



# HAEFELY HIPOTRONICS

*XV. Szigetelésdiagnosztikai Konferencia*

*Sikonda, 2015. 10. 28-30.*



**HAEFELY AG IS  
FOUNDED IN  
BASEL IN 1904**

**TETTEX COMPANY IS  
FOUNDED IN  
ZURICH IN 1945**

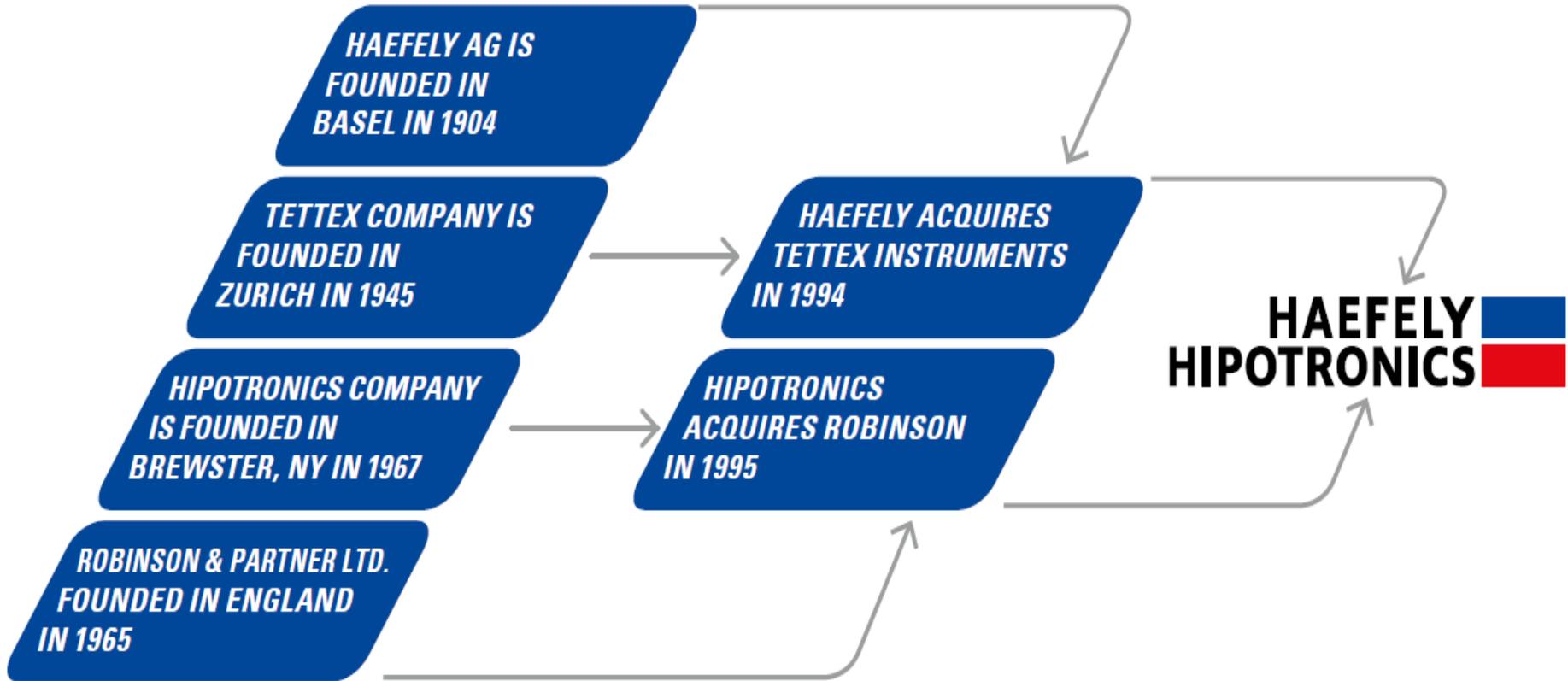
**HIPOTRONICS COMPANY  
IS FOUNDED IN  
BREWSTER, NY IN 1967**

**ROBINSON & PARTNER LTD.  
FOUNDED IN ENGLAND  
IN 1965**

**HAEFELY ACQUIRES  
TETTEX INSTRUMENTS  
IN 1994**

**HIPOTRONICS  
ACQUIRES ROBINSON  
IN 1995**

**HAEFELY**  
**HIPOTRONICS**





## Próbatermi nagyfeszültségű berendezések

### AC próbaberendezések és mérőműszerek





## *Próbatermi nagyfeszültségű berendezések*

*Nagyfeszültségű impulzus  
generátorok és impulzus  
mérő műszerek*





## *Próbatermi nagyfeszültségű berendezések*

*Rezonanciás  
próba*berendezések







## *Mérőműszerek laboratóriumi és helyszíni mérésekhez*

*Elektronikus  
feszültségosztó,  
precíziós mérésekhez*





## **FRA 5310** **FREQUENCY RESPONSE ANALYSER**

The Tettex FRA 5310 Sweep Frequency Response Analyser detects transformer winding movements and mechanical damage due to physical shock, transportation or short circuits.

The equivalent high frequency circuit of a transformer winding is a complex R-L-C-network. The measured frequency response (transfer function) of this network is unique analogous to a fingerprint. Changes in the winding geometry will be reflected by deviations between repeated measurements.



FREQUENCY  
RESPANALYSIS

### **APPLICATIONS**

- ✓ Power transformers



## TTR 2795 & TTR 2796 TRANSFORMER TURNS RATIO METERS

The Tettex Transformer Turns Ratio meter family combines mobility and user friendly handling with unmatched accuracy of up to 0.03%.

### APPLICATIONS

- ✓ Power- and distribution transformers
- ✓ Special transformers like phase shifting-, rectifier-, arc-furnace- and traction transformers
- ✓ Instrument transformers



TRANSFORMER  
TURNS RATIO



ARBITRARY PHASE  
SHIFT MEASUREMENT

TTR 2795 (100 V)

TTR 2796 (250 V)

Transformer Power	< 150 MVA	•	
	≥ 150 MVA		•



