GUSTAV KLEIN

High-performance test systems

Test power supplies (AC & DC source / sink)

Bidirectional power supplies for testing and simulating batteries, fuel cells, electric powertrains and other components.

Independent since 1948.
MADE IN
GERMANY
& AUSTRIA
PREMIUM
QUALITY
Innovative for You

Shaping the future together – A strong team for your high-performance test systems

"Our sales team for high-performance test systems is committed to working with you in a spirit of partnership and trust. We are dedicated to providing you with the best possible advice and working with you to develop the solution that's right for you!"

Michael Reith
Sales Director - High-Performance Test Systems

vertrieb@gustav-klein.com

"As Head of Engineering, I work with my team to ensure that our high-performance test systems are precisely tailored to the individual needs of our customers. Drawing on our extensive technical expertise and a clear understanding of the specific operating conditions, we develop customized solutions that are perfectly suited to their intended application."

Markus Siebachmeyer
Head of Engineering

"For our testing clients, I not only thoroughly test the systems before delivery, but also support our service team directly on-site—whether during commissioning, training sessions, or maintenance work. These challenges keep me motivated time and time again."

Christoph Engelniederhammer
Test Engineer & Field Service Representative


Im Forchet, Schongau / Germany

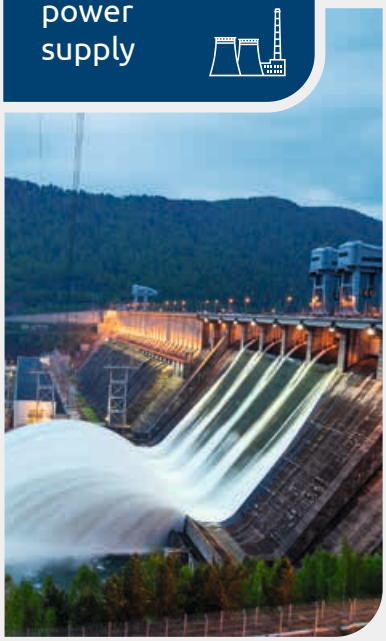

Greifenstraße, Schongau / Germany


Schießstand, Inzing / Austria

Our business divisions

Test & Simulation Systems

Reliable industrial power supply



Stationary power supply for rail & local transport

Our Gustav Klein Service – worldwide

Over
400,000
systems sold in

105
countries

Our quality promise

For over 75 years, Gustav Klein has been active in the market with power supply systems and solutions. The expertise and experience of our qualified employees provide you with reliability and competence in addressing your specific requirements. Through the continuous development of our products and our company, we will always strive to exeed your expectations.

Reliable Power Solutions.

Our commitment to the highest quality – focused on your benefits.

Examples of Applications for Test and Simulation Systems

Our test power supplies are highly versatile.
For a brief overview, here are a few examples of their applications.

Test of Batteries

- End of line test
- Long-term test
  e.g. according to WLTP
- In the development stage
- For type testing

Testing of electrical components & assemblies

- Contactors
- Penthouse
- Switches

Battery simulation

- Inverter testing
- Testing of electrical powertrains

Testing of fuel cells

- End of Line Test
- Long-term test
- In the development stage
- For type testing
- For conditioning

We would be happy to personally advise you and help you realize your individual project.

Fuel cell test

Battery simulation

Electrolysis test

Powertrain test

Battery test

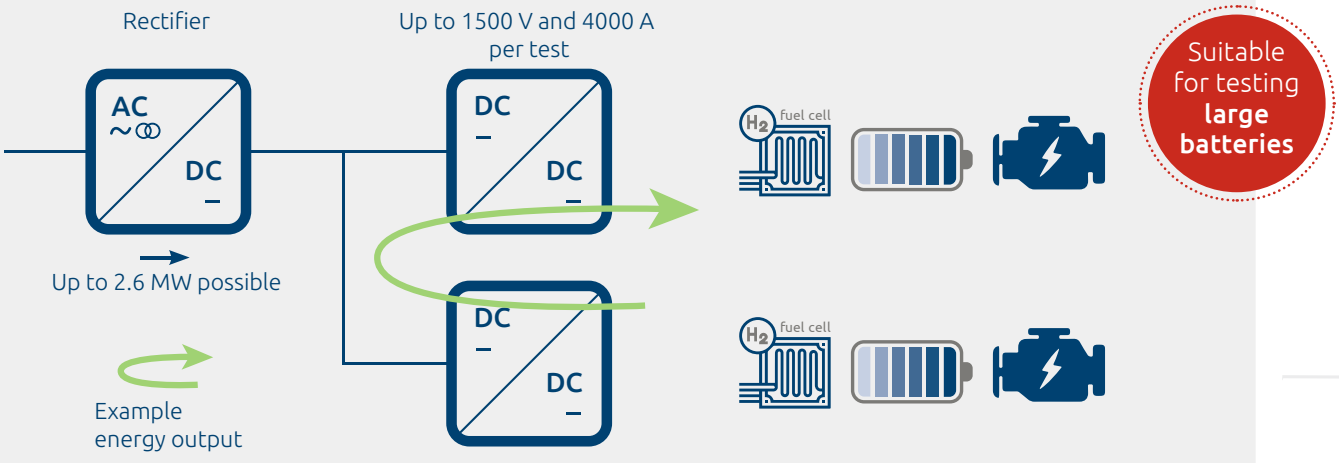
Application 1: Testing DC Charging Stations

Our I-TS is the perfect choice for optimal performance and realistic testing of your EV charging systems. The I-TS simulates EV batteries for these tests. Integrate the I-TS into the test bench in your testing environment to ensure the reliability and safety of your products and shorten time to market.*

Application 2: Multi-channel system with energy balancing via DC bus

Our innovative multi-channel MI-TS system allows you to test multiple devices at the same time and to use energy efficiently. The energy stored in test line 1 can be used directly via the DC converter to test line 2 (DC loop). This not only saves energy and costs, but also makes optimal use of the energy already available.

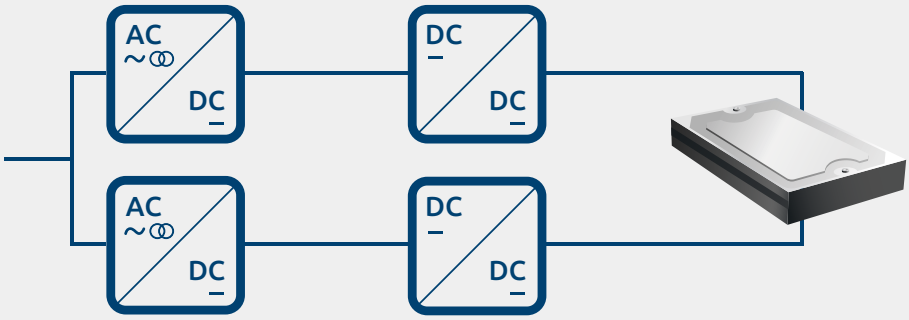
This system is particularly advantageous if your grid connection is limited or if it is necessary to effectively manage peak loads in the AC grid. With the MI-TS you can safely that you conserve your resources and at the same time carry out efficient and effective tests.*



*The test benches and equipment are not part of our test systems.

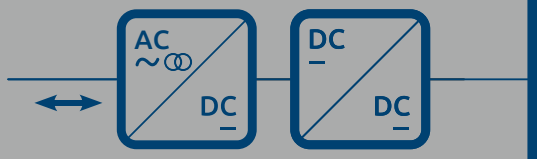
Application 3: HiL Test Bench for DC/DC Converters

When testing DC/DC converters, the DC channels of the (M)I-TS serve as both a source and a load. DC/DC converters with integrated galvanic isolation can be tested using a MITS-3871 with 2 channels. For DC/DC converters without internal galvanic isolation, the I-TS-3872 or two separate I-TS-3870 units are suitable for testing.*



Application 4: Battery Test Bench

Thanks to the seamless transition between source and sink modes and its high dynamic range, the (M)I-TS is ideal for testing batteries as a cycler or for pulse power testing. In pulse power testing, the overload-capable variants in particular demonstrate their strengths. Thanks to the various available interfaces (protocols are provided), the (M)I-TS can be integrated into all test benches.*



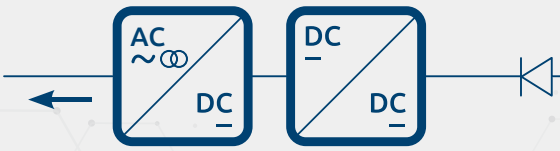
Battery test bench

- Climate chamber
- Shaker
- Conditioning
- Measurement technology
- Automation

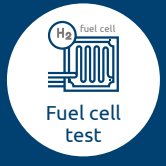
Application 5: Electrical Load for Fuel Cells

The outstanding performance of the I-TS high-dynamic test system is its hallmark. This includes, in particular, high load stability with low current ripple. This makes the I-TS the ideal choice for unidirectional load operation in fuel cell applications. To protect the fuelcell, a selectable diode is available as an option to ensure pure load operation.

