

# YDTW、 YDTCW series

## Cylinder Type Test Transformers



Conventional AC test transformers are especially designed for testing objects of medium capacitance in the factory. These systems are particularly suited for tests requiring stable voltage even if the load changes during the testing (heavy corona, wet & pollution tests) or when the load is of inductive kind (inductive voltage transformers). The possibility to stack several of these transformers allows reaching very high voltages by keeping a reasonable floor space.

Up to 1800KV

Up to 9MVA

Up to 30A



### User Benefit

- Compact dimensions resulting in minimum space requirements
- High flexibility for connecting the HV lead
- Large range of application and low acoustic noise level (approx. 65 to 75 dBA)
- Sophisticated protection features for optimal test object & personnel protection



### Quality

Samgor quality assurance complies with ISO9001. The electronic measurement and control devices are designed and manufactured in-house. The design of the test system complies with the VDE0104 standard for optimal protection of the operating personnel. The test system is shut-down in case of over-voltage, over-current and fast

voltage transients. Damage at the fault area is minimized.

## Standards

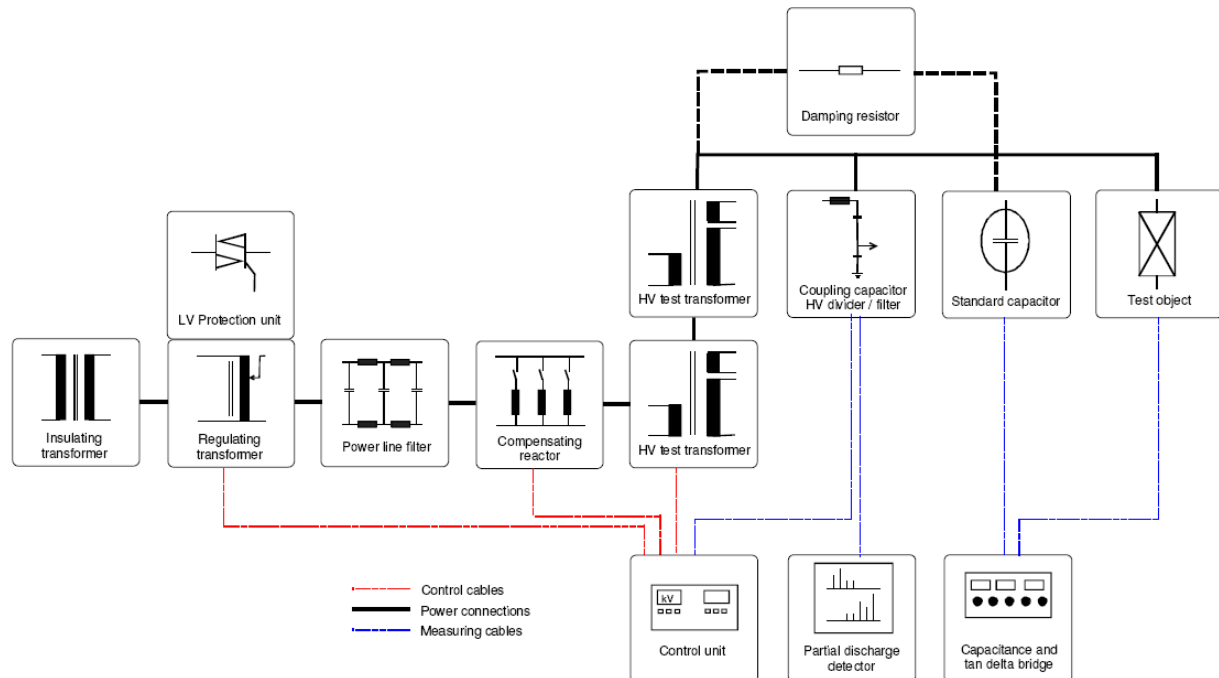


JB/T9641-1999	《Testing transformer》
GB1094.1-1996	《Power transformer》 First Part of General rule
GB1094.2-1996	《Power transformer》 Second Part of Temperature rise
GB1094.3-2003	《Power transformer》 Third Part of Insulation Level And Insulation Test
GB1094.5-2003	《Power transformer》 Fifth Part of Withstanding Short-circuits ability
GB311.1-1997	《High-voltage Power transformer Equipment Insulation And Coordination》
GB/T 16927.1-1997	《High-voltage test Technology》 first part of general testing request
GB/T 16927.2-1997	《High-voltage test Technology》 second part of measurement system
GB 7354-1987	《Shelf depreciation measurement》
GB/T509-1997	《Power transformer》 Test parameters
GB2536-1990	《Transformer oil》
GB7252-1987	《In Transformer oil Dissolves Gas Analysis And Judgment parameter》
GB7328-1987	《Transformer And Reactor Acoustic level measurement》
JB8749- 1998	《Voltage regulator General Engineering factor Request》
GB10229-1988	《Reactor》
IEC60-1	《High voltage test》

## Ambient Conditions for the AC test equipment

- Height above sea level	≤1000 m
For each add. 100 m, the HV rating must be decreased by	1 %
- Relative humidity in main hall under non condensing conditions	90 %