## **RVM 5462a**

### **RECOVERY VOLTAGE METER**

The Tettex RVM5462 uses the proven recovery voltage measuring method, based on the polarization of the water molecules to measure the water content in the oil paper insulation and therefore indicates the transformers aging.

This method, used extensively since the 1980's, has shown consistent results independent of the geometry of the transformer. Thanks to the improved "Turbo RVM", a test is now performed in about 3 to 5 hours.

#### **APPLICATIONS**

- ✓ On site diagnostics of oil paper insulation on power transformers
- ✓ Factory detection of improper power transformer drying process



RVM  
RECOVERY VOLTAGE



## MIDAS 2880 & MIDAS 2881 MOBILE INSULATION DIAGNOSIS & ANALYSING SYSTEM

The MIDAS is an insulation test set for measuring power / dissipation factor /  $\tan \delta$  on a variety of high voltage components in the factory and the substation. It includes a powerful and variable frequency high voltage source up to 15kV. The capabilities can be expanded with a variety of accessories to perform additional tests on transformers and rotating machines.



C AND TAN  $\delta$   
(POWER FACTOR)



SHORT CIRCUIT  
IMPEDANCE

### APPLICATIONS

- ✓ Rotating machines
- ✓ Power transformers
- ✓ Instrument transformers
- ✓ Bushings
- ✓ Capacitors
- ✓ Circuit breakers
- ✓ Surge arrestors

	MIDAS 2880	MIDAS 2880G	MIDAS 2881	MIDAS 2881G
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Voltage	12 kV	•		•	
	15 kV		•		•
Controller	Laptop			•	•
	Touch Screen	•	•		



# 2883 MIDAS micro

Mobile Insulation Diagnosis & Analysing System

## FEATURES AND BENEFITS



C AND TAN  $\delta$   
(POWER FACTOR)



VARIABLE  
FREQUENCY TAN  $\delta$   
(POWER FACTOR)



TIP-UP TEST

- ✓ Capacitance, dissipation / power factor testing
- ✓ Compact one-box design with only 25 kg / 55 lb
- ✓ 12 kV high voltage source
- ✓ Variable frequency 15 – 400 Hz
- ✓ Accuracy of 0.3% (capacitance) and  $1 \times 10^{-4}$  (tan  $\delta$ )
- ✓ Safe operation with interlock, emergency stop, safety checks and HV ground surveillance
- ✓ 7" color touch screen for easy operation
- ✓ Three operating modes: basic, guide, advanced





