PRODUCT CATALOGUE

2016

ENERGY MANAGEMENT SYSTEMS
POWER FACTOR CORRECTION
POWER QUALITY ANALYSERS

KMB
S Y S T E M S

Contents

Introduction

Power Quality and Energy Management

We cover all its needs from a simple low-cost panel meter for building management to the high-end power quality analysers for demanding smart grid applications. We also develop special meters for DC grids and hybrid AC/DC applications - in distributed generation, data centers, telco, energy storage, transportation etc. The NEMO portable data-loggers are excellent yet affordable tools for temporal power quality and energy management campaigns.

To analyse data in full details all instruments do support the ENVIS application. Remote communications for integration in other automation systems is also available.

Power Factor Correction Relays

NOVAR presents a complete product line of automatic power factor controllers. It is reliable, efficient, fully automatic, precise and easy to install and maintain. In our portfolio we offer basic controllers for budgetary applications, classical controllers with broad range of communication options and also a high-end three-phase controllers with graphical displays and optional data-logging functions.

Special real-time power factor controller NOVAR 1312 supports thyristor switched compensation with KATKA switches.

ENVIS: Software for Setup and Data Analysis

ENVIS represents a complete solution for local energy and power quality management monitoring system. In its simplest use case it helps the user to install and monitor supported instruments. It collects the data automatically and provide detailed insights, trends and reports. Back-end for data storage is optimized for speed and compression, but we also support other open formats for data exchange such as PQDIF, XLS, CSV. SQL server database can also be used.

Standard version of ENVIS is provided free of charge and allows configuration, data acquisition and basic data processing. Special functionality can be provided via customized plugins.
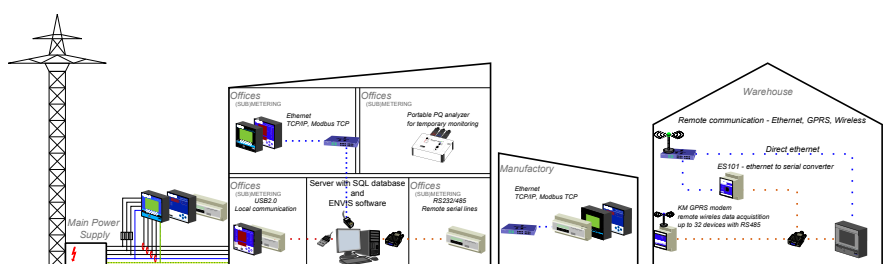
About KMB systems

Our main goal is to excel in development, manufacturing and marketing of advanced electronic devices for precise measurement and effective utilization of electrical power in all its possible applications. History of the company began in 1991 as an association of founders with experience in industrial automation and electronics. The first significant project for SCE Decin electrical utility led our interests towards remote monitoring of power distribution grids.

In 1992 we have transformed into a small business (ltd.). Portable data-logger SIMON for LV, MV and HV distribution networks is introduced the same year. We have used the SMD technology already in this product. Quite surprisingly some of these units are still in active use in 2015. Gradually our portfolio has grown with panel and din rail mounted meters, ripple control signal monitoring instruments and other devices.

In 1999 company has presented a successful innova-

tive and award winning product - the NOVAR power factor controller. And it has been living with us since then. Recently we have innovated and complemented this PFC product line to follow requirements of different markets in the coming years.

Since 2002 we are progressively expanding to foreign markets mostly in Europe, Asia and Middle East.

In cooperation with Technical University in Liberec we also assure advanced research capabilities and innovative approach to our customers. TrafoSTART electronic relay for soft starting single-phase transformers (patent number CZ 296466) and smart ferroresonance load AFR are prime examples of this cooperation.

In 2009 we have introduced a new line of power quality analysers for three phase voltage networks which we actively focus on since then. The innovated class S and class A analysers such as SMC, SMD, SMY and ARTIQ with high precision of measurement tested in accordance with the demanding IEC 61557-12 standard are the most up-to date products in this series.

