ARTEMES

measurement competence centre
www.artemes.org

AM-60

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1 Introduction

The **A**RTE**M**ES Analyser **AM-60** is a 19" Rack Measurement Data and Fault Recorder with a flexible channel design. It combines the tasks of a modern recorder with mathematics tools and a fault reorder with selectable trigger options with the state of the art possibilities of the modern telecommunication technology. Beside the operation via web interface with e.g. smartphone or PC also all post processing opportunities are available via the web - as a browser application directly on the instrument, on a dedicated server or by using the **A**RTE**M**ES CLOUD service.

KEY Features:

- 24 bit
- 144 kHz sampling rate
- up to +-1600V
- GPS (option)
- GSM (option)
- WLAN

Using the strong Power library also Power Quality, Power measurement and a Power fault reorder tasks can be obtained.

The GPS input allows synchron measurements over long distances and using the instrument as an PMU, where not only the fundamental oscillation can be transmitted to an PDC Server, but also the harmonics and the flicker distribution.

2 Safety Information

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2.1 General Safety

- Carefully read this manual before using the instrument.
- Use the instrument according to these instructions only.
- Use the instruments only under environmental conditions and signal strength described in the technical data. There is no guaranty if you exceed the values your safety.
- The input voltage shall not exceed the values rated in the technical data.
- The power supply must be within the limits given in the technical data.
- Always make a visual inspection of connection equipment such as leads and clamps before use.
- Use fuses (500mA) if you connect the instrument directly to voltage where no fuse is available or a high short circuit impedance is given.

- For working on equipment under voltage use the guidelines given in EN50110.
- Also follow the 5 golden safety rules:
  - Always switch off.
  - Secure against reconnection.
  - Test voltage for being switched off.
  - Connect to earth and short circuit the cables.
  - Protect voltage leading equipment in the neighborhood.

2.2 Warranty

The warranty for the instrument is 2 years - usual operating conditions preconditioned.

2.3 Recycling

This is an electronic instrument and must be recycled according to the WEEE directive.
Do not throw away!

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More information see:
http://ec.europa.eu/environment/waste/weee/index_en.htm

2.4 CE Conformity

This instrument is compliant with the CE requirements.

EMC Directive 2014/30/EU

Testprocedures:
- IEC 61326:2013
- IEC 61000-3-2:2014
- IEC 61000-3-3:2013

Safety:
- EN 61010-1:2010

2.5 ROHS

RoHS Compliant

This product is compliant with the RoHS Directive.

For further informations see:
http://ec.europa.eu/environment/waste/rohs_eee/index_en.htm

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3 Initial Operation

To operate the instrument you have to follow two main steps:

1. Software Connection
2. Signal Connection

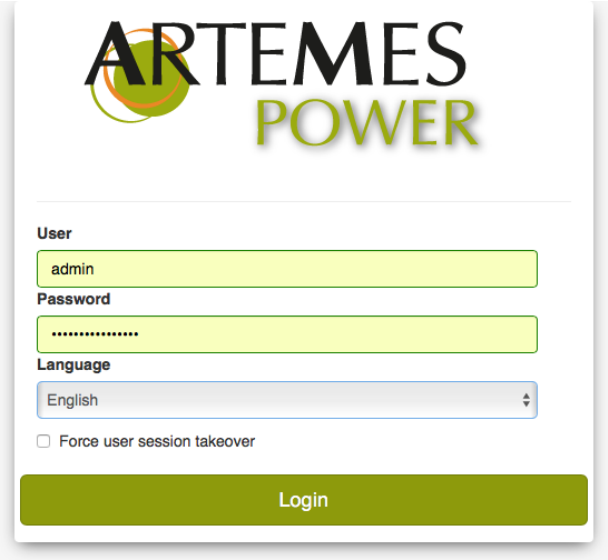
3.1 Software Connection

Start your web browser and connect to the instrument by entering the IP address (example WLAN: 192.168.1.1)

The network connection can be:
- LAN
- WLAN
- Internet / GSM

The login screen appears and you have to log on:

factory default
user: admin
pw:admin



How to operate the instrument is described in the ARTEMES Software manual.

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3.1.1 Connecting to the LAN

Connect you computer to the LAN port.
The IP address of the instrument is by default set to DHCP and alternatively to 192.168.1.50.

For further details see the instrument information sheet which was shipped with the instrument.

3.1.2 Connecting to the WLAN

The WLAN access is available in combination with the AM10/2-route option.

To connect to the WLAN use the settings from the instrument information sheet - page "router".

