

## TRAX

### Transformer and substation test system



- Replaces need for multiple test sets
- Saves time by eliminating need for multiple instruments learning
- User-friendly interface reduces training and testing time
- Portable and compact system components for easy shipping
- “State of the art” measurement methods for advanced diagnostic testing

#### DESCRIPTION

TRAX is a multifunctional solution for transformer and substation testing. TRAX applications range from power transformers, where it offers several unique and outstanding features, to instrument transformers, circuit breakers and many other substation components.

TRAX includes a total of 10 generators each tuned to the requirements of the specific test in which they are used. Combined with the widest range of inputs in the industry, you will always be able to do your measurement to the highest standard. Standard voltage and current output is 800 A and 2200 V (TRAX 280) but can be boosted further using the auxiliary instruments TDX 120 (voltage to 12 kV) or TCX 200 (current to 2000 A). DC measurements can be made with 100 A true DC, not just rectified AC.

To fit any application and budget, the TRAX is available in versions with or without touchscreen as well as in versions for 200 or 800 A AC output.

TRAX application areas can be greatly expanded using auxiliary instruments:

- TDX120 – Accessory for tan delta / power factor up to 12 kV
- TCX200 – High current accessory for primary injection testing up to 2000 A
- TSX303 – Automated 3-phase switchbox for one time connection which results in faster testing of power transformers
- TSX300 – Manual switchbox for easier connection during power transformer testing
- Line impedance kit – Kit for testing line impedance with TRAX

The TRAX system also comprises cable sets and connection accessories for just any test imaginable.

#### FEATURES AND BENEFITS

TRAX has an app based graphical user interface that is easy to learn and extremely easy to use. All apps have a common layout and interface and test object settings are stored between tests. Less time for training and operation means more time for testing. Apps are supplied in application specific packages:

- Power transformer – standard and advanced
- Instrument transformer
- Substation
- Line impedance

New apps and app packages are continuously developed and new functionality can easily be added through a software update.

The TRAX apps utilize the TRAX hardware to the fullest and include many state-of-the-art features:

- Winding and contact resistance measurement up to 100 A true DC for best accuracy
- Adaptive algorithm for faster and optimal transformer demagnetization
- True dynamic resistance measurement of on load tap-changers
- Individually temperature corrected tan delta / power factor and capacitance testing at 12 kV / 500 mA
- Built-in circuit breaker analyzer
- Manual mode for advanced trouble shooting or design of your own test

Measurement data is the testers most valuable asset and TRAX is well prepared to make the best out of your measurements:

- A full report generator that builds the report as you test is included in TRAX
- TRAX data can also be exported as pdf or to Meggers asset management software PowerDB
- Data output through USB, software upgrades through the internet and remote control via PC

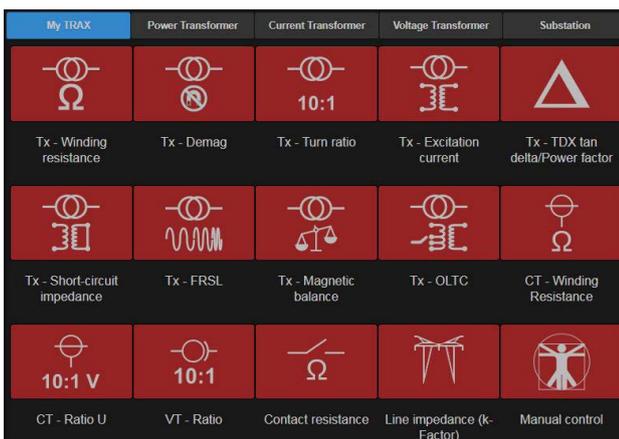
## TRAX Transformer and substation test system

Getting the connection to the test object right is a cumbersome and time-consuming tasks in substation testing. TRAX includes features that gets you faster to your actual job; testing.