- Temperature averaged over 24 h for H.V. components	min. 0 °C, max. + 30 °C
- Extreme temperatures for H.V. components	min. - 5 °C, max. + 40 °C
- Temperature for electronic controls (Equipment to operate with the specified measuring errors)	min. + 15 °C, max. + 25 °C

## Block-diagram of a typical Transformer Cascade with 2HV Transformers



### The Test System includes following main components:

- Regulating transformer with shielded insulating transformer
- Power noise filter
- Compensating reactor
- Fast over-voltage protection unit (included in systems rated 600 kV or higher)
- Test transformer(s)
- Coupling capacitor / HV divider / HV filter
- Control system AC2000 or ACA-2000
- HV and grounding connections between HV elements. The connection to test object is usually not included.
- Pre-stage high voltage switchgear cabinet
- Subordinate-stage high voltage switchgear cabinet

## Available Options

- Air-cushion base frame for transformers
- HV filter inductance for coupling capacitor
- Damping resistance
- Standard capacitor
- Additional HV connections
- Partial Discharge detectors
- Capacitance and power loss factor measuring bridges
- Other devices upon request.

## Regulating Transformer type YDYZ

The regulating transformers adjust the input voltage of the test transformer practically without steps. The unit is for indoor operation. The driving motor allows a slow and a fast regulating speed (40-240 s from 0-100 % of the voltage). The zero start interlock forces the operator to start always from zero.

The primary breaker and secondary contactor are placed in the regulator cabinet.  
The power line filter can be built-in or attached to the regulating transformer cubicle.  
The galvanic separation is given by a separate insulating transformer.



### Technical Data of regulating transformer series YDYZ:

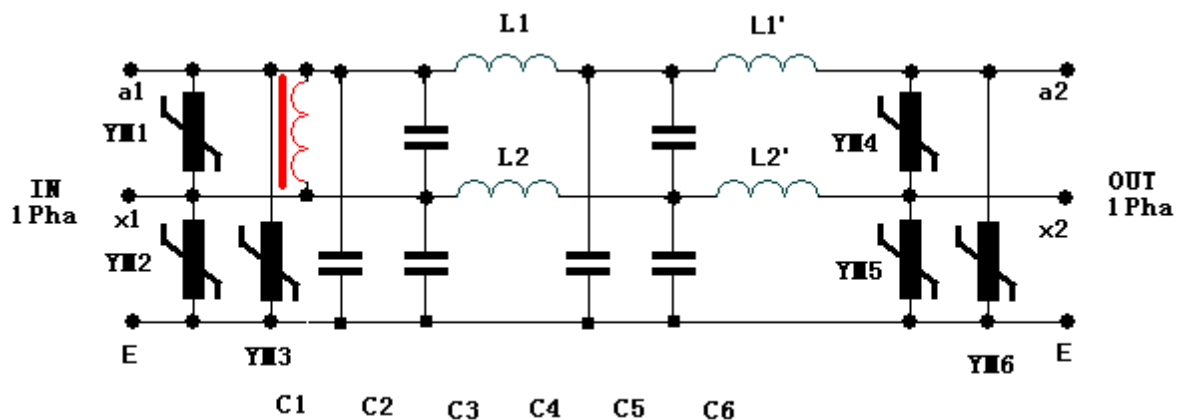
Type	Rated Power kVA cont. duty	Phases	Frequency( Hz)	Input Voltage (V)	Output Voltage(V)	Output Current(A)
TYDZ-20	20	1	50/60	380	0~430	46.5
TYDZ-50	50			380	0~430	116
TYDZ-75	75			380	0~430	174
TYDZ-100	100			380	0~430	232
TYDZ-150	150			380	0~430	349
TYDZ-250/3	250			3000	0~3300	76
TYDZ-250/10	250			10000	0~3300	76
TYDZ-300/10	300			10000	0~3300	91
TYDZ-500/10	500			10000	0~3300	152
TYDZ-750/3	750			3000	0~3300	227
TYDZ-750/10	750			10000	0~3300	227
TYDZ-1000/10	1000			10000	0~10500	95
TYDZ-1500/10	1500			10000	0~3300	455
TYDZ-2000/10	2000			10000	0~10500	190
TYDZ-2500/10	2500			10000	0~3300	758
TYDZ-2500/10	2500	10000	0~10500	238		

