



MICROPÌ

Elettronica Industriale e Automazione



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CATHODIC PROTECTION



CATHODIC PROTECTION DIVISION



**POWER SUPPLIES, DATA LOGGERS,
CURRENT INTERRUPTERS,
DEDICATED INSTRUMENTS**

**Electronic equipment for
cathodic protection system for:**

- **Underground gas pipes**
- **Water distribution networks**
- **Underground tanks**
- **Exhaust pipes**
- **Remote control and data logging**
- **Control cabins and measurement points**

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CATHODIC PROTECTION DIVISION

The Micropi Cathodic Protection Equipment Division cooperates with the companies that install and sell cathodic protection systems for buried tanks, gas & water pipelines, heating distribution systems, metal structures, anticorrosion of steel in concrete, etc., both by providing standard electronic equipment to be installed in cathodic protection plants, or by designing new ones in order to simplify the engineer's job.

Micropi was the first company in Italy (about 40 years ago) which proposed the PWM switch mode technology in the power supply units for Impressed Current Cathodic Protection technique; greeted with suspicion for some time (in the 90's seemed not plausible to obtain 1200W well regulated by a device that weighed only 7 kg!), the switching control technology is now being appreciated and shared by almost everyone in the power electronics devices, also for heavy duty applications.

For over 25 years, Micropi has also introduced the microprocessor control, resulting in greater flexibility of use, and the possibility to incorporate evolved functions such as data-logger and current interrupter (cycle switch) in his power supplies for cathodic protection systems, as well as the device's complete remote management.

Thanks to the long experience acquired, now our power supplies are among the most comprehensive, lightweight, accurate and reliable available on the market today.

These are some of the reasons why this type of equipment we produce for years not may be referred to simply as transformer rectifier for cathodic protection systems, as generically the power supply units are recognized in the oil & gas sector worldwide.

Our Data Loggers (smaller in size but endowed with alphanumeric display and control keys / programming) allow the installer to solve in a more simple and cheaper way the problems of monitoring and survey in any impressed current cathodic protection plant.

Our cathodic protection division offers three types of product:

Cathodic Protection Power Supplies, with a so wide range, that you can successfully deal with all the problems of active protection projects (standard BN Series & HT Series, special Series for High Current Systems (EHT, AP, EPC Series) including solar power supplies for Photovoltaic Cathodic Protection Systems (BF Series) for impressed current cathodic protection systems.

Data Loggers, including DL Series to monitor / record the P.D. (Potential Difference or Voltage Gradient) and current value at any protection system's point.

Dedicated Instruments & Accessories, including the specialized INC Series Current Interrupter (for the management of tests with the on/off technique) and other devices.

All our equipment is conceived, designed and produced in Italy, in our Laboratories.

If You got a specific need that require the use of electronic technologies endowed with high reliability and You are looking for a partner who will support You with solutions that ensure to Your products/services the right economic and technological competitiveness on the market, just contact us

A successful result always comes from the right synergies!

AUTOMATIC POWER SUPPLY FOR CATHODIC PROTECTION SYSTEMS - MICROPROCESSOR CONTROLLED -



This power supply represents the natural evolution of the established HT technology, which in almost 30 years of operation has been able to demonstrate in the field the validity of the solutions adopted in terms of reliability, efficiency and ease of use. This new version maintains the many strengths of the HT line unchanged (small size, great robustness, wide range of remote management via cable or radio, data logger and on-board ON-OFF interrupter, statistical memories), but adds further improvements made possible by the evolution of electronic technology in the POWER field.

Compared to the previous version it offers:

- **Higher energy efficiency (90% compared to the previous 84%)** thanks to the new FULL-BRIDGE / SOFTSWITCHING conversion technique. The result is: lower operating cost, and low self-heating (therefore a longer operating life, with lower intensity forced ventilation).
- **Greater robustness against input/output overvoltages** thanks to the adoption of the new high-energy dischargers available today (22KA).
- **Greater flexibility:** now it is possible to have the double amperometric scale (to better read even the low currents), and the PFC input (allows to absorb a sinusoidal current from the network instead of an impulsive one).
- **External cooling fin:** reduces internal airflow and long-term pollution of the electronic boards.

The new HT series is offered in 4 power sizes (6, 12, 18, 25 A), all in the same container.

Each model can be supplied with the following options, to be specified when ordering:

- **D** (data logger with 2 programmable channels).
- **M** (remote management via RS485 MODBUS cable).
- **G** (remote manag. via radio on the GSM network).
- **R** (remote manag. via radio on the local LORA network).
- **L** (TELEMETRY in current loop 4-20mA; 2 isolated channels: DDP and IOUT).
- **F** (cyclic relay for ON/OFF tests).
- **C** (cyclic relay for ON/OFF tests with GPS synchronization).
- **DS** (dual scaling on output current reading).
- **PF** (input power factor adjustment).
- **U** (rear terminal block for cables up to 16mmq, as an alternative to the rear multiple cable).

*HT2 model with 2A nominal current and 1mA resolution is available on demand.

TECHNICAL CHARACTERISTICS OF HT SERIES 8 POWER SUPPLIES

DEVICE TYPE	Automatic power supply for cathodic protection systems - microprocessor controlled
DIMENSIONS AND WEIGHT	34x18x23 cm (WxHxD) weight: 6.9kg (including cables)
PROTECTION LABEL	IP21 (cabinet installation by road)
ENVIRONMENTAL TEMPERATURE	from -15 to +50°C (inside closet, no condensation); automatic lock with device internal temperature >80 °C
MEASURING INSTRUMENTS	3 LCD display with 4 digits (14 mm LED display, high brightness) + 2x16 alphanumeric char. Measures and displays: P.D., output current and voltage, working hours and "off protection" hours, average operating parameters (P.D., current, output voltage, output power), internal temperature, supply voltage
DIAGNOSTIC / PROGRAMMING	2x16 alphanumeric char. Display - Backlit (temporized) LCD
KEYBOARD & SIGNALS	16 mechanical keys with tactile feedback, #14 high brightness leds, beeper
CALENDAR CLOCK (with /D option)	clock with independent power of 10 years duration (with data logger res. set to 1 sec.)
POWER REGULATION TECHNIQUE	AC/DC Converter type FULL-BRIDGE PHASE-SHIFT SOFT-SWITCHING
COOLING SYSTEM	fan assisted natural convection
OVERVOLTAGE PROTECTION	8 varistors 22KA, 1 gas discharges 10KA (mains, output, probe)
OVERCURRENT PROTECTION	2 magneto-thermal circuit breaker (mains, output)
INPUT VOLTAGE	230V+/-15% 50-60Hz with on-board mains voltmeter With the /PF option, the operating range of the Vnet becomes: 180 - 270 Vac
OUTPUT VOLTAGE	From 0 to 50Vcc (max programmable limits: from 10 to 50Vcc)
OUTPUT CURRENT	HT06=6A HT12=12A HT18=18A HT25=25A
EFFICIENCY	90% @ full power
RIPPLE & NOISE (OUTPUT)	< 100 mVrms @ 90% full power
BASIC CURRENT	programmable from 0.000 to Nominal Output Current (step = 10mA) With /DS option: from 0.000A to 1/10 of Nominal Output Current (step = 1mA)
DESIRED P.D.	programmable from -1.00 to -5.00V (step = 10 mV)
MEASURABLE P.D.	from - 10.0V to +10.0 V; differential type measure (Rdiff=1MΩ)
OPERATIVE MODES	CC (constant output current), CV (constant voltage (P.D.) with adjustable basic current)
REGULATION ERROR (REGIMEN)	CV mode: +/-20mV; CC mode: +/-30mA (+/-3mA with option /DS on scale 1)
DYNAMIC COMPENSATION	<250ms to restore the 90% of the programmed P.D
INSTRUMENTS ACCURACY	< 0.8% + 2digit (DDP e Vout); <1.5% + 4digit (amperometro); <2% (Vmains)
SERIAL PORT (optional)	USB-device; isolated RS485 (DB) (/M option)
REMOTE MANAGEMENT (/M, /G, /R options)	wired: MODBUS-RTU protocol by isolated RS485 wireless: GSM/GPRS module; LORA module
DATA LOGGER (/D option)	2 CHANNELS (P.D. and OUTPUT CURRENT); cadence from 0.1" to 120" (11 values) RANGE: from 54 hours (cadence 0.1") to ~7.5 years (cadence 120") RECORDS DISPLAYING: on board display or external PC (via USB port)
TELEMETRY 4-20mA (/L option)	N.2 analog outputs 4-20mA galvanically isolated from the system (500Vdc). Max error: +/-2%. Rmax of load: 600 ohms. Max output voltage: 14V
CURRENT INTERRUPTER (/F or /C options)	Programmable times: ON from 0.3 to 25.0 sec; OFF 0.7 to 25.0 sec With /C option: +/-20msec synchronization via on-board GPS module
DUAL SCALE CURRENT (/DS option)	Scale 1: 1/10*Imax (resolution 1mA) - Current bushings: 1000 mV/A Scale 2: Imax (resolution 10mA) - Current bushings: 100 mV/A Automatic or manual switching between the 2 scales
POWER FACTOR ADJUSTMENT (/PF option)	Power Factor = 0.95 @ full power Used Tecnology: active PFC boost CCM
MEMORY STATISTICS	#6 parameters (WORKING HOURS, OUT OF PROT. HOURS, AVG. P.D., AVG. OUTPUT CURRENT, AVG. OUTPUT VOLTAGE, AVG. OUTPUT POWER)
MAIN ALARMS	OUT OF WINDOW P.D. (programmable window and delay), OUTPUT CIRCUIT OPEN, OVER TEMPERATURE, LINE VOLT. OUT OF RANGE
REGULATIONS REFERENCE	safety: EN 61010-1 (1996); EMC: EN 50081-1, EN 50082-1 cathodic protection power supplies: UNI CEI 8 (1997)

HT8DEP11_IEN - WITH RESERVE OF CHANGES WITHOUT NOTICE

THE ELECTRICAL CHARACTERISTICS ARE MEASURED AT 25°C AND ARE THE SAME (EXCEPT CURRENT AND POWER) FOR ALL CURRENT SIZES

AUTOMATIC POWER SUPPLY FOR CATHODIC PROTECTION SYSTEMS - MICROPROCESSOR CONTROLLED -



HTE is an automatic switching power supply managed by a microprocessor, specifically designed for modern cathodic protection systems. All operating parameters are programmable in the field, and the device responds to almost all the system requirements of this sector, having already on board all the necessary instrumentation and being able to be equipped with a large number of optional functions.

This power supply represents the natural evolution of the now established HT technology, which in almost 30 years of operation has been able to demonstrate in the field the validity of the solutions adopted in terms of reliability, efficiency and ease of use. This new version maintains the strengths of the HT line (small size, great robustness, wide possibilities of remote management/remote control, statistical memories, etc.), but adds further improvements made possible by the evolution of electronic technology in the POWER field.