Without the diode, you can first start your fuel cell using the I-TS and then apply a load seamlessly. Alternatively, we can also provide power to a BoP via a second DC channel. We are also happy to offer solutions including a 0 V option upon request.*



Fuel cell test bench

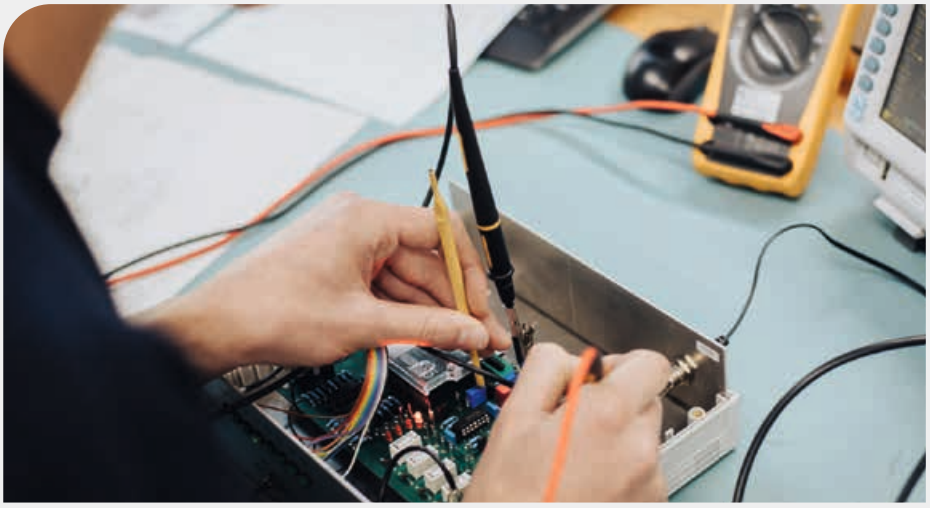


- Climate chamber
- Conditioning
- Measurement technology
- Automation
- Process engineering

*The test benches and equipment are not part of our test systems.

Test and simulation systems

Bidirectional power supplies for testing and simulating batteries, fuel cells, electric powertrains and other components.



NEW: Also available with SiC technology

DC source / sink: I-TS-3840

The I-TS-3840 is a single-channel DC source / sink that can be supplemented with selected options. The design is standardised.

DC source / sink: I-TS-3842

The I-TS-3842 is a single-channel DC source / sink with overload capability. It achieves, as standard, a voltage rise time of 250 V / ms and a measurement accuracy of 0.05% fs for current and 0.03% fs for voltage.

DC source / sink: I-TS-3872

State-of-the-art, liquid-cooled DC source / sink. Depending on requirements, the system can be used in various operating modes. It supports voltages up to 1500 V DC and currents up to 2000 A, as well as SiC technology.

DC source / sink: I-TS-3870 / MI-TS-3871

Single- or multi-channel system. Maximum power in single-unit operation: 650 kW; up to 2.6 MW in parallel operation. Two or four outputs, up to 1500 V DC or 2000 A per output (customizable).

DC source / sink: MI-TS-3873

Custom DC source / sink with high power (up to 5 MW), can be individually configured with a wide range of options. Test system for testing battery containers, MCS (megawatt charging), and testing electrolyzer stacks.

AC source / sink: TS-AC-5445 / 5446

Adjustable AC source / sink

Rated power up to
200 kVA single-phase,
up to 500 kVA three-phase
Frequencies from 16.7 to 800 Hz.

Gustav Klein Test & Simulation Systems

STANDARD

	I-TS-3840 Standard	I-TS-3842 Standard
	The I-TS-3840 product series, featuring a single channel, is characterized by its standardized design with select options.	The I-TS-3842 product series is characterized by its overload capacity, combined with high voltage dynamics (250 V/ms) and a measurement accuracy of up to 0.03% fs, and can be supplemented with selected options.
Power rating in kW	260, 320, 400, 650	60, 250, 320, 550
Overload-resistant, on request	–	✓
Max. DC voltage in V	1200, 1500	300 to 1500
Output voltage with center tap	–	–
Current range in A (per channel)	800, 1200	600 to 1200
Number of DC channels	1	1
Flexible parallel connection capability	2 systems	2 systems
Fixed parallel connection capability	4 systems	4 systems
Available protection ratings	IP20, IP54	IP20, IP54
Air cooling	✓	✓
Liquid cooling	o	o
Communication interfaces Standard	CAN, Modbus TCP, Ethernet, VNC	CAN, Modbus TCP, Ethernet, VNC
Communication interfaces Optional	–	Profibus, Profinet, EtherCAT, LabVIEW
Applications	Fuel cell test, electrolysis test, battery test, battery simulation, powertrain test	Fuel cell test, electrolysis test, battery test, battery simulation, powertrain test

INDIVIDUAL

I-TS-3872 / I-TS-3872-SiC Standard	I-TS-3870 individual	MI-TS-3871 individual	I-TS-3873 individual
The liquid-cooled I-TS-3872 product series can be used in various operating modes depending on requirements, and selected options are also available to support the application. New: Now also available with SiC technology	The I-TS-3870 product series is distinguished by its high degree of customization, thanks to the wide range of power ratings, voltages, currents, and selectable options.	The MI-TS-3871 product series is distinguished by its high degree of customization, thanks to the wide range of power ratings, voltages, currents, and selectable options, and also features multiple output channels (2 or 4) depending on the model	The I-TS-3873 product series is distinguished by its high available power of up to 5 MW in parallel operation, combined with a wide range of options, making it ideally suited for applications in megawatt charging, electrolysis, or battery container testing.
300 until 880	60 to 650	60 to 650	600 to 2400
✓	✓	✓	upon request
up to 1500	300 to 1500	300 to 1500	1500
✓	–	–	–
1000	600 to 1200	600 to 1200	2000
2	1	2, 4	1, 2, 4
2 systems	2 systems	2 or 4 channels	In part
2 systems	4 systems	2 or 4 channels	In part
IP54	IP20, IP21, IP23, IP54	IP20, IP21, IP23, IP54	IP20, IP54
–	✓	✓	–
✓	O	O	✓
CAN, Modbus TCP, Ethernet, VNC	CAN, Modbus TCP, Ethernet, VNC	CAN, Modbus TCP, Ethernet, VNC	CAN, Modbus TCP, Ethernet, VNC
Profibus, Profinet, 2x CAN, EtherCAT	Profibus, Profinet, EtherCAT, LabVIEW	Profibus, Profinet, EtherCAT, LabVIEW	Profibus, Profinet, EtherCAT, LabVIEW
Fuel cell test, electrolysis test, battery test, battery simulation, powertrain test	Fuel cell test, electrolysis test, battery test, battery simulation, powertrain test	Fuel cell test, electrolysis test, battery test, battery simulation, powertrain test	Fuel cell test, electrolysis test, battery test, battery simulation, powertrain test, heavy duty

✓ Standard O Optional – Not available

DC source / sink standard: I-TS-3840

The I-TS-3840 is a DC source/sink with one channel that can be supplemented with selected options. The design is standardized, the available options are provided in the already created designs.

Typical applications

- Battery tests (charge and discharge tests of batteries)
- Battery simulation / battery emulation
- Load for fuel cells
- Test power supply for contactors, fuses and circuit breakers
- Test of DC motors (drive train)
- EV / EVSE testing

Basic-Equipment

- Input voltage (standard): 3x400V, 3x380V, 50/60 Hz
- Main switch (switch disconnector with fuses at AC terminal; lockable in Off-Position)
- Safety control for Performance Level d (PLd) in accordance with ISO 13849-1 / EN 60204-1
- Display with touch operation
- Model: Battery tester / battery simulator (switchable)
- Analogue voltmeter in cabinet door
- DC output contactors with increased short-time current carrying capacity
- DC current measurement with 0.1 % fs accuracy
- Connection terminals for DC voltage measurement (0.1 % fs accuracy with sense lines)
- Connection terminals for external "Emergency Stop"
- Connection terminals for external "Stop"
- Connection terminals for calibrating case
- Interface Modbus TCP-IP
- Interface CAN-bus ("100 Hz" with dbc file)
- Interface VNC over Ethernet
- Protection type IP 20 alternative IP54
- Noise-reduced version (rubber buffer, fan control)
- Rittal cabinets Type VX

Options

- (M)I-TS-ISO-3.0, Insulation monitoring device DC
- I-TS-Parallel 3.0, Parallel control device
- I-TS-Stopp, Stop button (black) installed in cabinet door
- (M)I-TS-E-Stopp, Emergency stop button (yellow / red) installed in cabinet door
- (M)I-TS-IF-ANALOG-IN, Interface "Analogue - input"
- (M)I-TS-IF-ANALOG-OUT, Interface "Analogue - output"