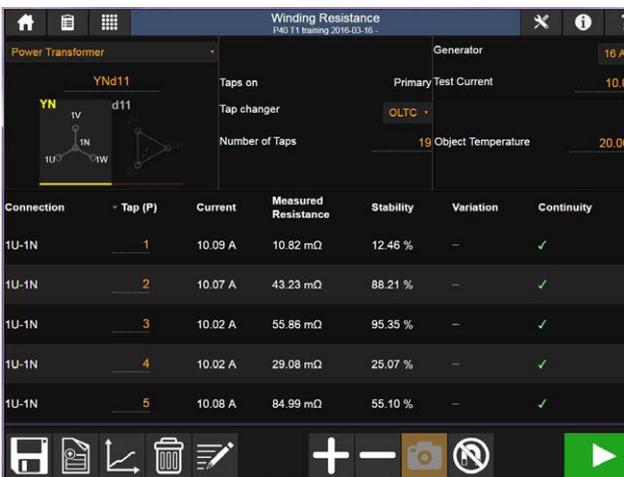
- Inputs and outputs that light up clearly indicating where to connect
- Wiring diagrams for each test, specific for your test object and TRAX configuration
- Optional 3-phase switchbox to minimize connections and reduce test time during power transformer testing.
- Lead sets designed to support multiple tests meaning that you have to bring less cables to the test site.
- Best-in-class Kelvin clamps for secure connection to the transformer.

Thanks to its compactness and low weight (TRAX 219/220, less than 32 kg in the lightweight, soft flight case), TRAX 219/220 can be checked in on regular flights and travels easily with you. For an international service company, this can save weeks of costly shipping time.

### USER INTERFACE



App selection menu



Winding resistance app

### SPECIFICATIONS TRAX

Specifications are valid at nominal input voltage and an ambient temperature of +23°C ±5°, (73°F). Specifications are subject to change without notice.

#### Environment

**Application field** For use in high-voltage substations and industrial environments

#### Temperature

Operating -20°C to +55°C (-4°F to +131°F)

Storage -20°C to +70°C (-4°F to +158°F)

#### Humidity

< 90%RH, non-condensing

#### CE- marking

**LVD** 2014/35/EU

**EMC** 2014/30/EU

**RoHS** 2011/65/EU

#### Classifications and standards

**IP-rating** IEC 60529

Instrument only IP20

Instrument in hard case IP21

#### General

**Mains input** 100-240 V, 50/60 Hz (± 10%)

**Input current** ≤ 16 A continuous  
Short-term up to 30 A < 60 s

#### Main fuses

F1 and F2, 25 A



TEST GROUND

To be connected to the test object ground before connecting any other cables to the unit.



GROUND

For connecting an additional ground between the main unit and accessories or to ground external objects e.g. optional trolley

#### Dimensions

**Instrument** 475 x 315 x 330 mm (excl. handles)  
(18.7" x 12.4" x 13")

**Soft case** 690 x 450 x 390 mm  
(27 x 18 x 15")

**Hard case** 690 x 410 x 450 mm  
(27 x 16 x 18")

#### Weight

	Instrument only	In soft case	In hard case
TRAX 219	25 kg (55 lbs)	29 kg (64 lbs)	37 kg (82 lbs)
TRAX 220	26 kg (57 lbs)	30 kg (66 lbs)	38 kg (84 lbs)
TRAX 279	29 kg (64 lbs)	33 kg (73 lbs)	41 kg (90 lbs)
TRAX 280	30 kg (66 lbs)	34 kg (75 lbs)	42 kg (93 lbs)

