because otherwise the device won't be able to safeguard itself. The feed-in into Set doesn't result in any voltage at the output, however, it is a prerequisite. The signal is fed-in to GND. The level and times are indicated in section 3.3.
Start A1 (Start A)	<b5>	If a signal is being applied, testing is carried out according to procedure A1 (A). Feed-in to GND.
U	<a5>	Normalized output signal for test voltage. Measured to GNA.
Start A2 (Start B)	<b4>	If a signal is being applied, testing is carried out according to procedure A2 (B). Feed-in to GND.
I	<a4>	Normalized output signal for leakage current. Measured to GNA.
Start B1 (Start S1)	<b3>	If a signal is being applied, testing is carried out according to procedure B1. Feed-in to GND (for the AI 5001 A and AI 5001 P devices, the supply to the testee is cut in by means of this signal).

DIN* = Deutsche Industrie-Normen (German industrial standards)

SES electronic
Steuerungs- und Prüfsysteme

Assignment AI 5000 series 3.2

in accordance with DIN 41 622

GNA	<b2>	Reference potential for analog signals (U/I). Floating to mains, test voltage and GND.
F	<b1>	If the set limit value for leakage current is exceeded, or if the test voltage is switched off or interrupted, a relay closes this connection to GND.
GND	<a1>	Reference potential for digital signals. Floating to mains, test voltage and GNA.
L1 IN	<b9>	Phase of the test voltage. The desired test voltage can be fed-in here. Not available for AI 5000 L device.
N IN	<b8>	Neutral of the test voltage. The desired test voltage can be fed-in here. Not available for AI 5000 L device.

Supplementary to AI 5000 L device, terminal connections.

PE		Protective wire
L IN	< 1>	Phase of the test voltage
N IN	< 2>	Neutral of the test voltage
pe	< 3>	Protective wire connection of test object
l1	< 4>	Phase of the test object
n	< 5>	Neutral of the test object

SCS electronic
Steuerungs- und Prüfsysteme

Index/p = Test voltage, or test current

Index/m = Measuring voltage
(the dc voltage accessible at the output and corresponding to the test voltage or to the test current)

GND = Reference potential for digital signals

GNA = Reference potential for analog signals

pe, l1, n : Supply connections for the test object

voltage	:	220 V - 250 V adjustable
current	:	16 A max. (2 A)
frequency	:	same as Input
fuse	:	16 A (2 A)

PE, L1, N : Supply mains

voltage	:	220 V +/- 10 %
frequency	:	50 Hz - 60 Hz
power	:	250 VA
fuse	:	2 A

Set : Set-Signal

voltage	:	12 VDC
ripple	:	< 30 %
internal resistance	:	1.2 kOhm
tolerance	:	+/- 30 % (same)
pulse duration	:	> 50 ms
note	:	The pulse must occur each time the device is triggered. Start and Set may not be set at the same time.

Start A1, A2, B1 (A, B, S1) : Start signal for A1, A2, B1 (A, B, S1)

voltage	:	12 VDC
ripple	:	< 20 %
internal resistance	:	1.2 kOhm
tolerance	:	< 20 %

U : Test voltage U/p

voltage	:	0 - 10 VDC
current	:	10 mA max.
residual ripple	:	0.8 V max.
error	:	1.5 % max. typically 0.5 %
function	:	$U/m\ (V) = U/p\ (V/eff) \times \frac{1}{30}$
note	:	floating to mains, test voltage and GND

I : Leakage current I

voltage	:	0 - 10 VDC
current	:	10 mA max.
residual ripple	:	0.8 V max.
error	:	1.5 % max. typ. 0.5 %
function	:	a) for final value I=0.1 mA $U/m\ (V) = I/p\ (mA) \times \frac{100\ V}{mA}$ b) for final value I/p=1 mA $U/m\ (V) = I/p\ (mA) \times \frac{10\ V}{mA}$ c) for final value I/p=10 mA $U/m\ (V) = I/p\ (mA) \times \frac{1\ V}{mA}$
note	:	floating to mains, test voltage and GND

GNA : Reference potential for analog signals

note	:	floating to test voltage, mains and GND

SES electronic
Steuerungs- und Prüfsysteme

F : Error output

voltage	:	28 VDC/AC max.
current	:	0.1 A max.
voltage drop	:	< 0.1 V
note	:	Switching occurs to GND. The connection is floating.