Compared to the previous version it offers:

- **Higher energy efficiency (90% compared to the previous 84%)** thanks to the new FULL-BRIDGE / SOFTSWITCHING conversion technique. The result is: lower operating cost, and low self-heating (therefore a longer operating life, with lower intensity forced ventilation).
- **Greater robustness against input/output overvoltages** thanks to the adoption of the new high-energy dischargers available today (22KA).
- **MOSFET Current Interrupter for ON-OFF tests** instead of relay (greater precision and no aging).
- **External cooling fin: low internal air flow and board pollution.**
- **Faulty dischargers can be replaced in the field without opening the power supply.**
- **The current absorbed from the powerline is sinusoidal rather than impulsive (input PFC).**

The model described hereby is equipped with the following functions:

- **Remote management via RS485 MODBUS cable.**
- **Cyclic relay for ON/OFF tests (synchronizable via GPS).**

TECHNICAL CHARACTERISTICS OF HTE POWER SUPPLIES

DEVICE TYPE	Automatic power supply for cathodic protection systems - microprocessor controlled
DIMENSIONS AND WEIGHT	38x22x30 cm (WxHxD) weight: 6.9kg (including cables)
PROTECTION LABEL	IP21B (cabinet installation by road)
ENVIRONMENTAL TEMPERATURE	from -15 to +60°C (inside closet, no condensation); automatic lock with device internal temperature >85 °C
MEASURING INSTRUMENTS	3 LCD display with 4 digits (14 mm LED display, high brightness) + 2x16 alphanumeric char. DDP, Output current and voltage, Internal temperatures (>20°C), Mains voltage (without PFC), Working hours, Out of protection hours, Operating averages
DIAGNOSTIC / PROGRAMMING	2x16 alphanumeric char. OLED Display - Backlit (temporized) LCD
KEYBOARD & SIGNALS	16 mechanical keys with tactile feedback, 14 high brightness leds, beeper
POWER REGULATION TECHNIQUE	AC/DC Converter type FULL-BRIDGE PHASE-SHIFT SOFT-SWITCHING
COOLING SYSTEM	fan assisted natural convection
OVERVOLTAGE PROTECTION	6 varistors 10kA/20kA/40kA remotely monitorable (network, output, probe) The varistors are replaceable in the field without opening the power supply
OVERCURRENT PROTECTION	2 magneto-thermal circuit breaker (mains, output)
INPUT VOLTAGE	230V+/-15% 50-60Hz with on-board mains voltmeter With the /PF option, the operating range of the Vnet becomes: 130 - 265 Vac Inrush current at start-up: < 30A
OUTPUT VOLTAGE	From 0 to 50Vcc (max programmable limits: from 12 to 50Vcc)
OUTPUT CURRENT	HTE12=12A, HTE25=25A (different nominal current available on demand)
EFFICIENCY	90% @ full power (HTE25)
RIPPLE & NOISE (OUTPUT)	< 100 mVrms @ 90% full power
BASIC CURRENT	programmable from 0.000 to Nominal Output Current (step = 10mA)
DESIRED P.D.	programmable from -1.00 to -6.00V (step = 10 mV)
MEASURABLE P.D.	from - 10.0V to +10.0 V; differential type measure (Rdiff=1700kΩ vs GND)
OPERATIVE MODES	CC (constant output current), CV (constant voltage (P.D.) with adjustable basic current)
REGULATION ERROR (REGIMEN)	CV mode: +/-20mV; CC mode: +/-40mA
DYNAMIC COMPENSATION	<250ms to restore the 90% of the programmed P.D
INSTRUMENTS ACCURACY	< 0.8% + 2digit (DDP e Vout); <1.5% + 4digit (amperometro); <2% (Vmains)
SERIAL PORT (optional)	USB-device; isolated RS485
REMOTE MANAGEMENT	wired: MODBUS-RTU protocol by isolated RS485
CURRENT INTERRUPTER	Programmable times: ON from 0.3 to 25.0 sec; OFF 0.7 to 25.0 sec +/-20msec synchronization via on-board GPS module
IOUT BUSHINGS	100 mV/A (Rint=2kΩ, ε<2%)
VOUT BUSHINGS	1V/V (Rint=1kΩ, ε<2%)
P.D. BUSHINGS	1V/V (Rint=2kΩ, ε<2%)
MEMORY STATISTICS	6 parameters: WORKING HOURS, OUT OF PROT. HOURS, AVG. P.D., AVG. OUTPUT CURRENT, AVG. OUTPUT VOLTAGE, AVG. OUTPUT POWER
MAIN ALARMS	OUT OF WINDOW P.D. (programmable window and delay), OUTPUT CIRCUIT OPEN, OVER TEMPERATURE, POWERLINE VOLTAGE OUT OF RANGE (without PFC); PROTECTIONS (SPD) TO BE REPLACED
REGULATIONS REFERENCE	safety: EN 61010-1 (1996); EMC: EN 50081-1, EN 50082-1 cathodic protection power supplies: UNI CEI 8 (1997)

AUTOMATIC POWER SUPPLY FOR CATHODIC PROTECTION SYSTEMS - MICROPROCESSOR CONTROLLED - - NEW SERIES 8 -



HTL is an automatic switching power supply managed by a microprocessor, specifically designed for modern cathodic protection systems. All operating parameters are programmable in the field, and the device responds to almost all the system requirements of this sector, having already on board all the necessary instrumentation and being able to be equipped with a large number of optional functions.

This power supply represents the natural evolution of the now established HT technology, which in almost 30 years of operation has been able to demonstrate in the field the validity of the solutions adopted in terms of reliability, efficiency and ease of use. This new version maintains the strengths of the HT line (small size, great robustness, wide possibilities of remote management/remote control, statistical memories, etc.), but adds further improvements made possible by the evolution of electronic technology in the POWER field.

Compared to the previous version it offers:

- **Higher energy efficiency (90% compared to the previous 84%)** thanks to the new FULL-BRIDGE / SOFTSWITCHING conversion technique. The result is: lower operating cost, and low self-heating (therefore a longer operating life, with lower intensity forced ventilation).
- **Greater robustness against input/output overvoltages** thanks to the adoption of the new high-energy dischargers available today; the varistors are replaceable in the field.
- **MOSFET Current Interrupter for ON-OFF tests** instead of relay (greater precision and no aging).
- **External cooling fin: low internal air flow and board pollution.**
- **Faulty dischargers can be replaced in the field without opening the power supply.**
- **The current absorbed from the powerline is sinusoidal rather than impulsive (input PFC).**

The model described hereby is equipped with the following functions:

- **Remote management via RS485 MODBUS cable.**
- **Cyclic relay for ON/OFF tests (synchronizable via GPS).**

TECHNICAL CHARACTERISTICS OF HTE POWER SUPPLIES

DEVICE TYPE	Automatic power supply for cathodic protection systems - microprocessor controlled
DIMENSIONS AND WEIGHT	38x22x30 cm (WxHxD) weight: 6.9kg (including cables)
PROTECTION LABEL	IP21B (cabinet installation by road)
ENVIRONMENTAL TEMPERATURE	from -15 to +60°C (inside closet, no condensation); automatic lock with device internal temperature >85 °C
MEASURING INSTRUMENTS	3 LCD display with 4 digits (14 mm LED display, high brightness) + 2x16 alphanumeric char. DDP, Output current and voltage, Internal temperatures (>20°C), Mains voltage (without PFC), Working hours, Out of protection hours, Operating averages
DIAGNOSTIC / PROGRAMMING	2x16 alphanumeric char. OLED Display - Backlit (temporized) LCD
KEYBOARD & SIGNALS	16 mechanical keys with tactile feedback, 14 high brightness leds, beeper
POWER REGULATION TECHNIQUE	AC/DC Converter type FULL-BRIDGE PHASE-SHIFT SOFT-SWITCHING
COOLING SYSTEM	fan assisted natural convection
OVERVOLTAGE PROTECTION	6 varistors 10kA/20kA/40kA remotely monitorable (network, output, probe) The varistors are replaceable in the field
OVERCURRENT PROTECTION	2 magneto-thermal circuit breaker (mains, output)
INPUT VOLTAGE	230V+/-15% 50-60Hz with on-board mains voltmeter With the /PF option, the operating range of the Vnet becomes: 130 - 265 Vac Inrush current at start-up: < 30A
OUTPUT VOLTAGE	From 0 to 50Vcc (max programmable limits: from 12 to 50Vcc)
OUTPUT CURRENT	HTE12=12A, HTE25=25A (different nominal current available on demand)
EFFICIENCY	90% @ full power (HTi25)
RIPPLE & NOISE (OUTPUT)	< 100 mVrms @ 90% full power
BASIC CURRENT	programmable from 0.000 to Nominal Output Current (step = 10mA)
DESIRED P.D.	programmable from -1.00 to -6.00V (step = 10 mV)
MEASURABLE P.D.	from - 10.0V to +10.0 V; differential type measure (Rdiff=1700kΩ vs GND)
OPERATIVE MODES	CC (constant output current), CV (constant voltage (P.D.) with adjustable basic current)
REGULATION ERROR (REGIMEN)	CV mode: +/-20mV; CC mode: +/-40mA
DYNAMIC COMPENSATION	<250ms to restore the 90% of the programmed P.D
INSTRUMENTS ACCURACY	< 0.8% + 2digit (DDP e Vout); <1.5% + 4digit (amperometro); <2% (Vmains)
SERIAL PORT (optional)	USB-device; isolated RS485
REMOTE MANAGEMENT	wired: MODBUS-RTU protocol by isolated RS485
CURRENT INTERRUPTER (/F or /C options)	Programmable times: ON from 0.3 to 25.0 sec; OFF 0.7 to 25.0 sec With /C option: +/-20msec synchronization via on-board GPS module
IOUT BUSHINGS	100 mV/A (Rint=2kΩ, ε<2%)
VOUT BUSHINGS	1V/V (Rint=1kΩ, ε<2%)
P.D. BUSHINGS	1V/V (Rint=2kΩ, ε<2%)
MEMORY STATISTICS	6 parameters: WORKING HOURS, OUT OF PROT. HOURS, AVG. P.D., AVG. OUTPUT CURRENT, AVG. OUTPUT VOLTAGE, AVG. OUTPUT POWER
MAIN ALARMS	OUT OF WINDOW P.D. (programmable window and delay), OUTPUT CIRCUIT OPEN, OVER TEMPERATURE, POWERLINE VOLTAGE OUT OF RANGE (without PFC); PROTECTIONS (SPD) TO BE REPLACED
REGULATIONS REFERENCE	safety: EN 61010-1 (1996); EMC: EN 50081-1, EN 50082-1 cathodic protection power supplies: UNI CEI 8 (1997)

HTLDEP1A_EN - WITH RESERVE OF CHANGES WITHOUT NOTICE

AUTOMATIC POWER SUPPLY FOR CATHODIC PROTECTION SYSTEMS - NEW SERIES BN8 -



Size: 6A - 12A - 18A - 25A

THE BEST MARKET PERFORMANCES/PRICE RATIO

This power supply represents the natural evolution of the established BN technology, which in almost 40 years of operation has been able to demonstrate in the field the validity of the solutions adopted in terms of reliability, efficiency and ease of use. This new version maintains the many strengths of the BN line unchanged (small size, great robustness), but adds further improvements made possible by the evolution of electronic technology in the POWER field. Compared to the previous version it offers:

- **Higher energy efficiency (90% compared to the previous 84%)** thanks to the new FULL-BRIDGE / SOFTSWITCHING conversion technique. The result is: lower operating cost, and low self-heating (therefore a longer operating life, with lower intensity forced ventilation).
- **Greater robustness against input/output overvoltages** thanks to the adoption of the new high-energy dischargers available today (22KA).
- **Greater ease of use:** there are now **3 4-digit displays** (compared to the 2 3-digit displays of the previous series), to simultaneously display P.D., output **VOLTAGE** and **CURRENT**. The displays now also show the mains voltage and the various set-ups. The measuring sockets are now 3 pairs instead of two, with 11 signalling LEDs.
- **Greater flexibility:** now it is possible to have the double amperometric scale (to better read even the low currents), and the **PFC** input (allows to absorb a sinusoidal current from the network instead of an impulsive one).
- **External cooling fin:** reduces internal airflow and long-term pollution of the electronic boards.
- **Telemetry:** the analog output 4-20mA for telemetry are now isolated from the plant.

