tradition

of modernity

ZWARpol

HIGH AND MEDIUM VOLTAGE TESTING APPARATUS AND SYSTEMS

POLSKIE CENTRUM BADAŃ I CERTYFIKACJI S.A.
02-699 Warszawa, ul. Kłobucka 23A

СЕРТИФИКАТ СООТВЕТСТВИЯ
СИСТЕМЫ КАЧЕСТВА

№ 2083/1/2008

Fabryka Aparatów Elektrycznych
„ZWARPOL" Sp. z o.o.
ul. Żegańska 1, 04-713 WARSZAWA

проектирование, производство, продажа и сервис
аппаратуры распределения
и управления электрической энергией

PN-EN ISO 9001:2001

Сертификат действителен:
с 2008-08-18 по 2011-08-17

ДИРЕКТОР
ТАДЕУШ ГЛАЗЕР

Варшава, 2008-08-18

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and PCBC
hereby certify that the organization

Fabryka Aparatów Elektrycznych
„ZWARPOL" Sp. z o.o.
ul. Żegańska 1, 04-713 WARSZAWA

for the following field of activities

design, production, sale and service of
apparatus of distribution
and steering electric energy

has implemented and maintains a

Quality Management System

which fulfills the requirements of the following standard

PN-EN ISO 9001:2001

Issued on: 2008-08-18
Validity date: 2011-08-17
PCBC certified since: 2008-08-18

Registration Number: PL – 2083/1/2008

René Wasmer
President of IQNet

Dr. Wojciech Henrykowski
President of PCBC

POLSKIE CENTRUM BADAŃ I CERTYFIKACJI S.A.
02-699 Warszawa, ul. Kłobucka 23A

CERTYFIKAT SYSTEMU
ZARZĄDZANIA JAKOŚCIĄ

Nr 2083/1/2008

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projektowanie, produkcja, sprzedaż i serwis
aparatury rozdzielczej i sterowniczej
energii elektrycznej

PN-EN ISO 9001:2001

DYREKTOR
ds. Badań i Certyfikacji
TADEUSZ GLAZER

Warszawa, 2008-08-18

Międzynarodowe Targi Poznańskie

ZŁOTY MEDAL
Międzynarodowych Targów Poznańskich

dla:
Automatyczne stanowisko diagnostyczne do badania dielektrycznego sprzętu ochrony osobistej

Producent:
Fabryka Aparatów Elektrycznych „ZWARPOL" Sp. z o.o.
Warszawa

Międzynarodowe Targi Energetyki
EXPOPOWER 2009

Międzynarodowe Targi Poznańskie
Poznań International Fair

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CERTIFICATE OF QUALITY
MANAGEMENT SYSTEM

No. 2083/1/2008

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PN-EN ISO 9001:2001

DIRECTOR
for Testing and Certification
TADEUSZ GLAZER

Warsaw, 2008-08-18

Automatyczne
stanowisko diagnostyczne
UPG40
do badania dielektrycznego
sprzętu ochrony osobistej

Kwalifikacja do Konkursu
na szczególnie wyróżniający się produkt
prezentowany na targach
ENERGETAB 2009

Przewodniczący
Komisji Konkursowej
mgr inż. Tomasz Kołakowski

Przewodniczący Komitetu
Programowo-Organizacyjnego
mgr inż. Ryszard Migdalski

Aparat
do badania oleju
typ ABO 80EP

Przewodniczący Komitetu
Programowo-Organizacyjnego
mgr inż. Ryszard Migdalski

Ladies and Gentlemen,

I am honored to introduce the company F.A.E. Zwarpol Sp. z o.o. – the leader on the market of heavy power devices and installations.

The professional career of the founders and engineers started at the Company Zakłady Wytwórcze Aparatury Wysokiego Napięcia ZWAR, heir to the glorious tradition of Kazimierz Szpotański, a great pioneer of electrical industry in Poland.

Our Factory deals with manufacturing and servicing both medium and high voltage test equipment, high voltage lab apparatuses as well as production of complete test stands for personal protective equipment, electric insulation equipment and special purpose current and voltage transformers.

Our specialized staff takes care of satisfying all still increasing requirements of Customers basing upon ISO 9001 Quality Management System.

In order to meet your personal needs we offer top quality devices which comply with the provisions of pertinent EU standards. Due to our knowledge of electric equipment, bolstered up by a long time practice in this field, we can be open to any atypical designs and modern workmanship techniques.

Bearing in mind the satisfaction of our Customers, we can offer competitive products which will guarantee the development of your companies.

Yours faithfully,

Jacek Rados
President of the Board

Table of contents:

Our Company reserves the right to introduce changes in order to improve the quality of the presented devices.

ABK test devices for cables testing

ABK test devices are perfect for performing acceptance tests on medium voltage power cables. Compact sizes and an ergonomic structure will guarantee their simple application in field tests.
ABK for cable tests, also named 'KENETRON", have enjoyed reliability among many home and foreign customers.
ABK devices are half wave rectified voltage sources of voltage. Yet, due to a simple removal of the rectifier it is also possible to obtain AC voltage.

Characteristics:

ABK Type C

- Various ranges of rectified voltage – according to the model: 45, 55, 63 or 70 kV;
- Digital meters to meter current and voltage RMS values;
- Measurement of DC and AC components of leakage currents
- Minimized errors of voltage measurements.

