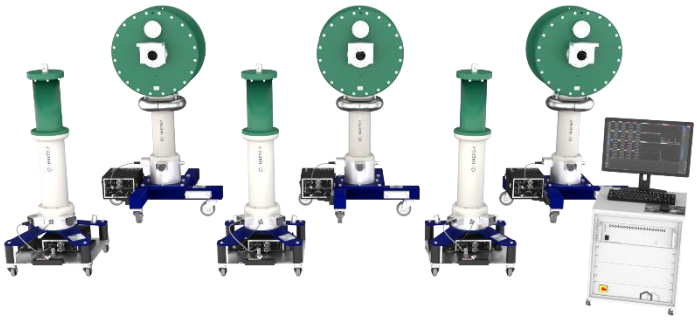
TMS 600

Transformer Loss Measuring System

Datasheet



HAEFELY

Current and voltage – our passion

Designed by Tettex

General Description

Accurate loss measurement has become essential for any manufacturer committed to delivering high-quality power transformers. Today's breakthroughs in materials and production technologies have dramatically lowered transformer losses, leading to tighter industry standards.

Because loss values are contractually specified - and penalties apply when guaranteed values are exceeded - precise, reliable testing is more important than ever. It's not just a compliance requirement; it's a competitive advantage.

The TMS 600 embodies decades of Haefely expertise and continuous development in high-voltage measurement technology. Designed to set new standards, it delivers exceptional accuracy even at extremely low power factors, ensuring reliable and precise results.

TMS has undergone extensive tests in independent reference laboratories and guarantees full confidence in every measurement.

The system is operated via Haefely's advanced Control and Measurement Suite (CaMS™), designed specifically for high-voltage applications. This intuitive platform seamlessly integrates power supply units such as SPTTS or PZT with precision measurement instruments like TMS or DDX, all within a single software environment.

Features	Advantages
▪ Highest accuracy loss measurement, even at very low power factors.	☑ **Precision –** Ensures measured losses truly correspond to the transformer's real losses.
▪ Type tested and accuracy certified at an independent reference laboratory.	☑ **Confidence –**.Fully Traceable Factory Test certification.
▪ Integrated wattmeter, no external device required.	☑ **Simplified Setup –** Embedded wattmeter in sensors reduces uncertainty due to fewer components and ensures maximum accuracy.
▪ Independent voltage and current sensors.	☑ **Correct Connection –** Separate sensors allow correct 4-wires connection and avoid cross coupling measurement errors.
▪ Haefely's CaMS™, powerful real time measurement software.	☑ **Easy to use –** Intuitive windows-based graphical interface, developed for high-voltage applications, featuring large configurable numeric indicators and optimized real-time charts.
▪ Single fiber optic connection between all channels and to control room.	☑ **Quick Installation –** Simple and secure setup with a single fiber optic link per channel and just one connection to the control computer
▪ Wide frequency bandwidth.	☑ **Versatility –** Supports induced voltage tests and provides detailed harmonic content analysis for comprehensive transformer assessment.

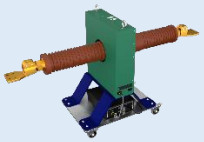
Applications

- Measurement of load losses, no load losses, induced voltage and heat run tests on power transformers according IEC 60076 and ANSI C57.12
- Measurement losses on shunt reactors

Scope of Supply

- TMS voltage channels (3) including reference capacitor (NK), digitizer unit (CMU) mains and fiber optic connection cables.
- TMS Current channels (3) including reference CT, digitizer unit (CMU), mains and fiber optic connection cables.
- Mini-Rack with PCI 811c Haefely computer for high voltage applications.
- Haefely CaMS™ Software.
- Haefely factory Test Certificate.
- Manual (English).