RESISTANT
LIGHTWEIGHT
EFFICIENT
ACCURATE
CLEAN

INPUT AND OUTPUT ARE SELF-PROTECTED FROM THE SURGES
WEIGHING LESS THAN 7 Kg, EASY TRANSPORTABLE BY ONE PERSON
HIGH-EFFICIENCY OF POWER CONVERSION TO NOT WASTE ENERGY
THE P.D. IS RESET TO THE DESIRED VALUE WITHIN 20mV
PROVIDE A PRECISE OUTPUT VOLTAGE, WITHOUT RIPPLES

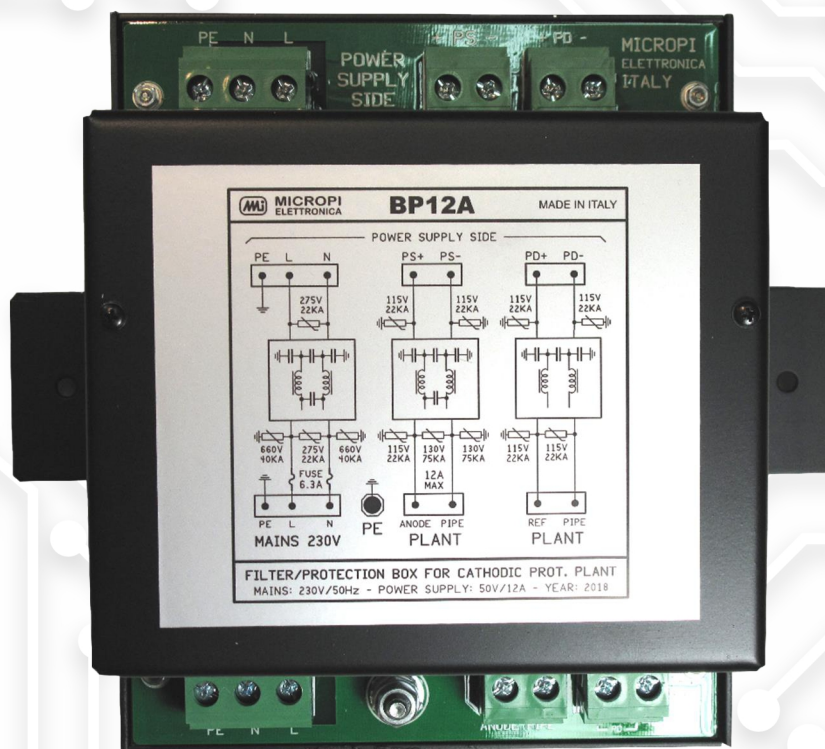
The BN8 series is offered in 4 power sizes (6, 12, 18, 25 A), all in the same container.
Each model can be supplied with the following option, to be specified when ordering:

/L (TELEMETRY in current loop 4-20mA; 2 isolated channels: PD and IOUT)

MAIN TECHNICAL SPECIFICATIONS - SERIE BN8xx	
DEVICE TYPE	automatic power supply with constant potential and basic current
DIMENSIONS AND WEIGHT	34x18x21 cm (WxHxD) weight: 6.5Kg - IP21 (cabinet installation by road)
ENVIRONMENTAL TEMPERATURE	from -15 to +50°C (inside closet, no condensation)
MEASURING INSTRUMENTS	n.3 with 4 digits (14 mm LED display, high brightness). Measures on display: desired PD, true PD, output Current, basic Current, output Voltage, mains Voltage, internal Temperature
COMMANDS ON PANEL	n.2 rotary encoders 12 steps with switch, 3 buttons, 11 LEDs
POWER REGULATION TECHNIQUE	AC/DC Converter; type: FULL-BRIDGE PHASE-SHIFT SOFT-SWITCHING Energy efficiency: 90% at full power
PROTECTION - POWER LINE SIDE	magneto-thermal circuit breaker, gas discharges surge supp., varistor, 22kA
PROTECTION - PLANT SIDE	magneto-thermal circuit breaker, varistor 22KA
INPUT VOLTAGE	230V + / -15% 50Hz (auto-lock out of range 180 - 270Vac) - CEE 7/7 Plug
OUTPUT VOLTAGE	from 0 to 50Vdc
OUTPUT CURRENT	BN806=6A BN812=12A BN818=18A BN825=25A (auto-derating with internal device temperature increase)
BASIC CURRENT	adjustable from 0 to Nominal Current (resolution = 10 mA)
DESIRED P.D.	adjustable from 0 to -5.0V (resolution = 10 mV)
MEASURABLE P.D.	from - 10.0V to +10.0 V; differential measure (Rdiff=1MΩ)
OPERATIVE MODES	CV (constant P.D. voltage); CC constant output current), MAN (Vout=const)
REGULATION ERROR (REGIMEN)	CV mode: <+/-20mV from programmed PD (within 200ms) CC mode: <+/-40mA from programmed Ibase (within 200ms) MAN mode: <+/-0.1V from programmed Vout
TELEMETRY 4-20mA (/L option)	N.2 analog output 4-20mA with galvanic isolation from the plant (500Vdc). Max error: +/-2%. Load Rmax: 600W. Max Output Voltage: 15V P.D. Channel: 4mA=0 V, 20mA= - 3.2V IOUT Channel: 4mA=0 A, 20mA= Imax
REGULATIONS REFERENCE	safety: EN 61010-1 (1996); EMC: EN 50081-1, EN 50082-1 cathodic protection power supplies: UNI CEI 8 (1997)

**BN2 MODEL WITH 2A NOMINAL CURRENT
AND 1mA RESOLUTION IS AVAILABLE ON DEMAND**

ADDITIONAL PROTECTION BOX FOR BN/HT SERIES CATHODIC POWER SUPPLIES - BP12A -



The additional Protection Box, BP12A model, is an external accessory, designed for the BN/HT series cathodic protection power supplies, with nominal output currents up to 12A.

Its protection function against overvoltage discharges, up to 75kA on the plant side and 40kA on the grid (power line) side, therefore adds, when required, to the protection devices (varistors and 10kA gas dischargers) already present in each power supply, considerably reducing the possibility of breakage or serious damage to the device's electronic boards, due to external overvoltages (e.g. indirect/direct lightning strikes).

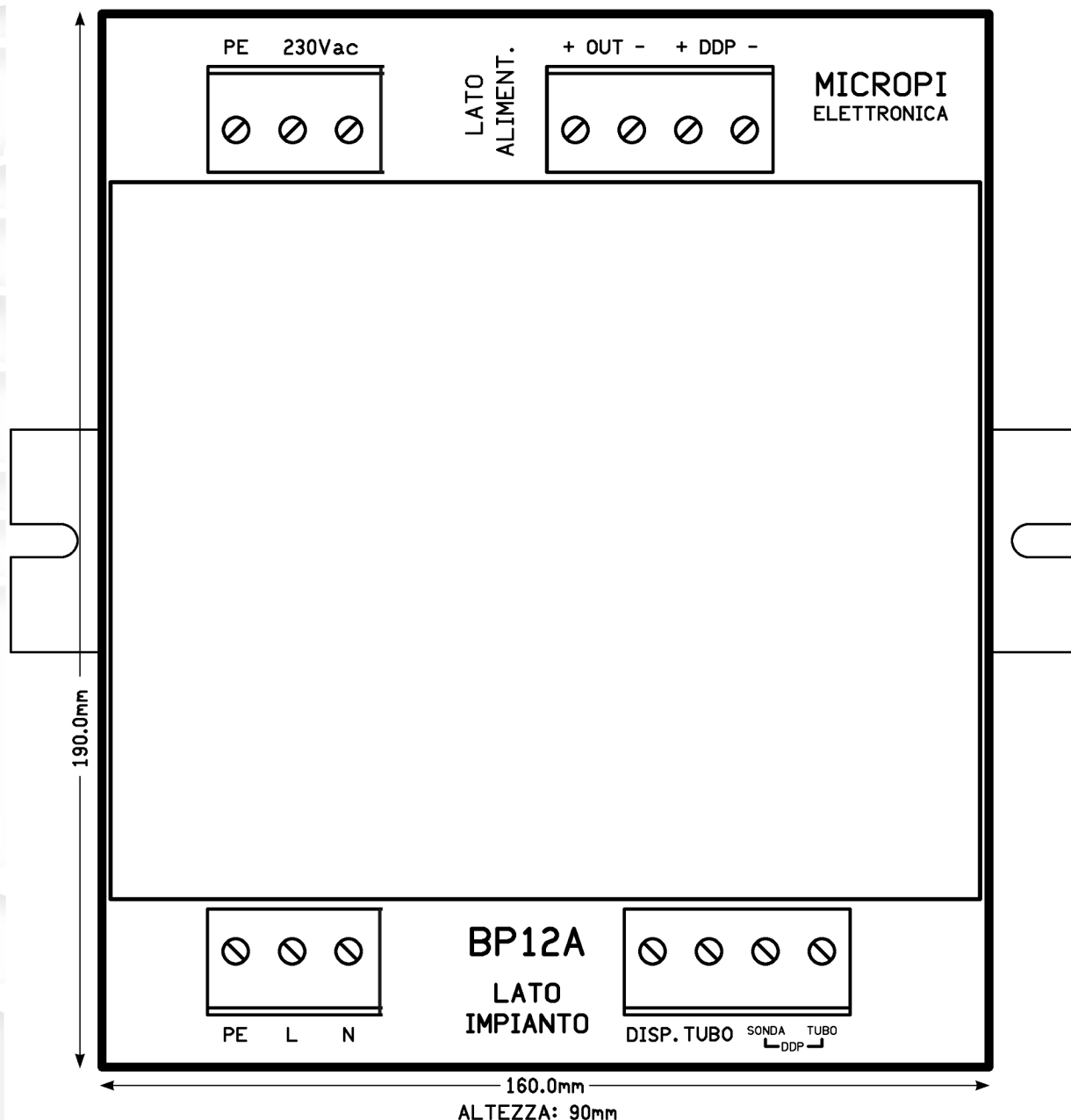
The device, assembled in a robust and compact metal box, is designed for easy installation in the electrical panel of the plant and/or inside the protection cabinet, usually used to house the power supply.

MAIN FEATURES

- Specialized device (contains everything needed, on board).
- Very competitive price, compared to the service offered.
- Easy installation, immediate connection to the system electric panel.
- Very compact dimensions and light weight.
- On demand, versions for other output current sizes are available.

BP12A - TECHNICAL SPECIFICATIONS

DEVICE TYPE	Supplementary protection module against external overvoltages for cathodic protection power supplies BN/HT series (nom. current up to 12A)
DIMENSIONS AND WEIGHT	160x190x90 mm (WxHxD); 600 g approx. - Mounting flange L = 220mm
ENVIRONMENTAL TEMPERATURE	Operative: from -10 to +45°C; storage: from -30 to +60°C
VOLTAGE SUPPLY	230 Vac - 50Hz
PROTECTION -> POWER LINE SIDE	n.2 Varistors of 40kA / 660V
PROTECTION -> PLANT SIDE	n.2 Varistors of 75kA / 130V
MOUNTING	On electrical panel, in protection cabinet



BP12A - MECHANICAL DRAWING AND CONNECTION DIAGRAM
BP12ADEP2_EN - NOTE: SUBJECT TO MODIFICATION

AUTOMATIC SOLAR POWER SUPPLY FOR PHOTOVOLTAIC CATHODIC PROTECTION SYSTEMS - INSULATED VERSION -



BFx is a specialized power supply for cathodic protection systems, designed to operate on plants that are not served by mains electricity, and to respond in the best way to all the needs required by a modern system of cathodic protection; BFx features are:



- **Solar panel powered, battery-backed;** it can provide up to 48V (also with a 12V battery) and up to 8A.
- **Battery charge regulator** embedded, with final charge voltage accorded to the battery temperature (optional) and testing of the power supplied by the solar panel.
- **Very low consumption (1W)** and a **high power conversion efficiency.**
- **Very high reliability** resisting to the heavy stress of its hard environment operating conditions and a very precise adjustment, with a low output noise.
- **Lightweight and compact (only 5 Kg),** so **very easy to transport** during installation and repairing operations.
- The output is **galvanically isolated** from the battery, to allow the sharing of the battery with other devices connected to the ground.
- **Overvoltage Protections Module** replaceable on field, endowed with **High Power Varistors.**
- **Easy and intuitive dialog** with the user.
- **4 digits digital displays** (can display measurements also in mA).
- **Alarms and statistical parameters management.**
- Available options: **Data Logger** (about 2 million samples), **Current Interrupters** for ON/OFF cycle tests.
- **Remote management module** via RS485/MODBUS or GPRS (optional)

The device, the result of a long and consolidated experience in cathodic protection and power conversion, brings together in the same compact housing the following key characteristics:

- PWM switching converter of high reliability and high performances, FULL BRIDGE circuit.
- Microprocessor management system (local or remote control) and 10A charge regulator.
- Possible options: 2-channel Data Logger, MOSFET Current Interrupters (Cycle Switch).

