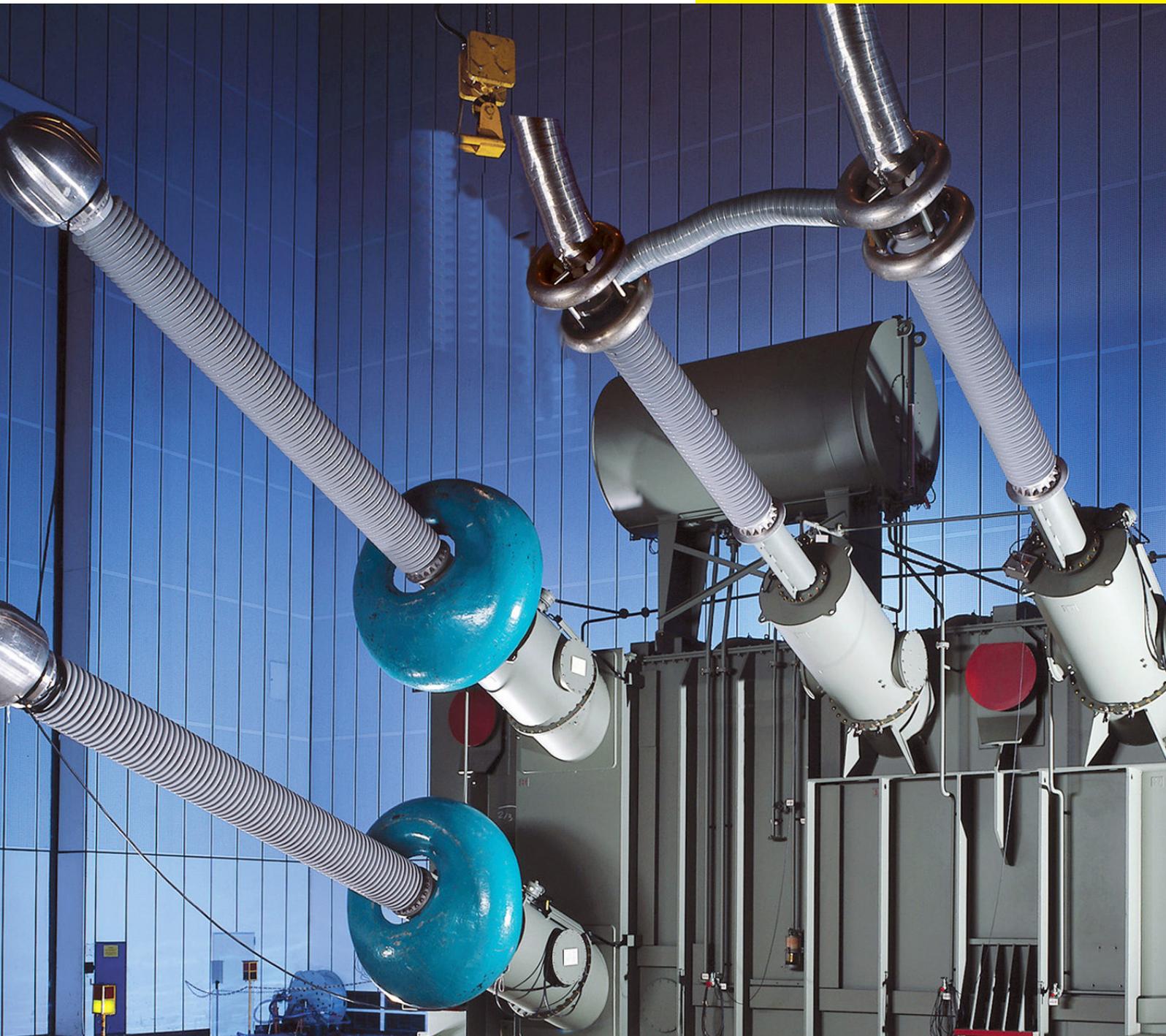


How can we reduce losses? Precisely

