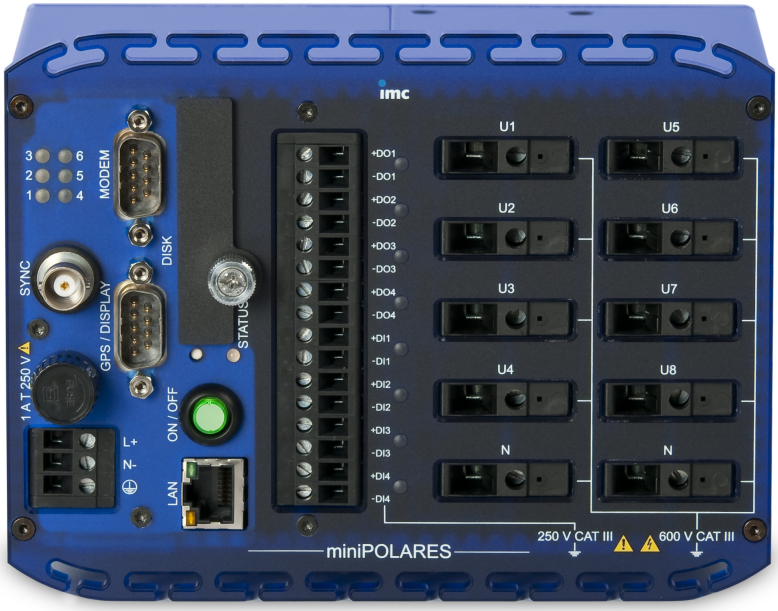
miniPOLARES

Version 1.13

Power quality analyzer per EN 50160, power measurement devices and event analyzer



miniPOLARES-8U-AC

miniPOLARES is a multi-function measurement device for all physical quantities designed for standards-compliant evaluation of the quality of electrical supply networks.

miniPOLARES is a power measurement and power analysis system all in one. The power on up to 4 differently circuited lines are measured and analyzed to a resolution of up to the 50th upper harmonic frequency.

A variety of event and triggering mechanism can be defined, enabling efficient evaluation of external influences on the power quality. The device comes with four digital inputs and four digital outputs (relays) for handling 230V_{rms} voltages.

Order code:

Devices with DC-supply:

- **POL/miniPOLARES** 4 U, 4 I signal inputs
- **POL/miniPOLARES-8U** 8 U signal inputs

Devices with AC-supply:

- **POL/miniPOLARES-AC** 4 U, 4 I signal inputs
- **POL/miniPOLARES-8U-AC** 8 U signal inputs

Construction

- Compact, robust aluminum housing with plastic front panel
- Top-hat rail installation set on the device's rear panel
- Slot for CF-card storage medium

Terminal connections

POL/miniPOLARES

- Voltage inputs: 4, isolated, via screw terminals 0,5 mm² to 6 mm²
- Current inputs:: 4, isolated, via screw terminals 0,2 mm² to 2,5 mm²

POL/miniPOLARES-8U

- Voltage inputs: 8, isolated, via screw terminals 0,5 mm² to 6 mm²
- Current inputs:: none

Terminal connections for both variants

- DI/DO: 4 relays inputs, 4 relays outputs
- LAN-Anschluss: via Ethernet TCP/IP 10/100 MBit via RJ 45 socket
- GPS: terminal for external GPS receiver (or NMEA), via DSUB-9 socket for external synchronisation
- Synchronisation: terminal for DCF, IRIG-B or other measurement devices, via SMB socket
- Modem terminal for optional external modems, via DSUB-9 socket

- Display terminal for graphical Display
- GPS/Display only with AC variant: GPS is configured at factory

Controls

- Toggle: LED-button for switching device on/off
- Status-LED: Operating status indicator (green/red)
- 6 LEDs: Status indicator during running measurement (green)
- Toggle for CF-Slot: Toggle for proper closing of data before removing the CF-card

Power supply

- 100 V to 240 VAC / 110 V to 250 VDC
- Automatic measurement operation with autostart following power outage
- Automatic data storage upon power outage
- Interne USV
- Automatic charge control
- 1 A fuse (changeable at the front - fuse only with AC variant)

Operating conditions

- Relative humidity 5 % to 95 %
- Shock resistance 15 g pk over 11 ms
- Operating elevation: up to 2000m
- Operating temperature: -10°C to 55°C without condensation

Included software

- Complete turnkey POLARES software for standards-compliant operation, adjustment, display of measured data and report composition under MS Windows 2000, -XP, Vista and Windows7.