GND : Reference potential for digital signals

note	:	floating with respect to test voltage, mains and GNA.

SAS electronic
Steuerungs- und Prüfsysteme

SFS electronic
Steuerungs- und Prüfsysteme

Mains switch or key switch (option) 4.1

Actuate mains switch or key switch.
The mains pilot lamp must light up.

Polarity (only for the AI 5000 A and AI 5001 A devices) 4.2

If the test voltage is connected to the wrong terminals, or if the test object isn't connected to the protective conductor, this is indicated by the LED "Polung" (polarity) and the warning buzzer. The device isn't ready to be switched on in this condition. The actuation of controls has no effect.

If the power plug is plugged in correctly, and the protective conductor is in order, the LED "Polung" (polarity) goes off and the device is ready to be switched on (buzzer continues to sound).

Reset 4.3

When the conditions indicated in 4.1 and 4.2 have been fulfilled, the LED "Fehler" (error) lights up. If an (internal or external) test voltage of at least 100 V is available, the device can be put into operation by means of the "Reset" pushbutton. Now the LED "Fehler" (error) goes out and the warning buzzer is switched off. If the set limit value for leakage current is exceeded, this is indicated by the warning buzzer and the LED "Fehler" (error). After removing the test object, the device can be put back into operation via the "Reset" button.

```
**********************************************************
*                                                        *
*  In order to avoid an error in operation, the device   *
*  can only be started via the "Reset" pushbutton if     *
*  the test voltage equals at least 100 V. Whether       *
*  or not this is the case can be read off the           *
*  instrument!!!                                         *
*                                                        *
**********************************************************
```

SES electronic
Steuerungs- und Prüfsysteme

Limit values 4.4

The set limit value (max. leakage current) can be indicated visually on the ammeter (according to type) via the "Test" pushbutton.

The limit value is continuously variable in two ranges from 0.1 mA to 10 mA.

The range change-over for current applies to both the measuring device and the limit value.

Test voltage 4.5

The test voltage (internal or external test voltage) can be read off the voltmeter.
The fed-in test voltage for the AI 50000 A, AI 5001 A and AI 5000 L devices can be set at approx. 30 V above the limit. A setting from 0 to 250 V is possible for the AI 5000 P and AI 5001 P devices.

Test object connections 4.6

The test object can be connected via the front panel socket or via the safety laboratory sockets. The yellow laboratory socket (pe) can be used for the feedback action for devices without non-fused earthed conductor connection. Supply voltage or test voltage can also be taken separately via the laboratory sockets.

External test voltage 4.7

The laboratory sockets located on the front panel allow the feed-in of an external test voltage. The "Intern/Extern" internal/external) switch must be flicked to Extern.

```
**********************************************************
*                                                        *
*   Switching to "Intern" may not occur whilst an        *
*   external test voltage is being fed-in !!!            *
*                                                        *
*                                                        *
**********************************************************
```

SES electronic
Steuerungs- und Prüfsysteme

Selecting the test procedure for AI 5000 A, AI 5000 P and AI 5000 L 4.8

The test procedure is selected by means of the A1, A2, B1 pushbuttons. Testing can only be carried out if a pushbutton is actuated.

A1 : The set test voltage (produced internally or externally) is fed to the test object via the schuko socket or the laboratory sockets. Leakage current is measured via the non-fused earthed conductor connection of the schuko socket or the yellow laboratory socket.

A2 : Same as A1, however, the phase and neutral wire are transposed by the test apparatus. The A1 and A2 test procedures are both carried out during operation (test object).

B1 : The supply connections of the test object (or outputs of the test device 1, n) are short-circuited and are connected to the phase of the test device. The test object feedback is connected to the neutral wire of the test voltage via the measuring circuit. The leakage current test is not carried out in operation.

Selecting the test procedure for AI 5001 A and AI 5001 P 4.9

S1 : Test voltage is applied to the test object.

A : Measuring circuit of test device is switched to phase.

B : Measuring circuit of test device is switched to neutral wire.