Other configuration is possible upon request!

### Power Noise Filter Type LBQ

For the reduction of line carried noise from the mains. This equipment is the L-C filter installment; it is mainly the solution to the high frequency high voltage filter inductance craft problem and it uses the filter circuit reasonably. This equipment high frequency high voltage filter inductance monolayer stands in circle; Line use "Δ" connection, and may both suppress the syntype disturbance, and the bad mold disturbance, this kind of filter shelf depreciation survey and in the same time solves the power source noise problem effect quite obviously.

Their power rating is adapted to regulating transformer rated power.



### Compensating Reactor Type GK

For the compensation of the reactive power of capacitive test objects:

The compensating reactor is connected between the regulating transformer and the test transformer. Therefore, the power rating of the regulating transformer and of a possibly pre-connected power filter can be kept small.

The compensating reactor comprises usually 3 inductors which can be combined to achieve up to 7 different power combinations. The re-connection is basically done manually. Upon request (option), a remote re-connection with switches actuated from the controls can be offered.



### Technical Data of the Regulating GK series Compensating Reactor:

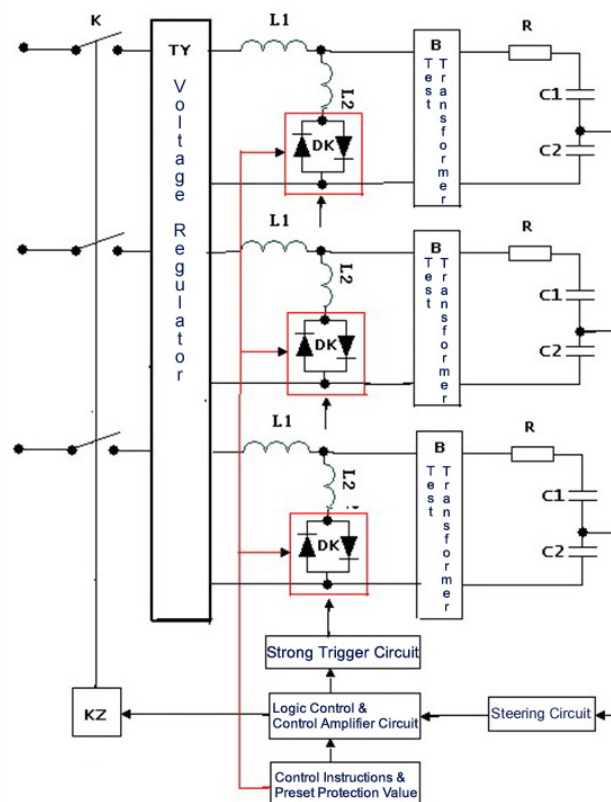
Type	Rated Power kVA cont. duty	Secondary Voltage V	Dimensions L×W×H M	Weight Net, approx. (kg)
GK 180	180	400	1.1×1.2×1.0	550
GK 360	360	400	1.2×1.2×1.0	850
GK 900	900	1000	1.6×1.3×1.4	1800
GK 1800	1800	1000	2.5×1.3×1.5	3200
GK 2800	2800	1000	2.7×1.4×1.5	4200

As the compensating reactors are designed specifically to the system specification, only a few examples are given in the above table.