## Output

Voltage	100 .. 12'000 V <sub>RMS</sub> (@ 45 .. 70 Hz)
Frequency	15 .. 400 Hz (Voltage ≤ 5 kV)
Current	180 mA <sub>RMS</sub>
DUT Capacitance	max. 47 nF @ 12 kV <sub>RMS</sub> @ 50 Hz, max. 39 nF @ 12 kV <sub>RMS</sub> @ 60 Hz

Measurement	Resolution	Accuracy
Dissipation / Power Factor tan δ/ cos φ□	0.0001 0.01 %	± 0.5 % rdg ± 0.0001□ @ 50..60Hz ± 0.5 %□ rdg ± 0.01 % @ 50..60Hz
Capacitance	0.01 pF	± 0.3 % rdg ± 0.3 pF
Test Voltage	1 V	± 0.3 % rdg ± 1V
Test Current	0.1 μA	± 0.3 % rdg ± 1 μA
Watts / Power	0.1 mW, mVA, mVAR	± 0.8 % rdg ± 1 mW, mVA, mVAR
Quality Factor	0.0001	± 0.5 % rdg ± 0.0001
<b>Internal Reference</b>	100 pF Reference Capacitance, tan δ < 0.00001 Temperature coefficient < 0.01 % / K, Capacitance ageing < 0.01 % / year	



## WA 2293 WINDING ANALYSER

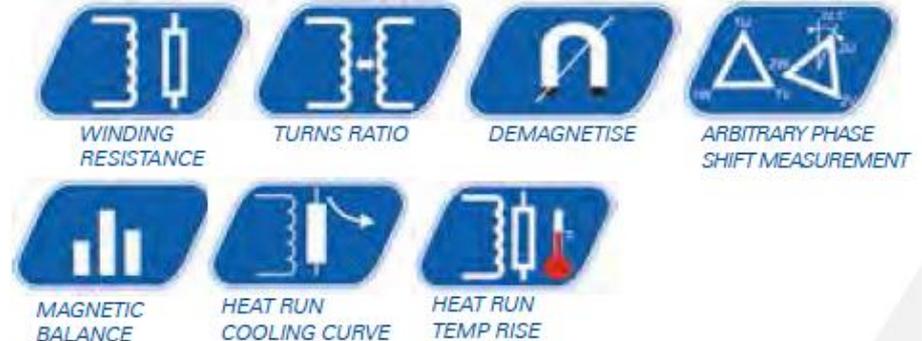
The Tettex 2293 is the world's first winding analyser that combines winding resistance and turns ratio measurement, demagnetisation, magnetic balance and heat run test in one instrument.