The BFX is offered in four sizes of current (2/4/6/8A); the battery voltage (12V or 24V) and any options must be specified in the purchase order.

Example: **BF824 / D / F:** version 8A, 24V battery, with data-logger and current interrupter.

BF824 TECHNICAL SPECIFICATIONS – standard version

DEVICE TYPE	Automatic power supply with Constant Potential Difference (P.D.) and Basic Current – insulated version
REGULATIONS REFERENCE	safety: EN 61010-1 (1996); EMC: EN 50081-1, EN 50082-1 cathodic protection power supplies: UNI CEI 8 (1997) GASD C.07.05.16; GASD C 7.00.07 (partial compliance)
INPUT/OUTPUT ISOLATION	500Vdc (functional isolation)
DIMENSIONS AND WEIGHT	39x18x23 cm (WxHxD) weight: 5.0kg
INTERNATIONAL PROTECTION LABEL	IP23 (cabinet installation by road)
ENVIRONMENTAL TEMPERATURE	from -15 to +50°C (inside closet, no condensation);
MEASURING INSTRUMENTS	#3 led 10 mm alphanumeric display (4 digit each), with auto power-off Measuring: Vout, Iout, P.D., Vbatt, Ibatt, Temp.Aletta, Batt. Temp. (option), Solar Panel Voltage and Current.
DIAGNOSTIC DISPLAYING	2x16 alphanumeric char. LCD backlit Display (operative temp. 0/50°C)
MESSAGES LANGUAGES	Italian; on demand: english, spanish, german, russian
CONSTRUCTION	#3 separable printed circuit boards
CENTRAL UNIT	Microcontroller @ 36MHz with 12bit ADC
POWER REGULATION TECHNIQUE	DC/DC insulated Converter FULL-BRIDGE regulation with PWM @ 50KHz
COOLING SYSTEM	Natural convection + Internal fan for overtemperature
IN/OUT PROTECTIONS	magneto-thermal circuit breaker, 22KA varistors, safety diode, PTC fuse with automatic restore
PHOTOVOLTAIC PANELS	24V/200W (2 panels of 12V/100W in series)
BATTERY	AGM or GEL 24V (at least 100Ah) Operative Range: 22,6 – 29,0V; Vmax= 36Vcc; Imax=18A
CHARGE REGULATOR	Incorporated, with end of charge threshold at 29,0V (or Tbatt function) Max Charge Current: 18A; Max Panel Voltage (without load): 45V Panel Test: voltage/current supplied from the panel on 2 ohm
SELF-CONSUMPTION	< 50mA (in STANDBY)
SUPPLIED POWER	380W (con batteria a 24.0V)
SUPPLIED VOLTAGE	from 0 to 48Vdc (with programmable max. limit from 10V to 48V)
SUPPLIED CURRENT	from 0 to 8Adc (with programmable max. limit from 0.1A to 8.0A)
EFFICIENCY	87% (@ Vout=35V, Iout=1.5A) ; 82% (@ Vout=10V, Iout=2A)
RIPPLE & NOISE (OUTPUT)	< 50mVrms @ full power
BASIC CURRENT	programmable from 0 to 8A (resolution = 1 mA)
DESIRED P.D.	programmable from -1.0 to -5.0V (resolution = 10 mV)
MEASURABLE P.D.	from - 12.0V to +12.0 V; differential measure
P.D. INPUT IMPEDANCE	>2MOhm between PD+/PD-; >1MOhm vs.OUT-
INPUT P.D. FILTER	12Hz, 60dB/decade
P.D. MEASURE CONNECTORS	1V/V; max +/-12V; internal impedance 500Ω
CURRENT MEASURE CONNECTORS	1V/A; max 9A; internal impedance 500Ω
VOU MEASURE CONNECTORS	1V/V; range: -1 / +75V; internal impedance 5KΩ
OPERATIVE MODES	CC (constant output current), CV (constant voltage (P.D.) with adjustable basic current)
REGULATION ERROR (REGIMEN)	CC mode : < +/-10mA up to 100mA; +/-15mA from 100mA to 1A; +/-40mA from 1A to 8A CV mode : < +/-25mV from the programmed value (from -1V to -5V)
DYNAMIC COMPENSATION	<200ms with Wout from 50W to 250W, DDP=-2,00V
INSTRUMENTS ACCURACY	< 0.5% + 2digit (voltmeters); < 1.5% + 4digit (amperometers)

BF8DEP16D_EN - THE CONSTANT PRODUCT EVOLUTION CAN LEAD TO CHANGES WITHOUT NOTICE

The BFx must be completed with batteries and solar panels, to be sized according to the average power necessary to your system; following options are available:

- D 2 channel data logger (2,000,000 samples), with time / date autonomous display.
- F current interrupter for the ON / OFF testing.
- N2 battery temperature measurement and automatic correction VBATTmax (flat cable B10 included).
- G remote management via GSM.
- M remote control via RS485 / MODBUS.
- L telemetry isolated 4-20mA (P.D. and IOUT).

POWER SUPPLY FOR PHOTOVOLTAIC CATHODIC PROTECTION SYSTEMS

- NEW HYBRID VERSION -



BFHx is a specialized power supply for cathodic protection systems, designed to operate on both electrified systems and those are not served by mains electricity, and to respond in the best way to all the needs required by a modern system of cathodic protection;

BFHx features are:

- Solar panel powered, battery-backed; it can provide up to 48V (also with a 12V battery).
- **Battery charge regulator** embedded.
- **Very low consumption** and a **high power conversion efficiency**.
- **Very high reliability** and a **very precise adjustment**.
- Easy and intuitive dialog with the user.
- **Lightweight and compact**, so **very easy to transport**.
- **Alarms and statistical parameters** organisation.
- It can be supplied with special options like data logger, current interrupter for ON/OFF tests, remote management via RS485/MODBUS or GPRS.

The following improvements have been made in this new version:

- **it can also be powered by a 230V/50Hz network.**
- The output is galvanically **ISOLATED** from the battery, to allow battery sharing with other devices connected to the ground.
- The overvoltage **PROTECTION** module is replaceable in the field.
- The connections to the system are all made on the front terminal block.
- Self-consumption has been reduced to 1W.
- Battery regulator-charger with end-of-charge voltage based on battery temperature (opt.) and test of the power that can be supplied by the photovoltaic panel.
- The numeric displays are now 4 digits (can display mA measures).

The device, the result of a long and consolidated experience in the cathodic protection and power conversion sectors, combines the following features in the same compact container:

- High reliability and high efficiency switching converter, in full-bridge.
- Microprocessor management system (local or remote) and charge regulator.
- Possible options: 2-channel data logger, MOSFET cyclic switch, GPRS module.

The **BFH** series is offered in 4 nominal current sizes (2/4/6/8A); specify the battery voltage (12V or 24V) and any options when ordering. Example: BFH824/D/F: 8A version, 24V battery, with datalogger and current interrupter.

BFH824 TECHNICAL SPECIFICATIONS – standard version

DEVICE TYPE	Photovoltaic power supply with Constant Potential Difference (P.D.) and Basic Current – insulated version
REGULATIONS REFERENCE	Safety: EN 61010-1 (1996); EMC: EN 50081-1 , EN 50082-1 Cathodic protection power supplies: UNI CEI 8 (1997)
INPUT/OUTPUT ISOLATION	500Vdc (functional isolation)
DIMENSIONS AND WEIGHT	39x18x23 cm (WxHxD) weight: 6Kg
INTERNATIONAL PROTECTION LABEL	IP23 (cabinet installation by road)
ENVIRONMENTAL TEMPERATURE	from -15 to +50°C (inside closet, no condensation);
MEASURING INSTRUMENTS	3 led 10 mm alphanumeric display (4 digit each), with auto power-off Measuring: Vout, Iout, P.D., Vbatt, Ibatt, Temp.Aletta, Batt. Temp. (option), Solar Panel Voltage and Current.
DIAGNOSTIC DISPLAYING	Yellow alphanumeric OLED Display 2x16 char.
MESSAGES LANGUAGES	Italian; on demand: english, spanish, german, russian
CONSTRUCTION	n.4 separable printed circuit boards
CENTRAL UNIT	Microcontroller 36MHz with 12bit ADC
TECNICA REGOLAZIONE VOUT	DC/DC insulated Converter FULL-BRIDGE regulation with PWM @ 50KHz
COOLING SYSTEM	Natural convection + Internal fan for overtemperature
IN/OUT PROTECTIONS	magneto-thermal circuit breaker, 22KA varistors, safety diode, PTC fuse with automatic restore
ALIMENTAZIONE DA RETE	90-264Vac/50Hz with input PFC
PHOTOVOLTAIC PANELS	24V/200W (2 panels of 12V/100W in series)
BATTERY	AGM or GEL 24V (at least 100Ah) Operative Range: 22,6 – 29,0V; Vmax= 36Vcc; Imax=18A
CHARGE REGULATOR	Incorporated, with end of charge threshold at 29,0V (or Tbatt function) Max Charge Current: 18A; Max Panel Voltage (without load): 45V Panel Test: voltage/current supplied from the panel on 2 ohm
SELF-CONSUMPTION	< 50mA (in STANDBY)
SUPPLIED POWER	380W (with battery at 24.0V)
SUPPLIED VOLTAGE	from 0 to 48Vdc (with programmable max. limit from 10V to 48V)
SUPPLIED CURRENT	from 0 to 8Adc (with programmable max. limit from 0.1A to 8.0A)
EFFICIENCY	87% @ Vout=40V, Iout=4A)
RIPPLE & NOISE (OUTPUT)	< 50mVrms @ full power
BASIC CURRENT	programmable from 0 to 8A (resolution = 10 mA)
DESIRED P.D.	programmable from -1.0 to -5.0V (resolution = 10 mV)
MEASURABLE P.D.	from - 12.0V to +12.0 V; differential measure
P.D. INPUT IMPEDANCE	>2MOhm between PD+/PD-; >1MOhm vs.OUT-
P.D. MEASURE CONNECTORS	1V/V; max +/-12V; internal impedance 500Ω
CURRENT MEASURE CONNECTORS	1V/A; max 9A; internal impedance 500Ω
VOUT MEASURE CONNECTORS	1V/V; range: -1 / +75V; internal impedance 5KΩ
OPERATIVE MODES	CC (const. output current), CV (const. voltage (P.D.) with adjustable basic current)
REGULATION ERROR (REGIMEN)	CC mode: +/- 20mA up to 1A; +/- 40 mA from 1A to 8A CV mode: +/- 25mV from the programmed value (from -1V to -5V)
DYNAMIC COMPENSATION	<200ms con Wout da 50W a 250W, DDP=-2,00V
INSTRUMENTS ACCURACY	< 0.5% + 2digit (voltometri); < 1.5% + 4digit (amperometri)

NOTE: IN THIS DEVICE THE INPUT CIRCUIT (BATTERY / PHOTOVOLTAIC PANEL) IS ISOLATED FROM THE OUTPUT CIRCUIT (SINK / PIPELINE / PROBE / MEASURING SOCKETS) BY 500Vdc. THIS IS A FUNCTIONAL ISOLATION WHICH ALLOWS POSSIBLE SHARING OF THE BATTERY WITH OTHER EXTERNAL DEVICES CONNECTED TO GROUND.