	I-TS-3840-1500-260-800	I-TS-3840-1500-400-800	I-TS-3840-1200-320-1200	I-TS-3840-1200-650-1200
DC output parameters				
Power	260 kW	400 kW	320 kW	650 kW
DC voltage	10 – 1500 V	10 – 1500 V	10 – 1200 V	10 – 1200 V
DC current	± 800 A	± 800 A	± 1200 A	± 1200 A
Current rise time	< 1,4 ms	< 1,4 ms	< 1,0 ms	< 1,0 ms
Internal resistance	-19 mΩ to +1875 mΩ	-19 mΩ to +1875 mΩ	-10 mΩ to +1000 mΩ	-10 mΩ to +1000 mΩ
Ripple voltage residual	< 0,1 % fs RMS			
Ripple current residual	< 0,1 % fs RMS			
Accuracy				
Voltage Control CV	0,1 % fs			
Current Control CC	0,1 % fs			
Power Control CP	0,2 % fs			
Voltage measurement	0,1 % fs / 16 bit			
Current measurement	0,1 % fs / 16 bit			
AC Input Parameters				
Voltage	380 V 3/PE ± 10 %; 400 V 3/PE ± 10 %			
Frequenz	50 Hz ± 5 %; 60 Hz ± 5 %			
Power factor at rated power	> 0,99 ind.			
Rated short-circuit current	50 kA			
Power consumption	285 kVA	431 kVA	342 kVA	685 kVA
Max. AC current @ 400 V - 10%	457 A	693 A	549 A	1100 A
Electrical isolation between AC and DC,	By default, the DC side is isolated from ground			
Mechanical details for IP 20 protection class (AF air cooling)				
Dimensions (W x D x H) in mm	(1400 + 1200) x 800 x 2200	(1200 + 1200 + 1200) x 800 x 2200	(1400 + 1200) x 800 x 2200	(1600 + 1200 + 1200) x 800 x 2200
Weight in kg	1500 + 1150	1540 + 1080 + 1150	1600 + 1150	2200 + 1080 + 1150
Minimum distance from the ceiling	300			
Minimum distance from the rear wall	0			
Door hinge	on both sides			
Mechanical details for IP 54 protection rating (WF water cooling via a heat exchanger on the roof)				
Dimensions (W x D x H) in mm	(1400 + 1200) x 900 x 2555	(1200 + 1200 + 1200) x 900 x 2555	(1400 + 1200) x 900 x 2555	(1600 + 1200 + 1200) x 900 x 2555
Weight in kg	1650 + 1300	1690 + 1230 + 1300	1750 + 1300	2350 + 1230 + 1300
Minimum distance from the ceiling	0			
Minimum distance from the rear wall	0			
Door hinge	on both sides			
General information				
Operating conditions	3K22 / 3M11: +5 to 40°C; 5–85% relative humidity, non-condensing			
Maximum installation height based on rated specifications	1,000 m above sea level; air pressure ≥ 870 hPa			
Cable entry	from below			
Color	RAL 7035; textured paint			

This is just a sample of our product range;
we would be happy to assist you in developing a customized project.

Subject to technical changes.

DC source / sink standard: I-TS-3842: Overload single-channel system

The I-TS-3842 is a single-channel DC source / sink that can be supplemented with selected options. As standard, the I-TS-3842 achieves a measurement accuracy of 0.03% fs for voltage and 0.05% fs for current. For configurations of ≤ 1000 V DC, a voltage rise time of 250 V/ms is also achieved.

Typical applications

- Battery tests (charge and discharge tests of batteries)
- Battery simulation / battery emulation
- Load for fuel cells
- Test power supply for contactors, fuses and circuit breakers
- Test of DC motors (drive train)
- EV / EVSE testing

Basic-Equipment

- Input voltage (standard): 3x400V, 50/60Hz
- Main switch (switch disconnector with fuses at AC terminal; lockable in Off-Position)
- Safety control for Performance Level d (PLd) in accordance with ISO 13849-1 / EN 60204-1
- Display with touch operation
- "Battery tester" version
- Voltage rise time of 250 V / ms (for versions with < 1000V DC: 100V/ms)
- Overload capability for 30 seconds every 10 minutes
- Analogue voltmeter in cabinet door
- DC output contactors (standard contactor)
- DC current measurement with 0.05 % fs accuracy
- Connection terminals for DC voltage measurement (0.03 % fs accuracy with sense lines)
- Connection terminals for external "Emergency Stop"
- Connection terminals for external "Stop"
- Connection terminals for calibrating case
- Interface Modbus TCP-IP
- Interface CAN-bus ("100 Hz" with dbc file)
- Interface VNC over Ethernet
- Protection type IP 20 alternative IP54
- Noise-reduced version (rubber buffer, fan control)
- Rittal cabinets Type VX

Options (excerpt; further options available on request)

- (M)I-TS-ISO-3.0, Insulation monitoring device DC
- I-TS-Parallel 3.0, Parallel control device (only I-TS with 1 channel)
- (M)I-TS-E-Stopp, Emergency stop button (yellow / red) installed in cabinet door
- (M)I-TS-IF-ANALOG-IN, Interface "Analogue - input"
- (M)I-TS-IF-ANALOG-OUT, Interface "Analogue - output"
- (M)I-TS-TEST-EM, switchable battery tester / battery simulator
- (M)I-TS-EM, battery simulator
- (M)I-TS-IF- Interface "EtherCat"
- (M)I-TS-IF- Interface "Profibus DP"
- (M)I-TS-IF- Interface "Profinet"

	I-TS-3842-300-60-600	I-TS-3842-1000-250-1000	I-TS-3842-1200-320-1200	I-TS-3842-1200-550-1200	I-TS-3842-1500-250-800
DC output parameters					
Power	60 kW / 120 kW (every 10 minutes for 30 seconds)	250 kW / 400 kW (every 10 minutes for 30 seconds)	320 kW / 420 kW (every 10 minutes for 30 seconds)	550 kW / 660 kW (every 10 minutes for 30 seconds)	250 kW / 400 kW (every 10 minutes for 30 seconds)
DC voltage	5 – 300 V	5 – 1000 V	10 – 1200 V	10 – 1200 V	10 – 1500 V
DC current	± 600 A	± 1000 A	± 1200 A	± 1200 A	800 A
Current rise time	≤ 1,0 ms	≤ 1,3 ms	≤ 1,0 ms	≤ 1,0 ms	≤ 1,4 ms
Internal resistance	-5 mΩ to +500 mΩ	-10 mΩ to +1000 mΩ	-10 mΩ to +1000 mΩ	-10 mΩ to +1000 mΩ	-18,75 mΩ to +1875 mΩ
Ripple voltage residual	< 0,1 % fs RMS				
Ripple current residual	< 0,1 % fs RMS				
Rate of voltage rise 10 – 90% U_{nenn}	100 V/ms	250 V/ms	250 V/ms	250 V/ms	250 V/ms
Accuracy					
Voltage Control CV	0.1 % fs				
Current Control CC	0.1 % fs				
Power Control CP	0.2 % fs				
Voltage measurement	0.03 % fs / 16 bit				
Current measurement	0.05 % fs / 16 bit				
AC Input Parameters					
Voltage	3/PE AC 400 V 50 Hz ± 10 %				
Frequenz	50 Hz ± 5 %				
Power factor at rated power	> 0,99 ind.				
Rated short-circuit current	50 kA				
Power consumption (rated power/maximum power)	67 kVA / 130kVA	269 kVA / 425 kVA	346 kVA / 454 kVA	577 kVA / 693 kVA	274 kVA / 438 kVA
AC current (max. at rated power / max. RMS / max. power)	107 A / 115 A / 209 A @ 400 V -10 %	431 A / 447 A / 682 A @ 400 V -10 %	555 A / 565 A / 728 A @ 400 V -10 %	925 A / 935 A / 1111 A @ 400 V -10 %	439 A / 456 A / 702 A @ 400 V -10 %
Electrical isolation between AC and DC	By default, the DC side is isolated from ground				
Mechanical details for IP 20 protection class (AF air cooling)					
Dimensions (W x D x H) in mm	1600 x 800 x 2200	(1400 + 1200) x 800 x 2200	(1400 + 1200) x 800 x 2200	(1400 + 1200 + 1200) x 800 x 2200	(1800 + 1200) x 800 x 2200
Weight in kg	1280	1680 + 1180	1830 + 1180	1900 + 1160 + 1180	2080 + 1200
Minimum distance from the ceiling	300				
Minimum distance from the rear wall	0				
Door hinge	on both sides				
Mechanical details for IP 54 protection rating (WF water cooling via a heat exchanger on the roof)					
Dimensions (W x D x H) in mm	1600 x 900 x 2555	(1400 + 1200) x 900 x 2555	(1400 + 1200) x 900 x 2555	(1400 + 1200 + 1200) x 900 x 2555	(1200 + 1200 + 1200) x 900 x 2555
Weight in kg	1600	1840 + 1340	1990 + 1340	2060 + 1320 + 1340	2240 + 1360
Minimum distance from the ceiling	0				
Minimum distance from the rear wall	0				
Door hinge	on both sides				
General information					
Operating conditions	3K22 / 3M11: +5 to 40°C; 5–85% relative humidity, non-condensing				
Maximum installation height based on rated specifications	1,000 m above sea level; air pressure ≥ 870 hPa				
Cable entry	from below				
Color	RAL 7035; textured paint				

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Subject to technical changes.

DC source / sink standard: I-TS-3872 / I-TS-3872-SiC:

State-of-the-art, liquid-cooled DC source/sink. Depending on requirements, the system can be used in various operating modes, and selected options are also available to support the application.