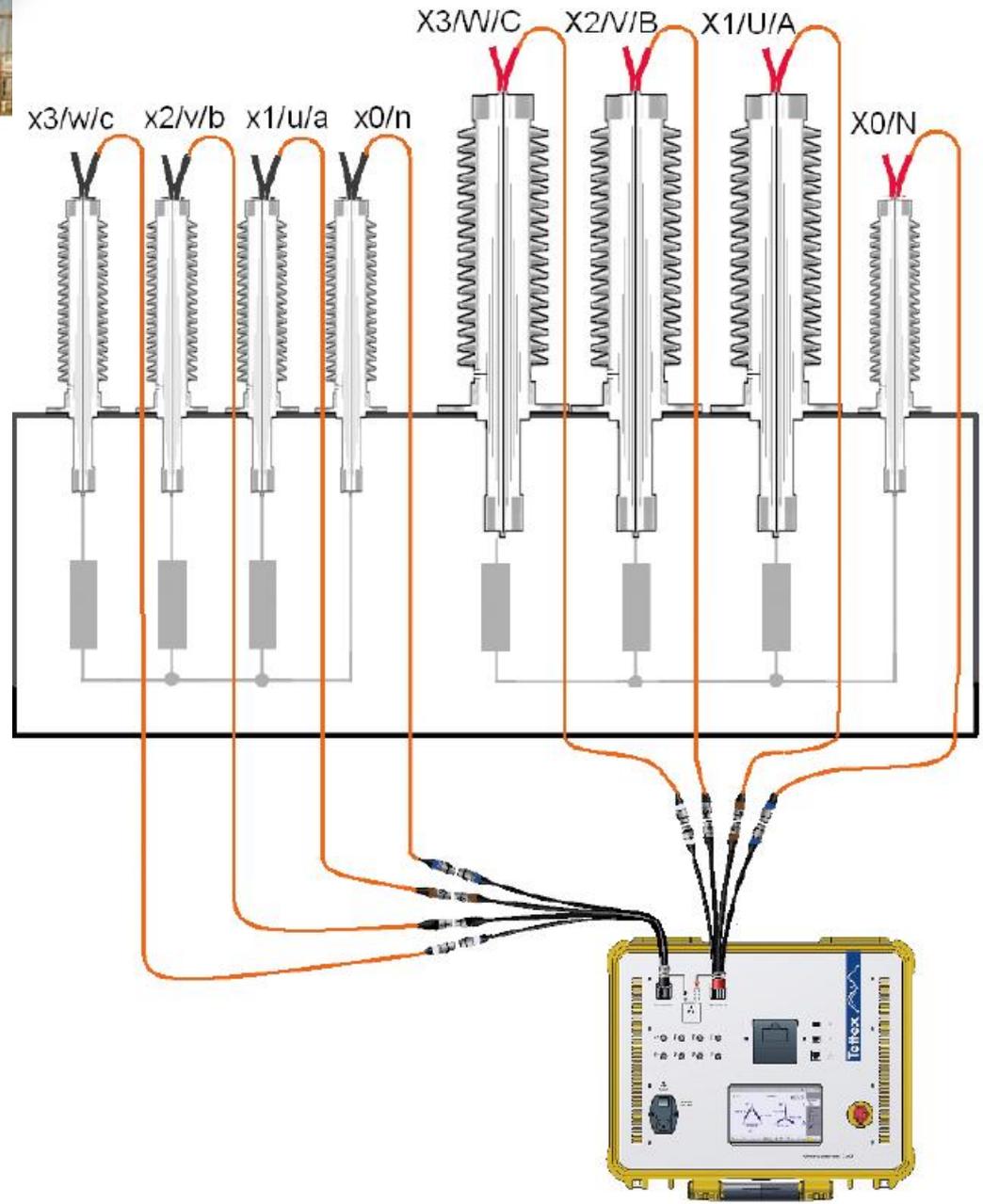
A simple one-time-connection system drastically reduces measuring time. Once connected all tests can be done in a row without reconnection.



### APPLICATIONS

- ✓ Power transformers
- ✓ Distribution transformers
- ✓ Generators and motors
- ✓ Instrument transformers





WINDING  
RESISTANCE



TURNS RATIO



DEMAGNETISE



ARBITRARY PHASE  
SHIFT MEAS.