Included accessories

- Manufacturer’s Calibration Certificate
- 2 GB CF-card
- German and English operating instruction and system manual as online help and PDF on CD
- Ethernet connection cable (2 m) 1 x STP, 1 x STPx (crossed)

Measurement properties

Measurement channels

- 4 analog inputs for current measurement
- 4 analog inputs for voltage measurement
- Connection types:
  - Single line L1 – N, L2 – N, L3 – N
  - Multi-wire system (star) star, delta, open delta L1, L2, L3, (N), L4 optional
- Definition of converter parameters (e.g. 100V – 230kV, 1A – 1kA)

Data storage

- CF-Card supported up to 16 GB

Miscellaneous

- PC-independent measurement operation
- Message transmission upon occurrence of various events.
  E-Mail, SMS or Fax upon power outage, voltage dip, etc.

Optional enhancements:

- Database module:
  - Evaluation of and search for events, such as standards violation
  - Tabular classification of results according to duration, amplitude etc.
    Chronologically correct evaluation over multiple networked devices/stations
- In-Rush module
  - Software for freely configured short-term measurement
  - Freely configured data capture, up to 100 kHz sampling rate per channel
  - Definable threshold or range trigger, trigger linkage, pretrigger etc.
- Removable CF-cards
  Shock resistance during operation: 1000 g, available in volumes up to 16 GB
- German and English operating instruction and system manual printed

Technical data miniPOLARES

Version 1.13

Parameter	typ.	min. / max.	Test conditions/ Remarks
General (at 25°C)			
Ambient conditions	The normal *ambient conditions* according to EN 61010-1 apply (see Operating conditions). These ambient conditions are can be broadened in accordance with the statements made in these technical specs		
Signal inputs	4 x current [I] 4 x voltage [U] 8 x voltage [U]		for miniPOLARES-DC and miniPOLARES-AC for miniPOLARES-8U-DC and miniPOLARES-8U-AC
Digital in/out	4 binary inputs 4 relays outputs		
Power supply rating voltage rating frequency rating power consumption	 10 V to 60 VDC (+10%) 100 V bis 240 VAC / 110 V to 250 VDC (±10%) 50 / 60 Hz < 20 VA < 12 W < 10 W		 for miniPOLARES-DC and miniPOLARES-8U-DC for miniPOLARES-AC and miniPOLARES-8U-AC for miniPOLARES-AC and miniPOLARES-8U-AC after switch-on (recharging the UPS) permanent operation
UPS capacitor	buffer time: ≤ 1 second		factory settings
EMC Interference resistance/ transient emissions	class A		according IEC/EN 61326-1
Protection degree		IP 20	according EN60529
Weight		ca. 1,9 kg	
Dimensions	166 mm x 105 mm x 126 mm		(W x H x D) without top-hat rail
Ambient temp. range	-10 °C to 55 °C		acc. to IEC 60688, no condensation
Storage temperature	-40 °C to 90 °C		acc. to IEC 60688, within < -15°C or > +55°C only for short time recommended
Fuses	1 A T, 1500 A @AC 250 V 1 A T, 1500 A @DC 300 V		e.g. type 179200 /SIBA or 0001.2504 SCHURTER
Interfaces	Ethernet, Modem		RJ45 (TCP/IP) DSUB9
Memory capacity	2 GB standard up to 16 GB possible		CF-Card
Timer (internal RTC) crystal-controlled real time clock external synchronization	± 1s/day GPS, DCF, IRIG-B, NTP or other miniPOLARES		battery backed GPS-input Sync-input

Parameter	Test conditions/ Remarks
Mechanical stress	
Vibrations, sinusoidal; stationary use	- IEC 60068-2-6: test Fc - IEC 60255-21-1 class 2
Vibrations, sinusoidal; transport	- IEC 60068-2-6: test Fc - IEC 60255-21-1 Klasse 1
Seismic stress, stationary use	- IEC 60068-3-3: test Fc - IEC 60255-21-3 class 1
Shock, half sine wave; stationary use	- IEC 60068-2-27: test Ea - IEC 60255-21-2 class 1
Shock, half sine wave; for resistance	- IEC 60068-2-27: test Ea - IEC 60255-21-2 class 1
Shock, half sine wave; continuous shock, transport	- IEC 60068-2-29: test Eb - IEC 60255-21-2 class 1
Drop test in transport packaging Fall of 0,5 m height	- IEC 60068-2-31 + /A1 - EN 60068-2-31 - DIN EN 60068-2-31 Device packaged ready to ship
Mechanical resistance to shock and impact	- IEC 61010-1, section 8.1 and 8.2 - IEC 60068-3-75 / 1997
Industrial atmosphere	
SO_2 H_2S	-IEC 60068-2-42 / DIN 40046 part 36 test -IEC 60068-2-43 / DIN 40046 part 37 test