SGS electronic
Steuerungs- und Prüfsysteme

Data sheet AI 5000 Series 5.0

Dimensions:

width : 464 mm
depth : 310 mm
height : 177 mm
corresp. to: 19" / 4 HU

Weight:

gross : 58 N

Mains:
(for measuring instrument)

voltage : 220 V +/- 10 %
frequency : 50 Hz - 60 Hz
power : 200 W
fuse : 2 A slow-blow

Mains:
(for internal test voltage)

voltage : 100 V - 300 V
frequency : 40 Hz - 500 Hz
power : 4.8 kW max.
fuse : 16 A (automatic cut-out on the front panel), or 2 A for floating devices

Test voltage:

range : 100 V - 300 V
frequency : 40 Hz - 500 Hz
current : 16 A max., or 2 A for floating devices

Voltage measurement

Range : 0 - 300 VAC
40 Hz - 500 Hz
105 degree scale
class 1,5
floating to mains and test voltage

Current measurement:

Range 1 : 0 - 1 mAAC
40 Hz - 500 Hz
105 degree scale
class 1, 5
floating to mains and test voltage

Range 2 : 0 - 10 mAAC
40 Hz - 500 Hz
105 degree scale
class 1,5
floating to mains and test voltage

Limit-value setting:

Range 1 : 0.1 mAAC - 1 mAAC
Range 2 : 1 mAAC - 10 mAAC
Note : the set limit value can be rendered visible on the ammeter. ("Test" pushbutton).
Note : For AI 5000P and AI 5001P devices, the ranges for current and limit value are multiplied by the factor 0.1

Selection switch:

internal/external

SIS electronic
Steuerungs- und Prüfsysteme

Protective measures:

electronic fuse

warning buzzer

internal checking of protective wire connection

two separate circuits for phase recognition

blocking of all controls in case of defective protective wire or if the poles are connected improperly (also for external feed-in)

Features:

warning buzzer

external feed-in

two current ranges

continuously-variable fuse

warning buzzer

three separate circuits for safety cut-off

directly applicable for automatic test procedure

floating outputs for current and voltage

SES electronic
Steuerungs- und Prüfsysteme

SP000030

Schwäbisch Hall, July 01, 199

Spare-parts list no. 30 for AI 5000A leakage-current testers

P = priority (1=very important)
L = delivery period
MS = minimum quantity
MI = amount in device
Pl = price index

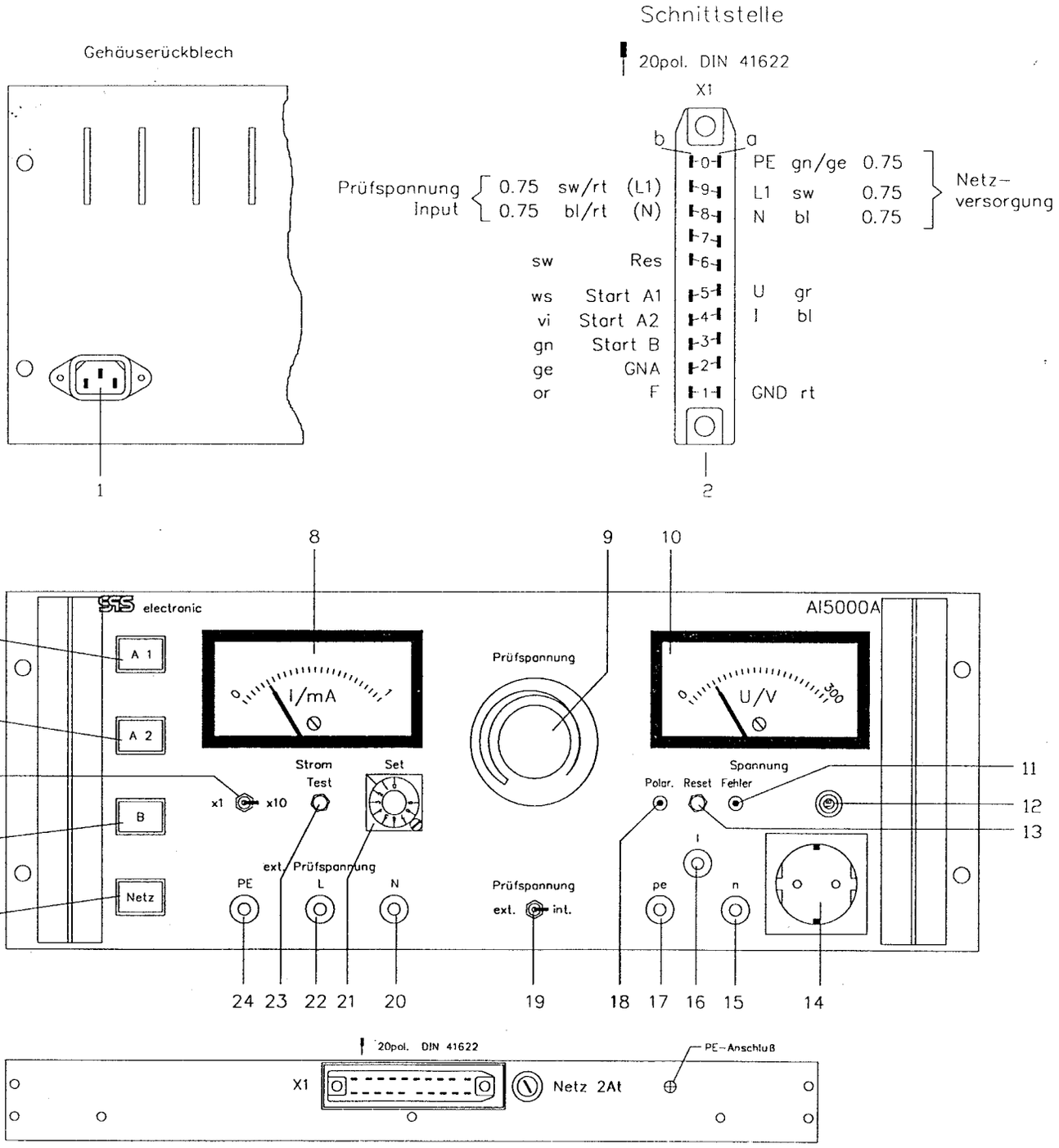
System no. :
Feature :