Typical applications

- Battery testing (battery charging and discharging tests)
- Battery simulation / battery emulation
- Test power supplies for contactors, fuses and circuit breakers
- EV / EVSE testing
- Power supply for trains for maintenance purposes
- Load for fuel cells

Basic-Equipment

- Main switch (load-break switch on the AC connection; lockable in the OFF position)
- Safety control system for Performance Level d (PLd) in accordance with ISO 13849-1 / EN 60204-1
- 1x terminal block for external “Emergency Stop” (2-channel with cross-short detection)
- 2x terminal blocks for external “Stop” (for the output channel, 2-channel with cross-short detection)
- 1x terminal block for external “operating mode selection” (2-channel with cross-short detection)
- 2x DC contactors per output channel
- Voltmeter and standby indicator in cabinet door
- Terminal blocks for external DC voltage measurement (sense lines)
- 2x insulation monitors (separately switchable)
- Touchscreen display
- Switchable battery tester / battery simulator configuration
- Ethernet interface for Modbus TCP and VNC
- CAN bus interface
- Plug-and-play parallel operation of two I-TS-3872 units with identical technical specifications

Advantages of SiC (silicon carbide) technology

- Higher power output without increasing the size
- Up to 1200 V output voltage per channel
- Optimised efficiency
- Significantly reduced noise levels
- Reduced losses

Options (selection)

- I-TS 3872 Parallel / Cable for parallel operation
- I-TS 3872 Funct-gen / Function generator for superimposed AC signals at the DC output
- I-TS 3872 IF-EtherCAT / EtherCAT interface
- I-TS 3872 IF-PROFIBUS / Profibus interface
- I-TS 3872 IF-PROFINET / Profinet interface
- I-TS 3872 IF-2x CAN / CAN bus 2 interface
- I-TS 3872 Float-S / Potential-free contact
- I-TS 3872 STIME / Adjustment of “safe shutdown time”
- I-TS 3872 Control cabinet door lock
- I-TS 3872 MARK-PH / Single-core marking, Phoenix version
- I-TS 3872 Special lacquer finish

	I-TS-3872-1500-300-1000	I-TS-3872-1500-440-1000	I-TS-3872-1500-600-1000	I-TS-3872-1500-880-1000	I-TS-3872-SiC-1200-375-1000-2	I-TS-3872-SiC-1200-750-1000-2
DC output parameters						
Power	300 kW	440 kW	600 kW	880 kW	375 kW (planned)	750 kW (planned)
Overload capacity (30 sec., every 5 minutes)	345 kW	–	690 kW	–	–	–
DC voltage (single / parallel / series operation)	2x 5 – 750 V / 1x 5 – 750 V / 1x 10 – 1500 V	2x 5 – 750 V / 1x 5 – 750 V / 1x 10 – 1500 V	2x 5 – 750 V / 1x 5 – 750 V / 1x 10 – 1500 V	2x 5 – 750 V / 1x 5 – 750 V / 1x 10 – 1500 V	2 x 10 – 1200 V / 1 x 10 – 1200 V / –	2 x 10 – 1200 V / 1 x 10 – 1200 V / –
DC power (single / parallel / series operation)	2x ± 1000 A / 1x ± 2000 A / 1x ± 1000 A	2x ± 1000 A / 1x ± 2000 A / 1x ± 1000 A	2x ± 1000 A / 1x ± 2000 A / 1x ± 1000 A	2x ± 1000 A / 1x ± 2000 A / 1x ± 1000 A	2x ± 1000 A / 1x ± 2000 A	2x ± 1000 A / 1x ± 2000 A
Current rise time	≤ 1,3 ms				≤ 1,3 ms	
Internal resistance	-10 mΩ to +1000 mΩ				-10 mΩ to +1000 mΩ	
Ripple voltage residual	< 0,1 % fs RMS				< 0,1 % fs RMS	
Ripple current residual	< 0,1 % fs RMS				< 0,1 % fs RMS	
Accuracy						
Voltage Control CV	0,1 % fs				0,1 % fs	
Current Control CC	0,1 % fs				0,1 % fs	
Power Control CP	0,2 % fs				0,2 % fs	
Voltage measurement	0,1 % fs / 16 bit				0,1 % fs / 16 bit	
Current measurement: 1000 A or 350 A	0,1 % fs / 16 bit				0,1 % fs / 16 bit	
AC Input Parameters						
Voltage	3/PE AC 400 V / 380 V ± 10 %				3/PE AC 400 V / 380 V ± 10 %	
Frequenz	50 Hz ± 5 %				50 Hz ± 5 %	
Power factor at rated power	> 0,99 ind.				> 0,99 ind.	
Rated short-circuit current	15 kA				15 kA	
Power consumption (rated power / maximum power)	326 kVA / 375 kVA	468 kVA / –	2x 326 kVA / 2x 375 kVA	2x 468 kVA / –	tbd	tbd
AC current (max. at rated power / max. RMS / max. power)	523 A / 532 A / 602 A @ 400 V -10 %	753 A / - / - @ 400 V -10 %	2x 523 A / 532 A / 602 A @ 400 V -10 %	2x 753 A / - / - @ 400 V -10 %	tbd	tbd
Electrical isolation between AC & DC / DC & DC	By default, the DC side is isolated from earth				By default, the DC side is isolated from earth	
Mechanical details for IP 54 protection rating						
Dimensions (W x D x H) in mm	(1600 + 800) x 800 x 2200	(2000 + 800) x 800 x 2200	2x (1600 + 800) x 800 x 2200	2x (2000 + 800) x 800 x 2200	(1600 + 800) x 800 x 2200	2x (1600 + 800) x 800 x 2200
Weight in kg	2150 + 400	2800 + 400	2x (2150 + 400)	2x (2800 + 400)	Tbd	Tbd
Minimum distance from the ceiling	100 mm				100 mm	
Minimum distance from the rear wall	0				0	
Door hinge	Hinged doors, swing-open, 180 degrees				Hinged doors, swing-open, 180 degrees	
General information						
Operating conditions	3K22 / 3M11: +5 to 40°C; 5 – 85% relative humidity, non-condensing				3K22 / 3M11: +5 to 40°C; 5 – 85% relative humidity, non-condensing	
Maximum installation height based on rated specifications	1,000 m above sea level; air pressure ≥ 870 hPa				1,000 m above sea level; air pressure ≥ 870 hPa	
Cable entry	from below				from below	
Color	RAL 7035; textured paint				RAL 7035; textured paint	

This is just a sample of our product range; we would be happy to assist you in developing a customized project.

Subject to technical changes.

DC source / sink individual:

I-TS-3870:

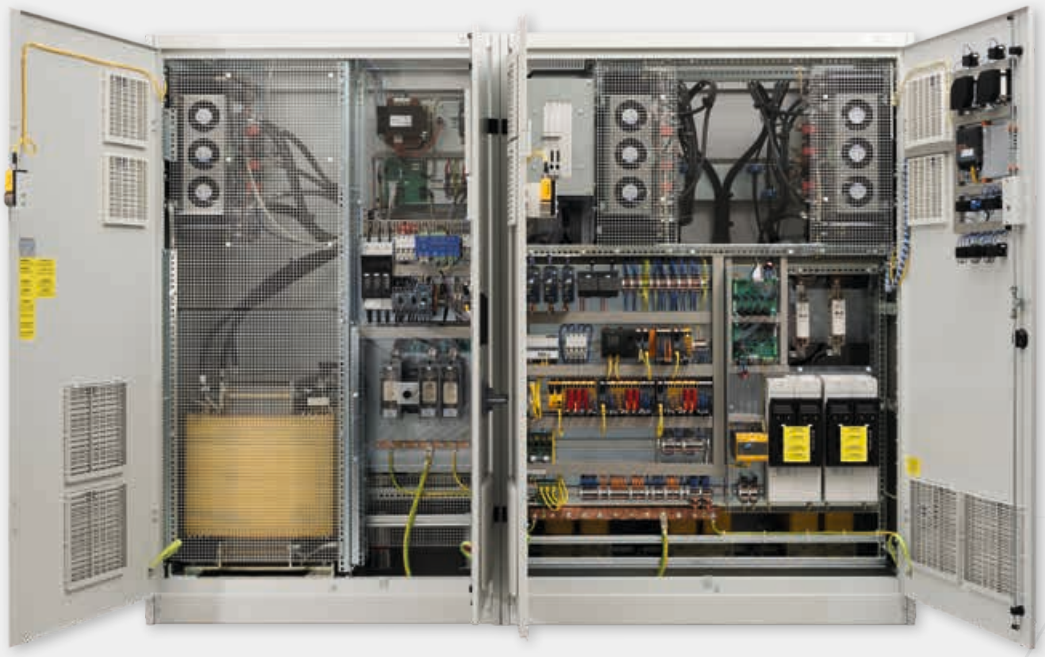
Single-channel system for testing and simulating batteries, fuel cells, and powertrains. One output channel capable of up to 1500 V or 1200 A. Maximum power in single-channel operation: 650 kW; up to 2.6 MW in parallel operation (maximum values for voltage, current, and power depend on the specific configuration).

MI-TS-3871:

Multi-channel system for energy-efficient testing and simulation. Two or four outputs, up to 1500 V or 1200 A per output (no galvanic isolation between DC outputs // Maximum values for voltage, current, and number of output channels depend on the specific configuration).