MAY LEAD TO CHANGES WITHOUT NOTICE

The BFH x must be completed with batteries and solar panels, to be sized according to the average power necessary to your system; following options are available:

- D 2 channel data logger (2,000,000 samples), with time / date autonomous display.
- F current interrupter for the ON / OFF testing.
- B battery temperature measurement and automatic correction VBATTmax.
- G1 remote management via GSM.
- L telemetry isolated 4-20mA (P.D. and IOUT).
- M remote control via RS485 / MODBUS.

PORTABLE POWER SUPPLY WITH BATTERY FOR CATHODIC PROTECTION

- ALP3 -



ALP3 is a portable power supply with rechargeable battery, specialized for cathodic protection systems.

The device, designed for testing in the field of the gas industry, is accompanied by specific functions for this purpose: it allows for various types of electrical testing on the plants, without the necessity of a connection to the electrical network such as, for example, performing insulation tests or ON / OFF tests, Potential Difference adjusting, recording the time trend of the main electrical parameters.

ALP3 is able to deliver up to 48V and it can adjust output currents from a few μA up to 3A.

It incorporates a programmable MOSFET cyclic switch and, optionally, a 3 channels datalogger (measuring and recording P.D., Vout, Iout) which is endowed with a large memory capacity of about 2 million samples.

The internal battery is a 22V Li-Po delivering up to 10Ah with balancer, which it can be recharged from any 10-18Vdc source (charger plug, car battery, solar panels).

On specific request, it can be supplied with Bluetooth interface for data dump and/or a GPS module for an accurate synchronization between multiple devices, when used for the ON / OFF tests..

The ALP3 power supply has 3 operating modes available:

- Constant Voltage Mode (CV): it works like a constant voltage generator.
- Constant Current Mode (CC): it works like a constant current generator.
- Potential Difference Mode (DDP): it adjusts the Potential Difference, with base current.

CONSTANT VOLTAGE GENERATOR (CV Mode): it adjusts the output voltage to the desired value, and can deliver up to I_{max} (2A or 3A according to the version). ALP3 automatically selects an appropriate current scale, based on the output current (autoranging on 4 scales: 3mA, 30mA, 300mA and 3A).

CONSTANT CURRENT GENERATOR (CC Mode): it adjusts the output current to the desired value, with an output voltage up to 48V. 187 preset values are available for the desired current.

CONSTANT POTENTIAL DIFFERENCE with automatic regulation (DDP Mode): it adjusts the P.D., read at the bushes, to the desired value with the limits $V_{\text{max}} = 48\text{V}$ and I_{max} set. In this mode, ALP3 works as a normal power supply for the automatic adjustment of the P.D., with the base current (the output current is obliged to never go down below the BASE CURRENT programmed). The full scale of the P.D. voltmeter may be any of $\pm 10\text{V}$ and $\pm 50\text{V}$; the current full scale set is automatic.

TECHNICAL FEATURES - ALP3C1 model

DEVICE TYPE	Portable Battery-Powered Power Supply able to provide 48V/3A
DIMENSIONS AND WEIGHT	19x27x10 cm (BxHxP). Weight: 3.3Kg (including battery)
ENVIRONMENTAL TEMPERATURE	from -10 to +45°C (inside closet, no condensation)
DIAGNOSTIC DISPLAYING	Blue Graphic Display 128x64 LCD (backlit with auto power off)
KEYBOARD & SIGNALS	6 keys with tactile feedback, 2 rotary encoders, 8 high brightness leds, beeper
CENTRAL UNIT	20MHz Microcontroller with 12bit ADC
CALENDAR CLOCK	clock with independent power of 8 years duration (data logger resolution set to 1sec.)
POWER REGULATION TECHNIQUE	Full-Bridge PWM DC/DC Converter + linear post regulator
COOLING SYSTEM	Natural convection with thermal protection circuit and safety cooling fan
HIGH VOLTAGE PROTECTION	High Power varistors (2 VDR 20KA/115V/230J at bushings)
INTERNAL BATTERY	#2 5Ah Li-Po (6S1P20C); working voltage: from 19.2V to 25.2V; energy: 220Wh Charge controller and cell balancer system on board
BATTERY CHARGER	C.B. supplied 12V/4A; car battery 12V; solar panel 12V (Imax 4A)
SUPPLIED POWER	144W max (48V , 3A)
EFFICIENCY	88% @ 48V/1A; 84% @ 48V/3A. (self-consumption = 1.0W)
RIPPLE & NOISE (OUTPUT)	120h@15V/5mA; 50h@30V/80mA; 8h@40V/500mA; 70min@48V/3A
DEVICE TYPE	< 50 mVrms @ full power
OPERATIVE MODES	CV (Vout stabilizing), CC (Iout stabilizing), DDP (P.D. stabilizing)
SUPPLIED VOLTAGE	from 0V to 48.0V; programmable with 100mV resolution step
DESIRED P.D.	Programm. from 0 to -5V; with 10mV resolution step (+/-10V sc.), 100mV (+/-50V sc.)
SUPPLIED CURRENT	from 0µA to 3A (187 preset values)
BASIC CURRENT	from 0µA to 3A (187 preset values)
CURRENT FULL SCALE	4 scales with autoranging: 3mA/30mA/300mA/3000mA
OUTPUT IMPEDENCE	1 MW + 20nF (switch ON/OFF set OFF)
MEASURING INSTRUMENTS	Vout, Iout, P.D., Vbatt, Ibatt, Vcb, HEATSINK Temperature
INSTRUMENTS ACCURACY (@25°C)	voltmeter: 0.5% + 2digit; ammeter: 1% + 3digit; ohmmeter: 2%+6digit
SETTINGS RESOLUTION	VOUT: 100mV; IOUT: from 2uA to 100mA DDP: 10mV (+/-10V), 100mV (+/-50V); IBASE: from 2uA to 100mA
REGULATION ERROR (REGIMEN)	CV mode: <+/-0.2V ; CC mode: <+/-2%FS from the programmed value ; DDP mode: <+/-20mV from the programmed value
P.D. COMPENSATION VELOCITY	<250ms (from 10% to 90% with Iout from 0.5A to 2A)
P.D. FULL SCALE AND INPUT FILTER	2 scales: +/-10V e +/-50V; Rin=1.5Mohm; filter 12Hz, 60dB/decade
DATALOGGER	CHANNELS: 3 (Potential Difference, Vout, Iout) Record Cadence: from 0.1" to 120" (11 values); Record Capacity: 1.9 million samples Record displaying: on board display or external PC Date/Time: internal clock with separate battery (precision: 50PPM)
CURRENT INTERRUPTER	ON=12sec (programmable from 1 to 60sec); OFF=3sec (programmable from 1 to 60sec); Programmable Cycles=1000 (from 0 to 1000); Starting HOUR=12:00 (adjustable) Standard Timing precision (with internal clock): 10PPM Timing with GPS option: UTC time synchronization (max. err.: 3,6ms/h)

ELECTRIC PARAMETERS @ 25°C

TECHNICAL EVOLUTION MAY INVOLVE CHANGE WITHOUT NOTICE

SUPPLIED ACCESSORIES

n.1 BATTERY CHARGER PLUG (12Vdc/2A)
n.1 USER MANUAL
n.2 CONNECTING cables (OUT/P.D.) 60 cm with crocodile clips, detachable
n.1 USB CABLE for PC connection
n.1 CDROM with data processing software
n.1 CARRYING CASE

OPTIONS*

/CC3: MICROPI CERTIFICATE OF CALIBRATION
/BT: BLUETOOTH embedded module for data dump*

*Availability to be verified

DUAL CHANNEL DATA LOGGER FOR CATHODIC PROTECTION SYSTEMS

- DL12 -



A CONCENTRATION OF ITALIAN TECHNOLOGY

DL12 is a two-channel Data Logger specifically designed for preliminary investigations and operation monitoring on test points of cathodic protection systems; it allows you to acquire, display and record the progress in time of the plant's protection parameter status (**Potential Difference** and **Impressed Current** at the PIPE or Structure **PROBE** end and at the **SINK** end).

The device is easy to use, containing already on board the needed interface to the system, and it is accompanied by a very large non-volatile memory, so as to allow long and detailed data acquisitions, including those relating to the **ON-OFF** tests. DL12 is powered by an internal battery (type 18650 - not provided) but can also operate using an external 12V DC source (e.g. car battery) or the supplied 230V adapter.

- Two specialized and configurable channels by keyboard (DL12D model): 6 P.D. scales (+/- 0.1V / 0.5V / 2V / 10V / 30V / 100V) and Current (external shunt + / - 300mV).
- Programmable Filtering, very high accuracy for ON/OFF tests.
- Small size and very low weight (cm.12x5x3, 200 g). It is suitable for installation in standard road pole housing.
- The on board display shows P.D. and CURRENT in time, and can display the acquired data (date and time), or summary parameters (counter, average, etc.).
- Easy to set on field or via a PC.
- Very large memory (2 million samples: up to 3 years of data recording with 1 sample per minute).
- Powered by internal rechargeable battery (type 18650 - not provided) or external 12V source.
- Internal clock /calendar with date/time storage of the samples.
- Ability to program date/time of the recording start, and period.
- Unique serial number per device (also provided in the data file).
- Free software available for data records managing on a PC: diagrams viewing/printing, zoom, automatic calculations, data export.
- USB and RS232 ports; remote connection via GSM (optional).
- Housing protected against water and dust (protection rating Ip65).
- Designed and manufactured in Italy, versions available (see table):
 - DL12A Data Logger battery powered, 1 channel P.D. measuring (4 scales), USB port.
 - DL12B Data Logger battery powered, 1 channel P.D. measuring (6 scales), USB port, 12V Battery charger.
 - DL12C Data Logger battery powered, 1 channel CURRENT (external shunt), USB.
 - DL12D Data Logger battery powered, 2 channels (P.D. 6 scales + CURRENT measuring), USB port, 12V Battery charger.

DL12D TECHNICAL SPECIFICATIONS

DEVICE TYPE	#2 channel compact Data Logger for Cathodic Protection Systems
WEIGHT - DIMENSIONS - PROTECTION RATING	200 g. - 115 x 55 x 30 mm (BxHxP) - IP65
ENVIRONMENTAL TEMPERATURE	Operative: from -20 to +50°C; storage: from -30 to +60°C
INTERNAL 1 / EXTERNAL POWER SUPPLY	- Rechargeable battery ¹ type 18650 - Recharge time: 8 hours (internal charge regulator 400 mA) - MAIN 230Vac +/-15% with charge adapter 12V/300mA (supplied) - 12V external BATTERY (with internal battery recharging)
TYPICAL RANGE	Up to 20 days (with internal battery only)
DISPLAY / ALARMS	2x16 alphanumeric char. LCD; #3 high brightness LEDs; beeper
COMAND KEYBOARD	#4 keys protected by cover film
P.D. INPUT 2	Selectable range within: 4 or 6 scales (+/- 0.1V / 0.5V / 2V / 10V / 30V / 100V; Rin > 2MΩ; Accuracy: 0.5% + 4digit; resolution: 100μV/1mV/10mV/50mV
CURRENT INPUT 3 (external SHUNT)	Differential input +/-300mV; Rin = 1MΩ; VCommMode < 4V vs. PIPE Current Full Scale programmable according with the used shunt Accuracy: 1% + 4digit; resolution: from 10μA a 50mA
NOISE FILTERING (both channels)	Low Pass Filter selectable within: 0.2Hz, 2Hz, 20Hz, ON/OFF tests compatible and UNI EN 13509-app.H (80dB @50Hz / 64dB @16Hz) compliant
SERIAL OUTPUT	USB port; RS232 port (for GSM remote control module)
MEMORY CAPACITY	2 millions samples (capability: over 3 years with 1 sample/min set)
CLOCK / CALENDAR	Embedded and always working
DEVICE SERIAL NR.	Unique and permanent for each produced device

DL12 MAIN PARAMETERS

Description	Range	Step	Default	note
ID CODE SYSTEM	0_999	1	0	
MEASURING STORAGE CADENCE	0.1_120 sec.	11 steps	1 sec.	
P.D. WINDOW ALARM: MINIMUM VALUE	0_-5V	10mV	0.00V	
P.D. WINDOW ALARM: MAXIMUM VALUE	0_-5V	10mV	-5.00V	
OUT OF PROTECTION ALARM VALIDATION (TIMING)	0_255 sec.	1 sec.	2 sec.	
DELAYED RECORDS START	Programming YEAR/MONTH/DAY/HOUR/MINUTES			
DELAYED RECORDS PERIOD	Programming HOUR/MINUTES			

ELECTRICAL CHARACTERISTICS MEASURED @ 25°C WITH RESERVE OF CHANGES WITHOUT NOTICE

SUPPLIED ACCESSORIES (standard package):

- Battery charger plug (5V for DL12A, DL12B and DL12C; 12V for DL12D).
- P.d./current input cable 30cm with 4 crocodile clips; usb output data cable.
- Complete user guide on cdrom + software for download / managing / displaying of acquired data.
- Summary (paper) user guide + micropi calibration report.