Models

TMS type	Max. Voltage (Phase-Ground)	Max. Current	Current Channel	Voltage Channel
TMS 600 45-3000	45 kV	3000 A	 CT-M	NK 100
TMS 600 100-2000	100 kV	2000 A 2400 A (*)	CT-100-2000	NK 100
TMS 600 100-4000	100 kV	4000 A 4800 A (*)	CT 100-4000	NK 100
TMS 600 200-2000	200 kV	2000 A 2400 A (*)	CT 200-2000	NK 200
TMS 600 200-4000	200 kV	4000 A 4800 A (*)	CT 200-4000	NK 200

(*) 120% excitation at reduced duty cycle, 1h ON , 4h OFF , 4 times/day

Technical Data

Voltage measurement

		TMS 600 45-3000	TMS 600 100-2000 TMS 600 100-4000	TMS 600 200-2000 TMS 600 200-4000
Nominal Voltage	($V_{Nom\ ph\text{-}ground}$)	45 kV	100 kV	200 kV
	($V_{Nom\ ph\text{-}ph}$)	78 kV	173 kV	346 kV
Excitation			0 … 110 %	
Voltage range		0.1 V … 45 kV	0.1 V … 100 kV	0.1 V … 200 kV
$Frequency_{fund}$ [a]			10 … 600 Hz	
Temp. coefficient			30 ppm / °C	
Amplitude error		Reference Conditions [1]		Extended Conditions [2]
45 …. 65 Hz	**10 V … V_{Nom}**	**±0.02 % (200 ppm)**		**±0.08 % (800 ppm)**
	0.1 V … 10 V	±0.04 % (400 ppm)		±0.10 % (1000 ppm)
10 … 45 Hz &	10 V … V_{Nom}	±0.03 % (300 ppm)		±0.09 % (900 ppm)
65 … 600 Hz	0.1 V … 10 V	±0.06 % (600 ppm)		±0.12 % (1200 ppm)
600 … 12 kHz [b]	0.1 V … V_{Nom}	±0.10 % (1000 ppm)		±0.16 % (1600 ppm)

[a] Fundamental power frequency [b] Harmonics

Current measurement

		TMS 45-3000	TMS 600 100-2000 TMS 600 200-2000	TMS 600 100-4000 TMS 600 200-4000
Nominal Current	(I_{Nom})	3000 A	2000 A	4000 A
Excitation			0 …. 120 %	
Current range [c]		1 mA … 3000 A	1mA … 2400 A [c]	1 mA … 4800 A [c]
$Frequency_{fund}$			10 … 600 Hz	
Temp. coefficient			5 ppm / °C	
Amplitude error		Reference Conditions [1]		Extended Conditions [2]
45 …. 65 Hz	**25 mA … I_{Nom}**	**±0.02 % (200 ppm)**		**±0.03 % (300 ppm)**
	1 mA … 25 mA	±0.04 % (400 ppm)		±0.05 % (500 ppm)
10 … 45 Hz &	25 mA … I_{Nom}	±0.03 % (300 ppm)		±0.04 % (400 ppm)
65 … 600 Hz	1 mA … 25 mA	±0.06 % (600 ppm)		±0.07 % (700 ppm)
600 … 12 kHz [b]	1 mA … I_{Nom}	±0.10 % (1000 ppm)		±0.16 % (1600 ppm)

[a] Fundamental power frequency [b] Harmonics

[c] Currents above I_{Nom} at reduced duty cycle, 1h ON , 4h OFF , 4 times/day

Power measurement

Range	Cos ϕ (PF)	Reference and Extended Conditions [2]
	1	0.11 %
	0.1	0.16 %
	0.05	**0.21 %**
≥ 10 V	**0.02**	**0.36 %**
≥ 1 A	**0.01**	**0.61 %**
	0.008	0.74 %
	0.005	1.11 %
	0.002	2.61 %

Connectors

Fiber-optic	2 x HARTING optic connector, Han 3A-gw-M20, SC type
FiberLink converter	HARTING optic connector, Han 3A-gw-M20, SC type, Ethernet 10/100, USB 2.0
High voltage (NK)	Multicontact
High current (CT)	Copper bar