Typical Applications

- Battery testing (battery charging / discharging tests)
- Battery simulation / battery emulation
- Test power supply for contactors, fuses, circuit breakers
- EV / EVSE testing
- Power supply for trains for maintenance purposes at ICE facilities
- Load for fuel cells
- Testing of DC motors (powertrain)



Basic-Equipment

- Input voltage (standard):
  3x 400 V, 3x 380 V, 50 / 60 Hz
- Main switch (load break switch with fuses in the AC input; lockable in the off position)
- Safety control for Performance Level d
  (PLd) in accordance with ISO 13849-1 / EN 60204-1
- Touchscreen display
- Battery tester version
- Stop switch (black mushroom switch)
  in control cabinet door
- Voltmeter and standby indicator in cabinet door
- DC output contactors (standard contactor)
- DC current measurement with 0.1% f.s. accuracy
- Terminals for DC voltage measurement
  (accuracy 0.1% f.s. with sense leads)
- Terminals for external “Emergency Stop”
- Terminals for external “Stop”
- Terminals for calibration kit
- Modbus TCP-IP interface
- CAN bus interface (“100 Hz” with dbc file)
- VNC interface via Ethernet
- Protection class IP20
- Low-noise design
  (vibrating metal components, fan control)

Options (selection)

- (M)I-TS-ISO-3.0, DC insulation monitoring unit
- I-TS-Parallel 3.0, parallel control unit
- (M)I-TS-EM, battery simulator
- (M)I-TS-TEST-EM, switchable battery tester / battery simulator
- (M)I-TS-E-Stopp, emergency stop button (yellow / red)
  installed in the cabinet door
- (M)I-TS-IF-ANALOG-IN, “Analogue Input” interface
- (M)I-TS-IF-ANALOG-OUT, “Analogue Output” interface

	I-TS-3870-300-60-600	I-TS-3870-600-160-1000	I-TS-3870-1000-250-1000	I-TS-3870-1000-400-1200	I-TS-3870-1200-320-1200	I-TS-3870-1200-550-1200
DC output parameters						
Power	60 kW	160 kW	250 kW	400 kW	320 kW	550 kW
DC voltage	5 – 300 V	5 – 600 V	5 – 1000 V	5 – 1000 V	10 – 1200 V	10 – 1200 V
DC current	± 600 A	± 1000 A	± 1000 A	± 1200 A	± 1200 A	± 1200 A
Channels	1	1	1	1	1	1
Current rise time	≤ 1,0 ms	≤ 1,0 ms	≤ 1,3 ms	≤ 1,3 ms	≤ 1,0 ms	≤ 1,0 ms
Internal resistance adjustment range	-5 mΩ to +500 mΩ	-6 mΩ to +600 mΩ	-10 mΩ to +1000 mΩ	-8mΩ to +833 mΩ	-10mΩ to +1000 mΩ	-10mΩ to +1000 mΩ
Voltage ripple	< 0,1 % fs RMS					
Residual current ripple	< 0,1 % fs RMS					
Accuracy						
Voltage control (CV)	0,1 % fs					
Current control (CC)	0,1 % fs					
Power control (CP)	0,2 % fs					
Voltage measurement	0,1 % fs / 16 bit					
Current measurement	0,1 % fs / 16 bit					
AC input parameters						
Voltage	3/PE AC 400 V 50 Hz ± 10 %					
Frequency	50 Hz ± 5 %					
Power factor at rated power	> 0,99 ind.					
Conditional Rated short-circuit current	50 kA					
Max. power consumption in kVA	67	173	269	426	342	577
Max. AC current @ 400 V -10 %	107	278	431	684	549	925
Galvanic isolation between AC & DC	By default, the DC side is isolated from earth					
Mechanical details for protection class IP 20 (AF air cooling)						
Number of cabinets	1	2	2	3	2	3
Dimensions L x W x H in mm	1400 x 800 x 2000	2400 x 800 x 2000	2600 x 800x 2000	3600x 800 x 2000	2600 x 800 x 2200	3800 x 800 x 2200
Weight in kg	990	1200 + 760	1500 + 1150	1540 + 770 + 1150	1600 + 1150	1900 + 1160 + 1180
Minimum clearance to ceiling	300					
Minimum clearance to rear wall	0					
Door Hinge	on both sides					
General data						
Ambient conditions during operation	3K22 / 3M11 +5 to 40°C; 5 – 85% relative humidity, non-condensing					
Max. installation height at rated data	1000 m above sea level; air pressure ≥ 870 hPa					
Cable entry	from below					
Color	RAL 7035; textured paint					

I-TS-3870-1200-650-1200	MI-TS-3871-1200-320-600-2	MI-TS-3871-1200-320-1200-2	MI-TS-3871-1200-650-1200-2	MI-TS-3871-1200-650-1200-4	I-TS-3870-1500-250-800	I-TS-3870-1500-400-800	MI-TS-3871-1500-400-800-2
DC output parameters							
650 kW	320 kW	320 kW	650 kW	650 kW	250 kW	400 kW	400 kW
10 – 1200 V	10 – 1200 V	10 – 1200 V	10 – 1200 V	10 – 1200 V	10 – 1500 V	10 – 1500 V	10 – 1500 V
± 1200 A	± 600 A	± 1200 A	± 1200 A	± 1200 A	± 800 A	± 800 A	± 800 A
1	2	2	2	4	1	1	2
≤ 1,0 ms	≤ 1,0 ms	≤ 1,0 ms	≤ 1,0 ms	≤ 1,0 ms	≤ 1,4 ms	≤ 1,4 ms	≤ 1,4 ms
-10 mΩ to +1000 mΩ	-20 mΩ to +2000 mΩ	-10 mΩ to +1000 mΩ	-10 mΩ to +1000 mΩ	-10 mΩ to +1000 mΩ	-19 mΩ to +1875 mΩ	-19 mΩ to +1875 mΩ	-19 mΩ to +1875 mΩ
< 0,1 % fs RMS							
< 0,1 % fs RMS							
Accuracy							
0,1 % fs							
0,1 % fs							
0,2 % fs							
0,1 % fs / 16 bit							
0,1 % fs / 16 bit							
AC input parameters							
3/PE AC 400 V 50 Hz ± 10 %							
50 Hz ± 5 %							
> 0,99 ind.							
50 kA							
685	344	352	695	716	274	431	442
1100	553	565	1116	1149	439	693	710
By default, the DC side is isolated from earth							
Mechanical details for protection class IP 20 (AF air cooling)							
3	3	3	4	6	2	3	4
4000 x 800 x 2200	3800 x 800 x 2200	3800 x 800x 2200	5200 x 800 x 2200	7600 x 800 x 2200	2600 x 800 x 2200	3600 x 800 x 2200	4800 x 800 x 2200
2200 + 1080 + 1150	1600 + 1060 + 1060	1600 + 1150 + 1150	2200 + 1080 + 1150 + 1150	2200 + 1080 + 4 x 1150	1500 + 1150	1540 + 1080 + 1150	1540 + 1080 + 2x 1150
300							
0							
on both sides							
General data							
3K22 / 3M11 +5 to 40°C; 5 – 85% relative humidity, non-condensing							
1000 m above sea level; air pressure ≥ 870 hPa							
from below							
RAL 7035; textured paint							

This is just a sample of our product range;
we would be happy to assist you in developing a customized project.

Subject to technical changes.

We would be happy to provide you with a customized quote for systems with overload protection and liquid cooling.

DC source / sink individual: I-TS-3873:

The I-TS-3873 is a customisable high-power DC source/sink (up to 5 MW in parallel operation) that can be individually configured using a wide range of options. Test system for testing battery containers, MCS (megawatt charging), large commercial vehicles and electrolysers.

Typical applications

- Discharge testing of entire battery containers)
- Battery simulation / battery emulation at very high power levels
- Load testing for fuel cells
- Test power supply for electrolysers
- Testing of DC motors at very high power levels (powertrain)
- EV / EVSE testing specifically for MCS (Megawatt Charging)

Fuel cell test | Electrolyser test | Battery test | Battery simulation | Powertrain test | Heavy Duty

Basic-Equipment

- Input voltage (standard): 3x 400 V, 50 / 60 Hz
- Main switch (load break switch with fuses in the AC input; lockable in the off position)
- Safety control for Performance Level d (PLd) in accordance with ISO 13849-1 / EN 60204-1
- Touchscreen display
- Battery tester version
- Stop switch (black mushroom switch) in control cabinet door
- Voltmeter and standby indicator in cabinet door
- DC output contactors (standard contactor)
- DC current measurement with 0.1% f.s. accuracy
- Terminals for DC voltage measurement (accuracy 0.1% f.s. with sense leads)
- Terminals for external 'Emergency Stop'
- Terminals for external "Stop"
- Modbus TCP-IP interface
- CAN bus interface ("100 Hz" with dbc file)
- VNC interface via Ethernet
- Protection class (order-specific)

Options (selection; further options available on request)

- (M)I-TS-SV-INP-AC, special input voltage
- (M)I-TS-ISO-3.0, DC insulation monitoring unit
- I-TS-Parallel 3.0, parallel control unit
- (M)I-TS-EM, battery simulator
- (M)I-TS-TEST-EM, switchable battery tester / battery simulator
- (M)I-TS-E-Stopp, emergency stop button (yellow/red) installed in the cabinet door