ABK 45C
ABK 55C

ABK 63C

ABK 70C

ABK type A

- Various ranges of rectified voltage – according to the model: 45, 55, 63 or 70 kV;
- • Analog and digital current and voltage meters;
- • Measurement of the DC component of leakage currents.

ABK 45A
ABK 55A

ABK 63A

ABK 70A

Technical data:

Type		ABK-45C	ABK-45A	ABK-55C	ABK-55A	ABK-63C	ABK-63A	ABK-70C	ABK-70A
Supply voltage 50 Hz	V	230	230	230	230	230	230	230	230
Secondary alternating voltage	kV	0-32	0,32	0-39	0-39	0-45	0-45	0-50	0-50
Secondary rectified voltage	kV	0-45	0-45	0-55	0-55	0-63	0-63	0-70	0-70
Max continuous current	mA	6	6	6	6	10	10	5	5
Max 30 minute current	mA	10	10	10	10	15	15	6	6
DC test voltage on device	kV	54	54	66	66	76	76	84	84
Accuracy of voltage measurements	%	±2	±4	±2	±4	±2	±4	±2	±2
Accuracy of current measurements	%	±2	±3	±2	±3	±2	±3	±2	±3
DC voltage polarity	-	+	+	+	+	+	+	+	+
Weight	kg	26	26	26	26	48	48	40	40

Advantages::

- Infinitely variable voltage control;
- Safety interlock to prevent an inadvertent power connection;
- Overload protection of the device – with an electronic overcurrent
- release;
- Easy use due to appropriate control and signaling systems
- Ergonomic structure which makes tests easier;
- Mobility;
- Possible application as a source of rectified or AC high voltage;
- Adaptation to field tests due to a solid housing made of aluminum alloy and possible removal of the rectifier;
- Manufacturing process parameters comply with the Quality
- Management System acc. to PN-EN ISO 9001:2009.

Optional features:

- Discharge rod;
- High voltage lead – according to the customer's needs..

ABO devices for testing breakdown voltage of oil

ABO test devices are designed for testing the dielectric strength of insulating fluids. They are perfect for testing mineral and synthetic oils. The said devices are applied in company laboratories which deal with manufacturing, operation or service of transformers, oil circuitbreakers, transformers and capacitors.

Characteristics:

- Various voltage ranges on test electrodes – according to the model: 60, 80 or 100 kV;
- Usually, the device is equipped with spherical test electrodes with a diameter of 36.0 mm. Optionally, available are also diameters of 12.7 mm
- Tests are carried out according to 7 programs which comply with home and foreign standards;
- Available are two device versions, viz.:
  1. ABO-D (with a LCD touch screen and a thermal printer which allows to print test records);
  2. ABO-A (with a LED display, without printer);
- A RS232 interface to communicate with a computer.

ABO 80D incl. a touch panel and a thermal printer

Advantages:

- Possibility of measuring both mineral and synthetic oils;
- Tests acc. to own usage schedule – programmable are test voltage value, voltage increase rate, testing time and /or mixing time:
- Safety interlock to prevent an inadvertent power connection when the cover is open;
- Tests in accordance with home and foreign standards;
- Ergonomic design facilitating proper test performance;;
- Automatic calculation of measurements average values and of the standard deviation;
- Possibility of printing out the test results (optional);
- Optional implementation of temperature meter of the tested oil;

Manufacturing process parameters comply with the Quality Management System acc. to PN-EN ISO 9001:2009.

Technical data:

Type		ABO-60A ABO-60D	ABO-80A ABO-80D	ABO-100A ABO-100D
Supply voltage 50 Hz	V	230	230	230
Max voltage on testing electrodes	kV	60	80	100
Voltage increase rate	kV/s	0,1-5 programmable	0,1-5 programmable	0,1-5 programmable
Accuracy of voltage measurements	%	<2	<2	<2
Mixing time	min	0-20 programmable	0-20 programmable	0-20 programmable
Weight	kg	40	43	45
Working condition • temperature • relative humidity		 from 0 to +40°C <80%	 from 0 to +40°C <80%	 from 0 to +40°C <80%
Overall dimensions	mm	550 x 290 x 550 (h)	550 x 290 x 550 (h)	550 x 290 x 550 (h)

ABI-40 device for dielectrics testing

A ABI-40 device is used in laboratories testing dielectrics as well as in education

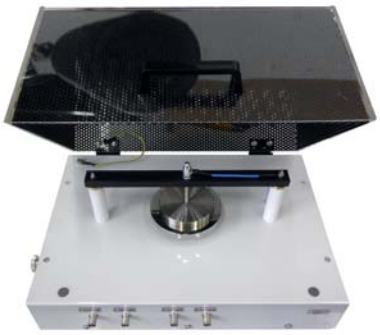
Characetristics:

A ABI-40 tester is a device designated for testing the dielectric strength of insulating material samples ranging from 0 to 40kV. The testing sequence is performed automatically acc. to the parameters introduced by the user.

- Programmable, automatic performance of the test with digital measurement and recording the breakdown voltage,
- A transparent cover of the testing chamber, incl. an EMC screen and a closure sensor,
- Testing electrodes allow for uniform clamping force of each sample,
- A measurement vessel integrated with the electrodes allowing for testing the sample inside oil.