Item no	Item	Type	P	L	MS	MI	Pl
XXXXXX	Complete plug-in unit	AI 5000A	3	6	1	1	967
XXXXXX	Plug-in housing	EH 1904-a	3	4			97
890035	Jack plug-in unit	BU 20-n	3	4			9
890171	Power supply	ST 300a	2	4	1	1	152
890155	Measurement current/voltage	U1 300a	2	4	1	1	221
890172	Polarity recognition	N 300a	2	4	1	1	148
890156	Relay unit	Rel 300a	2	4	1	1	80
850022	Transformer test voltage	AI 1	2	4	1	1	36
850025	Transformer measurement	AI 2	2	4	1	1	17
850000	Variable-ratio trans. 2A	220V/220V	2	4	1	1	50
840150	Ceramic potentiometer	10k/lin.	2	4	1	1	8
840071	Analog instrument 10VDC	10mA	2	4	1	1	36
840073	Analog instrument 10VDC	300VAC	2	4	1	1	36
840165	Automatic circuit breaker	16A	2	4	1	1	13
830482	Earthing-contact type plug	built-in, black	2	4	1	1	3
820090	Resistor	5k6/4W	2	4	5	1	1
840009	Pushbutton	1*CHANGE-OVER	2	4	1	2	4
840021	Switch	2*ON Rafi	2	4	1	1	8
840019	Pushbutton	1*ON Rafi	2	4	1	3	7
840023	Switch	1*CHANGE-OVER	2	4	1	2	2
860003	Relay (contactor)	DIL 00-M4	2	4	2	4	15
840018	Incandescent bulb	30V	1	2	5	1	1
840016	Incandescent bulb	12V	1	2	5	3	1
820467	Fuse	2 A slow-blow	1	2	10	1	1

- All prices, which aren't listed, according to the valid price index.
- Offer firm for 6 months, after which the prices are subject to change.
- There will be a DM 25,- surcharge on all orders under DM 250,-.
- Delivery ex works, 30 days net.

Technische Unterlagen

Ableitstromprüfgerät AI5000A



Achtung !

Wird das Gerät in Verbindung mit dem Gehäuse EH 1904 betrieben, sind die Brücken a9/b9 und a8/b8 (≙ Gehäuse EH 1904-a) nötig.

Layer
Text deutsch:__ deutsch
Text engl.:_____ engl

SRS electronic				
BltNR:	Bl.Nr.	Zeichner:	Datum:	AuftragNR:
Original:		H.Schwarz	23.02.1990	Frontplatte
Projektleiter:		M. Stier	12.07.1996	
Projekt:		Technische Unterlagen AI5000A		