The IP address is by default set to 192.168.1.1.

3.1.3 Connecting throug the Internet

To connect to the instrument to the internet you should have a unique IP address or access to an ARTEMES cloud server with the instrument.

For further details about IP address contact your system administrator.

For details on the ARTEMES cloud access contact ARTEMES directly.

3.2 Connecting Signals

There are many possibilities to connect signals to the instrument.

This guide shows two possibilities as example:

- Single phase connection with direct current input
- Full three phase low voltage connection

For the pin assignment of the connectors please see chapter Hardware/Connectors.

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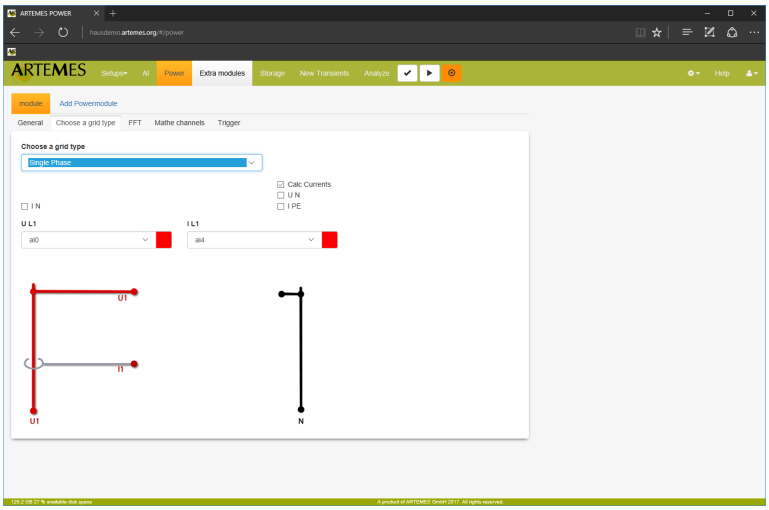
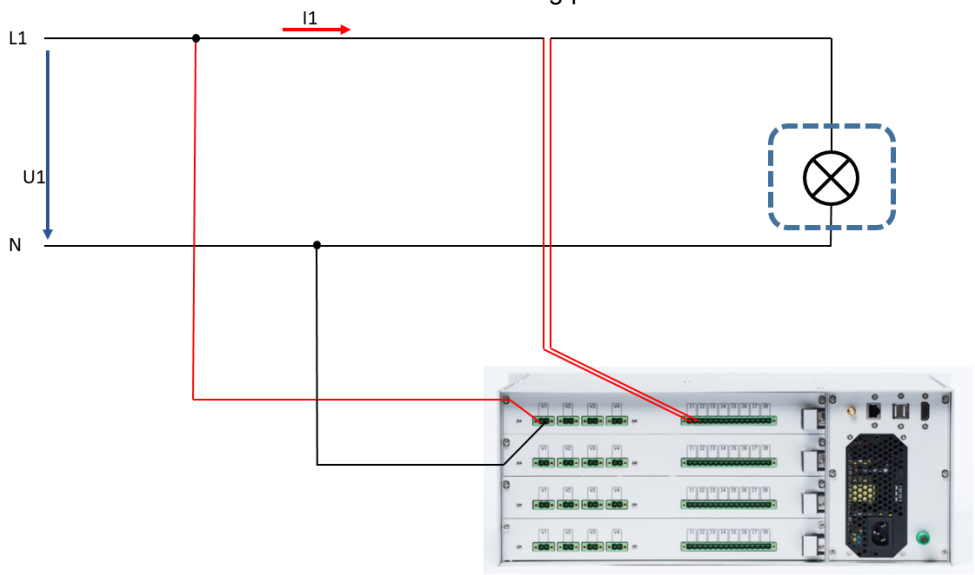
3.2.1 Single phase connection with direct current input

For the single phase connnection choose the grid type "Single Phase" in the "Power" Section of the setup.



Connect the instrument as shown in the following picture:



It is recommended, but not necessary to use fuses of type 500mA for the voltage connections.

During connecting the leads take care of the voltage.