OPTIONS:

- GSM module for remote control with antenna.
- Special cable to use the CURRENT channel as twin P.D. channel.
- Calibrated shunts with 0.5 class (several range).
- Plastic CARRYING CASE.

¹ Battery not provided - suggested model: NCR18650PF

² PIPE / PROBE input; on DL12 the PIPE is the same of the circuit board GROUND.

³ The CURRENT input channel is of differential type, and it admits a COMMON MODE voltage of +/-4V referring to the PIPE; that is the shunt must be installed on the PIPE side and not on the SINK side.

The SHUNT can be chosen freely according to the current to be read, with the only one constraint that the voltage at its ends must not exceed 300mV. For example: with 10mΩ the Full Scale must be set at +/-30A..



3 INSULATED CHANNELS DATA LOGGER FOR CATHODIC PROTECTION SYSTEMS

- DL23 -



DL23 is the next-generation data logger, able to satisfy all the requirements for the monitoring of CATHODIC PROTECTION SYSTEMS.

It allows you to acquire, to viewing, to storing (and optionally to transmitting via GSM) the three main electrical parameters in this type of systems: **Potential Difference (P.D.) PIPE-GROUND, VOLTAGE and CURRENT** given by the system's power supply.

The three acquiring channels are insulated each other and allows the AC value readings (except DL23A).

The device is easy to use, containing already on board the interface requested by the system (including shunts) and accompanied by a very large non-volatile memory, allowing in this way long and detailed data acquisitions.

DL23 is powered by an **internal rechargeable Li-Ion battery** of very large capacity and can be supplied optionally with on board GSM module; this makes it ideal for long-term measurement campaigns as well for the remote monitoring of those systems equipped with old technology analog power supplies.

DL23 is designed, manufactured and technically assisted in Italy, on the basis of over twenty years' experience in the cathodic protection field; it is offered in several versions, and at an extremely competitive price.

AVAILABLE MODELS

MODEL	DESCRIPTION
DL23A/xx	Battery Data Logger, 3 insulated channels (/xx: full-scale CURRENT channel)
DL23B/xx	Battery Data Logger, 3 insulated channels; AC reading on channels; CH4 input = 0/+100V
DL23C/xx	Like DL23B + GSM with antenna + 2 aux input
DL23D/xx	Like DL23C + GPS module + external CYCLIC output for ON/OFF tests
SUPPLIED ACCESSORIES: BATTERY CHARGER 12V, INPUT cables CH1/CH2 30cm with alligators, USB cable, CD-ROM with: USER MANUAL + PC SOFTWARE for download/dataview, INDIVIDUAL CALIBRATION REPORT, CARRYING CASE.	

- Three specialized channels, configurable by keyboard, with AC value readings (except DL23A):
 - CH1 (P.D.): 5 scales (+/-0.4 / 2V / 10V / 30V / 100V); 16 bit insulated ADC.
 - CH2 (VOUT): 5 scales (+/-0.4 / 2V / 10V / 30V / 100V); 16 bit insulated ADC.
 - CH3 (CURRENT): 2 scales (+/- 5A / 50A), with embedded shunts and 10mmq clamps.
 - CH4 (VOUT): 1 scale (+100V) (except DL23A).
- Sampling rate : 100ms / 1s / 10 s (10 samples/s for ON / OFF testing).
- Record rate : 100ms to 120 s (11 step).
- Selectable hardware filtering: 0.5Hz or 12Hz (analog front-end is always active).
- Small dimensions and weight: cm.16x12x5; 780 g.
- Large memory (2 million samples: up to 4 years of recording).
- Powered by internal rechargeable (Li-ion) battery or external 12V battery / solar panel.
- Very low operating power (1.5mW) that allows up to 2 years of autonomy with internal battery.
- Clock / date display with internal storage date / time in the records.
- Ability to program date / time of recording start and stop.
- Unique serial number for each device (also provided in the data file).
- Graphic display: displaying current measures, acquired data (with date and time programming on field) Free Availability of post-processing software: graphics viewing / printing, zoom, automatic calculations, data export.
- USB port for data download or firmware updating (bootloader on board).
- Many versions available (see table; /xx=end scale current: 15/30/50A).
- GSM module with on board antenna and programmable working time duration (only DL23C).

DL23B/50 TECHNICAL FEATURES

DEVICE TYPE	4 channel Data Logger for Cathodic Protection Systems
DIMENSIONS / WEIGHT	16x5x12 cm (BxHxP) / 780g
PROTECTION RATING	IP54 front panel, IP20 on the sides
ENVIRONMENTAL TEMP.	Operative: from -10 to +50°C
INTERNAL POWER SUPPLY (SR = sampling rate)	Li-Ion rechargeable battery 3.6V/10Ah (4*18650/2.6Ah) Operating battery voltage range: 3.2V - 4.2V ; Current from battery: 90mA @ LCD=100%, 40mA @ LCD=40% ; LCD=off: 10mA @ SR=0.1sec, 1.5mA @ SR=1sec, 0.8mA @ SR=10sec
EXTERNAL POWER SUPPLY	MAINS 230Vac with charge adapter (supplied), or from USB port, or from 12V external BATTERY or 12V PHOTOVOLTAIC PANEL ; Voltage range on B.C.plug: 9V - 18V (< 400mA) ; Recharge time: 24 hours (internal charge regulator 4.2V/450 mA)
DISPLAY / SIGNALING	Graphic 128x64 LCD blue backlit (2 levels) with auto power off ; 5 high brightness LEDs; beeper
COMAND KEYBOARD	8 keys protected by cover film
VOLTAGE INPUTS (CH1, CH2)	2 insulated channels with 4 scales each: +/- 3V/10V/30/100V; DC accuracy: 0.2%+5digit; resolution 1mVdc @ 10V scale; AC accuracy: 1%+4digit (sine-wave 15-70Hz); resolution 10mVrms @10V scale; ADC 16bit+sign; Rin=2 Mohm; Vmax=+/-300V ; Selectable filter (60dB/dec): DC-0.5Hz or DC-12Hz
CURRENT INPUT (CH3)	2 scales: +/- 5A / 50A (internal shunts) DC accuracy: 0.5%+5digit; resolution 1mAdc @ 5A scale - AC accuracy: 1%+4digit (sine-wave 15-70Hz); resolution 10mArms ADC 12bit+sign; Rin = 50mohm (5A) / 5mohm (50A) ; Selectable filter (60dB/dec): DC-0.5Hz or DC-12Hz; Imax (5A): 6.3A (fuse 5x20) ; (50A): 60A/120sec; 80A/20sec; 120A/2sec (no fuse)
AUX VOLTAGE INPUT (CH4)	1 scale: 100Vdc (same COMMON of current channel) Accuracy: 0.5%+5digit; resolution 0.1V; NO AC reading
INPUT INSULATING	CH1,CH2,CH3 channels are insulated among them (200Vdc) ; CH4 have the same COMMON of CH3
SAMPLING RATE (SR)	0.1sec or 1sec or 10sec
RECORD RATE (RR)	100/200/500msec (SR=100msec) ; 1/2/5sec (SR=1sec) ; 10/20/30/60/120sec (SR=1sec or 10sec) Record: MEAN_OF_SAMPLES
OTHER MEASURES	Internal battery voltage
CALIBRATION	Software calibration, by keyboard
DATE/TIME	Internal RTC; accuracy: +/-20ppm
MEMORY CAPACITY	Flash 32MB: 2 millions samples
OPERATING AUTONOMY	1 month @ RR=0.1sec; 8 months @ RR=1sec ; Up to 2 years @ RR=60sec & SR=10sec
FIRMWARE UPDATING	via USB port
PORTS	USB 2.0 - Optional: GSM module

ELECTRICAL PARAMETERS AT 25°C - WITH RESERVE OF CHANGES

CURRENT INTERRUPTER for ON/OFF TESTING on CATHODIC PROTECTION SYSTEMS

- INC3 -

GPS SYNCHRONIZATION MODULE EMBEDDED



60A and 100A version



15A and 30A version

INC3 is a **CURRENT INTERRUPTER** specifically designed for use in the **ON-OFF** testing on cathodic protection systems; it allows you to stop cyclically, and in a programmed way, the power supply current, in order to assess the polarization of the pipeline by means of **on-off** technique. The switch is "static" (**MOSFET** transistor), and it can manages **15A / 30A / 60A / 100A** current (depending on the version) without any constraint on the polarity, with **120V** or **150V** maximum voltage, and no bounces and the timing inaccuracies typical of electromechanical contactors. In parallel to the switch output there is a voltage limiter (TVS) used to absorb the energy associated with any stray inductance in series with the load. This series is characterized by an internal clock synchronized with the UTC time, thanks to the presence of the **embedded GPS module**. This allows the synchronized interruption of two or more systems with very high precision and stability. On demand, a remote management module (embedded) by SMS via GSM is available. The switch operates in two modes: **AUTO** and **MANUAL**. In **AUTO** mode the break is defined by programmable time sequences: there are 16 sequences, each of which can be programmed with starting time and number of on / off cycles to execute. In **MANUAL** mode the interruption occurs manually by pressing the **ON / OFF**. The apparatus is simple to use, both for the presence on board of a graphic LCD, both for the possibility to be programmed via PC. **INC3** is equipped with a terminal block for the system power cables attesting (cables up to 35 mm²); It is powered by an internal battery (type 18650 - not provided), but can also operate from an external source (USB port, 12V external battery or AC adapter 12V / 300mA supplied); the external source also provides for the charging of the internal battery.

- Specialized device: it contains on board all needed components for ON-OFF tests.
- Very competitive price in comparison with the offered features.
- Powered by internal rechargeable battery (type 18650 - not provided) or external 12V source.
- Compact dimensions and weight.
- 4 models available: 15A - 30A - 60A - 100A.
- Bipolar static switch (MOSFET) Low Dropout.
- Screw terminals for cables up to 35mm².
- Easy user interface for programming sequences locally or via PC (USB).
- Free availability of programming software via PC.
- Up to 16 sequences, each with its own scheduling (time and number of cycles).
- Internal clock synchronized with UTC time thanks to the integrated GPS module.
- Synchronization error between several INC3: <10 msec (with GPS sync. every 3h).
- Remote management by SMS via GSM (optional).