Voltage inputs

4 channels for voltage measurement			
Parameter	**typ.**	**min. / max.**	**Test conditions / Remarks.**
input	4 8		for miniPOLARES-DC and miniPOLARES-AC for miniPOLARES-8U-DC and miniPOLARES-8U-AC single end, isolation for each group
terminal connections	screw terminal AWG 10-20 rigid line 0,5 mm² to 6 mm² flexible line 0,5 mm² to 4 mm²		American Wire Gauge
sampling rate per channel		10 kHz ≤ 50 kHz	network analysis with In Rush module
bandwidth		0 Hz to 4,1 kHz 0 Hz to 21 kHz	-3dB, network analysis -3dB, with In Rush module
electrical safety rating / measurement category degree of pollution		600 V / CAT III 2	according EN 61010-1 voltage inputs U1..U4 according IEC 60664
insulation test voltage		5,4 kV_{RMS}	50 Hz Sinus; 1 min
measurement ranges	1000 V_{RMS}		automatic range setting
overload limit	1000 V_{RMS}		
overload resistance		±1,5 kV 1,1 kV_{RMS}	DC or 50 Hz simus, permanent
input impedance	2,5 MΩ	±1%	differential
measurement insecurity drift	0,04 % ±10 ppm/K·ΔTa	≤0,1 % ± 50 ppm/K·ΔTa	of ranges ΔTa=|Ta -25°C| ambient temperature Ta
isolation suppression		>110 dB >71 dB >47 dB	isolation voltage 1000V_{RMS} DC 50 Hz 1 kHz
channel crosstalk		< -110 dB < -85 dB < -60 dB	test voltage: 1000 V_{RMS} DC 50 Hz 1 kHz
strain voltage(RTI)	20 mV_{RMS}		bandwidth: 0,1Hz to 10 kHz

Current inputs

4 channels for current measurement			
Parameter	**typ.**	**min. / max.**	**Test conditions / Remarks.**
input	4		for miniPOLARES-DC and miniPOLARES-AC; differential, isolated
terminal connection	screw terminal 14 to 24 AWG 0,2 mm² to 2,5 mm²		(American Wire Gauge) for rigid or flexible line
sampling rate per channel		10 kHz ≤ 50 kHz	network analysis with In Rush module
bandwidth lower cutoff frequ. upper cutoff frequ.		 10 Hz 4,1 kHz 21 kHz	 -0,1 dB -3 dB, network analysis -3 dB, with In Rush module
electrical safety rating / measurement category pollution degree		 600 V / CAT III 2	 in accordance with EN 61010-1 current inputs I1…I4 in accordance with IEC 60664
measurement ranges	10 A, 5 A, 2,5 A, 1 A, 0,5 A		RMS values 5 A – connection 1 A – connection
overload limit		±145 %	of range
overload strength 5A terminal 1A terminal		 ≤ 20 A ≤ 100 A ≤ 10 A ≤ 100 A	 long-term 1 s long-term 1 s
input impedance 5A terminal 1A terminal		 ≤ 10 mΩ ≤ 20 mΩ	differential
measurement uncertainty	0,06 % ±8 ppm/K·ΔT_a	≤ 0,1 % ±60 ppm/K·ΔT_a	of input range ΔTa=|Ta –25°C| ambient temperature T_a
isolation suppression	 1,5 µA/V 50 µA/V		Isolation test voltage 500 V_{eff}· 50 Hz 1 kHz
channel cross talk	 -120 dB -100 dB		test current: 10 A_{eff}, 50 Hz 1 kHz
phase uncertainty		≤ 1 °	40 Hz to 2,5 kHz
noise signal	600 µA_{eff} 60 µA_{eff}		bandwidth: 0,1 kHz to 1 kHz range > 1 A range ≤ 1 A

Digital inputs

4 digital inputs			
Parameter	**typ.**	**min. / max.**	**Test conditions / Remarks.**
channels / bits	4		each isolated
terminal connections	screw terminal 14 to 24 AWG 0,2 mm² to 2,5mm²		American Wire Gauge for rigid or flexible line
insulation test voltage	3,6 kV_{RMS}		50 Hz, 10 sec between channels and chassis
electrical safety rating measurement category degree of pollution	250V / CAT III 2		in accordance with EN 61010-1 in accordance with IEC 60664
max. input level ue		≤600 V	peak-to-peak or DC voltage
nom. input level ue	230 V_{RMS} / 350 V_{DC}		
switching level Us unipolar low unipolar high	<16 V >16,8 V	<14 V >18 V	Schmitt-Trigger-characteristics Hysteresis 0,04 V typ.
current input	280 µA	<500 µA	ue = -600 V to +600 V
circuit time low → high high → low	70 µs 23 µs	<180 µs <40 µs	