ABI-40

SBR2



SBP

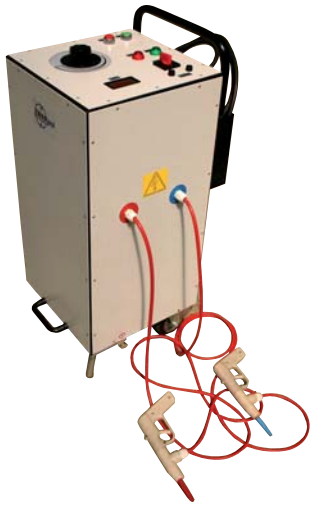
Technical data:

Type		ABI-40
Supply voltage 50Hz	V	230
Max voltage on testing electrodes	kV	40
Voltage increase rate	kV/s	0,1-5 programmable
Accuracy of voltage measurements	%	<2
Weight	kg	30
Working condition - temperature - relative humidity		 from 0 to +40°C <80% (without outdropping of water)
Overall dimensions	mm	550 x 290 x 550 (h)

HV and MV testing devices

AP testing devices constitue adjustable AC, DC or AC and DC supply sources. They are used in laboratories for insulation measurements of systems with high internal capacitance. They are comprehensible, simple in use and safe tools for checking the dielectric strenght of insulation systems.

Characteristics:



AP2-5

- Max testing voltage up to 5 kV;
- The voltage measurement performed on the low voltage side. A digital voltage meter calibrated in kilovolts;
- Possible is to manufacture the device with two insulated clamps or with one earthed clamp and one insulated clamp

AP1-12

- Two ranges of max testing voltage, up to 6 kV or up to 12 kV;
- A mocroprocessor contrloller allows for programming the voltage value, voltage increase range and testing time;
- a switchable winding allows for obtaining two voltage ranges, which means a better accuracy of both settings and measurements;
- Voltage measurement can be performed on the low voltage side, or from the measurement tap running from the high voltage winding. The voltage meter is scaled in kV;
- Current and voltage digital meters.

AP05-5

- Max testing voltage up to 5 kV;
- A mocroprocessor contrloller allows for programming the voltage value, voltage increase range and testing timey;
- Voltage measurement is performed on the high voltage side, via a voltage divider,;
- Current and voltage digital meters;
- Possible is to manufacture the device with two insulated clamps or with one earthed clamp and one insulated clamp (current measurement only on the other side of the structure);
- Switching the high voltage realized on a gun or on the front panel.

AP1-10

- Two ranges of AC or DC max testing voltage up to 5 kV and 10 kV;
- A microprocessor controller allows for programming the voltage value, voltage increase range and testing timey;
- A switchable winding allows obtaining two voltage ranges, which means a better accuracy of both settings and measurements;
- Voltage measurement is performed on the high voltage side, via a voltage divider;
- Current and voltage digital meters.

Technical data:

Type	AP2-5	AP1-12	AP05-5	AP1-10
Supply voltage	230V	230V	230 V	230 V
Secondary voltage adjustable	0-5 kV AC	0-6kV lub 0-12kV AC	0-5 kV AC	0-10 kV AC 0-10 kV DC
Max current of the HV side	0,4A	0,1A	100 mA	150 mA AC 5 mA DC
Accuracy of voltage measurements	±3%	±3%	±2%	±2%
Voltage increase rate		0,05 – 0,5 kV/s	0,05 – 0,5 kV/s	0,05 – 0,5 kV/s
HV circuits testing value	6kV AC	14kV AC	6kV AC	12 kV AC
Testing voltage of the low voltage circuits	2kV	2kV	2kV	2kV
Dimensions	360x490x880(h) mm	360x490x880(h) mm	489x450x193(h) mm	489x450x320(h) mm
Weight	70 kg	60 kg	22 kg	65 kg

Advantages:

- Choice of the operation mode - automatic or manual (except AP2-5);
- Overload protection of the device – with an electronic overcurrent release;
- A control autotransformer with a motor drive (except AP2-5)
- A simple operation and clear signaling system;
- Safe use due to an option of using convenient 'gun' electrodes on the leads;
- Versatile application;
- As a standard practice, the devices are provided with high voltage leads;
- Manufacturing process parameters comply with the Quality Management System acc. to PN-EN ISO 9001:2009.

AP03-30, AP03-40, AP03-50 devices

- Max testing voltage according to the type up to 30, 40, 50 kV.
- Voltage measurement is performed on the low voltage side.
- The voltage meter is scaled in kV.
- Version A - analogue meters
- Version A - digital meters and timer

AP03-30A

AP03-40C

AP03-50C

Technical data:

Typ		AP03-30 A i C	AP03-40 A i C	AP03-50 A i C
Supply voltage 50 Hz	V	230	230	230
Secondary AC voltage	kV	0-30	0-40	0-50
Max continuous current	mA	6	6	6
Max current 30-min	mA	10	10	10
Accuracy of voltage measurements	%	±2	±2	±2
Current measurement accuracy	%	±2	±2	±2
Weight	kg	26	26	40

Advantages:

- Infinitely variable voltage control;
- Safety interlock to prevent an inadvertent power connection;
- Device protection with electronic overcurrent-short circuit trip;
- Easy use due to appropriate control and signaling systems;
- Ergonomic structure which makes tests easier;
- Mobility;
- Adaptation to field tests due to a solid housing made of aluminum alloy;
- Manufacturing process parameters comply with the Quality Management System acc. to PN-EN ISO 9001:2009.