INC3 - TECHNICAL SPECIFICATIONS

DEVICE TYPE	Current Interrupter (cycle switch) for Cathodic Protection Systems
WEIGHT - DIMENSIONS	160x133x45 mm (BxHxP); 600 g (vers. 15A-30A) 195x120x45 mm (BxHxP); 700 g (vers. 60A-100A)
PROTECTION RATING	IP65 frontal panel, IP20 at the sides
ENVIRONMENTAL TEMPERATURE	Operative: from -10 to +45 °C ; Storage: from -30 to +60 °C
INTERNAL POWER SUPPLY	2x Li-Ion Battery (type 18650 - not provided); Recharge time (typical): 12 hours (internal regulator 400mA)
EXTERNAL POWER SUPPLY	by USB port or 12V charge adapter (supplied) by external 12 Vdc BATTERY
DISPLAY / ALARMS	LCD 128x64 pixel Graphic Display; #5 high brightness led, beeper
COMAND KEYBOARD	#8 keys with tactile feedback, protected by cover film
MEASURES	Internal battery voltage (10mV resolution) Heatsink temperature (0.1°C resolution)
EMBEDDED GPS MODULE	Sensitivity: up to -163dBm; TTFF: <1s,<35s,<38s (warm, tepid, cold); chip set SIRFstarIV; integrated LNA; low consumption
SEQUENCES PROGRAMMING	By device keyboard or by PC (via USB port)
REMOTE MANAGEMENT (OPTIONAL)	Sequences programming and commands by SMS via GSM
DATA PORT	USB port
CURRENT INTERRUPTER	Static (MOSFET), Bipolar, with TVS 10KWp (E _{max} =1.5J) 15A Model: I _{max} =+/-15A, V _{max} =+/-150V, R _{on} =8mΩ 30A Model: I _{max} =+/-30A, V _{max} =+/-150V, R _{on} = 4mΩ 60A Model: I _{max} =+/-60A, V _{max} =+/-120V, R _{on} = 2.4mΩ 100A Model: I _{max} =+/-100A, V _{max} =+/-120V, R _{on} = 1.2mΩ Parasitic inductance in series with the load: max 1mH @ 50A
SYNCHRONIZATION	By embedded GPS module (UTC synchronization)
SYNCHRONIZATION ERROR	Typ.: < 10ms (with GPS sync. every 3h)
CLOCK / CALENDAR	Internal RTC synchronized with UTC
CALIBRATION	Via Software, by keyboard

INC3 - MAIN PARAMETERS

Description	Range	Step	Default	note
SEQUENCE SETTING: nn	0-16	1	-	
SEQUENCE ACTIVATION "DAY" - T:=DD/[xx:xx] (Active only if the daily repeat mode is disabled)	0-31	1	-	Valid start: max 5 days after the current date
SEQUENCE ACTIVATION "HOUR" - T:[HH:xx]	0-23	1 ora	-	
SEQUENCE ACTIVATION "MIN" - T:[xx:MM]	0-59	1 min	-	
NUMBER OF "ON-OFF" CYCLES - C:[n]	0-999	1	5	Cycles=1000 => No Stop
"ON" Time of each Interruption Cycle	1-255	1 sec	12	
"OFF" Time of each Interruption Cycle	1-255	1 sec	3	
AUTOMATIC/MANUAL INTERRUPTION	AUT/MAN	-	MAN	

WITH RESERVE OF CHANGES WITHOUT NOTICE

SUPPLIED ACCESSORIES (standard package):

- n.1 battery charger plug (12Vdc/330mA).
- n.1 usb output data cable.
- n.1 user manual (including calibration report).
- n.1 cdrom + software for p.c.
- n.1 carrying case.

OPTIONS (on demand):

- GC - integrated GSM module and antenna for remote management via SMS.
- AE - External GPS Antenna (detachable; standard wire length: 5m) - With this option, no internal GPS antenna is provided.

Note: INC3 is also available in the TL version (with contactors for 230VAC interruption)

AUTOMATIC POWER SUPPLY FOR CATHODIC PROTECTION SYSTEMS

- SERIE EHT - MICROPROCESSOR CONTROLLED



This line of power supplies was created with the aim of modernizing the technology used for the cathodic protection of structures that require **protection currents up to 100A (this model 60A)**, introducing some solutions that have been developed in the last twenty years in the industrial sector: power section in high frequency **FULL BRIDGE/ SOFT-SWITCHING** technology (instead of the old SCR or saturable reactor technologies), microprocessor management with graphic display and digital meters, cooling in air instead of oil, protection against in/out overvoltages using varistors latest generation high energy. The resulting device:

- It is compact compared to the power managed, and easily transportable (only 21Kg).
- Offers high reliability, resisting the strong stresses of its operating environment with new high energy dischargers (22KA).
- Allows an easy and intuitive dialogue with the operator.
- Offers extremely precise regulation, with a very clean output voltage.
- Has a high energy efficiency (90% at full power), for a low operating cost.
- Manages alarms and statistical parameters.
- Incorporates data logger and current interrupter for ON/OFF tests (optionals).
- Can be completely remotely managed by wire using the MODBUS protocol or wireless by GSM network (optionals).
- Wide range of serial ports: RS232, RS485, USB, BLUETOOTH, ETHERNET (optionals).
- Analogue inputs/outputs and ON/OFF for the system (optional).
- Front bushings for DDP, Vout, Iout measurements.

EHT is cooled by forced air and does not use oil; it can work with ambient temperatures from -10°C to +45°C and requires installation in a street cabinet, that guarantees the IP degree requested by the client. The power supply is three-phase with a 5-pole plug.

This power supply can be set to work in 4 modes:

- **Constant voltage:** supplies the programmed voltage (adjustable in 0.1V steps).
- **Constant current:** d supplies the programmed current (adjustable in 0.1A steps).
- **Constant PD:** supplies the voltage necessary to stabilize the pipe-earth DDP at the programmed value (read via Cu-CuSO4 PROBE) and adjustable in 10mV steps.
- **Constant PD with IBASE:** stabilizes the PD, but the current never drops below the IBASEE.

EHT60 TECHNICAL CHARACTERISTICS (series 11)

DEVICE TYPE	Automatic power supply for cathodic protection systems - microprocessor controlled
DIMENSIONS AND WEIGHT	54x31x36 cm (WxHxD) (power cable on the side) - weight: 21Kg
PROTECTION LABEL	IP20 (cabinet installation by road)
ENVIRONMENTAL TEMPERATURE	-15 to +45 degrees °C (in cabinet, non-condensing) automatic derating for exceeding internal device temperature thresholds
MEASURING INSTRUMENTS	3 LCD display with 4 digits (14 mm LED display, high brightness) + 2x16 alphanumeric char. Measures and displays: P.D., output current and voltage, working hours and "off protection" hours, average operating parameters (P.D., current, output voltage, output power), internal temperature, supply voltage
DIAGNOSTIC / PROGRAMMING	2x16 alphanumeric char. Display - Backlit (temporized) LCD
KEYBOARD & SIGNALS	16 mechanical keys with tactile feedback, #14 high brightness leds, beeper
CALENDAR CLOCK (with /D option)	clock with independent power of 10 years duration (with data logger res. set to 1 sec.)
POWER REGULATION TECHNIQUE	AC/DC Converter type FULL-BRIDGE PHASE-SHIFT SOFT-SWITCHING
COOLING SYSTEM	fan assisted natural convection
OVERVOLTAGE PROTECTION	varistors 22KA, (mains, output, probe)
OVERCURRENT PROTECTION	magneto-thermal circuit breaker (mains side)
INPUT VOLTAGE	THREE PHASE 400V+/-10% 50-60Hz 12A, with on-board mains voltmeter Inrush current at start-up: < 30A
OUTPUT VOLTAGE	From 0 to 50Vcc (max programmable limits: from 12 to 50Vcc)
OUTPUT CURRENT	From 0 to 60Acc
EFFICIENCY	90% @ full power
RIPPLE & NOISE (OUTPUT)	< 200 mVrms @ 90% full power
BASIC CURRENT	Programmable from 0.0A to Nominal Output Current (step = 100 mA)
DESIRED P.D.	Programmable from 0.00 to -5.00V (step = 10 mV)
MEASURABLE P.D.	from - 10.0V to +10.0 V; differential type measure (Rdiff=1MΩ)
OPERATIVE MODES	CC (constant output current), CV (constant voltage (P.D.) with adjustable basic current)
REGULATION ERROR (REGIMEN)	CV mode: +/-20mV; CC mode: +/-200mA
DYNAMIC COMPENSATION	<250ms to restore the 90% of the programmed P.D
INSTRUMENTS ACCURACY	< 0.8% + 2digit (DDP and Vout); <2% + 4digit (IOUT); <5% (Vmains)
SERIAL PORT (optional)	USB-device (standard); isolated RS485 (DB) (/M option)
REMOTE MANAGEMENT (/M, /G, /R options)	wired: MODBUS-RTU protocol by isolated RS485 (/M option) wireless: GSM/GPRS module (/G option); LORA module (/R option)
DATA LOGGER (/D option)	2 CHANNELS (P.D. and OUT CORRENT); CADENCE from 0.1" to 120" (11 vaues) RANGE: from 54 hours (cadence 0.1") to ~7.5 years (cadence 120") RECORD DISPLAYING: on board display or external PC (USB port)
TELEMETRY 4-20mA (/L option)	N.2 analog outputs 4-20mA galvanically isolated from the system (500Vdc). Max error: +/-2%. Rmax of load: 600 ohms. Max output voltage: 14V
CURRENT INTERRUPTER (/F or /C options)	Programmable times: ON from 0.3 to 25.0 sec; OFF 0.7 to 25.0 sec With /C option: +/-20msec synchronization via on-board GPS module
MEMORY STATISTICS	#6 parameters (WORKING HOURS, OUT OF PROT. HOURS, AVG. P.D., AVG. OUTPUT CURRENT, AVG. OUTPUT VOLTAGE, AVG. OUTPUT POWER)
MAIN ALARMS	OUT OF WINDOW P.D. (programmable window and delay), OUTPUT CIRCUIT OPEN, OVER TEMPERATURE, LINE VOLT. OUT OF RANGE
REGULATIONS REFERENCE	safety: EN 61010-1 (1996); EMC: EN 50081-1, EN 50082-1 cathodic protection power supplies: UNI CEI 8 (1997)

EHT60dep1_ENG - WITH RESERVE OF CHANGES WITHOUT NOTICE

Each model can be supplied with the following options, to be specified when ordering:

- D (data logger with 2 programmable channels).
- M (remote management via RS485 MODBUS cable).
- G (remote manag. via radio on the GSM network).
- R (remote manag. via radio on the local LORA network).
- L (TELEMETRY in current loop 4-20mA; 2 isolated channels: DDP and IOUT).
- F (cyclic relay for ON/OFF tests).
- C (cyclic relay for ON/OFF tests with GPS synchronization).