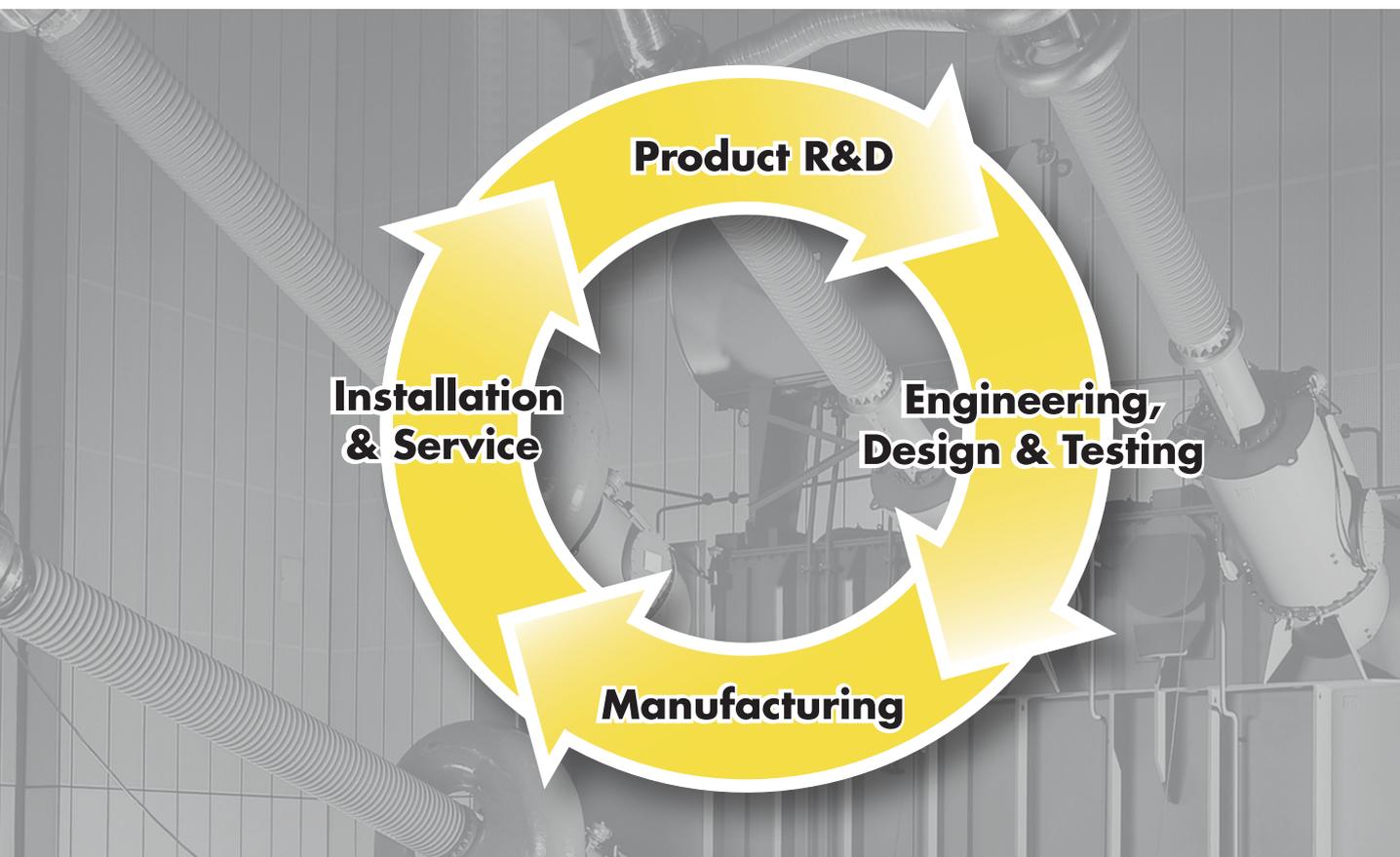


The world's most accurate power analyser for the transformer industry.



