INOTECH SPAIN METER CALIBRATION SYSTEMS

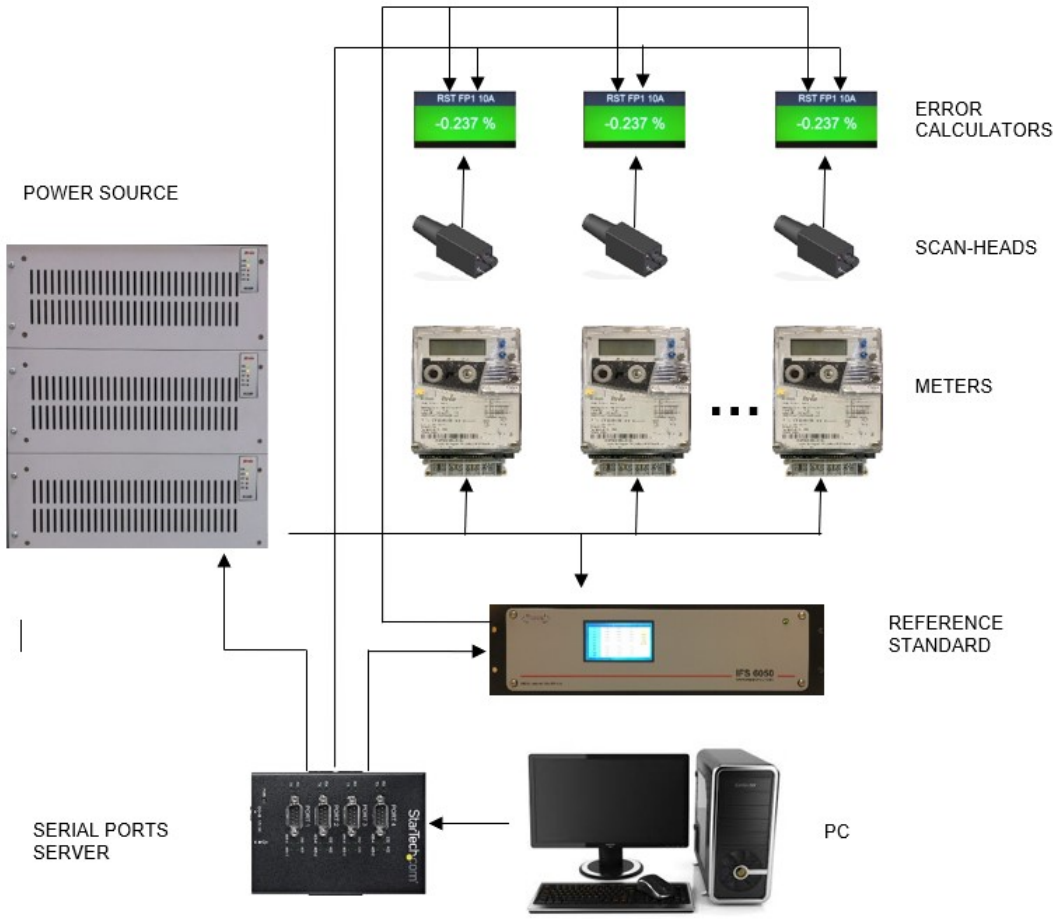
TEST SYSTEMS FOR ELECTRICITY METERS

OVERVIEW

Inotech offers a complete range of electric meter testing systems aimed at meeting the needs of all customers in the energy sector, such as electricity companies, metrology laboratories and meter manufacturers.

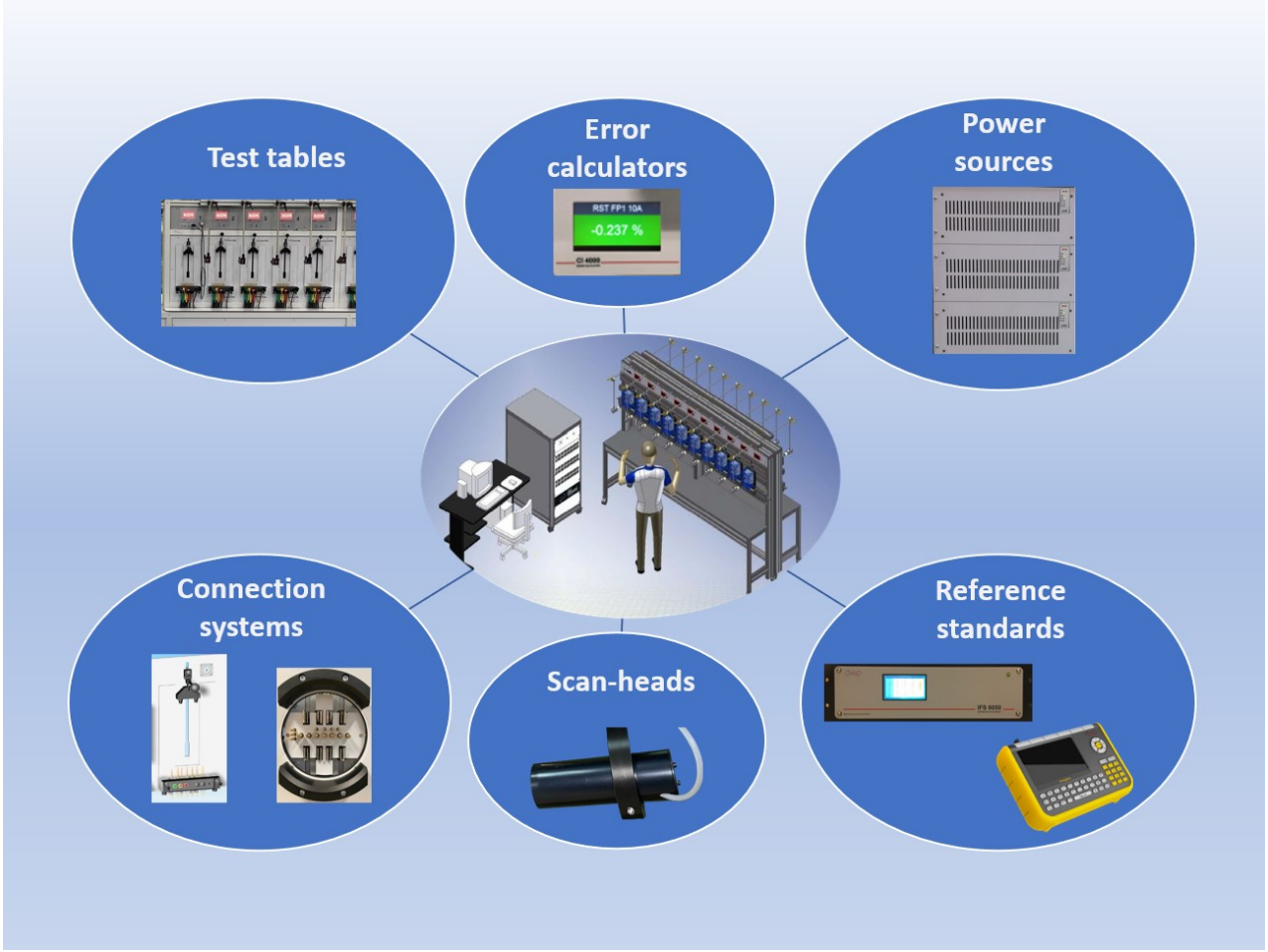
Our test systems are fully modular and customizable to always offer the best solution in each case and meet the specific needs of each client. The modular design also allows modifications and expansions of the equipment already manufactured.