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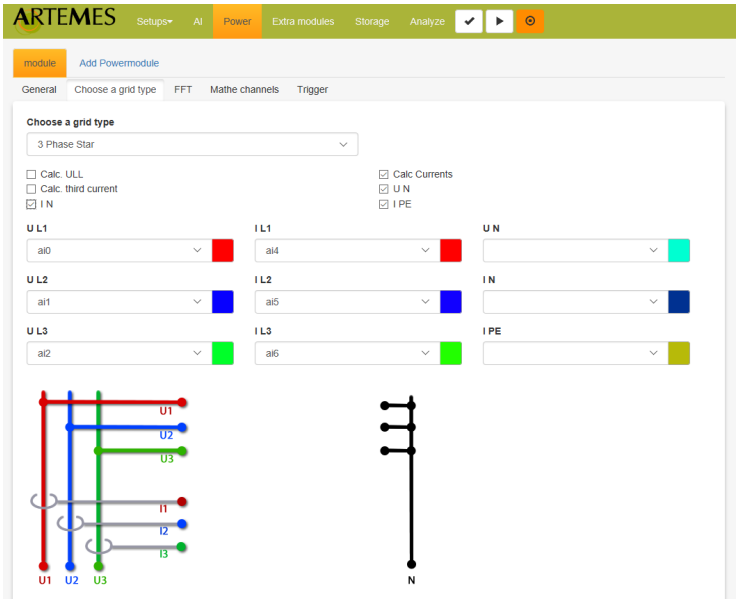
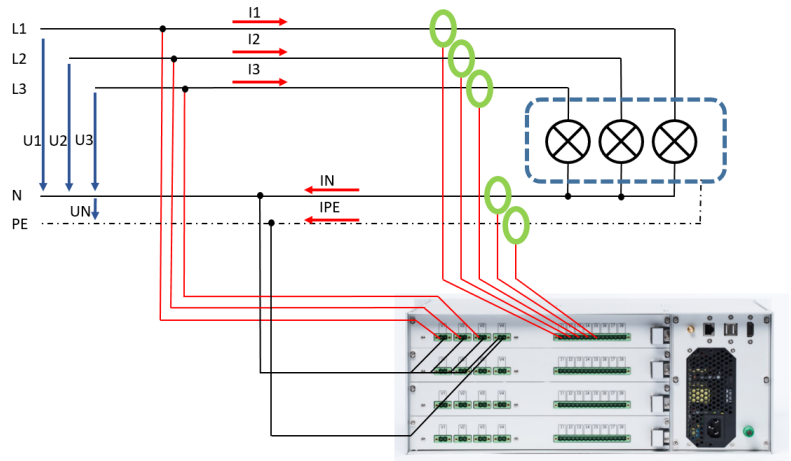
3.2.2 Full three phase low voltage connection

For a complete low voltage three phase connnection choose the grid type "3 Phase Star" in the "Power" section of the setup and select also "U N", "I N" and "I PE".



Connect the instrument as shown in the following picture (connection may vary with different board types):



It is recommended, but not necessary to use fuses of type 500mA for the voltage connections.

During connecting the leads take care of the voltage.

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4 Hardware

4.1 The Instrument

Deppending on the AM-60-board type you can use up to 4, 6 or 8 current inputs and 4 voltage inputs.
Each chassis can hold up to 4 AM-60-boards.

4.2 ON OFF Switch

The ON/OFF switch is located on the front side of the instrument.

push for on/off

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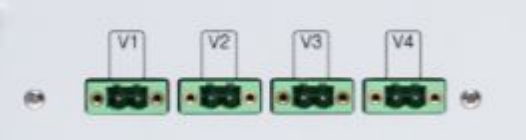
4.3 Connectors

All signal connectors are located on the rear of the instrument.

4.3.1 Voltage

The voltage connectors:

the connectors can be either banana 4mm or screw twrerminals for 4mm^2 wires.



Pin	Signal
left	U+ (L)
right	U- (N)

All channels are differential and isolated one to each other. You can either connect three voltages of a three phase system or even connect totally different voltages.
The inputs are for DC and AC.

Depending on the hardware the channels are assigned to different AI channels.

example with one board:

AI0...V1
AI1...V2
AI2...V3
AI3...VN

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4.3.2 Current

For direct current inputs screw terminals are provided in a numvber of 4, 6 or aight channels.

Screw Terminals 4mm^2:

- Direct current input 5A

Pin	Signal
left	I CT+ (k)
right	I CT- (l)

Depending on the hardware the channels are assigned to different AI channels.

AI4...I1, CT1
AI5...I2, CT2
AI6...I3, CT3
AI7...IN, CTN
...

4.3.3 Low voltage signals

Depending on the input card there can be low voltage signals (+-10V) instead ogf the curent inputs.