### Fast over-voltage Protection Device Type TPU-2000

Used to prevent inadmissible high recovery over-voltages on the test transformer in case of disruptive discharges on the test object. The Fast over-voltage protection device TPU acts by opening the power supply and by short-circuiting the test transformer within a few hundred microseconds.

This avoids repetitive flash-over in the test object.



## AC Test Transformer type YDTW/YDTCW

Test transformers are used for the generation of high AC voltages, and are part of a complete test system. The YDTW/YDTCW type test transformers are of the so-called insulating shell design. The merits of this design are:

- Small dimensions and reduced floor space requirements in the test laboratory
- Cascade connections by superimposing two, three or four transformer units, without an additional requirement in floor space (YDTCW transformers only).

### General Design:

- The transformer is equipped with “mouth” type iron core and put in horizontal. The upper prop is button stem. The left and the right one is yoke prop. High voltage winding and low voltage winding are set on the upper button stem.
- The high-voltage low-current transformer belongs to high voltage heavy insulation structure. And the energy that caused by the coil loss transmit out difficultly .So it's necessary to bring down the ampere density of the winding conductor to less than 2.2/mm<sup>2</sup>, to obtain the aim of reduce the load loss of the transformer.
- High voltage coil has cylinder-pagoda type structure in case of the slap of the coil caused by the vacuum drying or the ground discharge .Our company's special wind method which use vittae compress structure on the top can deal with the slippage.
- In order to make sure of a low wave distortion, intensity of magnetic flux of the transformer is set below the inflexion of the silicon sheet. The intensity of magnetic flux of the core less than 1.5T. The iron core is made from high quality DQ130-30 grain orientation silicon sheet, Overstow 45° seam, using horizontal/vertical jog line on clipping to make sure the conformance of the roller compaction direction, and wrapping tightly with epoxy belt and parching after Overstow to make sure that there are no flexible.
- The monolithic construction is insulate shell .The insulate cylinder is wined by twistless roving. High densit, low leakage current, and not easy to absorb moisture.
- We use 25# transformer oil on major insulate and use fluorubber which made with aerotechnics and has the character of hard wearing, high temperature tolerance ,pressure-proof ,hardness reach to 70, tensile-strength 1Mpa>12, snap tensile stretch ≥200, air compression set≤35 , tension set by dip in 25# transformer oil ≤50.
- We can check the original material strictly in order to make sure an equal current resistance of each copper coil. We use compound insulate material epoxy lacquered wire. And we control strictly on the turns per coil, diameter of the conductor, electrical conductivity and width of the conductor, paper and coil dimension, and so on.