Inotech also offers the best alternatives for updating existing test systems that require changes to adapt to new technologies and metrological requirements.

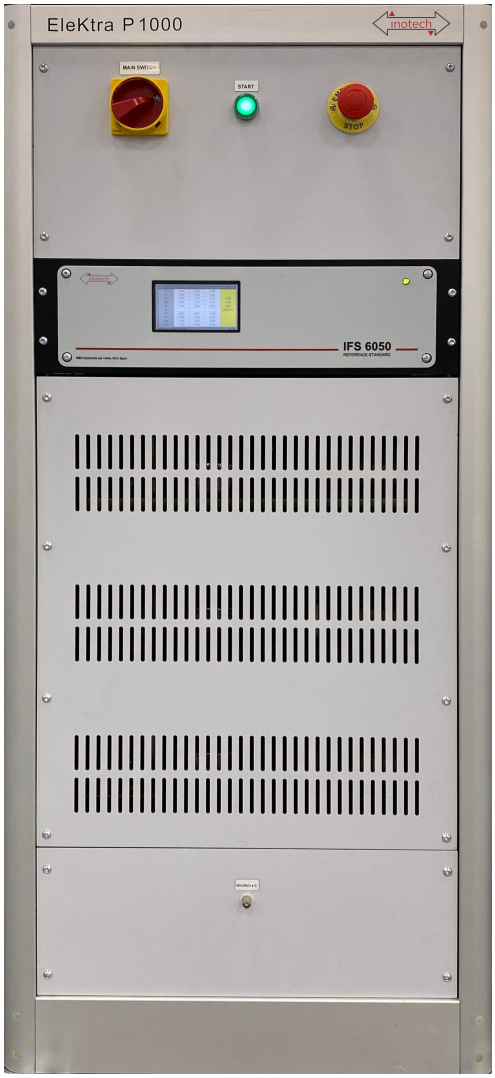


Configuration of a stationary test system

MODULAR SYSTEM COMPONENTS



ELECTRONIC POWER SOURCES



ELEKTRA equipment, three-phase power source.

The Elektra equipment consists of an electronic power source that generates 3 phases of voltage and current for the testing of electricity meters and other electrical measuring instruments such as reference standards, for example.

The output network is digitally generated, is completely independent of the power supply network and allows the testing of up to 20 meters.

The equipment consists of the following components:

- Control unit and power supply.
- Signal generator SGQ700.
- 3 Amplifiers AQD1000.
- Reference standard IFS6050 of 0.02% accuracy class.
- Voltage and current ranges :
  30 V up to 320 V phase-neutral
  1mA up to 120 A or 200 A
- Output power per phase:
  600 VA in voltage
  1200 VA in current

QUALYTEST equipment, high-power three-phase power source.

The Qualytest equipment consists of a high-power electronic power source that generates 3 voltage and current phases for the testing of electricity meters and other electrical measuring instruments such as reference standards, for example.

The output network is digitally generated, is completely independent of the power supply network and allows the testing of up to 40 meters.

The equipment consists of the following components:

- Control unit and power supply.
- Signal generator SGQ700.
- 6 Amplifiers AQMF.
- Standard reference IFS6050 of 0.02% accuracy class.
- Voltage and current ranges :
  31 V up to 320 V phase-neutral
  1mA up to 120 A or 200 A
- Output power per phase:
  750/1500 VA in voltage
  2500/4000 VA in current

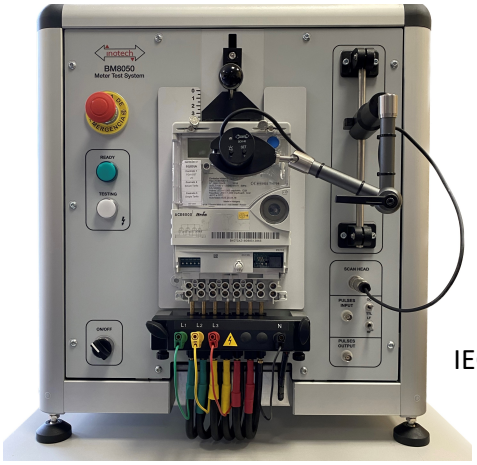
BM8050 equipment, ultra-compact test bench for 1 position IEC/ANSI

The BM8050 is a complete, compact, bench-top calibration system that combines a three-phase power source with a reference standard of class 0.02%.