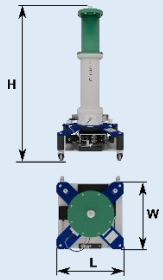
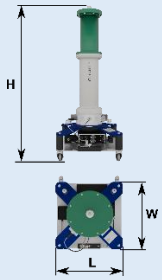
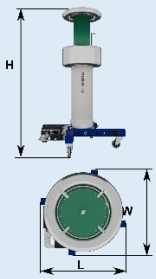
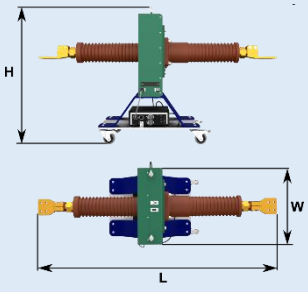
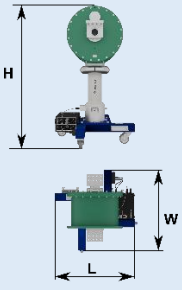
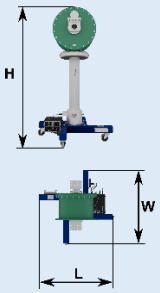
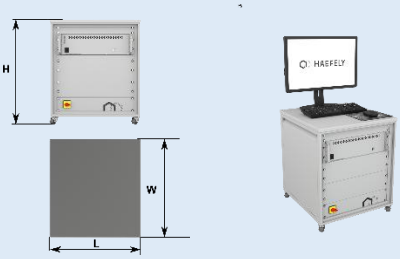
Environmental, Mechanical and Power Supply		
Operating temperature	(1) Reference Conditions	(2) Extended Conditions
	20°C … 25°C	0°C … 50°C
Storage temperature	-20°C … 60°C	
Humidity	20 … 90 % r.h. (non-condensing)	
Power supply	90 … 264 VAC, 50/60 Hz, 500 VA	

PC, Screen Resolution and Operation System Requirements		
Software	Haefely CaMS™	
PC min. configuration	Intel Core i7® 9th Gen/ AMD Ryzen 7 5700® or better, 8 GB RAM, Ethernet / USB 2.0	
Screen resolution	Minimum	Recommended
	1920 x 1080 (Full HD)	2560 x 1440 (QHD)
Operating system	MS Windows 11™, 64bit	
Remote control	Available, SCPI commands over TCP/IP (**)	

(**) Remote commands only over running Haefely CaMS™ software.

Applicable Standards	
General	Specifications conform to the standards / recommendations of IEC 60076 and IEEE C57.12.
CE conformity	EMC Directive 2014/30/EU and RoHS Directive 2011/65/EU (*)

(*) Electronic measuring devices only

Mechanical				
Voltage channel		TMS 45-3000	TMS 100-2000 TMS 100-4000	TMS 200-2000 TMS 200-4000
	NK + CMU			
	WxLxH (mm)	610 x 600 x 1450	610 x 600 x 1450	1260 x 1260 x 2100
	Weight (kg)			
Current channel		TMS 45-3000	TMS 100-2000 TMS 100-4000	TMS 200-2000 TMS 200-4000
	CT + CMU			
	WxLxH (mm)	565 x 1750 x 950	1010 x 1010 x 1750	1260 x 1260 x 2220
	Weight (kg)			
Control unit				
				
	WxLxH (mm)	610 x 560 x 630		
	Weight (kg)			

Global Presence

EUROPE

HAEFELY AG
Birsstrasse 300
4052 Basel Switzerland

☎ +41 61 373 4111
✉ sales@haefely.com
💻 www.haefely.com

CHINA
HAEFELY AG Representative Office
8-1-602, Fortune Street, No. 67,
Chaoyang Road, Beijing 100025
China

☎ +86 10 8578 8099
✉ sales@haefely.com.cn
💻 www.haefely.com

INDIA
HAEFELY Services Private Ltd.
1st Floor, 1, 2, 3 & 4,
Vedas Spaces Commercial,
Nashik – 422 009, India

☎ +1 800 266 4052 (toll free)
✉ sales@haefely.com
💻 www.haefely.com

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HAEFELY
Current and voltage – our passion

H HIGH VOLTAGE
I INSTRUMENTS
E EMC

precision. swiss made.