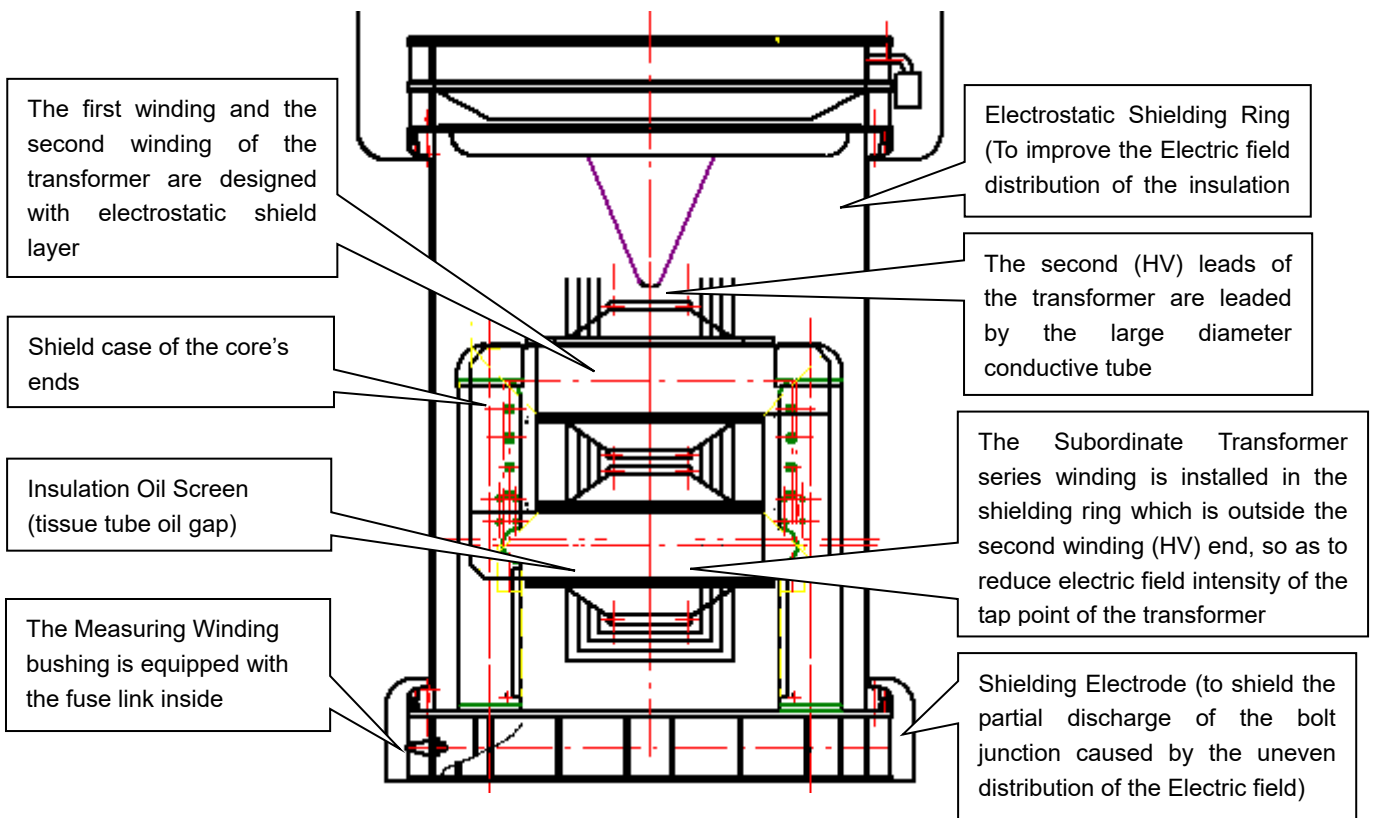
## Technical Data

Type	Rated power (kVA)	Voltage (kV)		Diameter× Height (mm)	Weight (kg)	Partial Discharge
		Second voltage	Rated voltage			
YDTW-2.5/50	2.5	0.22	50	φ280×500	70	<2pc
YDTW-5/100	5	0.22	100	φ640×820	130	<2pc
YDTW-10/100	10	0.22	100	φ620×850	160	<2pc
YDTW-50/100	50	0.4	100	φ725×1100	500	<2pc
YDTW-15/150	15	0.38	150	φ820×1220	500	<2pc
YDTW-50/250	50	0.38	250	φ1460×1520	1250	<2pc
YDTW-75/500	75	0.38	500	φ2000×4850	6800	<2pc
YDTW-100/100	100	0.38	100	φ1000×1250	800	<2pc
YDTW-100/250	100	0.6	250	φ1100×1450	1550	<2pc
YDTW-150/200	150	0.6	200	φ1900×1920	2500	<2pc
YDTW-150/500	150	0.38	500	φ3300×5250	7800	<2pc
YDTW-200/200	200	0.6	200	φ1520×1920	1680	<2pc
YDTW-250/500	250	0.5	500	φ2400×3940	9000	<2pc
YDTW-300/300	300	0.6	300	φ2080×2900	4700	<2pc
YDTW-300/600	300	0.6	600	φ2740×4700	12000	<2pc
YDTW-400/400	400	3	400	φ2430×3650	11000	<3pc
YDTW-450/300	450	0.6	300	φ1900×2100	5980	<3pc
YDTW-500/500	500	0.6	500	φ3600×5400	19800	<3pc
YDTW-600/600	600	3	600	φ2860×4800	15500	<5pc
YDTW-1250/250	1250	10	250	φ3300×2960	14500	<5pc
YDTW-2000/500	2000	6	500	φ3900×4900	38600	<5pc
YDTW-2200/550	2200	3	550	φ3970×5900	40000	<5pc
YDTCW-300/2×150	300	0.38	300	φ1600×3800	4280	<5pc
YDTCW-750/2×375	750	3	750	φ3540×7900	36000	<5pc
YDTCW-400/2×400	400	0.6	800	φ2800×7130	18000	<5pc
YDTCW-1000/2×500	1000	3	1000	φ3520×10000	37500	<5pc
YDTCW-1250/2×125	1250	3	250	φ4500×3200	14500	<5pc
YDTCW-1500/2×500	1500	10	1000	φ4800×12840	48500	<5pc
YDTCW-300/2×300	300	0.65	600	φ2610×5600	10000	<5pc
YDTCW-375/2×375	375	0.65	750	φ2940×8350	20000	<5pc
YDTCW-2000/3×500	2000	6	1500	φ4500×17000	115000	<5pc
YDTCW-3600/3×600	3600	6	1800	φ6500×20000	150000	<5pc
YDTCW-4800/2×600	4800	6	1200	φ4500×1350	105000	<5pc
YDTCW-6000/3×500	6000	10	1500	φ6000×18000	145000	<5pc

Other configuration or duty cycles are possible upon request!