Its compact design makes it an easily transportable equipment, ideal for moving it inside laboratories, which has all the functionalities of a large test system with a simple USB connection to a PC.

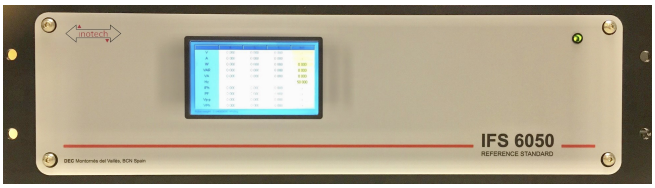
The equipment consists of the following components:

- Control unit and power supply.
- Voltage and current amplifiers.
- Quick connection system IEC/Socket
- Integrated reference standard of 0.02% accuracy class.
- Fixing system CIE or ANSI.
- Scan-head SCH40
- Error calculator CI4000
- CalwinElec software
- Voltage and current ranges :
  30 V up to 300 V
  1mA up to 120 A
- Output power per phase:
  20 VA in voltage
  50 VA in current
- Weight and dimensions:
  50kg, 56x57x58cm



IEC version

ANSI version



Reference standard IFS6050

The IFS6050 is a high-accuracy three-phase electrical energy reference standard ideal for all calibration systems and designed to calibrate any type of meter on the market.

The IFS6050 has a typical accuracy of 0.02% for all measurement functions across its operating range.
It has serial communication and a built-in multimetric TFT color screen that allows you to visualize all electrical quantities in real time.

- Accuracy class: 0.02%
- Current range:
  1mA … 120A or 1mA … 200A
- Voltage range:
  30V … 320V or 30V … 600V
- Serial communication port
  RS232/485
- Simultaneous measurement of active, reactive and apparent energy in the 4 quadrants.
- Harmonic analysis

Portable standard IPS5050/6050

The IPS 5050/6050 is a portable standard for testing active and reactive, three-phase (3 or 4 wire) and single-phase (2 or 3 wire) meters. Designed to work in the field or in the lab.

It has a robust carrying case with wheels for easy transport with all accessories.

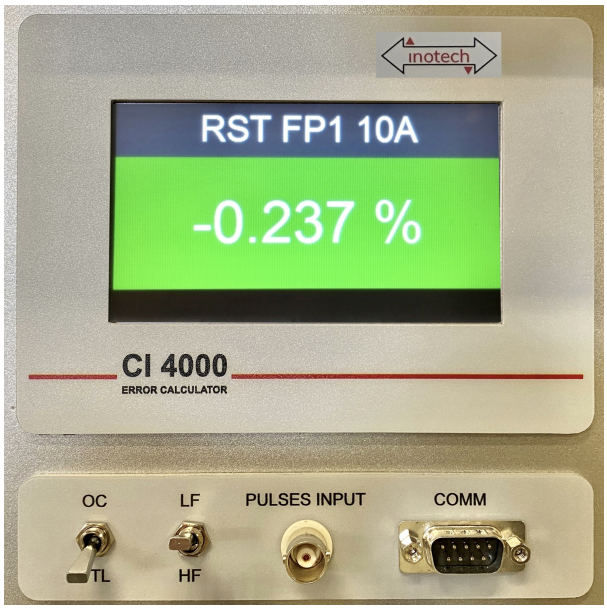
Includes accessories:

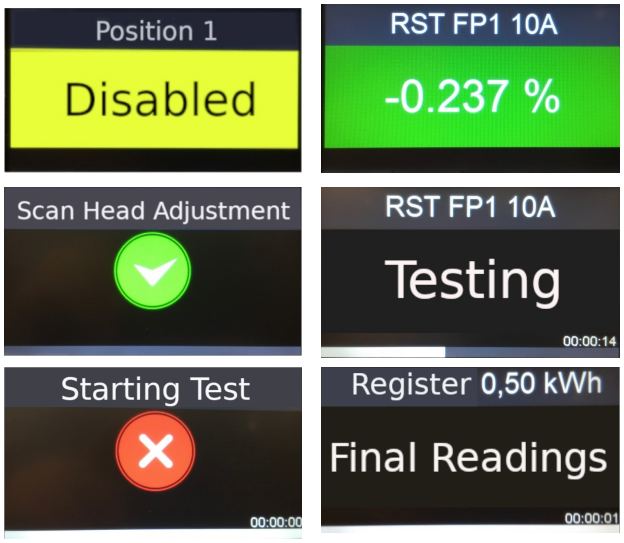
- Power supply
- 100A current clamps
- Scan-head with support
- Voltage and current connection cables
- RS232 communication cable
- Power cable
- Battery charger.

Characteristics:

- Accuracy class:
  Direct connection (25mA-12A): 0.05%
  Current clamp connection (0.5A-100A): 0.2%
- Weight and dimensions:
  2.5/12kg (with accesories), 295x193x74 / 559 x 351 x 229 mm (with carrying case)
- Network and harmonic analysis
- 7 inch high-resolution touchscreen.
- Serial communication ports RS232 and USB.

ERROR CALCULATORS





Examples of screen messages

Error calculator CI4000

The individual error calculators are mainly used to calculate and display the test error, but their graphical touch screen also allows other system information to be displayed: test status, alarms, etc.
The calculators have serial communication and a pulse input port for testing other measuring instruments.