#### Display<sup>1)</sup>

**Size** 10.4"

**Resolution** 1024x768 XGA

**Type** TFT touch

**Contrast ratio** 1000:1

**Brightness** 1000 cd/m<sup>2</sup>

1) TRAX 219 and 279 has no display

## TRAX

### Transformer and substation test system

#### Outputs

Name	Specification	Comment
0-2200 V <sub>AC</sub>	1 A, 1 min 0.2 A, >2h 2500VA (max) Frequency range: 5-70Hz	The output is disconnected with a relay and the output is "live" only when this generator is selected
0-250 V <sub>AC</sub> / 0-10 A <sub>AC</sub>	10 A, 1 min 20 A, max 10s 2.5 A, >2 h Frequency range: 5-505 Hz	
0-200 A <sub>AC</sub>	200 A/6 V, 1 min 80 A, >2 h Frequency range: 45-70Hz	TRAX 219/220
0-800 A <sub>AC</sub>	0-800 A/6 V, 1 min 0-200 A/10 V, >2 h Frequency range: 45-70Hz	TRAX 279/280
0-16 A <sub>DC</sub>	16 A, continuous 1 A continuous	
0-300 V <sub>DC</sub>	10 A, 1 minute 2.5 A, >2 h	Rectified DC. Intended to be used as e.g. auxiliary DC supply
0-100 A <sub>DC</sub>	100 A, 2 minutes 70 A, continuous	
DC output power	Max 1000 VA , continuous Max 50 V compliance voltage	
Binary output	250V/35A (max) 2 x 0-10000 s	Output contacts for OLTC and circuit breaker operation with internal voltage and current measurements

#### AUX

CONTROL	54 V DC	Ethernet communication and power to accessories.
POWER	0-235 V AC	Directly from power amplifier for powering accessories (TDX/TCX)
With TDX 120	12 kV AC 500 mA, 30 s 300 mA, 4 min 200 mA, 30 min 100 mA, continuous	See TDX datasheet
With TCX 200	2000 A AC 0-2000 A/2.4 V, 1 min 0-1000 A/4.8 V, 1 min	

#### Inputs

Name	Specification	Comment
<b>ANALOG</b> 1 2 3 4		
Current	4 x 0-10 A AC/DC	
Voltage	4 x 250/300V AC/DC	
R1 R2	2 x 0-50 V DC	Intended for resistance measurements but can be used for AC voltage measurement up to 40V <sub>RMS</sub>
TRANS		Input for analog transducers and low level analog signals
TRIG IN		Contact or voltage sense
TIMING	3 x 0-10000 s	Binary inputs for timing measurements in timer and relay testing applications. A and B inputs dedicated for Start and Stop.

#### Calculated / displayed parameters

<b>Arithmetic</b>	+, -, *, /
<b>Power</b>	P, VA, Q, S
<b>Impedance</b>	R (DC), Z, Xp, Xs, Rs, Rp, Ls, Lp, Cs, Cp, phase

#### Derating at lower mains voltage

TRAX specification is valid at 230-240 V mains voltage. Output power is decreased at lower mains voltages.

#### Derating at high ambient temperature

TRAX specification is valid at 23 ±5°C. Max output current times will be reduced when using TRAX in high ambient temperature.

#### Derating at lower frequencies

TRAX voltage output specification is at 50 Hz. Maximum voltage output at lower frequencies is limited by the transformer. Derating is linear with frequency and max voltage output at 5 Hz is 10% of rated output.

#### Measurement accuracy

<b>External AC/DC voltage and current</b>	0.05% of reading + 0.05% FS (1 ≤ 5 ADC/AC RMS) 0.2% of reading + 0.2% FS (5 < 1 ≤ 10 ADC/AC RMS)
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**Internal DC current** 0.1% of reading + 0.1% FS

**Internal AC current** 0.2% of reading + 0.2% FS

**Internal AC voltage** 0.2% of reading + 0.2% FS

**Phase (0-360°)** 0.1°

#### Measurement accuracy derived parameters (typical)

	Range	Accuracy	Resolution
WRM	1 A generator: 10 mΩ – 10 kΩ 16 A generator: 0.63 mΩ – 33.3 Ω 100 A generator: 0.1 mΩ – 2.5 Ω	0.15 % RD + 0.15 % FS	Up to 4 digits
TTR	2500:1 – 1:25 000	0.07 %	Up to 4 digits

#### COM

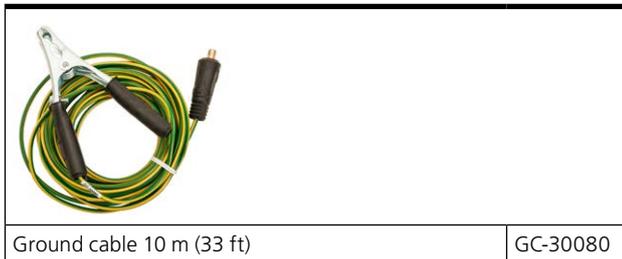
**Ethernet port** For running the instrument from an external PC or connect it to an external network.