Optional features:

- High voltage lead's lenght according to the customer's needs.

Testing device with Parameteres deviating from typical can be manufactured on request.

Test transformers

TP test transformers are sources of high AC voltage (or, if provided with a rectifier, also of DC voltage). They are used in lab tests on dielectric strength of devices as well as in test systems designed for diagnosing electric insulation equipment.
Nowadays, we manufacture test transformers with secondary voltages of up to 300 kV and powers of up to 100 kVA.

Characteristics:

Test transformers - type TP 10

- Power: up to 10 kVA;
- Maximum secondary voltage up to 300 kV;
- Transformer can be provided with a measurement tap placed on the high voltage winding;
- Two ranges of secondary voltage due to a two-section primary winding which allows to change the transformer vintage ratio;
- Resin housing;
- Paper and oil insulation;
- Cascade structure is possible.

TP10 - AC

TP10 - DC

TPJ testing devices

- Power: up to 100 kVA;
- Max secondary voltage up to 300 kV
- Rugged structure guarantees tightness and save movement of the transformer;
- The transformer can be provided with a measurement tap placed on the high voltage winding;
- Two ranges of secondary voltage due to a two-section primary winding which allows to change the transformer vintage ratio;
- Steel housing;
- Paper and oil insulation;

TP50J

TP6J

Exemplary technical data of testing transformers:

Type		TP2-40	TP10-250	TP6J-60	TP50J-100
Supply voltage 50 Hz	V	230	230	230	230
Secondary voltage	kV	20-40	125-250	30-60	50-100
Max continuous current	mA	50	40	100	500
Max 15-minute current	mA	60	48	120	800
Testing value 50 Hz	kV	48	300	72	120
Short-circuit voltage	%	5	5	5	5
Height	mm	870	2050	1240	2000
Weight	kg	90	530	180	950

Special purpose test transformers, type TPS

- A structure allowing to obtain a transformer with four ranges of voltage and two ranges of power;
- Optimum selection of transformer parameters according to the requirements for a high voltage test;
- Such transformers are used, among others, in test systems for checking insulating rods and mats;
- A measurement tap on the transformer core;
- A resin housing
- Paper and oil insulation;

TPS110 3/6 kVA

TPS110 2/4 kVA

Exemplary technical data of testing transformers:

Type	TPS110 3/6 kVA	TPS 110 2/4 kVA
Supply voltage 50 Hz	230 V	230V
Secondary voltage	55/110 kV	55/110 kV
Measurement tap secondary voltage	20/40 kV	20/40
Measurement tap max continuous current 20/40 kV	150 mA	100 mA
Max continuous current 55/110 kV	55 mA	36 mA
Weight	250 kg	120 kg
Overall dimensions [mm]	610 x 790 x 1500 (h)	400 x 560 x 1400 (h)

Advantages:

- Low level of dielectric discharges;
- Light housing;
- Mobility;
- A robust design;
- Manufacturing process parameters comply with the Quality Management System acc. to PN-EN ISO 9001:2009.

Testing transformers of parameters different to typical can be manufactured on request. Voltage control and measurement can be performed via panels or portable cases, PS series manufacured by Zwarpol and voltage dividers, DNC or DNRC series manufacured by Zwarpol .

DN series of voltage dividers

DN voltage dividers are used for voltage measurements in high voltage lab systems.

Characteristics:

- Voltage ranges – up to 300 kV;
- Made basing upon selected low loss polypropylene capacitors
- Measurements of voltages, harmonic components and possible connection to an oscilloscope - both for AC voltages – DNC capacitive dividers, and DC voltages – DNRC type capacitance and resistance dividers;
- Dry type devices.

DNC -150

DNRC - 250

DNR - 250

Technical data:

Typ	DNC-150	DNRC-150	DNR-250	DNC-300	DNRC-300
Voltage range [1)]	0-150 kV		0-250 kV	0-300 kV	
DC	-	X	X	-	X
AC	X	X	X	X	X
Measurement accuracy	0,5%	1,5% for DC 0,5% for AC	0,5%	0,5%	1,5% for DC 0,5% for AC
Capacitance	78pF	78pF	-	39pF	39pF
Resistance	-	688,8MΩ	2500MΩ	-	1,38GΩ
Dimensions [mm]	Φ 500x1200		Φ 800x1750	Φ 800x1850	
Weight	37 kg		55 kg	65 kg	

1) Other voltage values possible for manufacturing on request.

Advantages:

- A safe structure
- A device scaled with a digital meter
- High quality construction materials
- Mobility
- Small weight
- The process parameters comply with the Quality Management System – according to PN-EN ISO 9001:2009.

AC/DC kV-meters

DN kV-meters are used in high voltage test systems and may be used in measurements of AC and DC voltages. Moreover, they can be connected to an oscilloscope. Available are both a meter version with a LED display which measures exclusively the RMS voltage and an option with a multifunction LCD display with a touch screen to measure the RMS, average and peak voltage value with an option of graphic representation of the course under examination.

Characteristics:

- A kV-meter is designed for measuring high AC or rectified voltages.
- The device consists of a capacitive divider or a capacitancy-and-resistance divider made of selected, low loss polypropylene capacitors and a MU-1 voltage meter connected t to the lower segment of the divider.
- The lower segment of the divider consists of two branches of capacitors, which permits to change the measuring range.