Digital outputs

4 digital outputs			
Parameter	**typ.**	**min. / max.**	**Test conditions / Remarks.**
channel / bits	4		mechanical closer
terminal connection	screw terminal 14 to 24 AWG 0,2 mm² to 2,5mm²		American Wire Gauge for rigid and flexible lines
insulation test voltage	3,6 kV_{RMS}		50 Hz Sinus; 10 sec
electrical safety rating / measurement category degree of pollution	250 V / CAT III 2		according EN 61010-1 according IEC 60664
switching time	5 ms	<8 ms	
max. switching power		<1000 VA	
switching voltage	>1 V_{DC}	<250 V_{RMS}	min. switching voltage at 1mA
max. switching current		<1 A <4 A	250 V~ cos φ=1.0 ... 0.4 250 V~ cos φ=1.0
contact impedance		<50 mΩ	

Computations

Computations		
voltage, current	RMS-values Curve plots (reduced RMS values)	Moving RMS value with each half-period over one period One data point at least per 24 h
flicker	short-term and long-term flicker momentary flicker value and maximum	optional
frequency	50 Hz 60 Hz	40 Hz to 57,5 Hz 50 Hz to 69 Hz
harmonics	voltage, current, power, cos phi up to the 50th,THD	
interharmonics	up to 10 frequencies 10 Hz to 3000 Hz, resolution: 5 Hz	
symmetry	zero-, positive-, negative phase sequence system	
power	single- or multi-wire, overall system	active, reactive, apparent power power factor
trigger	for voltage and current – RMS-trigger, curve shape trigger signal frequency trigger (e.g. ripple control signals)	amount of triggered recordings limited only by the memory card used
voltage events	overvoltage, dips, outages, rapid voltage fluctuations slow voltage fluctuations	

Evaluations / Standards		
	Voltage quality as per EN 501606 Data search and data comparison across multiple measurements	IEC 61000-4-30, -15, -7 Power calculation as per DIN 40110-1 and –2 optional software module

Calibration conditions

Calibration conditions		
Parameter	**typ.**	**Test conditions / Remarks.**
temperature	23 °C	±5 °C
humidity	40 %	±30 %
power supply	24 V	60 W power adapter

Synchronization and time base

Parameter	value typical	min. / max.	Remarks
time base per device without external synchronization			
balanced (default)		±10 ppm	at 25°C (accuracy of internal time base)
Drift	±20 ppm	±50 ppm	-40 °C bis +85 °C operating temp.
Ageing		±10 ppm	at 25°C, 10 years

time base per device without external synchronization				
Parameter	**GPS**	**DCF77**	**IRIG-B**	**NTP**
Supported format			B002 B000, B001, B003*	version 4 (downwards compatible)
Precision	±1 µs			<5 ms after ca. 12 h
Jitter (max.)	±8 µs			
Voltage level	TTL	5 V TTL Pegel LOW active	5 V TTL Pegel	---
Input resistance	1 kΩ (pull up)	20 kΩ (pull up)		---
Input connector	DSUB-9	SMB connector "SYNC" short circuit proof, not isolated		Ethernet
Shield potential input		system ground		---

*using BCD information only

Synchronization with DCF77 for several devices (Master/Slave)			
Max. cable length		200 m	SMB cable
Max. number of devices		20	slaves only
Common mode	0 V		theses device must have the same ground voltage level, otherwise signal quality problems (signal edges) may result.Remedy see ISOSYNC
Voltage level	5 V		
DCF input/output	connector "SYNC"		SMB
Shield potential, IRIG-input	system ground		

ISOSYNC with different potentials			
Isolation strength	1000 V		1 minute
Delay	5 µs		@ 25°C
Temperature range		-35°C to +80°C	

RS232 interface for GPS

The following RS232 settings are required to use a clock module Meinberg GPS161AHSx or HOPF6875. Garmin GPS receivers will be set to 38400 by *miniPOLARES*.

8n1: 8 bit, no parity, 1 stop bit, no flow control

Baudrate: Autobaud for 4800, 9600, 19200, 38400, 57600, 115200.