### Structural Diagram:



### Voltage Divider/Coupling Capacitors/HV Filter (Type TAWF series)

The coupling capacitors of the series TAWF consist of 1 or more modular units, built into glass-fiber reinforced epoxy tubes. Their applications are:

- Partial discharge measurements with an optional coupling quadripole.
- Measuring AC voltages in the industrial frequency range.

The standard base frame is fitted with castors for mobility. The capacitors are built for indoor use.

Attenuating interferences coming from the HV side.

The standard base frame is fitted with castors for mobility. The capacitors are built for indoor use.



## Technical Data of TAWF series

Type TAWF	Voltage kV	Capacity nF	PD Lever at Un pc	Tan $\delta$
100-1	100	1	$\leq 1$	<0.2%
200-1	200	1	$\leq 1$	<0.2%
300-1	300	1	$\leq 1$	<0.2%
400-1	400	1	$\leq 2$	<0.2%
600-1	600	1	$\leq 3$	<0.2%
800-0.5	800	0.5	$\leq 5$	<0.2%
800-1	800	1	$\leq 5$	<0.2%
1000-0.2	1000	0.2	$\leq 5$	<0.2%
1200-0.2	1200	0.2	$\leq 5$	<0.2%
1600-0.2	1600	0.2	$\leq 5$	<0.2%

### High Voltage Filter for TAWF series (Option)

By adding an inductance to the coupling capacitor, they form the high voltage filter, which attenuates interference coming from the high voltage reactor / transformer side.

The high voltage filter inductance is connected between the transformer and the coupling capacitor and is usually placed in the top electrode.

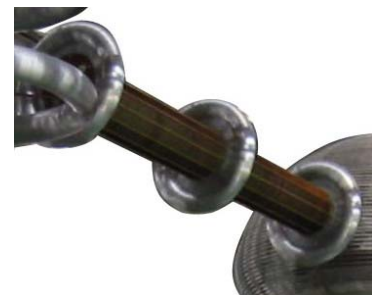
Typical insertion loss ( $50\Omega / 50\Omega$ ) at 40 kHz - 400 kHz  $\geq 20$  dB or 10kHz-400kHz  $\geq 30$  dB



### Damping Resistor Description

The damping resistors consist of 1 or more modular units, built into glass fiber reinforced epoxy tubes. Their applications are:

- Protecting the high voltage AC test transformer from transients when a flash-over occurs
- They are built for indoor use and connected between the test transformer (cascade) and the voltage divider electrodes. Their resistance is in the range of 1 kOhm.