Its main functions are:

- Calculation of meter error through scan-head or pulse input.
- TFT touch screen for display of error results, messages about tests and alarms.
- Automatic adjustment and control of scan-head.
- Restart of tests by touch screen pulsation.
- Indication of scan-head failure and test results out of tolerance.
- Pulse counting in register tests.

Options:

- COMM communication module with RS232 or USB interfaces
- Automatic disk positioning module.

Scan-head SCH40

The scan-head SCH40 is used to detect both the marks of electromechanical meters and the LED pulses of electronic meters.

The SCH40 has manual and automatic adjustment by means of 2 buttons, or through 2 inputs controlled remotely from the PC.

The bi-color LED indicates detection and operating status.

The optical-grade glass lens and digital signal process (DSP) ensure optimal fit in all conditions.

The articulated single control support allows the rapid positioning of the scan-heads with any type of meters.

Mark detection:

- Max. frequency: 1 kHz
- Detection distance: 5 ... 30mm

LED detection:

- LED type: Visible and infrared
- Max. frequency: 1 kHz
- Detection distance: 0 ... 200mm
- Spectrum: 400 … 1000nm

Quick Connector QC

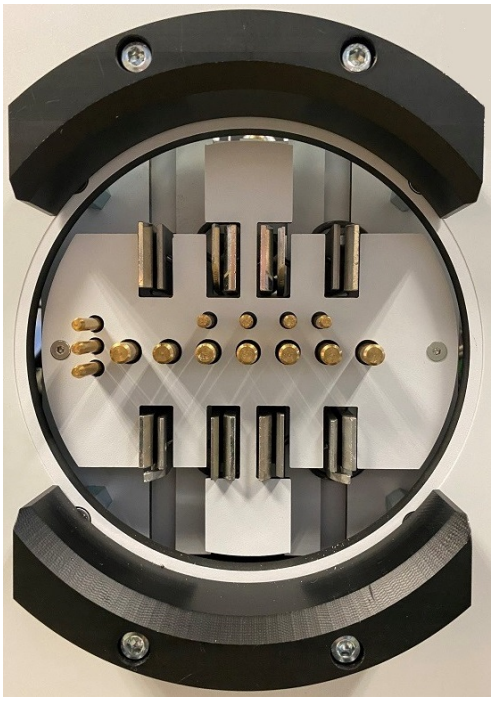
The quick connectors (QC) are used for fixing and connecting any type of meter by means of retractable pins.
They can be used for current levels up to 80A in permanence and up to 120A in short duration tests.

The lever fixing mechanism makes it easy to mount and connect the meters quickly and safely.
Thanks to its multiple settings, it can be adapted to any single-phase or three-phase meter, with symmetrical or asymmetric connection.

It has safety terminals for the connection of voltages in indirect meters.

"Voltage in Curent" connection

For direct meter tests, voltages are connected directly to the current pins, avoiding the use of additional cables and facilitating the assembly and disassembly of the meters.

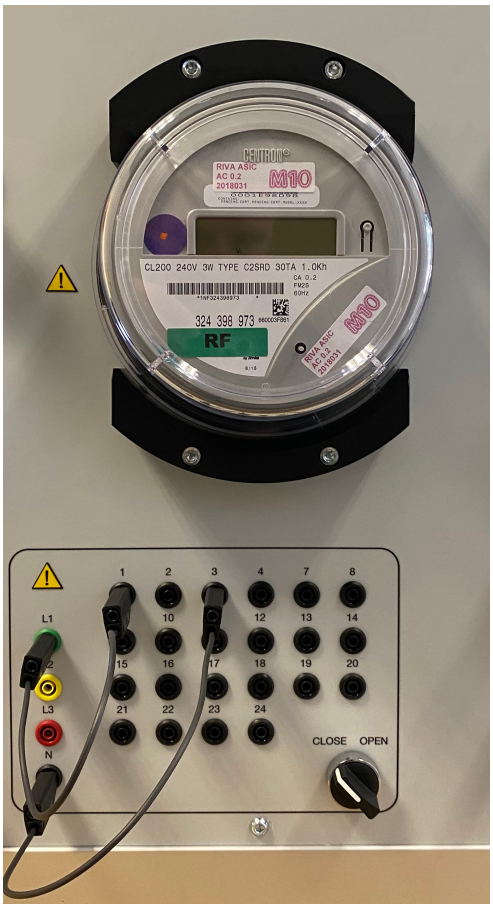


Socket connector

Socket connectors are mechanisms formed by a set of clamps and retractable pins that serve to connect ANSI meters.
They can be used for current levels up to 100A in permanence and up to 200A in short duration tests.

The placement and removal of meters is extremely simple by activating the opening and closing of the mechanical clamps from external controls.

For safety, there is an automatic lock of opening clamps during the execution of tests.



Thanks to a connection matrix system, the connections of any form of ANSI meter existing today can be reproduced to test it correctly.

TEST TABLES

The test tables are structures built mainly with aluminum profiles and laminated panels where the meters to be tested are connected, and which have the necessary elements for the realization of the tests.
All test positions have a meter connection system, an individual error calculator, a scan-head and fixing devices for all these components.

The modular design of the tables allows the construction of different versions adapted to the needs of each client: number of positions, types of meters, communication ports, hand-held terminals, etc.

Example of a double-sided 20-position test table for IEC meters with three-phase quick connectors

Example of a double-sided 20-position test table for ANSI meters with three-phase sockets

Example of 3-position test table for IEC meters with quick connectors.