The connectioon can then be:

- SUBD9
- Lemo

SUBD9:

Pin	Signal
1	+15V
2	Signal +
3	GND
4	GND
5	+12V
6	+3.3V
7	Signal -
8	-15V
9	TEDS

LEMO:

Connector 10pin Lemo Redel P1:

- Clamp

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- Rogowsky coil
- other clamps

Pin	Signal
1	Signal +
2	Signal -
3	FGND
4	NC
5	TEDS
6	GND
7	+3.3V
8	+12V
9	+15V
10	-15V

4.3.4 Digital IO

On some board there are Digital IO connectors equipped.

4.3.5 Digital Connectors

The digital connectors are on the right side:

Antenna GPS (Option)

LAN

Pin	Signal
1	BI_DA+
2	BI_DA-
3	BI_DB+
4	BI_DC+
5	BI_DC-
6	BI_DB-
7	BI_DD+
8	BI_DD-

2 * USB 3.0

Pin	Signal

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1	Vcc
2	Data-
3	Data+
4	GND

HDMI output

Pin	Signal
1	TMDS Data 2+
2	TMDS Data 2 shield
3	TMDS data 2-
4	TMDS Data 1+
5	TMDS Data 1 shield
6	TMDS data 1-
7	TMDS Data 0+
8	TMDS Data 0 shield
9	TMDS data 0-
10	TMDS clock+
11	TMDS clock shield
12	TMDS clock-
13	CEC
14	NC
15	DDC clock
16	DDC data
17	GND
18	+5V
19	Plug detect

FGND...Additional GND for chassis in highly emc disturbed environment

4.4 Status LEDs

Front panel:

red LED: HDD activity
ACQ: measurement is running (measurement or storing mode)

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5 Software

The used software is the ARTEMES software.

For further information use the manual of the software, which can be downloaded from our website: https://www.artemes.org/index.php/de/blackboard-de/downloads/category/3-manuals

The online manual is available here: https://www.artemes.org/index.php/de/blackboard-de/online-manuals

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6 Technical Data and Specifications

6.1 Chassis

	AM60-4U-i5	AM60-4U-i7
size	19", 4U	19", 4U
slots	4	4
CPU	i5	i7
GPS	option	option
Supply Voltage	85-264 V AC / 47-63 Hz	85-264 V AC / 47-63 Hz

6.2 Modules

	AM60-V4C4-144K24	AM60-V4C6-144K24	AM60-V4C8-144K24-SS
input connector	banana/LEMO (-BL)	banana/LEMO (-BL)	
	banana/DSUB (-BD)	banana/DSUB (-BD)	
	screw/DSUB (-SD)	screw/DSUB (-SD)	
	screw/screw (-SS)	screw/screw (-SS)	screw/screw (-SS)
for clamps and Rogowski coils	(-BL),(-BD),(-SD)	(-BL),(-BD),(-SD)	yes
direct current input 5A	(-SS)	(-SS)	-
voltage channels	4	4	4
range	1600 V		
accuracy	0,1%		
resolution	24 bit		
sampling rate	144 ksamples/sec, adjustable		
connector	banana 4mm (-BL), (-BD)		screw terminals 5.08mm*2
	screw terminals 7.62mm*2 (-SD), (-SS)		
isolation voltage	6 kV		4 kV
burst	4 kV		
surge	4 kV		
current channels	4	6	8

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range	±10V for clamp input, ±2V for Rogowski coil, ±20A for direct input		
accuracy	0,1% (0,5% for direct input)		
resolution	24 bit		
sampling rate	144 ksamples/sec, adjustable		
connector	Lemo P1 (-BL)		screw terminal 5.08mm*16
	SUB-D9 (-BD), (-SD)		
isolation voltage	-		4 kV
burst	4 kV	4 kV	4 kV
surge	4 kV	4 kV	4 kV
digital Inputs	8	-	-
switch level	0~50 Vpeak	-	-
compatibility	adjustable trigger levels		
trigger resolution	12 mV	-	-
isolation	1 kV	-	-
connector	screw terminal 2.5mm*8	-	-
digital outputs	2	-	-
contact	PhotoMOS relais	-	-
isolation	1.5 kV	-	-
load	350Vp / 0,12A cont / 0,3A p	-	-
connector	screw terminal 2.5mm*8	-	-