**USB** 3 USB ports for multipurpose use

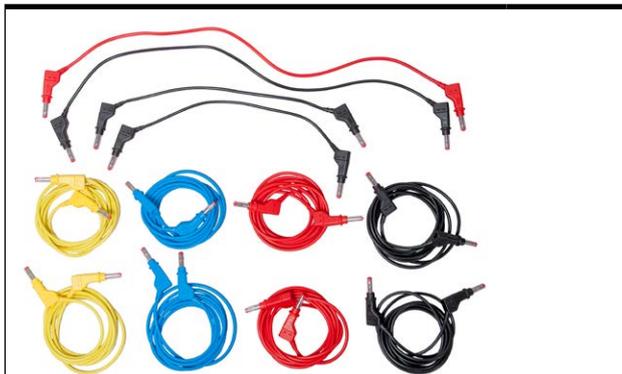
## TRAX

### Transformer and substation test system

#### INCLUDED ACCESSORIES



Ground cable 10 m (33 ft)	GC-30080
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Test cable set, 2 each 5 m red/black, 2 each 2 m yellow/blue. 1 each 0,5 m red/black, 2 x 0,25 m black	GA-00037
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Sense cable, 10 m (33 ft), black	KG-00530
Sense cable, 10 m (33 ft), red	KG-00532
OR	
Sense cable, 15 m (49 ft), black	KG-00540
Sense cable, 15 m (49 ft), red	KG-00542
OR	
Sense cable, 20 m (66 ft), black	KG-00570
Sense cable, 20 m (66 ft), red	KG-00572



Kelvin cable, 10 m (33 ft), black	GC-32310
Kelvin cable, 10 m (33 ft), red	GC-32312
OR	
Kelvin cable, 15 m (49 ft), black	GC-32315
Kelvin cable, 15 m (49 ft), red	GC-32317
OR	
Kelvin cable, 20 m (66 ft), black	GC-32320
Kelvin cable, 20 m (66 ft), red	GC-32322

**Note:** Only included in the Power transformer testing versions of TRAX



Current cable, 35 mm <sup>2</sup> , 10 m (33 ft), black	GC-32010
Current cable, 35 mm <sup>2</sup> , 10 m (33 ft), red	GC-32012
OR	
Current cable, 35 mm <sup>2</sup> , 15 m (49 ft), black	GC-32015
Current cable, 35 mm <sup>2</sup> , 15 m (49 ft), red	GC-32017
OR	
Current cable, 35 mm <sup>2</sup> , 20 m (66 ft), black	GC-32020
Current cable, 35 mm <sup>2</sup> , 20 m (66 ft), red	GC-32022



Current cable, 800 A, 95 mm <sup>2</sup> , 2 x 6 m (20 ft), (TRAX 279/280)	GC-32106
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HV cable, 2200 V, 10 m (33 ft), black	04-35310
HV cable, 2200 V, 10 m (33 ft), red	04-35312



Alligator clip, black	40-08320
Alligator clip, red	40-08322



Large clamp for HV-cable, black	GC-80040
Large clamp for HV-cable, red	GC-80042

## TRAX

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Jumper cable, 10 mm<sup>2</sup>, 5 m (16 ft) GC-32091  
**Note:** Only included in the Power transformer testing versions of TRAX.



Ethernet cable, shielded, 3 m (10 ft) GA-00985



Safety hand switch interlock, 2.4 m (8 ft) GC-31103



Transport case, with wheels GD-30200  
 Case for accessories, with wheels GD-30220

### OPTIONAL ACCESSORIES



TDX 120, AJ-69090

High voltage unit (12 kV) for tan delta and capacitance measurements



TCX 200, AJ-69290

High current accessory, 2000 A



TSX 303, AJ-69490

3-phase/6-winding automated switchbox, 250 V / 16 A



TSX 300, AJ-69390 / AJ-69395

3-phase/6-winding manual switchbox, 250 V / 16 A with IEC or ANSI panel design

## TRAX Transformer and substation test system



Line impedance kit, AJ-69690

The Line Impedance Kit is an accessory for TRAX. It consists of TSA230 - surge arrester unit and TPB230 - protection box, plus cables, accessories and AJ-8050X software app for TRAX.