ACCURATE MEASUREMENT

REDUCING LOSSES IN THE TRANSFORMER LIFE CYCLE



Transmission and distribution transformers exhibit losses under no-load condition and during normal operation. If the transformer experiences losses which exceed the specified limits under no-load condition, the manufacturer can face penalties imposed by the power utility. These losses can typically cost the manufacturer as much as €11,000 per kilowatt lost. The losses can occur at any stage of the transformer development cycle, from research and development through to installation and servicing.

For the manufacturer to build a reliable transformer, it is necessary to measure losses accurately. The more precise the measurement accuracy, the less likelihood there will be penalties, and the greater will be the trust from the customer. Transformer manufacturers are

continuously looking at new technology which will enable them to minimise the total cost of ownership for their customers.

To support the transformer industry and to help deliver highly reliable transformers, Yokogawa provides the only dedicated power analyser for this sector. The WT3000T (T for Transformer Version) is the world's most accurate power analyser, ensuring high accuracy, precision and stability at very low power factors. With 100 years of experience and leadership in measurement, Yokogawa enables manufacturers to develop the next generation of transformers with lower life-cycle costs.

BEST ACCURACY AT LOW POWER FACTORS

The WT3000T is the world's most accurate precision power analyser, offering the best accuracies at low power factors for commercial frequencies of 45 to 66 Hz. Low power factors have a dramatic effect on accuracy. The WT3000T offers accuracy of 0.6% of the reading for measurement, even at a power factor as low as 0.01 at 100 V and 1 A. This makes the WT3000T ideal for the precision testing of transformer losses according to the IEC60076-8 Standard.

HIGH PRECISION

The WT3000T uses a 32-bit RISC processor and specifically selected 16-bit A/D converters to provide high resolution. It allows power readings to be displayed with a resolution as high as six digits, which minimises the uncertainties in the calibration process.

LONG TERM STABILITY

The WT3000T is very stable and only needs to be calibrated at intervals of two years. This minimises the downtime and hence saves money.

CLEAR OVERLOAD/SAFETY INDICATORS

Both standard formulas used to calculate the corrected power, when small loads are connected to potential transformers, are directly supported.



ACCREDITED CALIBRATION CERTIFICATE

The WT3000T is delivered with an accredited calibration certificate from the Yokogawa Europe accredited calibration laboratory. It is calibrated, tested and measured according to ISO/IEC 17025. The calibration is performed at frequency of 53

Hz and at power factors of 1, 0.5, 0.05, 0.01 and 0.001. This enables the accuracy of the integrated transformer measurement system to be kept within the limits described in the IEC60076-8 Standard.

EASY TO USE AND CLEAR TO READ

The WT3000T is easy to use at all stages of the transformer life cycle. The large (8.4-inch) LCD display makes it easy for the user to read the measurements.

DIRECT READOUT OF CORRECTED POWER FOR POTENTIAL TRANSFORMERS

When small loads are connected to the potential transformers, the WT3000T directly supports both the standard formulas used to calculate correct power.

IEC76-1(1976), ANSI/IEEE C57.12.90-1993	IEC76-1(1993)
$P = \frac{P_m}{P_1 + k \cdot P_2}$ $k = \left(\frac{U}{U'} \right)^2$	$P_0 = P_m (1 + d)$ $d = \frac{U' - U}{U'}$
<p>Where</p> <p>P or P₀ = corrected power P_m = measured power P₁ = ratio of hysteresis loss to total iron losses P₂ = ratio of eddy current losses to total iron losses</p>	<p>U' = mean value of voltage U = rms value of voltage</p>

USAGE AS CALIBRATION STANDARD AND ADDITIONAL APPLICATIONS

The high accuracy, precision and stability offered by the WT3000T allows it to be used as a calibration standard. The accuracy of the instrument enables measurement of capacitors and power factor correcting equipment.