	I-TS-3873-1500-600-2000	I-TS-3873-1500-1200-2000	I-TS-3873-1500-1800-2000	I-TS-3873-1500-2400-2000	I-TS-3873-1500-2400-2000-2	I-TS-3873-1500-2400-2000-4
DC output parameters						
Power	600 KW	1200 kW	1800 kW	2400 kW	2400 kW	2400 kW
DC voltage	10 – 1500 V					
DC current	± 2000 A					
Channels	1	1	1	1	2	4
Current rise time	≤ 1,4 ms					
Voltage ripple	< 0,1 % fs RMS					
Residual current ripple	< 0,1 % fs RMS					
Accuracy						
Voltage control (CV)	0,1 % fs					
Current control (CC)	0,1 % fs					
Power control (CP)	0,2 % fs					
Voltage measurement	0,1 % fs / 16 bit					
Current measurement	0,1 % fs / 16 bit					
AC input parameters						
Voltage	3/PE AC 400 V (other options available upon request)					
Frequency	50 Hz ± 5 % oder 60 Hz ± 5 %					
Power factor at rated power	> 0,99 ind.					
Conditional rated short-circuit current	50 kA					
Max. power consumption in kVA	640 kVA	2x 640 kVA	3x 640 kVA	4x 640 kVA	4x 640 kVA	4x 640 kVA
Max. AC current @ 400 V -10 %	1030 A	2x 1030 A	3x 1030 A	4x 1030 A	4x 1030 A	4x 1030 A
Galvanic isolation between AC & DC	By default, the DC side is isolated from earth					
Mechanical details for protection class IP 20 (AF air cooling)						
Number of cabinets	upon request					
Dimensions L x W x H in mm	upon request					
Weight in kg	upon request					
Minimum clearance to ceiling	300					
Minimum clearance to rear wall	0					
Door hinge	on both sides					
General data						
Ambient conditions during operation	3K22 / 3M11 +5 to 40°C; 5 – 85% relative humidity, non-condensing					
Max. installation height at rated data	1000 m above sea level; air pressure ≥ 870 hPa					
Cable entry	from below					
Color	RAL 7035; textured paint					

This is just a sample of our product range;
we would be happy to assist you in developing a customized project.

Subject to technical changes.

Adjustable AC source / sink: TS-AC-5445 / 5446

The TS-AC is a test power supply with adjustable voltage and frequency. Depending on your requirements, the system can be further equipped with selected options tailored to your applications (e.g., “Bidirectional” operating mode).

Typical applications

- Generation of single-phase or three-phase AC networks with adjustable voltage and adjustable frequency
- Supply of equipment with different mains voltage or mains frequency
- Simulation of networks for specific applications such as rail (16.7 Hz) or aviation (400 Hz, 800 Hz)
- Symmetrical distribution of current from single-phase loads across 3 phases in the network

Basic-Equipment

- Source configuration
- Mains voltage (standard): 3 x 400 V, 3 x 380 V, 50/60 Hz
- AC fuse-type load disconnect switch at the mains connection
- External emergency stop via terminals
- Color TFT screen with touchscreen
- IGBT rectifier with sinusoidal current waveform and low feedback into the grid (THDi < 6 %)
- Remote signals (potential-free changeover contacts)
- Protection class IP20
- RS232 interface
- CAN interface

Options (selection; further options available on request)

- TS-AC-bidirectional / ‘Bidirectional’ operating mode
- TS-AC-100-400 Hz / Output frequency range 100–400 Hz
- TS-AC-15-45 Hz / Output frequency range 15–45 Hz
- TS-AC-200-800 Hz / Output frequency range 200 – 800 Hz
- TS-AC-Output voltage / Output voltage deviating from standard
- TS-AC input voltage / Input voltage deviating from standard
- TS-AC emergency stop / Emergency stop button in the control cabinet door
- CAB-IP21/CAB-IP22 / Protection class IP21/IP22
- CAB castors/mobile cabinet / Base frame with 4 castors

TS-AC-5445

Entrance	
Standard	3x 400 V, 50 Hz
Optional	3x 380 V / 3x 415 V / 3x 440 V / 3x 480 V / 3x 690 V, 50 Hz / 60 Hz (alternatively, other areas are available upon request)

Output voltage	
Standard	3 – 150 V, 6 – 300 V, 12 – 600 V
Optional	Alternatively, other areas are available upon request

Output frequency	
Standard	45 – 105 Hz
Optional	15 – 45 Hz / 95 – 420 Hz / 195 – 805 Hz (only in the EU)

Output voltage range (1/N/PE)			
Power	3 – 150 V	6 – 300V	12 – 600V
10 kVA	X	X	X
15 kVA	X	X	X
20 kVA	X	X	X
25 kVA	X	X	X
30 kVA	X	X	X
40 kVA	X	X	X
50 kVA	X	X	X
60 kVA	X	X	X
80 kVA	X	X	X
100 kVA	X	X	X
120 kVA	–	X	X
160 kVA	–	X	X
200 kVA	–	X	X

TS-AC-5446

Entrance	
Standard:	3x 400 V, 50 Hz
Optional:	3x 380 V / 3x 415 V / 3x 440 V / 3x 480 V / 3x 690 V, 50 Hz / 60 Hz (alternatively, other areas are available upon request)

Output voltage	
Standard:	3x 8 – 150 / 87 V, 3x 15 – 300 V / 173 V, 3x 30 – 600 / 346 V
Optional:	Alternatively, other areas are available upon request

Output frequency	
Standard:	45 – 105 Hz
Optional:	15 – 45 Hz / 95 – 420 Hz / 195 – 805 Hz (only in the EU)

Output voltage range (3/N/PE)			
Power	8 / 4,6 – 150 / 87 V	15 / 8,7 – 300 / 173 V	30 / 17,3 – 600 / 346 V
10 kVA	X	X	X
15 kVA	X	X	X
20 kVA	X	X	X
25 kVA	X	X	X
30 kVA	X	X	X
40 kVA	X	X	X
50 kVA	X	X	X
60 kVA	X	X	X
80 kVA	X	X	X
100 kVA	X	X	X
120 kVA	X	X	X
160 kVA	X	X	X
200 kVA	X	X	X
250 kVA	–	X	X
330 kVA	–	X	X
400 kVA	–	X	X
500 kVA	–	–	X

This is just a sample of our product range; we would be happy to assist you in developing a customized project.
Subject to technical changes.

Accessories for Test and simulation systems

A range of additional accessories
is available to complement and enhance our power supplies.

PDSB
(Power distribution switching box)

A control cabinet for connecting multiple DC outputs in parallel or for switching a single DC output to various test benches. Over 50 different variants are available.

PDU
(Power distribution unit)

A control cabinet for the local connection of the test specimen on the test bench. In addition, additional capacitors and isolating devices can be integrated here.

Capacitor box

Touch-proof housing containing capacitors for stabilising the control loop.

DCU (Discharge unit)

If the capacity for feeding energy back into the mains is insufficient, the discharge unit allows the energy of the test object to be dissipated via discharge resistors within the battery emulation.

Safety Master for parallel operation

Master safety controller to achieve Performance Level d (PLd) when operating two I-TS units in parallel.

PDSB –
Power distribution switching box

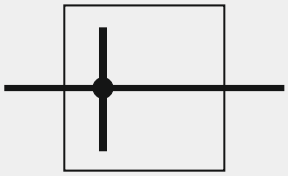
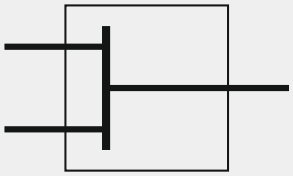
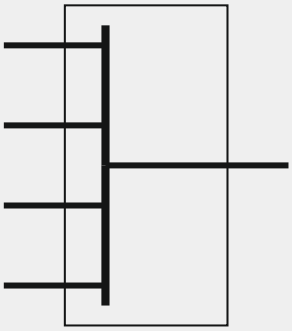
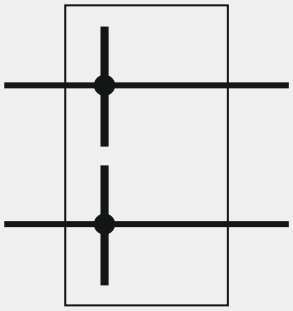
The PDSB (Power Distribution Switching Box) is an additional switchgear or distribution cabinet at the DC output of the I-TS. There are many different versions of the PDSB, which are tailored to the power, current and voltage ratings as well as to the customer's requirements.

Just as we offer solutions with integrated control, we can also implement solutions that are controlled by your test bench automation system.

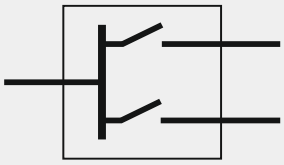
The following table provides an overview of our available standard circuits.

We would be happy to advise you in person to help you find the ideal solution for your application.