MULTIPROCESSOR FULL AUTOMATIC HIGH POWER SUPPLY FOR CATHODIC PROTECTION SYSTEMS

- MODEL EPC 100/50 -

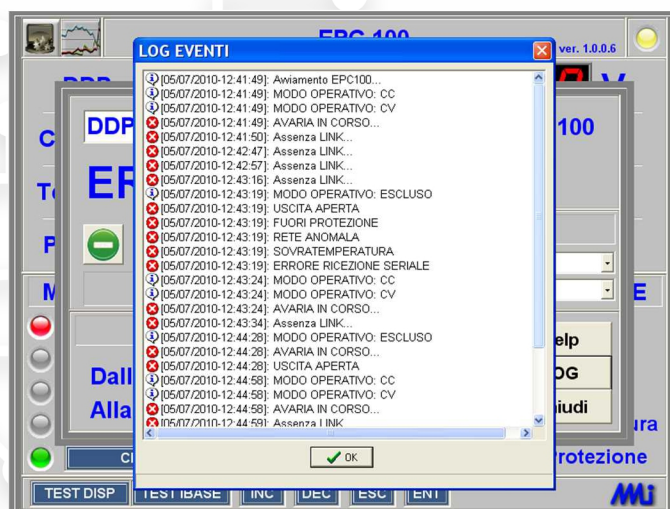
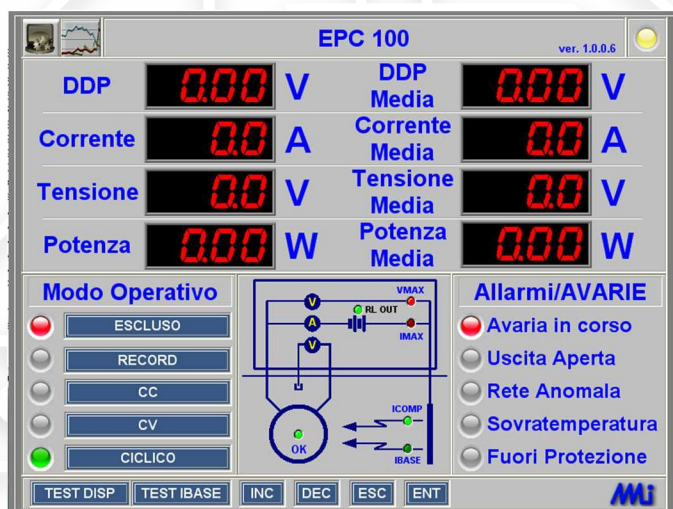


This line of Power Supplies born with the aim of modernizing the technology used in the field of Impressed Current Cathodic Protection Systems, introducing a number of solutions that have emerged in the last decade in the electronic industry and in computer science, we refer in particular to:

- Management by PANEL-PC with touch-screen graphical display and internal UPS.
- User-friendly management software, with extensive use of colour images and context help.
- Improving of energy efficiency by means of soft-switching adjustment technique.
- Ability to work with multiple probe types, logging measures/events, and broad connectivity.
- Small size and very low weight (cm.49x30x32; approximately 25 kg for a 100A machine).
- Possibility of later expansion, adding 50/100/150A external power modules.

EPC100 is a multiprocessor system in which more intelligent modules share the tasks and control each other. The master system is the **PANEL-PC**, which is a true **industrial grade PC**, fan-less, with **12" colour touch screen**, network connection by Wi-Fi and Ethernet, 8 serial ports (USB , RS232, RS485). It allows to implement a very simple and intuitive interface, for example, the basic display shows a synoptic touchscreen, then interactive and dynamically variable, which shows the status of the system and all the measures, and offers the possibility to vary the settings (lockable) with a touch bar. It has an **on board HDD** that allows virtually unlimited recording of the measured data (events, total current, any current of each group of anodes, total voltage, one or more Potential Differences, temperature).

EPC100 contains a true **multi-track recorder**, which offers the ability to view real-time traces of the quantities of interest (P.D.1, P.D.2, Current, etc..) related to the last minute or the last days, in order to have a complete framework and detailed history of the plant; it is able to record (for a limited time of course), even in the absence of the Mains, thanks to the **internal UPS**.



EPC100: SOME SAMPLE DISPLAYS

EPC100/50 Technical Features/Facilities (note: with reserve of change):

- Power supply: **three-phase with neutral 400V/50Hz**; maximum current consumption: 15A.
- Max output current (programmable): **100A**; maximum output voltage (programmable): 50V.
- **High efficiency: 89%**, low output ripple: 100mV at full power.
- Ferrite isolation/safety transformer; electronic boards with **anti-salt/humidity treatment** (coating).
- **Internal protection from surges** by using gas discharge tubes and VDR both in input and output.
- Management by **industrial PC (PANEL- PC)** with 12" LCD colour **touch-screen**.
- **Internal UPS** to serve PC and logic boards in the absence of the Mains, with recording of events and measures.
- Secondary display (32 alphanumeric characters) with 6 control buttons, independent from the PANEL-PC.
- **Serial interfaces:** RS232, RS485, USB , LAN (Wi-Fi or Ethernet); options: fax modem, GSM module.
- **Control panel system status on the LCD screen, with context-sensitive help; programmable alarms.**
- Measures and displays: P.D., output voltage, output current, sink resistance, mains voltage.
- **Data logger** (P.D., current, voltage) with graphing and reporting of out-of-protection periods.
- **Remote management:** allows you to remotely view recorded data, download, display the synoptic and alarms.
- **Can operate with 2 probes**, of any kind : Cu/CuSO4 , Ag / AgCl , Zn, Hg/Hg2Cl2.
- **Internal solid state relay (MOSFET)** for ON/OFF cycle tests; circuit breaker on mains input.
- It has 3 outputs for 4-20mA standard telemetry: P.D., impressed current, output voltage.
- No.3 signalling outputs with relays (dry contact): failure, siren, aux.
- Operating modes: OFF, CC, CV, TEST, ON/OFF; probe choice: 1/2/AUTO.
- Forced air cooling (self-regulated flow) **internal thermal protection circuit**.
- Dimensions: cm.49x30x32; weight: about 25kg; operating temperature: -10/+50 °C.
- Hardware options: 8 probes module with automatic selection, 8 sinks module (with 8 current readings), GSM module (for remote connection or **remote probes**), 16 in/out module for digital servos, SLAVE power modules driven by EPC and parallelable to increase the output current.
- **Software options:** remote control, post-data processing, data storage, printing.
- Also available in **marine version** (maximum output voltage: 20V).
- **Designed and manufactured entirely in Italy.**

CATHODIC PROTECTION AUTOMATIC POWER SUPPLY FOR HIGH CURRENT SYSTEMS

- SERIE AP - MICROPROCESSOR CONTROLLED



Available sizes:

- 20V/100A
- 25V/150A
- 32V/100A
- 50V/50A
- 50V/100A
- 75V/50A

Available options:

- Modbus remote management.
- Gsm remote management.
- On/off current interrupter.
- Datalogger.
- 4-20ma telemetry.
- Multiple universal probes.
- Base for pavement.

Main features:

- 400V 3PH mains supply.
- Output power up to 5KW.
- Protection Degree up to IP65.
- Tropicalized PCB's.
- Large external heatsink.
- Very high efficiency.

AP1 is a family of CATHODIC PROTECTION power supplies intended for particularly challenging systems both from the point of view of the currents involved and from the environmental conditions in which the device must operate. In fact, the AP1 series power supplies:

- Can provide high power with very small dimensions and weight thanks to the use of switching technology; for example: 50V / 100A (5KW) in a cabinet of just 60x40x30cm / 28Kg.
- Offer high reliability, thanks to the generous internal protections against over-voltages and natural convection cooling with ample external heatsink; they can also be configured with IP65 prot. degree.
- Have a high energy efficiency (over 90%): low heating, more reliability and low operating cost.
- The microprocessor management allows an easy and intuitive dialogue with the user, makes various alarms and statistical parameters available, and allows great flexibility of use to adapt it to several situations.
- Can be supplied with many options on board: data logger, current interrupter for on / off, 4-20mA telemetry, remote management via cable (MODBUS) or via GSM, GPS synchronizer, multiple universal probes.
- They are designed and produced in Italy and offer an exceptional performance / price ratio.

TECHNICAL CHARACTERISTICS AP32100/4S version (32V/100A)

DEVICE TYPE	Automatic power supply for cathodic protection systems - 32V/100A MICROPROCESSOR CONTROLLED - with 4 inputs for Ag-AgCl probes
DIMENSIONS AND OVERALL WEIGHT	40x60x30 cm (WxHxD), weight 30Kg
PROTECTION DEGREE	IP50 or IP65 (on demand). Standard provided: IP50
ENVIRONMENTAL TEMPERATURE	from -15 to +45 °C automatic block for internal device temperature > 75 °C
MEASURING INSTRUMENTS	3x LCD display with 4 digits (10 mm LED display, high brightness) + 2x16 OLED alphanumeric char.display Measures and displays: P.D., output current and voltage, working hours and "off protection" hours, average operating parameters (P.D., current, output voltage, output power), internal temperature
USER INTERFACE (SIGNALS)	Alphanumeric display 32 char., 16 keys, 14 led's, beep
POWER REGULATION TECHNIQUE	AC / DC converter switching with isolation transformer @ 40KHz
COOLING SYSTEM	External heatsink with natural convection assisted by 2 internal fans
PROTECTION - POWER LINE SIDE	Magnetotermico 16A, varistori 22KA, scaricatore a gas 16A magneto-thermal circuit breaker, gas discharges surge suppressor, 22KA varistor
PROTECTION - PLANT SIDE	75KA varistors, electronic limitation of the output current
VOLTAGE SUPPLY	400V / 50Hz (three-phase without neutral); voltage operating range: +/- 12%
CURRENT SUPPLY	8A at full power; <30A at startup
SUPPLIED POWER	3200W
SUPPLIED VOLTAGE	32Vcc (max limit programmable from 12.0 to 32.0Vcc)
SUPPLIED CURRENT	100Acc (max limit programmable from 10 to 110Acc)
EFFICIENCY	92% at full power
RIPPLE & NOISE (OUTPUT)	<200 mVrms at full power
BASIC CURRENT	Programmable from 0 to 100A, in steps of 1A
DESIRED P.D.	Programmable from -1.00 to -5.00V, in 10 mV steps
MEASURABLE P.D.	From -10.0V to + 10.0V; differential type measurement; Rin = 1 MW 4x channels for Ag-AgCl probes that can be used with various criteria
MEASURING BUSHES	Vout, Iout, P.D.1
OPERATIVE MODES	CC (stabilizes output current), CV (stabilizes DDP + base current)
REGULATION ERROR (REGIMEN)	CC mode: <+/- 1A with respect to the programmed value CV mode: <+/- 20mV with respect to the programmed value
DYNAMIC COMPENSATION	<300ms for 90% P.D. restore, with Iout from 40A to 80A
INSTRUMENTS ACCURACY	<0.8% + 2digit (DDP and Vout); <1.5% + 4digit (ammeters); <+/- 3C (thermometers)
MAIN ALARMS	P.D. out of window (programmable window and delay), OUTPUT CIRCUIT OPEN, OVER TEMPERATURE, INSUFFICIENT MAINS VOLTAGE
SERIAL PORT (optional)	USB-device, RS485 (DB9) isolated.
DATA LOGGER (optional)	2x CHANNELS (P.D. and OUTPUT CURRENT); CADENCE from 0.1 "to 120" (11 values) AUTONOMY: from 54 hours (0.1 "cadence) to ~ 7.5 years (120" cadence) RECORDING DISPLAY: on-board display or external PC
REMOTE MANAGEMENT (optional)	wired: with MODBUS-RTU protocol on isolated RS485. wireless: GSM / GPRS embedded module with external antenna
CURRENT INTERRUPTER for ON / OFF tests (optional)	ON time: 7.0 sec. (programmable from 1.0 to 25.0 sec) OFF time: 3.0 sec. (programmable from 1.0 to 25.0 sec) Option /C: GPS synchronizer with external antenna
MEMORY STATISTICS	6 parameters (WORKING HOURS, HOURS OUT OF PROTECTION, DDP AVERAGE, IOUT AVERAGE, VOUT AVERAGE, AVERAGE POWER)
TELEMETRY 4-20 mA (optional)	2x 4-20mA analog outputs galvanically isolated from the system (500Vdc). Max error: +/- 2%. Load Rmax: 600 Ohm. Max output voltage: 15V
REGULATIONS REFERENCE	Safety: EN 61010-1 (1996) EMC: EN 50081-1 EN 50082-1 Cathodic protection power supplies: UNI CEI 8 (1997)

WITH RESERVE OF CHANGES WITHOUT NOTICE

NOTE: ELECTRIC CHARACTERISTICS ARE THE SAME

(EXCEPT FOR OUTPUT CURRENT & POWER) FOR ALL MODELS - ALL MEASURE @ 25°C



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