Trolley, AJ-90040

Trolley suited for TRAX and optional accessories, e.g. TDX120



B10E, BG-29092

A variable DC voltage can be needed to test a circuit breaker. The B10E supplies 24-250 V AC or DC.



GA-90010

Connection kit for control cables



TIB 225, AJ-90030

Warning lamp indicating safe (green) or voltage/current generating (red), 10 m (30 ft).



GC-31120

Safety hand switch interlock, 18 m (60 ft)



Interlock foot switch, GC-31150

Safety foot switch interlock, 3 m (10 ft)



Soft flight case, GD-31050

Soft flight case for TRAX, except accessories, to minimize weight for flight purpose. TRAX 219/220 in soft flight case is less than 32 kg, the limit for checked in luggage.



AJ-90020

TCB200 - TRAX Calibration Box. Only available for accredited service partners.

## TRAX

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#### ORDERING INFORMATION

TRAX main units		TRAX 280	TRAX 279	TRAX 220	TRAX 219
<b>Current output [AC]</b>		800 A		200 A	
<b>Touchscreen</b>		Yes	No	Yes	No
<b>Transformer testing application</b> Including: <ul style="list-style-type: none"> <li>Standard transformer (AJ-8010X)</li> <li>Manual control app</li> <li>Accessory packages 1 and 2.</li> </ul>	10 m cables	AJ-19090	AJ-19190	AJ-19290	AJ-19390
	15 m cables	AJ-19091	AJ-19191	AJ-19291	AJ-19391
	20 m cables	AJ-19092	AJ-19192	AJ-19292	AJ-19392
<b>Primary testing application</b> Including: <ul style="list-style-type: none"> <li>Instrument transformer (AJ-8030X)</li> <li>Manual control app</li> <li>Accessory packages 1 and 3.</li> </ul>		AJ-19093	AJ-19193	AJ-19293	AJ-19393
		AJ-19000	AJ-19100	AJ-19200	AJ-19300
<b>General application</b> Including: <ul style="list-style-type: none"> <li>Manual control app only, no accessories</li> </ul>		AJ-19000	AJ-19100	AJ-19200	AJ-19300

#### Software packages

Apps denoted with \* are supported also when using the automatic switchbox TSX303

#### Manual control

Included in all TRAX versions

- 6 channel multimeter
- Oscilloscope
- LCR meter
- Phase-angle meter
- AC and DC generator
- Analysis & calculations

#### Standard transformer

Included in TRAX versions for Power transformer testing

- Winding resistance with OLTC continuity\*
  - Single phase up to 100 A
  - Three-phase/six windings up to 16 A (with TSX300/303)
- Adaptive demagnetization\*
- Turns ratio up to 250 V with excitation current\*
- Excitation current
- Short-circuit impedance (leakage reactance) AJ-8010X

#### Advanced transformer (optional)

- Dynamic OLTC measurements: True DRM with diverter switch timing and resistances, ripple, slope & motor current. For resistive, reactive and vacuum type tap changers on primary or secondary side\*
- FRSL (frequency response of stray losses)
- Magnetic balance
- Excitation current (GOST) AJ-8020X

#### Instrument transformer (optional)

Included in TRAX versions for instrument transformer testing

- CT ratio, burden, excitation curve (knee point), polarity, winding resistance
- VT ratio, burden (manual), polarity AJ-8030X

#### Substation (optional)

See also recommended accessories below

- Circuit breaker analyzer
- Phase angle meter (manual)
- Ground/earth/impedance (manual)
- Primary injection timing (only TRAX 279/280 or TCX200) AJ-8040X

#### Line impedance (optional)

Included in line impedance kit AJ-69690

- Measurement of line impedance
- Calculation of K-factors AJ-8050X

#### Tan delta / power factor software

Activated when optional TDX120 is connected to TRAX

- Tan delta / power factor and capacitance testing at maximum 12 kV and 500 mA
- Frequency range 1-505 Hz
- Also supports narrowband dielectric frequency response (frequency sweep), tip-up testing and manual mode incl balancing of external inductor
- Automated individual temperature correction (ITC) and Voltage dependence detection (VDD)