PDSB without a switch option

 **1 input / 1 output**	 **2 inputs / 1 output**	 **4 inputs / 1 output**	 **2 inputs / 2 outputs**
Application: • Space for DCU	Application: • Fixed parallel operation • Space for DCU • Parallel operation integration Master	Application: • Fixed parallel operation • Space for DCU	Application: • Space for DCU
Without controller	Optional with or without parallel operation Master	Without controller	Without controller
I-TS-3870 MI-TS-3871	I-TS-3870 MI-TS-3871	MI-TS-3871	MI-TS-3871

PDSB with a switch option, without optional parallelization

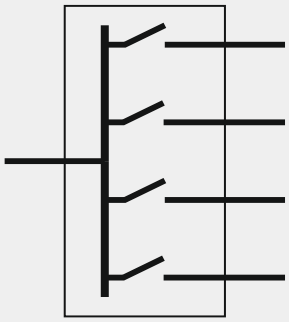


1 input / 2 outputs

Application:
• Test bench switching

Optionally with or without integrated control. In the version without control contactor coils and feedback contacts are connected to terminals.

I-TS-3870
MI-TS-3871

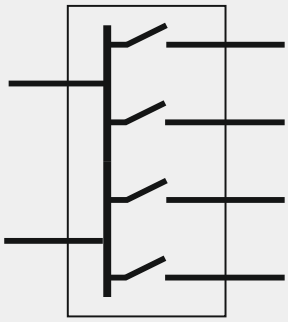


1 input / 4 outputs

Application:
• Test bench switching

Optionally with or without integrated control. In the version without control contactor coils and feedback contacts are connected to terminals.

I-TS-3870
MI-TS-3871



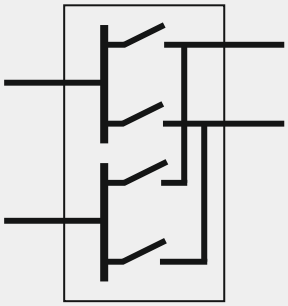
2 inputs / 4 outputs

Application:
• Parallel connection to increase current
• Test bench switching

Optionally with or without integrated control. In the version without control contactor coils and feedback contacts are connected to terminals.

MI-TS-3871

PDSB with a switching option and optional parallelization

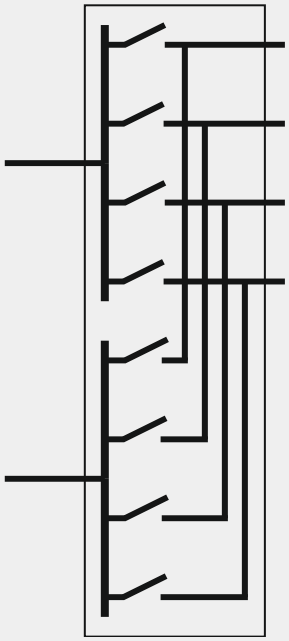


1 input / 2 outputs

Application:
• Switching between single and parallel operation
• Test bench switching

Only with integrated control

I-TS-3870
MI-TS-3871

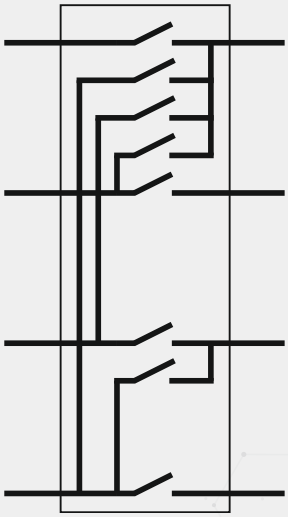


2 inputs / 4 outputs

Application:
• Switching between single and parallel operation
• Test bench switching

Only with integrated control

MI-TS-3871



4 inputs / 4 outputs

Application:
• Switching between single and parallel operation
• Test bench switching

Only with integrated control

MI-TS-3871

Subject to technical changes.

PDU –
Power distribution unit

The PDU (power distribution unit) is used for local connection of the test specimen when the I-TS or MI-TS is located some distance from the test chamber.

Depending on its size, the PDU consists of a control cabinet or wall-mounted enclosure with IP54 protection.

Basic-Equipment

- Connection of (M)I-TS to copper busbar
- Connection of test specimen to copper busbar
- Earth busbar
- Shielding busbar
- Voltmeter for displaying the applied DC voltage
- Connection for sense line, including fuse
- Safety control unit connected to (M)I-TS
- Stop button (black, mushroom-shaped)
- Reset stop button, for acknowledging a resolved stop
- Door contact switch
  (with safe shutdown when door is opened)
- Signal column with the following indicators:
  - Red – Fault / Emergency stop
  - Yellow – Ready
  - Green – Test mode
  - White – Stop

Available currents

Type	Current	**Dimensions (W x D x H)** Signal column not included
(M)I-TS-PDU-1000	1000 A	1000 x 310 x 1000 mm
(M)I-TS-PDU-2000	2000 A	600 x 600 x 1900 mm
(M)I-TS-PDU-4000	4000 A	On request

Options (excerpt; further options available on request)

- Capacitor bank to reduce feedback from the test object
- Short-circuit bar (not applicable for battery tests)
- Protection diode to prevent source operation
  (electronic load application)

Capacitor box

When using the I-TS as a battery simulator, feedback from the test specimen can affect the entire system. To reduce this feedback, we offer capacitor boxes in various configurations, which are then connected as directly as possible to the test specimen to ensure maximum effectiveness.

The electrolytic capacitors contained within serve as energy storage devices to buffer load spikes. The MKP capacitors contained within divert ripple currents close to the test specimen. Depending on the design, the capacitor boxes are available either in a plastic housing or a metal housing with IP65 protection.

We would be happy to provide you with a quote tailored to your specific application.

DCU – Discharge unit

The DCU (Discharge unit) consists of a discharge resistor, a thyristor and a control unit. It is installed either in a PDSB or in its own cabinet. The discharge unit is activated when the voltage at the test object exceeds a set value. This is usually the case when the I-TS can no longer regulate the voltage (insufficient power, mains failure, DCW is switched off).

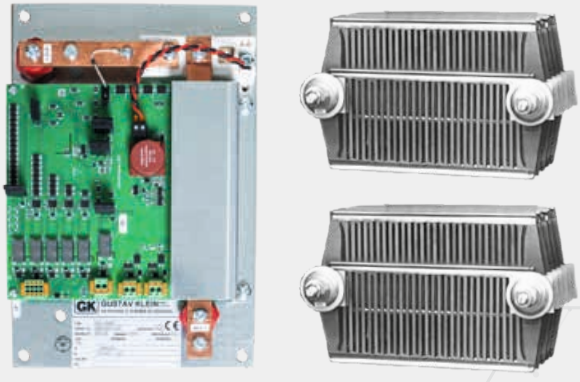
In the event of a normal shutdown of the I-TS DC converter, it can be selected whether the test specimen should not be discharged, or whether discharge should take place via feedback into the mains or via the DCU.

Please note: Once the discharge unit has been triggered, this cannot be stopped. The The test object will be completely discharged. For this reason, the resistor must be selected according to the energy content of the test object (not suitable for batteries / fuel cells / etc.). If necessary, several DCUs can also be used in parallel to discharge test objects with high energy content. After activation of the DCU, a cooling-off period is required before the next use!

Available versions (other versions available on request)

Type	Resistance	Cabinet (W x D x H)
CAB-DCU-500-1	1x (2,0 Ω / 500 kWs / 1000 VDC)	600 x 800 x 2000 mm
CAB-DCU-500-2	2x (2,0 Ω / 500 kWs / 1000 VDC)	600 x 800 x 2000 mm
CAB-DCU-500-4	4x (2,0 Ω / 500 kWs / 1000 VDC)	1200 x 800 x 2000 mm
CAB-DCU-670-1	1x (1,5 Ω / 670 kWs / 1000 VDC)	600 x 800 x 2000 mm
CAB-DCU-670-2	2x (1,5 Ω / 670 kWs / 1000 VDC)	600 x 800 x 2000 mm
CAB-DCU-670-4	4x (1,5 Ω / 670 kWs / 1000 VDC)	1200 x 800 x 2000 mm
(M)ITS-PDSB-DCU-500	1x (2,0 Ω / 500 kWs / 1000 VDC)	For installation in PDSB
(M)ITS-PDSB-DCU-670	1x (1,5 Ω / 670 kWs / 1000 VDC)	For installation in PDSB

Subject to technical changes.



Safety Master for parallel operation

When operated individually, the I-TS has Performance Level d (PLd) in accordance with ISO 13849-1 / EN 60204-1.

In parallel operation, the combination of multiple I-TS units loses this performance level. This must then be restored by means of appropriate wiring between the I-TS units and an overall assessment.