ACCESSORIES

IMCT4 Isolation Current Transformer Module

The IMCT-4 is a three-phase current transformer module designed to upgrade existing calibration systems when multiple three-phase meters need to be tested with voltage link closed (direct meters).

Electronically compensated, the accuracy of IMCT-4 is below 0.04% in all its dynamics.

With all connections on top, its compact design allows easy mounting of up to 20 modules on existing tables with a single power module.

- Relation: 120/120A
- Range: 10mA up to 120A
- Output power: 75VA
- Weight and dimensions:
  21kg
  185x335x315 mm
- Alarms for protection against open circuits and saturation.
- Serial communication with PC.

Handheld terminal with barcode reader ZEBRA TC21/TC26

This wireless terminal communicates via bluetooth with the computer and has a barcode reader, which allows easy and quick reading of serial numbers or other information contained in the bar codes of the meters.

It also allows to enter the meters readings for the register and max. demand tests. The system is completed with the presence of a console that includes the power supply of the battery of the terminal.

The terminal has a touch screen and incorporates the CalwinHHT software, developed by Inotech, which allows to customize the terminal to the needs of each client.

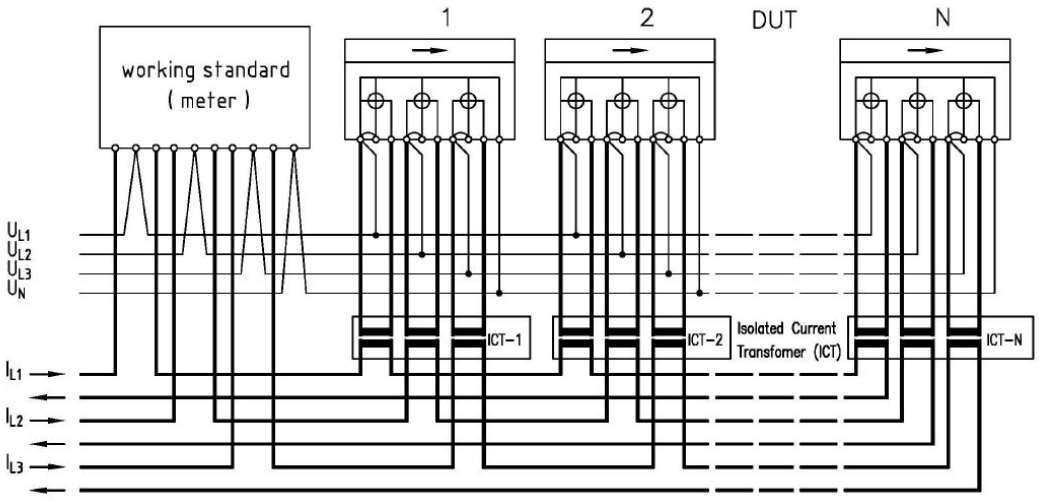
Optical port reader

The optical port reader is a device that allows communication between any type of electrical meter equipped with a port according to IEC 62056-21 and a reading device equipped with an RS-232 or USB 2.0 port.

This reader, connected to the error evaluation system of each test position, allows the reading of meter data and the states of the registers.

ISOLATION CURRENT TRANSFORMERS

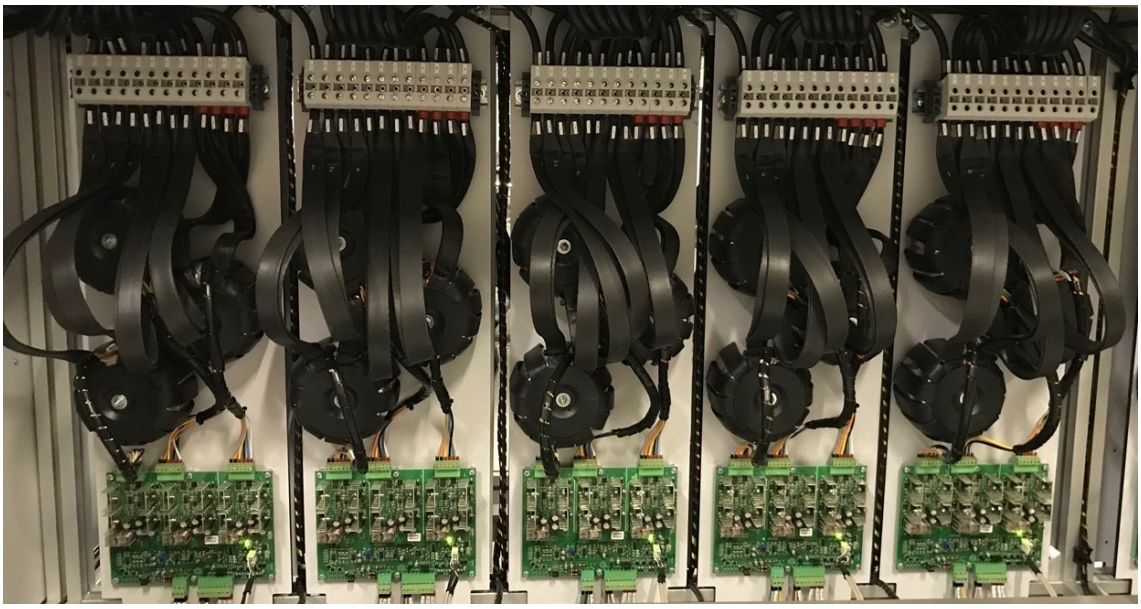
Isolation current transformers (ICT) are required when multiple closed-link meters are tested simultaneously, providing the necessary galvanic isolation between the current and voltage circuits of each meter under test.



Connection diagram of isolation current transformers

Three-phase transformer modules ICT4 integrated in the table

ICT4 Isolation Current Transformer Module



The ICT4 is a three-phase module of isolation current transformers integrated in each test position of the test table.