KDN 250 kV-meter

Technical data:

Type							
Voltage range	kV	0 ÷ 110		0 ÷ 150		0 ÷ 250	
Constant voltage	-	-	X	-	X	-	X
AC voltage	-	X	X	X	X	X	X
Measurement accuracy	%	0.5	0.5 for AC 1.5 for DC	0.5	0.5 for AC 1.5 for DC	0.5	0.5 for AC 1.5 for DC
Capacitance	pF	110		80		40	
Resistance	MΩ	-	510	-	700	-	1400
Dimensions	mm	φ400 × 1200		φ500 × 1200		φ800 × 1850	
Weight	kg	30		37		65	

1) Other voltage ranges to be agreed upon.

TRP control transformers

TRP brushless transformers are used for supplying electric circuits which need infinitely variable control in which brush transformers would otherwise cause voltage rushes in receiver circuits, among others in test transformers.

Characteristics:

- A brushless design – the voltage control is performed with a sliding coupling winding;
- The coupling winding is supplied from a one phase motor;
- If the voltage increase rate is to be changed, it is possible to use a stepper motor delivered together with the control system.
- Manual or automatic control with control buttons;
- A metal housing;
- The controller is to be only in position '0' to switch on.

Parameter	Unit	TRP10		TRP70	
Supply voltage	V	230	400	230	400
Adjustable voltage	V	5-240±2%	10-420±2%	12-240±2%	18-410±2%
Frequency	Hz	50	50	50	50
Max continuous current	A	40	24	290	160
Max 15-minutes current	A	110	60	625	360
Testing value	kV	2,5	2,5	2,5	2,5
Dimensions	mm	350x350x1135(h)	350x350x1135(h)	800x840x1590(h)	800x840x1590(h)
Weight	kg	225	225	800	800

Advantages:

- Infinitely variable voltage control;
- A brushless design allowing for extended meintenance-free operation;
- A solid hosuing;
- Mobility;
- A robust design;
- Manufacturing process parameters comply with the Quality Management System acc. to PN-EN ISO 9001:2009.

TRP10

TRP70

Heavy Current Transformers, types TW25 and TW75

A heavy current transformer is used for generating heavy currents indispensable for testing releases and overcurrent relays, fuses, current transformers, switchgears, etc.
If connected to TRP10 and TRP70 control transformers, they may become one-or three phase systems to perform heat run tests.

Characteristics:

- The main parts of the transformer are two toroidal cores. On one of them, there is provided a multi-section primary winding to supply the transformer, and on the other – the test winding. The secondary (heavy current) winding consists of four sections. Each turn of winding includes both the cores with the supply and test windings.
- The transformer windings end with leads provided with terminals mounted on them; due to a combination of connections of the supply winding section and heavy currents section it is possible of obtain the desired voltage ratio and the transformer's output current ranges.

Parameter	Unit	TW25	TW75
Supply voltage 50Hzv [1)]	V	230	230 / 400
Rated power	kVA	25	52,5 (1 h - 75kVA)
Testing value 50 Hz	kV	6	6
Weight	kg	485	930
Leads' weight	kg	90	145
Current transformer		50….10000/5A kl 0.2 power 10VA	100….1000 0/5A kl 0.1 power 10VA

1) It is possible to manufacture transformers for different supply voltage.

A set for high voltage three phase systems with TW25 and TRP10 transformers

AC/DC Test Systems

Those systems are designed for testing the strength of dielectrics with AC or DC voltages. They are used mainly in high voltage laboratories at research establishments and quality control divisions.

Characteristics:

- The system consists of a high voltage test transformer (TP, TPJ or TPS), a control panel (PS), and optionally, also of a divider (DN) and control transformer (TRP10);
- Power range – up to 100 kVA;
- Range of maximum secondary voltages – up to 300 kV;
- The control is performed from a control panel or cabinet provided with a control autotransformer with a drive with a microprocessor controller;
- A controller which enables programming voltage values, voltage increase rates and test duration time;
- The system can be equipped with a brushless control transformer, type TRP;
- voltage measurements with a DN divider or tap placed on the high voltage side;
- The transformer is provided with a half wave rectifier, which enables to obtain a DC voltage test system

PS10-250 Control panel

PS2-250 Control panel

TP10 DC Transformers

TP10 Transformers
AC 150÷300 kV

150 kV Divider – optional

300 kV Divider – optional

1) It is possible to manufacture transformers of voltages above 300 kV on request.
2) It is possible to manufacture transformers of powers above 10 kV on request.

Advantages:

- Safety interlock to prevent an inadvertent power connection
- Manual or automatic control
- A fast operating overload protection
- Voltage and current measurement
- Possibility of application of a type DN voltage divider (optional)
- Possibility of application of a type TRP10 brushless transformer
- Optional is a control panel PS2-250 in Rack 19" housing
- A set of connecting and supply leads, lengths 2 x 10 m
- An ergonomic structure facilitating correct test performance
- Manufacturing process parameters comply with the Quality Management System acc. to PN-EN ISO 9001:2009

AC/DC MOBILE testing devices

Mobile testing devices are designated for high voltage AC testing with mains frequency and DC voltage. Adaptation on the van's chassis or a wagon allows for testing field power units (substations, power lines, current transformers, limiters, etc.)