#### Included accessories

##### Accessory package 1

Included in TRAX versions for transformer & primary testing application:

- Mains cable
- Ground cable, 10 m (33 ft)
- Alligator clips, black and red
- Large clamps for HV-cables, black and red
- Test cable set
- Current cables 800 A, 95 mm<sup>2</sup>, 2 x 6 m (20 ft) (TRAX 279/280)
- Current cables 200 A, 35 mm<sup>2</sup>, 2 x 6 m (20 ft) (TRAX 219/220 w. 15/20m (49/66 ft) cables)
- HV cables, 2 x 10 m (33 ft)
- Interlock hand switch, 2.4 m (8 ft)
- Ethernet cable, 3 m (10 ft)
- Case for accessories, with wheels
- Transport case, with wheels
- User Manual

##### Accessory package 2

Additional included accessories only in TRAX versions for transformer testing application:

- Kelvin cables, 2 x 10/15/20 m (33/49/66 ft), black and red
- Current cables, 35 mm<sup>2</sup>, 2 x 10/15/20 m (33/49/66 ft), black and red
- Sense cables 2 x 10/15/20 m (33/49/66 ft), black and red
- Jumper cable, 10 mm<sup>2</sup>, 5 m (16 ft)

##### Accessory package 3

Additional included accessories only in TRAX versions for primary testing application:

- Current cables, 35 mm<sup>2</sup>, 2 x 10/15/20 m (33/49/66 ft), black and red
- Sense cables, 4 x 10 m (33 ft), black and red

### Optional accessories

#### Test lead set

Recommended for software package AJ-8040X

- 4 Test leads, 0.5 m (1.6 ft) red/black/yellow/blue
- 6 Test leads, 2 m (6.5 ft) red/black/yellow/blue
- 4 Test leads, 5 m (16 ft) red/black/yellow/blue
- 4 Dolphin clamps (black/red) GC-32600

#### Timing test lead set

Recommended for software package AJ-8040X

- 6 Clamps with banana jack
- 6 Test cables, 10 m (33 ft) black/red GC-32610

#### Connection kit for control cables

Recommended for software package AJ-8040X

- 5 Test clips
- 5 Adapters for terminal block
- 5 Cable lug adapters
- 1 Plastic box GA-90010

#### Other

Trolley AJ-90040

Lightweight soft flight case GD-31050

Interlock foot switch, 10 m (33 ft) GC-31150

Interlock hand switch, 18 m (60 ft) GC-31120

Interlock extension cable, 10 m (33 ft) GA-01005

TIB225, Indicator box AJ-90030

### Optional instruments

**TDX 120** – High voltage unit for tan delta, capacitance and excitation current measurements. With hardware connected to TRAX main unit the SW app is activated <sup>1)</sup> AJ-69090

**TCX 200** – High current accessory (cable + booster) that can be placed close to the measurement object for minimizing high current cable length/weight when performing high current primary testing up to 2000 A <sup>1)</sup> AJ-69290

**TSX 303** – 3-phase/6-winding switchbox for automated measurements of winding resistance (16 A) and turns ratio (250 V). Also supports demagnetization.

**Incl. connecting and bushing cables** AJ-69490

**Incl. connecting cables only** AJ-69492

**TSX 300** – 3-phase/6-winding switchbox for simplified measurements of turns ratio (250 V), winding resistance (16 A), excitation current, leakage reactance and FRSL. **Note:** Cables not included <sup>1)</sup>

**IEC panel design** AJ-69390

**ANSI panel design** AJ-69395

**Line impedance kit** – Hardware kit for safe connection of the TRAX during line impedance measurements including TSA230 Surge arrester box, TPB230 Protection box, cables and accessories. Line impedance app AJ-8050X is also included <sup>1)</sup> AJ-69690

**B10E – Variable DC power supply**<sup>1)</sup> BG-29092

TCB200 - TRAX Calibration Box. Only available for accredited service partners. AJ-90020

<sup>1)</sup> See separate datasheet for more information.

Other options e.g. SFRA/FRAX, DFR/IDAX, DC insulation/S1/MIT and accessories included offered as separate products if requested.

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