## Control and Measuring System type ACA-2000:

### Control System Functions:

- Manual and automatic control dual use
- Meter Precision: Level 1 (High Voltage Measurement Part)
- Over-current and Over-Voltage Protection
- Withstanding Timing
- Automatic voltage boost follows GB311 and GB/T16927 Standards.



That means voltage boost can be controlled automatically under automatic control, also means voltage boost speed is fast before reaching 75% experimental voltage. After reaching 75% experimental voltage, the voltage will increase by 2% per second.

### Measurement and Analysis System Functions:

- The main functions of Power Frequency High Voltage Digital Measurement
- Analyzing System follow GB/T 16927.1-1997 《High Voltage experimental technologies: common experimental requirements》 regulations about AC voltage experiments to finish relative measurement analyzing projects. This system can record experimental voltage waveforms, analyze voltage value, and print reports etc.
- Power Frequency High Voltage Digital Measurement Analyzing Software is based on virtual apparatus' digital measurement analyzing system. It is mainly used to monitor the process of AC high voltage experiment, measure voltage's peak value and effective value, calculate voltage transient frequency, analyze 1-40th harmonic, and calculate voltage waveform distortion rate etc.

### Measurement System's Hardware Structure

- Industrial computer, PIV series CPU, 1G memories above, 40G hard disk or deploy by the customer's requirements.
- Data acquisition card, three buses complete photoelectric isolation virtual import
- A/D (Analog to Digital) conversion resolution: 16 bits
- A/D chip conversion time:  $\leq 10\mu\text{s}$
- Maximum Sampling rate: 66KHz/s
- Channel switching time(simulated switch guide time + amplifier establishing time):  $\leq 5\mu\text{s}$
- System Overall Error:  $\leq 0.2\% \text{FSR}$
- Isolation Transformer, System power protection and isolation
- HP printer, Laser printer with LPT and USB ports
- Shielding cabinet, Store computers and other devices

### Software of Measurement System

• Measurement system uses the virtual instrument design. By replacing the hardware instrument panel to software panel to complete the function settings of measurement system, wave analysis, recording the voltage value, and print test reports output, etc. It is truly realize the idea of "software is instrument". By using software instead of hardware, the virtual instrument not only saves users' investment, but also changes the situation that definitions of instruments' functions are defined by manufacturers. The users can expand the use of situation, based on different requirements, to custom some individual instruments' function.

- Testing operator monitors the trial process of transformation of the wave through the window. Real-time access to test the voltage value, analyze the harmonic content and waveform distortion and record the voltage value and withstanding voltage time.
- Some transient waveforms are formed by in the withstanding voltage stage or flashover of the samples. We can choose to save waveforms as graphics files and data files, which is used for generation of test reports and off-line analysis.
- After the test, you can generate voltage - time curve for the analysis of the test.
- Some historical documents can be monitored off-line through testing voltage control window.

## Test Data Analysis Functions

- **Waveforms Record:**

Measurement Software can entirely record the test data, and generate data files which will be stored to the appointed directory.

- **Digital Filter:**

Use multipoint smooth, digital windows, adaptive filter etc. Effectively keep the noise from outside interference and equipment down.

- **Test Voltage Analysis:**

Real-time calculate the current value of the test voltage and peak voltage, and track the test curve.

- **Transient Waveform Record and Analysis:**

Based on different test projects, set up certain types of transient waveform record and analysis, and calculate values such as the peak voltage, the voltage gradient, the duration, anti-peak value, and so on.

- **Test harmonic analysis:**

When test voltage is low, due to the unsaturated magnetic core, harmonic content is high. National Standards for harmonic content in a test voltage is provided. Therefore to monitor the harmonic content during the test process is also very necessary.

- **Test Reports Generating and Printing:**

Following Test-specific templates, print test reports and test waveforms.

- **Other Data Analysis Functions:**

Based on different test projects, it is convenient to add data processing functions which clients need.

**For further information please contact:**

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