Characteristics:

- The unit consists of a robust high voltage testing transformer resistant to overloads and vibrations coming from transport, power rack and portable control case.
- Power range up to 50 kVA;
- Max secondary voltage range up to 300 kV;
- The control of the system performed via portable control case and power rack, equipped with a control autotransformer and the voltage controlled by microprocessor controller and current and voltage digital meters. The controller also allows for programming the voltage values, voltage increase range and testing time;
- Voltage can be measured from the measurement tap on the low voltage side, or via type DN divider;
- The transformer is provided with a half wave rectifier, which enables to obtain a DC voltage test system.

Advantages:

- Possible is an option of a stationary system provided with wheels or placed on a wagon;
- Safety interlock preventing an inadvertent connection of power;
- Manual or automatic control;
- A fast operating overload protection;
- Voltage and current measurements;
- Optional is a control panel PS2-250 in Rack 19" housing;
- A set of connecting and supply leads, lengths: 10 m + 10 m;
- An ergonomic structure facilitating correct test execution;
- The process parameters comply with the Quality Management System – according to PN-EN ISO 9001.

Exemplary execution of the testing systems

UP20-185 unit (20kVA, 185kV AC) adapted on a wagon

UP6J 100AC 130DC unit adapted on a wagon
(a rectifier mounted on the top clampof the transformer)

Stands for testing dielectric equipment

1. RODS, MATS AND BLANKETS, EQUIPMENT FOR WORKING UNDER VOLTAGES

Test stands are applied in the plants producing electrical insulating mats and rods as well as by their users in order to perform periodic checks and for the diagnostics of equipment working under voltages.

Characteristics:

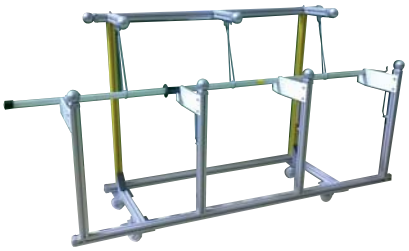
SC40 Test Stand for insulating mats

- SC-40 Stand is designed to perform voltage tests on mats in line with the requirements of Standard PN-IEC 61111;
- Exchangeable electrodes (as a standard: 400x400, 600x600, 750x750 with corresponding masking frames) to test mats sized 600x600 mm, 750x750 mm and over 1000 mm;
- Possible are other electrode sizes.

SC40

SD1, SD3 Test Stands for insulating rods testing

- SD1 and SD3 stands are designated for voltage testing of insulating rods in compliance with the PN EN 60832 norm, respectively for 1 and 3 rods
- Testing the insulation rods with 100 kV voltage (per each 300 mm of the rod's length)



SD1

SD3

SH1 Stand for testing equipment working under voltages

- SH1 Stand designed to test the resistance of spark discharges and the protection against bridging of equipment working under voltages of up to 36 kV as well as voltage indicators and phasers
- Tests on working parts of various lengths in conformity with the guidelines of the equipment manufacturer.

SH1

Technical data:

Type	SC-40	SD-1	SD-3	SH1
Testing insulations values of hight voltage circuits	48kV	120kV	120kV	-
Working voltages of tested tools	-	-	-	36kV
Test voltage	do 40 kV	100 kV	100 kV	43,2 kV
Testing value of the system	48 kV	120 kV	120 kV	52kV
Dimensions of tested mats	600x600, 750x750, pow. 1000 mm (klasa 2)	-	-	-
Lenght of the tested rod in one trial	-	max. 1800 mm	max. 1800 mm	-
Weight [kg]	65 kg	25 kg	35 kg	90 kg
Environmental conditions:				
- Temperature	5÷30°C	5÷30°C	5÷30°C	5÷30°C
- Relative humidity	<80% (without outdropping of water)	<80% (without outdropping of water)	<80% (without outdropping of water)	<80% (without outdropping of water)
- Atmospheric pressure	80÷106kPa	80÷106kPa	80÷106kPa	80÷106kPa
- Protection class	IP 00	IP 00	IP 00	IP 40

Advantages:

- Conforms current PN-EN standards
- Ergonomic structure ensures test performance
- Manufacturing process parameters comply with the Quality Management System acc. to PN-EN ISO 9001:2009.

Exemplary solutions of suppling the SD1 or SD3 stands

TP2 -100 Transformer

PS2-250 Control panel

DNC-100 Divider, optional

Advantages:

- Safety interlock to prevent an inadvertent power connection
- Conforms current requirements of the PN-EN standards
- Optional voltage measurement via a divider
- Light – mobile structure
- A set of connecting leads, lengths 5m
- Supply lead, length 3 m
- High voltage connecting lead (optional)
- An ergonomic structure facilitating correct test performance
- Manufacturing process parameters comply with the Quality Management System acc. to PN-EN ISO 9001:2009.

Exemplary solutions for supplying the rod test stations (SD1, SD3) and electroinsulating mats (SC40)

TPS110 Transformer

PS10-250 Control panel

DNC-100 Divider, optional

Advantages:

- Safety interlock preventing an inadvertent connection of power
- Conforms current requirements of the PN-EN standards
- 4 voltage levels are obtained
- A set of connecting and supply leads, lengths 10m
- Supply lead, lenght 5 mb
- High voltage connecting lead (optional)
- An ergonomic structure facilitating correct test performance
- Manufacturing process parameters comply with the Quality Management System acc. to PN-EN ISO 9001:2009.