Readout of:

Rms voltage	U rms1	100.053	V
Rms current	I rms1	1.00154	A
Power	P1	1.007	W
Power, 6-digits	F1	1.00712	W
Apparent power	S1	100.208	VA
Power factor	λ1	0.01005	
Phase angle	φ1	G 89.424	°
Frequency	fU1	52.941	Hz

Update 13 2009/09/02 09:14:14

Printer output: 104.36, 0.4344, 30.27, 50.020

WT3000T Power Analyser ordering code

Model	Suffix Codes	Description
T760303-03-SV		WT3000T 3 input elements model
T760304-04-SV		WT3000T 4 input elements model
		GPIB communication (standard delivery)
		Advanced Calculation, harmonics measurements /G6
		Ethernet port, (100BASE-TX/10BASE-T) /C7
		USB ports, for screenshots, data and settings on USB memory. Keyboard /C5
Power Cord	-D	UL/CSA Standard
	-F	VDE Standard
	-R	AS Standard
	-Q	BS Standard
Options	/DT	Delta calculations, calculate individual phase voltages from line voltages
	/CC	Cycle by cycle measurement, time series listing of measurements/cycle
	/C12	Communication with PC by USB connection type B
	/FQ	Frequency measurements from six (standard: 2) measurement channels
	/V1	VGA output to external monitor
	/B5	Internal printer

WT3000T Specifications

Range 100V 1A or 5A		
Frequency 44-66 Hz		
Specification value in % of reading, valid for 24 months		
Temperature 23 +/- 4° C		
Integration Time 2 seconds		
Voltage 100V range:		
20% to 60% of range	0.025%	
60% to 110% of range	0.005%	
Current 1A or 5A range:		
20% to 60% of range	0.025%	
60% to 110% of range	0.005%	
Phase 100V, 1A or 5A range:		
10 to 170°	0.002°	normal mode
-10 to -170°	0.002°	normal mode
Phase 100V, 1A or 5A range:		
0 to +/-180°	0.002°	Harmonics mode
Power 100V, 1A or 5A range:		
20% to 60% of range		
PF 1	0.03%	
PF 1 to 0.5	0.06%	
PF 0.5 to 0.05	0.15%	
PF 0.05 to 0.02	0.35%	
PF 0.02 to 0.01	0.7%	
60% to 110% of range		
PF 1	0.01%	
PF 1 to 0.5	0.03%	
PF 0.5 to 0.05	0.15%	
PF 0.05 to 0.02	0.3%	
PF 0.02 to 0.01	0.6%	

“The accuracy of the power measurements is currently one of the most important factors in minimising the no-load losses in transformers. The manufacturers of power turbines frequently have a penalty clause in their contracts regarding the level of these losses, and they risk paying heavy fines if the no-load losses are too high. The level of these fines can be judged by the fact that it can cost about 11,500 euros per kilowatt lost, making it vital to be able to measure the losses with great precision. My experience in this sector reinforces my belief that it is important to maintain power measurement accuracy thorough the transformer life cycle from R&D, though production and installation, to service and maintenance, and the Yokogawa WT3000T has certainly enabled us to rise to this challenge.”

Claes Hugoson
CEO of Elektrisk Drivteknik AB, Sweden

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**WT3000T
PRECISION POWER ANALYSER**

ABOUT YOKOGAWA

Yokogawa's global network of 88 companies spans 55 countries. Founded in 1915, the US\$4 billion company conducts cutting-edge research and innovation. Yokogawa is engaged in the industrial automation and control, test and measurement and other business segments. Yokogawa Test & Measurement Division is a major worldwide force in the test & measurement market, with products that include oscilloscopes, power meters and optical communications test equipment, portable test instruments, recorders and data-acquisition systems.

For more information, please visit the company's web site at www.tmi.yokogawa.com