Each module includes 3 high-precision current transformers and an electronic card for error compensation and control.

The system is self-protected against accidental opening of the load and against overpower or saturation, indicating on the computer the type of anomaly and its position.

- Relation: 120/120A
- Range: 10mA up to 120A
- Accuracy: 0.02% (20mA .. 120A)
- Output power: 75VA

Remote control from PC that allows:

- Deactivation of empty test positions (no additional jumpers required)
- Alarms management
- Monitoring of secondary voltage drops to evaluate contact quality or default.
- Non-stop testing in case of accidental meter openings (pre-paid meters, for example).

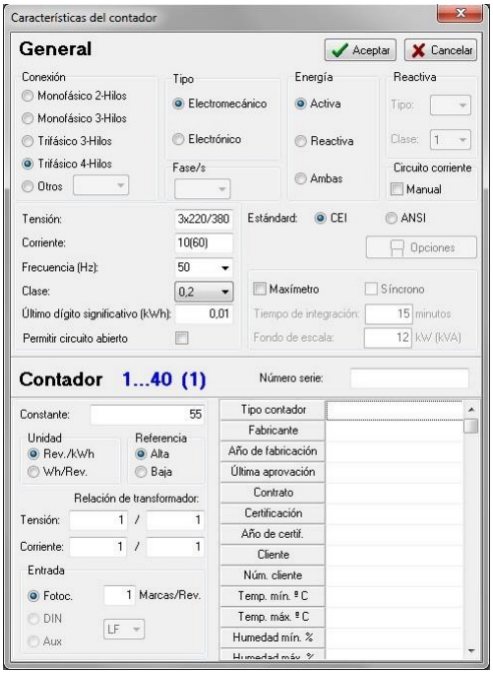
SOFTWARE CALWIN ELEC

CalwinElec is a software package specially designed for inotech electric meter testing equipment.
It is a unique and valid platform for the entire range of inotech electrical equipment, offering all the functions and requirements of current electrical metrology and allowing the incorporation of possible future needs.

Its configuration possibilities and flexibility make CalwinElec the ideal software for any customer, from small laboratories to meter manufacturers, complying with current regulations (e.g. IEC, ANSI, BS).

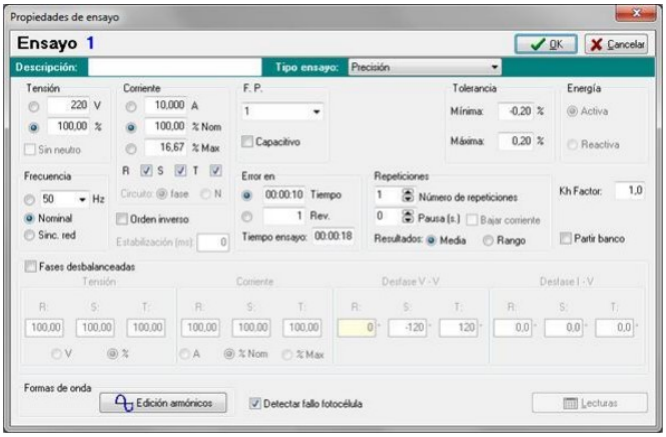
Main features of CalwinElec

- **Modular and configurable**. From the same platform, it adapts to any inotech calibration hardware configuration, and modules can be added according to needs (special tests, harmonics, communication with SmartMeters, etc.)
- **User-friendly interface.** The interface is designed to be easy and intuitive to use, allowing a quick learning curve by operators.
- **SQL database.** The database, based on SQL, allows fast, stable, and secure access, and can be stored on the PC itself or on an easily configurable local server.
- **Data export.** The results can be exported to various formats such as Excel or PDF with a simple click.
- **Configurable result protocols.** The results reports are Excel templates, totally flexible and customizable for each client, and can be added as many as necessary.
- **Advanced uncertainty calculation.** Essential in metrology, CalwinElec includes a complete uncertainty calculation package to comply with the most demanding regulations.
- **Sequential and continuous test modes.** Various test execution modes are available depending on the type of laboratory and test objectives, from automatic sequences to manual tests.
- **Self-calibration of the reference standard.** CalwinElec has a unique function to automatically recalibrate the IFS6050 standard against an external standard, saving time and more costly procedures.
- **User management.** It consists of the management of several user levels with configurable passwords and permissions.
- **Generation of harmonics.** the harmonic generation module allows compliance with harmonic test requirements in accordance with IEC 62053.
- **Batch acceptance (optional).** This module facilitates the sample control procedure according to current regulations.



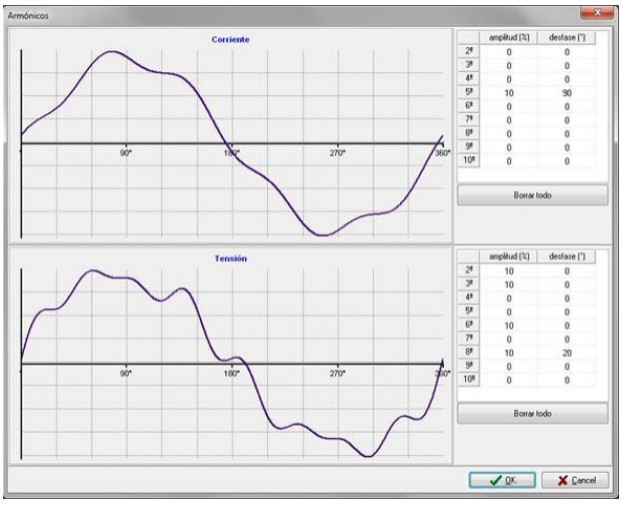
Programming the meters

In this menu all the information related to the meters under test is entered: type of meter, electrical parameters, and identification data (manufacturer, serial number, etc.).
This information will determine the type of connection and the voltage and current values to be generated during the tests.
The programming data for a meter type is stored with the test data so that it can be used later in new tests.