2. GLOVES, SHOES AND BOOTS UPG40

An automatic diagnostic bench for performing dielectric tests on personal protective equipment UPG-40 is a modern device for examining electrical insulating protective gloves, shoes and boots, incl. firemen's footwear, type OFFICER.

Characteristics:

A stand for simultaneous testing – according to the type of measuring tank – up to 2, 4, or 6 gloves, electrical insulating protective gloves, shoes and boots. It consists of a cabinet provided with a measuring tank and a control cabinet with high voltage transformers, a control autotransformer with a drive, control systems and protections. Due to a system of interlocks, protections and an automatic earthing switch, the system is safe to the operators and requires no demarcated test field. Each measuring circuit is supplied from its own 40 kV 25mA high voltage test transformer. A test takes place simultaneously on all the circuits. Such a supply solution allows avoiding voltage fluctuations in case of a breakdown in one of the items under testing. The system automatics allow filling the items under testing with water up to the required level and its immersion in the measuring tank. The operation of the device is controlled by a microprocessor controller with a LCD touch screen. The parameters for the item under testing is achieved by selecting the item from a scroll menu (by selecting the class and length of a glove or by programming one's own parameters). The controller can either store the measurement results in an internal nonvolatile memory or send them to a computer for statistical processing or for making a protocol. The control cabinet can be also connected to an external transformer with a power slightly exceeding 10 kVA to supervise its operation with a controller, which gives an option of performing tests on other equipment, like electrical insulating rods, indicators or mats.

This is an only system manufactured in Poland which can guarantee that during tests – if one item should be broken down – only the circuit (transformer) concerned, viz. in which the breakdown has taken place, will be switched off. It will not cause any fluctuations (or voltage decay) or switching surges in other circuits as it happens when a multi-circuit system supplied from one transformer. Therefore, satisfied are the requirements of point 16.1.2. of the PN--92/E-04060 standard.

UPG40-2

UPG40-4

UPG40-6

Advantages:

- Safe design
- Measurement, adjustment, control and protection systems
- Automatic measurement process
- Automatic hydraulic system
- Clear presentation of parameters
- Intuitive and ergonomic operation
- Compliance with the harmonized standards PN-EN 60903 and PN-EN 50321
- Color touch panel
- User-friendly interface
- Data archiving
- Ready-made programmes for different classes of equipment, in compliance with the standards or own parameters
- Innovative solutions of test circuits – elimination of voltage fluctuations and stoppage of testing after breakdown on one of the circuits.
- Possibility of controlling of an outside transformer
- Manufacturing process parameters comply with the Quality Management System acc. to PN-EN ISO 9001:2009.

Mobile laboratory for dielectric testing of personal protective equipment

The devices produced by ZWARPOL enable performing tests on labor safety dielectric equipment directly at the customer's place; such devices are adapted to an insulated container, its minimum sizes being 4,5m x 2m x 2m, embedded on a standard chassis of a van under 3.5 t.
Such a solution allows saving the time required so far for transporting the equipment to and from the customer, and it also renders the test itself more reliable in front of a customer.
Of significance is also saving the space needed in buildings for demarcating a high voltage test field, which is especially true in the case of small labs.
Optionally, the vehicle may be also equipped with a generating set to secure an independent source of energy.

A mobile laboratory includes :

- A two-circuit stand for testing gloves and boots, type UPG40-2M;
- A stand for testing electrical insulating rods, type SD-1M;
- A stand for testing mats, type SC-40M;
- A stand for testing indicators up to 52 kV, type SW-1;
- 2 Test transformers 50kV/2kVA;
- A control panel formed into a case;
- Optionally, a system for testing phasers, type SUF-1.

SUF-1 testing systems for examining phasers and voltage indicators

Characteristics:

- The stations is used for testing phasers with voltage up to 36 kV in compliance with PN-EN 61481 standard or voltage indicators up to 52 kV in compliance with PN-EN 61243;
- Testing unit consists of two independent stations (ring– sphere) equipped with separate transformers;
- Test voltage32 kV;
- Adjustment panel in the form of a portable case allows for continuous adjustment of the voltage and adjustment of the phase shift angle;
- Voltage measurement from the measuring tap on the high voltage side of the transformer;

Technical data:

Supply voltage	V	230
Secondary voltage	kV	0 ÷ 32
Shift angle adjustment	°	0 ÷ 360
HV circuits testing value	kV	38,5
LV circuits testing value	kV	2
Dimensions	mm	1092 x 750 x 2040
Weight	kg	44

Advantages:

- Safety interlock to prevent an inadvertent power connection;
- Conforms current requiremnents of PN-EN standards;
- An ergonomic structure facilitating correct test performance;
- Manufacturing process parameters comply with the Quality Management System acc. to PN-EN ISO 9001:2009.

DIS-A Modelling Spark Gap

A sparking gap designed for didactic purposes in high voltage labs. It can be used to investigate into the phenomena occurring in the case of high voltage discharges in the air or in high voltage measurements according to PN-EN 60052.