6.3 Bandwidth Specifications

	V4C6S		V4C6D		V4C4D (With DIO)	
	HV	LV	HV	Direct Current	HV	Direct Current
CH	4	6	4	6	4	4
Input Range	±1600V	±10V	±1600V	20A	±1600V	20A
DC Accuracy	±0.05%FS	±0.05%FS	±0.05%FS	±0.3%FS	±0.05%FS	±0.3%FS
Gain Linearity	-	10ppm (MAX)	-	-	-	-
Gain Drift Range	-	10ppm/K (MAX)	-	-	-	-
Offset Drift	6mV/K (MAX)	9uV/K (MAX)	6mV/K (MAX)	50ppm/K (MAX)	6mV/K (MAX)	50ppm/K (MAX)

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Input Resistance		3.8Mohm	10Mohm	3.8Mohm	-	3.8Mohm	-
ADC	Type	SigmaDelta		SigmaDelta		SigmaDelta	
	Oversampling Frequency	9MHz(Typ)		9MHz(Typ)		9MHz(Typ)	
	Datarate	144ksps (MAX)		144ksps (MAX)		144ksps (MAX)	
-3dB BW	Analog	630kHz 4th Order Butterworth		630kHz 4th Order Butterworth		630kHz 4th Order Butterworth	
	Digital	68kHz@140 ksps		68kHz@140 ksps		68kHz@140 ksps	
		9.6kHz@20ksps,140ksps		9.6kHz@20ksps,140ksps		9.6kHz@20ksps,140ksps	
		3.1kHz@12ksps,6ksps		3.1kHz@12ksps,6ksps		3.1kHz@12ksps,6ksps	
		2.6kHz@10ksps,5ksps		2.6kHz@10ksps,5ksps		2.6kHz@10ksps,5ksps	
-0.1dB BW	Analog	320kHz 4th Order Butterworth		320kHz 4th Order Butterworth		320kHz 4th Order Butterworth	
	Digital	66kHz@140 ksps		66kHz@140 ksps		66kHz@140 ksps	
		9.2kHz@20ksps,140ksps		9.2kHz@20ksps,140ksps		9.2kHz@20ksps,140ksps	
		3kHz@12ksps,6ksps		3kHz@12ksps,6ksps		3kHz@12ksps,6ksps	
		2.5kHz@10ksps,5ksps		2.5kHz@10ksps,5ksps		2.5kHz@10ksps,5ksps	
Typical SNR		95dB		95dB		95dB	
Typical CMRR		90dB		90dB		90dB	
Isolation Voltage		6kV	Sensor Isolation	6kV	4.3kV	6kV	4.3kV
Surge		±4000V	-	±4000V	±4000V	±4000V	±4000V
Burst		±4000V	±4000V	±4000V	±4000V	±4000V	±4000V

6.4 Mechanical Dimensions

19"
4HE height
400mm depth

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7 Accessories

Order Code	Description
AM-CL-5	current clamp 5A, Lemo connector 10pin
AM-CL-Rog10k	Rogowski coil up to 10kA, Lemo connector 10pin
AM-CL-300DC	DC clamp up to 300A, Lemo connector 10pin
AM-60-TP	rugged carrying case for AM-10-PA
AM-60-Route	internal Router for GSM and WLAN
AM-10-antenna	external antenna for AM-10-Route
AM-screwadapter	5 red and 5 black screwable banana adapter for terminals
AM-magnetic adapter	5 black magnetic voltage adapters, 5mm
AM-alligator clamp	5 crocodile clamps, black
AM-10-leads	5 red and 5 black measurement leads, 2m
AM-leadfuse	3 fuse holders for measurement leads, 500mA
AS-Server-light	ARTEMES server light for up to 4 measurement units (included in AS-Basic)
AS-Server	ARTEMES Server for more than 4 measurement units, web-based analysis tool for ARTEMES measurement instruments, for Windows Server, Linux on request
AS-Topo	ARTEMES toplogical view for control centres (add-on to the ARTEMES server)
AS-Cloud-light	using the cloud for 6 months, for new instruments only (included in AS-Basic)
AS-Cloud	monthly rent for the cloud server; The cloud server is a virtual server in the internet on which you can store and analyse your data, secured by VPN. The software corresponds to the ARTEMES server technology.
AS-Modbus	ARTEMES driver for AS-Basic: Modbus (TCP and serial)
AS-104	ARTEMES driver for AS-Basic: IEC 60870-5-104 protocol
AS-61850	ARTEMES driver for AS-Basic: IEC 61850

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8 Maintainance and care

8.1 Regular calibration

We recommend a calibration of the instrument every 2 years.
Calibration can be carried out directly by ARTEMES.

8.2 Service

In case of any questions, malfunction, damage or misuse, please contact ARTEMES.

Maintenance work should be done by ARTEMES only.

The service address is:

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