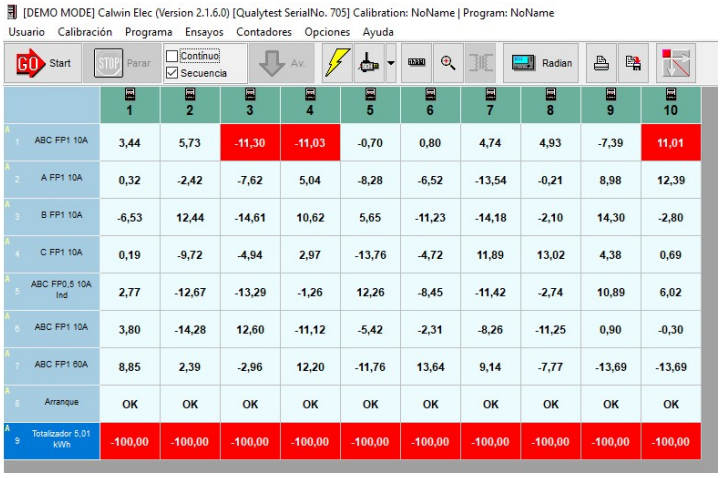
Programming the tests

In this menu, the parameters that define each of the tests are entered: voltage, current and angle settings, type of test, repetitions, tolerances, etc.
The test sequence associated with a meter type is stored within that meter's program in the database.



Harmonic programming

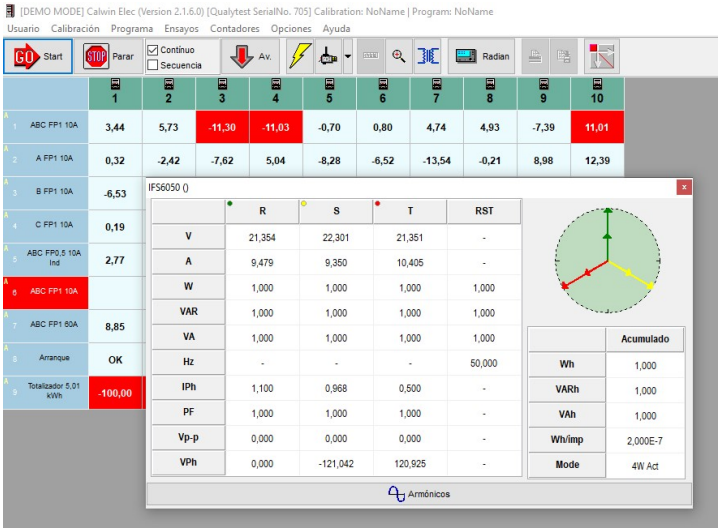
From this menu the harmonics are defined with their amplitude and angle values to carry out tests in the presence of harmonics.
It is also possible to unbalance the voltages and currents for testing meters under special conditions.



	1	2	3	4	5	6	7	8	9	10
ABC FP1 10A	3,44	5,73	-11,30	-11,03	-0,70	0,80	4,74	4,93	-7,39	11,01
A FP1 10A	0,32	-2,42	-7,62	5,04	-8,28	-6,52	-13,54	-0,21	8,98	12,39
B FP1 10A	-6,53	12,44	-14,61	10,62	5,65	-11,23	-14,18	-2,10	14,30	-2,80
C FP1 10A	0,19	-9,72	-4,94	2,97	-13,76	-4,72	11,89	13,02	4,38	0,69
ABC FP0,5 10A Ind	2,77	-12,67	-13,29	-1,26	12,26	-8,45	-11,42	-2,74	10,89	6,02
ABC FP1 10A	3,80	-14,28	12,60	-11,12	-5,42	-2,31	-8,26	-11,25	0,90	-0,30
ABC FP1 60A	8,85	2,39	-2,96	12,20	-11,76	13,64	9,14	-7,77	-13,69	-13,69
Arranque	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Totalizador 5,01 kWh	-100,00	-100,00	-100,00	-100,00	-100,00	-100,00	-100,00	-100,00	-100,00	-100,00

Execution of tests

The execution of the tests is carried out sequentially or continuously, displaying the results on the screen in real time together with other relevant information, such as the status of the test in progress, results out of tolerances, etc.

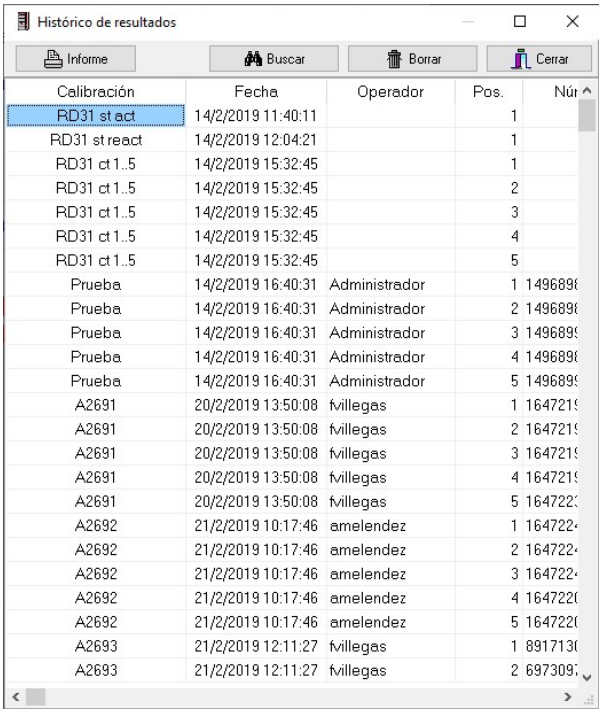


	R	S	T	RST
V	21,354	22,301	21,351	-
A	9,479	9,350	10,405	-
W	1,000	1,000	1,000	1,000
VAR	1,000	1,000	1,000	1,000
VA	1,000	1,000	1,000	1,000
Hz	-	-	-	50,000
IPh	1,100	0,968	0,500	-
PF	1,000	1,000	1,000	-
Vp-p	0,000	0,000	0,000	-
VPh	0,000	-121,042	120,925	-