MAGNETIC  
BALANCE



HEAT RUN  
COOLING CURVE



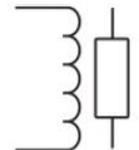
HEAT RUN  
TEMP RISE



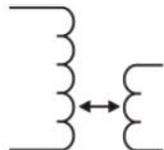
TAP CHANGER TEST



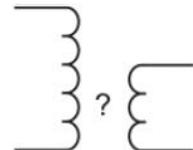
SHORT CIRCUIT  
IMPEDANCE



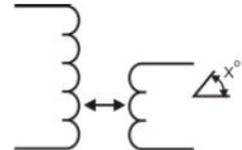
**Resistance**



**Turns ratio**



**Detection**



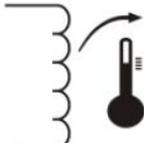
**Arbitrary Phase**



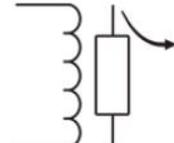
**Demagnetise**



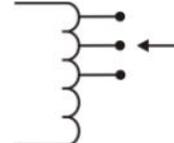
**Magnetic Balance**



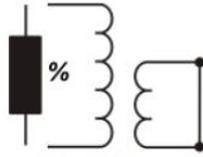
**Heat Rise**



**Cooling curve**



**Tap Changer**



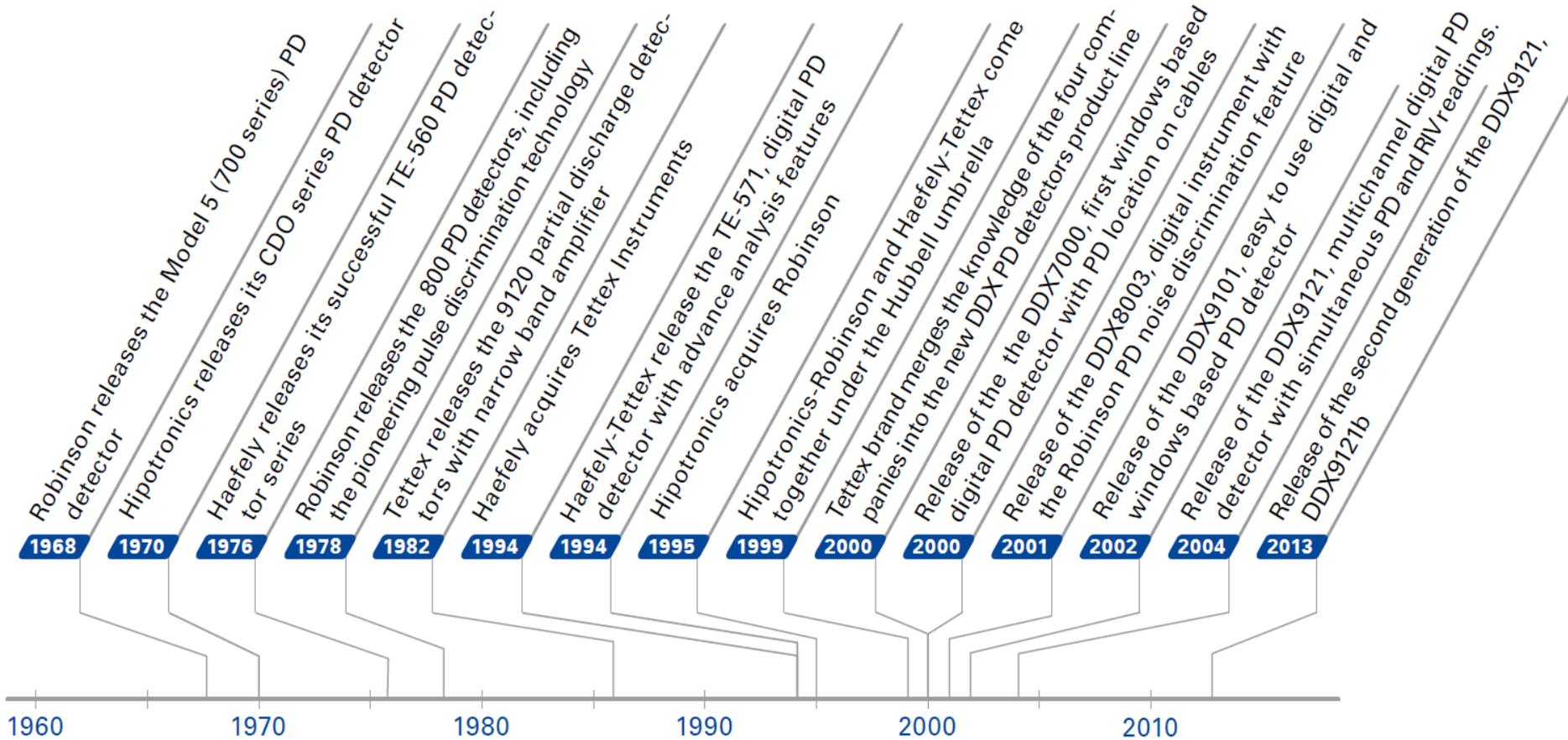
**Short Circuit Impedance**

**NEW**

**NEW**



# PARTIAL DISCHARGE



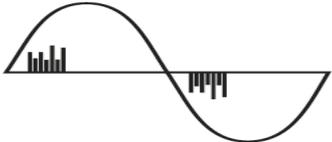
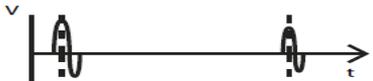


## DDX 9101





## PRODUCT LINE OVERVIEW

	DDX9101	DDX9121B	DDX7000	DDX8003
 Partial discharge AC	•	•	•	•
 Partial discharge DC		•	•	•
 Radio Interference Voltage (RIV)		•		
 Cable fault location			•	•



## **DDX 9121b**

### **MULTICHANNEL DIGITAL PD DETECTOR**



### **Applications:**

- Power and Distribution Transformers
- Instruments Transformers
- Rotating Machines
- Power Capacitors
- Switchgears
- Surge Arrestors
- Research & Development