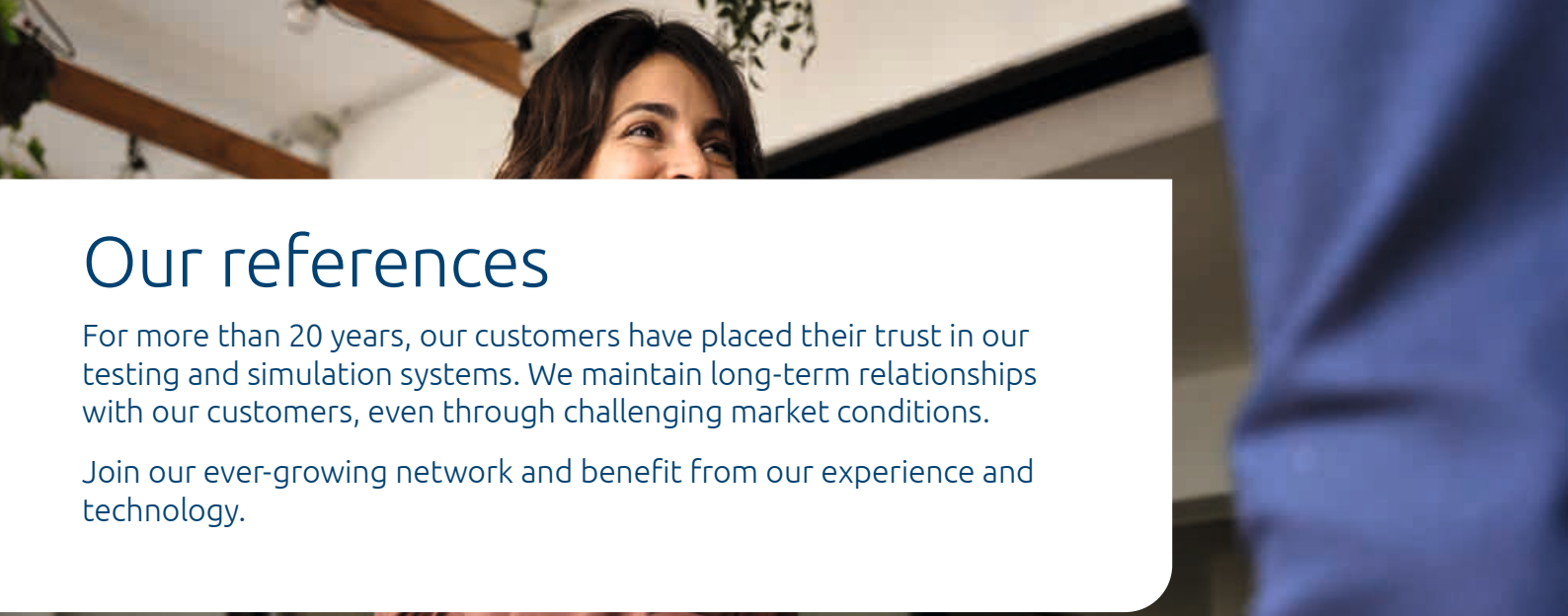
For the parallel connection of 2x I-TS-3840 / 3842 / 3870, we offer the Safety Master for parallel connection, which includes the necessary wiring and a safety assessment. The Safety Master incorporates a safety controller that communicates with the safety controllers of the two I-TS units. A mode selector switch allows selection of single or parallel operation.

The Safety Master can be installed in a dedicated control cabinet or in a wall-mounted enclosure with IP54 protection. It can also be integrated into a PDSB.

Available versions (other versions available on request)

Type	Resistance	Cabinet (W x D x H)
I-TS-Master 3.0_wall	Wall-mounted enclosure	600 x 250 x 800 mm
I-TS-Master 3.0_floor	Control cabinet	800 x 800 x 2000 mm
I-TS-Master-PDSB 3.0	For installation in PDSB	Not relevant

Subject to technical changes.



Our references

For more than 20 years, our customers have placed their trust in our testing and simulation systems. We maintain long-term relationships with our customers, even through challenging market conditions.

Join our ever-growing network and benefit from our experience and technology.

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TÜV SÜD

IPTE

AIRBUS

HYUNDAI

FFT

DRÄXLMAIER

History

2025
Martin Dlauhy serves as sole managing director of Gustav Klein

2023
75th anniversary of the Gustav Klein company

2022
Award „Großer Preis des Mittelstandes“ – we are one of the nine best Bavarian companies

2018
New construction of a production hall with 2,000 m² in the Greifenstraße / Schongau

2016
Delivery of bidirectional inverters for the world‘s largest second life Energy storage from e-vehicle batteries

2013
Extension of the Office building in Im Forchet / Schongau

2012
Presentation of the first four-channel test and simulation system MI-TS

2007
Günther Stensitzki acquires the Gustav Klein company and becomes sole managing director

1999
Delivery of pilot system for the development of electric vehicles

1997
The first energy storage units (250 kVA) for grid support were delivered

1989
Special inverter for room air conditioning

1986
Presentation of the first compact UPS system

1980
Ms. Jutta Baumann-Klein, the daughter of Mr. Gustav Klein, becomes managing director

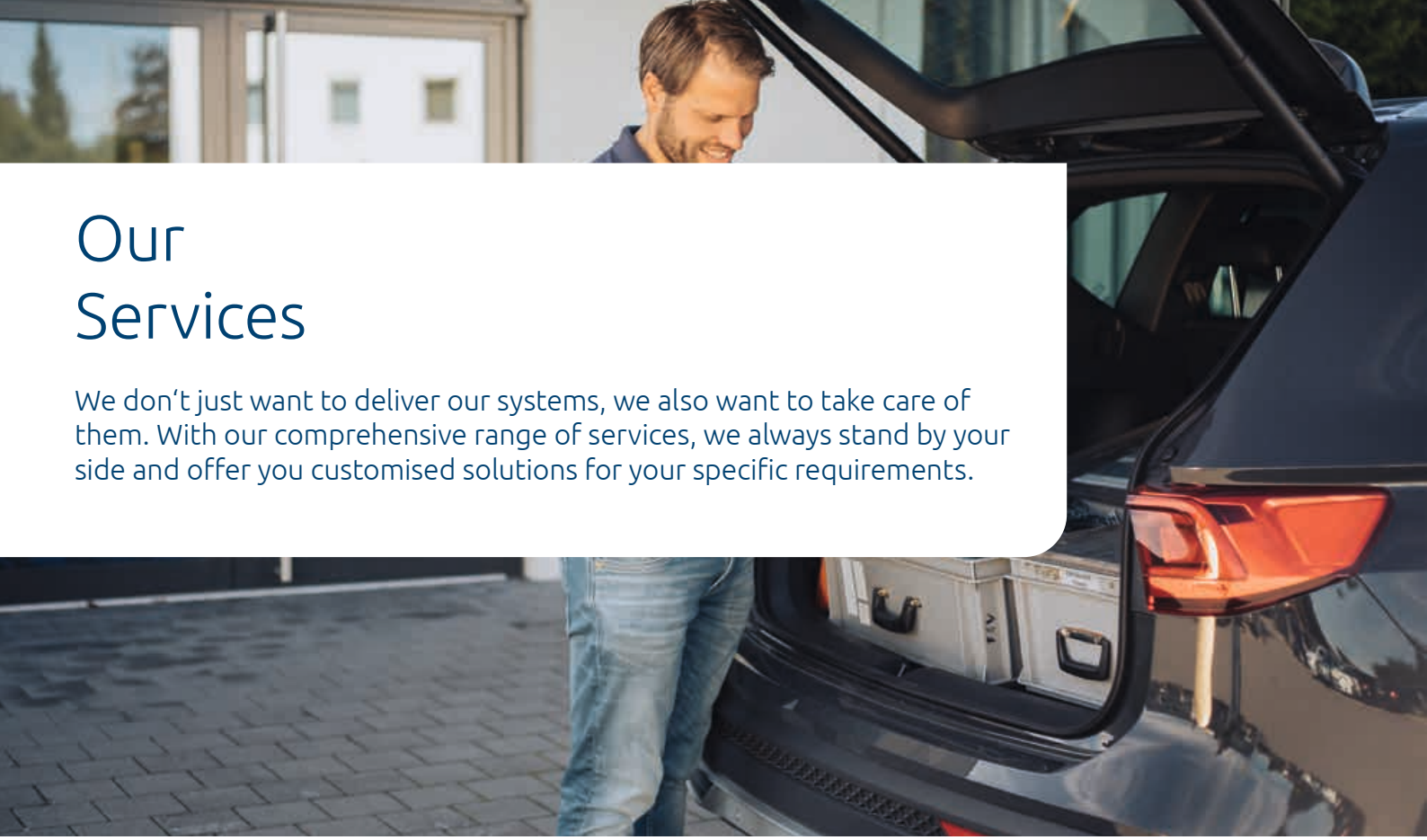
1978
PWM inverters and switched-mode DC/DC converters

1977
Delivery of the first BEV systems (special backup power supplies) for hospitals

1969
Foundation of the branch in Inzing / Austria

1960
Presentation of the first thyristor rectifiers and thyristor inverters

1948
Company founded by Gustav Klein



Our Services

We don't just want to deliver our systems, we also want to take care of them. With our comprehensive range of services, we always stand by your side and offer you customised solutions for your specific requirements.

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24h hotline

Spare parts supply

Maintenance

Calibration of test systems

Renewal & modernisation of your power supply

Repairs on site & in the factory

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We are a team of 250 dedicated colleagues whose creative ideas and products help shape the reliable electrification of our society. You can start your career with us through an apprenticeship or join us as a professional.

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Germany
Gustav Klein GmbH & Co. KG
Im Forchet 3
86956 Schongau / Germany
vertrieb@gustav-klein.com

Austria
Gustav Klein GmbH & Co KG
Schießstand 2
6401 Inzing / Austria
vertrieb.wien@gustav-klein.at

www.gustav-klein.com

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