	Acumulado
Wh	1,000
VARh	1,000
VAh	1,000
Wh/imp	2,000E-7
Mode	4W Act

Multimeter display

Additionally, it is possible to display on a pop-up screen the actual values of the electrical parameters of the current test: voltages, currents, power factors, powers, etc.



Calibración	Fecha	Operador	Pos.	Núr
RD31 st act	14/2/2019 11:40:11		1	
RD31 st react	14/2/2019 12:04:21		1	
RD31 ct 1..5	14/2/2019 15:32:45		1	
RD31 ct 1..5	14/2/2019 15:32:45		2	
RD31 ct 1..5	14/2/2019 15:32:45		3	
RD31 ct 1..5	14/2/2019 15:32:45		4	
RD31 ct 1..5	14/2/2019 15:32:45		5	
Prueba	14/2/2019 16:40:31	Administrador	1	149689
Prueba	14/2/2019 16:40:31	Administrador	2	149689
Prueba	14/2/2019 16:40:31	Administrador	3	149689
Prueba	14/2/2019 16:40:31	Administrador	4	149689
Prueba	14/2/2019 16:40:31	Administrador	5	149689
A2691	20/2/2019 13:50:08	fvillegas	1	164721
A2691	20/2/2019 13:50:08	fvillegas	2	164721
A2691	20/2/2019 13:50:08	fvillegas	3	164721
A2691	20/2/2019 13:50:08	fvillegas	4	164721
A2691	20/2/2019 13:50:08	fvillegas	5	164722
A2692	21/2/2019 10:17:46	amelendez	1	164722
A2692	21/2/2019 10:17:46	amelendez	2	164722
A2692	21/2/2019 10:17:46	amelendez	3	164722
A2692	21/2/2019 10:17:46	amelendez	4	164722
A2692	21/2/2019 10:17:46	amelendez	5	164722
A2693	21/2/2019 12:11:27	fvillegas	1	891713
A2693	21/2/2019 12:11:27	fvillegas	2	697309

Results

Once the tests are finished, the results are stored in the database and are available to be retrieved later for multiple purposes, such as printing test protocols with different template models, or being exported to other formats such as excel or pdf.

A powerful search engine allows data retrieval from different variables (serial number, type of meter, date, etc.).

Optional software modules

- Generation of special signals and waveforms for continuous component influence tests, even, odd, and subharmonic harmonics according to IEC 62052-11 and IEC 62053-11/-21/-22.
- Communication with SmartMeters, applying manufacturer protocols.
- Batch acceptance according to IEC 62058-11/-21/-31

REGULATIONS

All our equipment is manufactured based on market standards and in compliance with the main international regulations:

- IEC 61010-1 (Safety requirements for electrical measuring, control, and laboratory equipment)
- IEC 62052 (Electrical Energy (AC) Measurement Equipment: General Requirements, Tests and Test Conditions)
- EN 50470-1 (Electricity metering equipment (a.c.) - General requirements, tests, and test conditions)
- IEC 62058 (Electricity Metering (AC) Equipment - Acceptance Inspection)
- ANSI C12.20 (For Electricity Meters – 0.2 and 0.5 Accuracy Classes)

KEY BENEFITS

- **Modular philosophy:**

We know that in a world with constant change, needs also change. That's why we design the hardware and software to make the adaptations very simple and at minimum cost.

- **Designed and manufactured in Barcelona by Inotech Spain:**

In our facilities in Montornés (Barcelona) we develop the software and hardware of our equipment, we design and manufacture all parts, from the scan heads to the power amplifiers and reference standards. This gives us absolute control of our equipment and security to our customers, since we guarantee the maintenance and compatibility of new versions with old equipment, which contributes to extending the useful life of our test benches beyond the usual.

- **Easy to repair, easy to maintain:**

We design our systems to facilítate the replacement of components by personnel with minimal training, with our support if necessary, with services such as remote assistance, which minimizes the time and cost of diagnosis and resolution of faults.

- **Global maintenance and calibration service:**

Our maintenance services include from remote assistance to on-site assistance visits following our philosophy of maximum commitment to the Client and continuous attention. As experts in legal metrology, we offer on-site calibration services by going to the client laboratory with our reference standards certified by the CEM (Spanish Metrology Center) and with different certification options depending on the level of accreditation required.

- **Friendly Software:**

As software developers we know that if a program is easy to use, it's much better that way. After nearly 30 years developing calibration software, our "Calwin" program can do everything imaginable in the field of electric meter test systems, but at the same time we are proud that it can be used in just a few hours of training.

- **IEC and ANSI metrology experts:**

Inotech is a leader in meter calibration systems. This gives us a deep knowledge of everything related to legal metrology, regulations, directives, etc. both in the field of IEC and ANSI.

When we supply a test system to a customer, we are also putting all our experience at their disposal to get the most out of the test equipment. Aligning the possibilities of the system with the needs of the customer, we collaborate in the development of test sequences, procedures, etc., until maximum efficiency is achieved. In addition, our knowledge in both worlds of meters (IEC and ANSI) is invaluable to those customers who work in both.

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