Characteristics:

- A DIS-A sparking gap consists of a set of electrodes placed upon insulating columns attached to a steel frame provided with wheels.
- The sparking gap has electrodes situated horizontally, one of the electrodes is stationary, and the other is driven. The sparking gap can work either in a symmetric or non-symmetric system (one electrode is earthed); for non-symmetrical operation it is advisable to earth the driven electrode.
- The sparking gap is fitted with a control block consisting of an electrode driving system and a system for measuring the distance between the electrodes with a LED display.
- The sparking gap has got sharp and spherical electrodes, the diameters being 20mm, 50mm and 62,5mm (according to PN-EN 600520).
- Nominal voltage: 100kV;
- Test voltage of insulation of high voltage circuits: 120kV;
- Electrode system: horizontal (symmetric);
- Electrode distance setting: with a motor;
- Measurement of electrode distance: encoder with a LED display;
- Supply voltage of driving and measuring set: 230V 50Hz;
- Max distance between the electrodes: 200 mm.

DIS-A Spark Gap

Control panel

We design:

- complete high voltage laboratories

We repair:

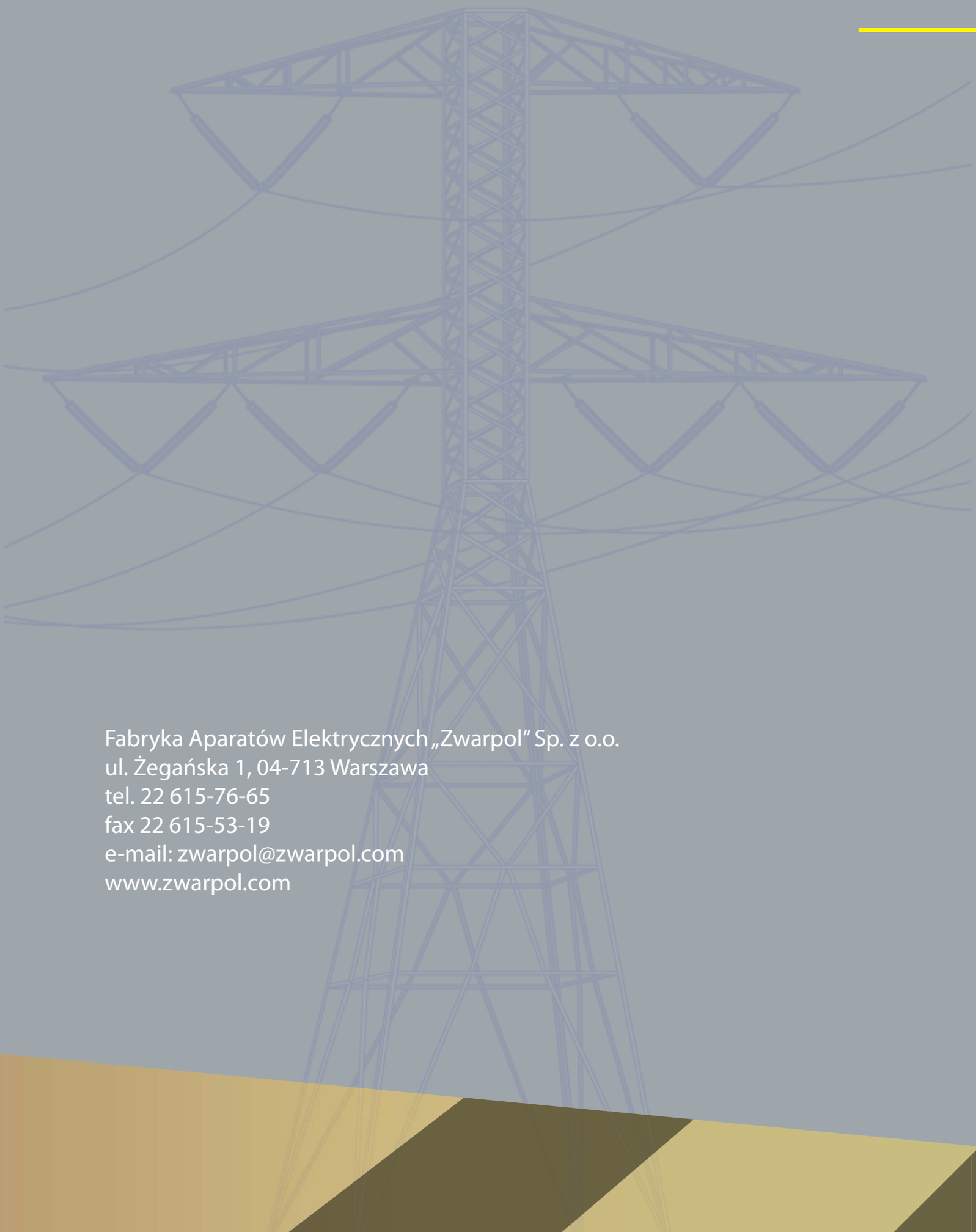
- test transformers
- test equipment
- control and heavy current transformers
- high voltage current and voltage transformers
- bushing accommodated current and generator transformers

We service and certify:

- test apparatus and systems

Additionally, we provide the following services:

- checks of transformer oil
- voltage tests
- tests on gloves (up to class 4)
- tests on dielectric safety footwear, including OFFICER fire officer's shoes
- tests on electric insulation rods
- tests on voltage indicators
- tests on phasers
- tests on insulating mats
- tests on insulation platforms
- tests on tongs
- tests on helmets
- tests on voltage limiters up to 110 kV (at the customer's location)
- tests on equipment used to work under voltage



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