	<i>DDX9121-1</i>	<i>DDX9121-1/RIV</i>	<i>DDX9121-3</i>	<i>DDX9121-3/RIV</i>	<i>DDX9121-4</i>	<i>DDX9121-4/RIV</i>	<i>DDX9121-6</i>	<i>DDX9121-6/RIV</i>	<i>DDX9121-8</i>	<i>DDX9121-8/RIV</i>
<b>SIMULTANEOUS PD INPUTS</b>	1	1	3	3	4	4	6	6	8	8
<b>NON-SIMULTANEOUS PD INPUTS</b> <i>OPTION DDX9121B/MUX</i>	Opt. 4	Opt. 3	Opt. 12	Opt. 11	Opt. 16	Opt. 15	Opt. 24	Opt. 23	Opt. 32	Opt. 31
<b>SIMULTANEOUS RIV INPUTS</b>	No	1	No	3	No	4	No	6	Not	8
<b>NON-SIMULTANEOUS RIV INPUTS</b> <i>OPTION DDX9121B/MUX</i>	No	Opt. 3	No	Opt. 11	No	Opt. 15	No	Opt. 23	No	Opt. 31
<b>PD ON DC</b> <i>OPTION DDX9121B/DC</i>	Opt.	Opt.								
<b>PHASE RESOLVING ANALYSIS</b>	Yes	Yes								
<b>SPECTRUM ANALYZER AND SCOPE</b>	Yes	Yes								
<b>SELECTABLE MEASURING BAND</b>	Yes	Yes								

Opt. = Option



**AKV9310**



**KAL 9520**



**9230**





# 2840

## High-Precision C, L & tan $\delta$ Measuring Bridge



### FEATURES

- Accuracy capacitance 0.02%, tan  $\delta$   $1 \times 10^{-5}$
- Additional signal analysis capabilities like Spectrum Analyser, Digital Scope and Data Logger are integrated
- Advanced, well-engineered test equipment, optimised to the specific application
- Compact, reliable and EMC hardened design
- Integrated solution with built-in industrial computer

# POWER TRANSFORMER APPLICATION



# ROTATING MACHINE APPLICATION EXAMPLE



**5478**



INSULATION  
RESISTANCE



C AND TAN  $\delta$   
(POWER FACTOR)



**MIDAS 288X + 5288a/89**



**WA 2293**



WINDING  
RESISTANCE



PARTIAL  
DISCHARGES



**MIDAS 288X + DDX9121b-1**



## TEVÉKENYSÉGEINK:

Műszerértékesítés

Mérőrendszerek

Diagnosztika

Irányítástechnika

Rendezvények

Keresés

E-mail cím:

Jelszó:

[Regisztráció](#)

Belépés

[Elfelejtette jelszavát?](#)

### B&C

#### Visszatérő feszültség mérés (RVM) - B&C



Magyar fejlesztésű mérőműszer az olaj-papír szigetelési rendszerek általános állapotának vizsgálatára. A "magyar módszer". Cégünk egyik tulajdonosa, a B&C Kft. gyárja az egész világ számára Tettex márkanév alatt.

Könnyű, hordozható készülék 200 és 2000V között állítható mérőfeszültséggel. Az olaj papír rendszer polarizációs spektrumának vizsgálatával a papír nedvességtartalmára és öregedési állapotára lehet következtetni. Szigetelési ellenállásmérő funkcióval is rendelkezik.

Olaj-papír transzformátorok és papírkábelek vizsgálatára ajánlott. (Nemzetközi szinten folynak kísérletek a műszer használatának polietilén kábelek vizsgálatára történő kiterjesztésére.)

[Bővebben...](#)

#### Fokozatkapcsoló kapcsolási karakterisztika felvétele (MT-3 műszerrel) - B&C



Az MT3 műszer segítségével fokozatkapcsoló kapcsolási idő regisztrálás, tekercs ellenállás mérés, áttétel mérés és mágnesezési áram mérés valósítható meg...

Árajánlatkérés

[Bővebben...](#)

#### Tekercs impedancia karakterisztika (FRA) felvétel (TRAFTEK) - B&C



Transzformátortekercsek mechanikai elmozdulásának detektálására szolgáló műszer. A tekercselés, mint megoszló RLC hálózat a geometria megváltozása során, a jellemző rezonancia helyeit is változtatja. A