For the year 2014 we have prepared advanced three-phase power factor controller — the NOVAR 26 with large graphical screen and optional memory and a simpler NOVAR 24 for budgetary applications. Communication port became an important feature - we now offer instruments with several communication port such as native Ethernet, simple Modbus RTU and TCP, web server and many more.

2016 sees our company strong in product portfolio, development capabilities and skilled man power. We focus our R&D in emerging technologies for measuring and controlling of the quality of electrical energy in smart grids, distributed generation, energy efficiency monitoring and advanced power quality solutions. This year we plan to release significant updates to portable data-loggers family,

The company is certificated by the quality assurance system according to the EN ISO 9001:2009 standard.

KMB
SYSTEMS

	SML 33	SMM 33	SMK 133	SML 133	SMC 118	PA 144
Measuring Range	**230**: 4 ÷ 500V$_{LL}$ 2,3 ÷ 285V$_{LN}$ **100**: 2 ÷ 200V$_{LL}$ 1 ÷ 115V$_{LN}$ **400**: 4 ÷ 505V$_{LL}$ 7 ÷ 880V$_{LN}$	**230**: 4 ÷ 500V$_{LL}$ 2,3 ÷ 285V$_{LN}$ **100**: 2 ÷ 200V$_{LL}$ 1 ÷ 115V$_{LN}$ **400**: 4 ÷ 505V$_{LL}$ 7 ÷ 880V$_{LN}$	**230**: 8 ÷ 620V$_{LL}$ 6 ÷ 360V$_{LN}$ **100**: 5 ÷ 310V$_{LL}$ 3 ÷ 180V$_{LN}$ **400**: 20 ÷ 865V$_{LL}$ 10 ÷ 600V$_{LN}$	**230**: 8 ÷ 660V$_{LL}$ 6 ÷ 375V$_{LN}$ **100**: 5 ÷ 330V$_{LL}$ 3 ÷ 190V$_{LN}$ **400**: 20 ÷ 865V$_{LL}$ 10 ÷ 600V$_{LN}$	11 ÷ 520V$_{LL}$ 6 ÷ 300V$_{LN}$	11 ÷ 520V$_{LL}$ 6 ÷ 300V$_{LN}$
Auxiliary voltage	**U**: 75 ÷ 510V$_{AC}$ 80 ÷ 350V$_{DC}$ **24**: 16 ÷ 30V$_{AC}$ 18 ÷ 36V$_{DC}$ **48**: 32 ÷ 54V$_{AC}$ 36 ÷ 72V$_{DC}$	**U**:75 ÷ 510V$_{AC}$ 80 ÷ 350V$_{DC}$ **24**: 16 ÷ 30V$_{AC}$ 18 ÷ 36V$_{DC}$ **48**: 32 ÷ 54V$_{AC}$ 36 ÷ 72V$_{DC}$	**U**: 85 ÷ 275V$_{AC}$ 80 ÷ 350V$_{DC}$ **S**: 10 ÷ 26V$_{AC}$ 10 ÷ 36V$_{DC}$ **H**: 85 ÷ 480V$_{AC}$ **N**: -	**U**: 90 ÷ 275V$_{AC}$ 90 ÷ 350V$_{DC}$ **S**: 10 ÷ 26V$_{AC}$ 10 ÷ 36V$_{DC}$ **L**: 20 ÷ 50V$_{AC}$ 20 ÷ 75V$_{DC}$	**U**:75 ÷ 510V$_{AC}$ 80 ÷ 350V$_{DC}$ **S**: 10 ÷ 26V$_{AC}$ 10 ÷ 36V$_{DC}$ **L**: 20 ÷ 50V$_{AC}$ 20 ÷ 75V$_{DC}$	**U**:75 ÷ 510V$_{AC}$ 80 ÷ 350V$_{DC}$ **S**: 10 ÷ 26V$_{AC}$ 10 ÷ 36V$_{DC}$ **L**: 20 ÷ 50V$_{AC}$ 20 ÷ 75V$_{DC}$
Measurement cat.	CAT III/ 300V	CAT III/ 300V	CAT III/ 300V	CAT III/ 300V	CAT III/ 300V	CAT III/ 300V
Measurement	3U, 3I	3U, 3I	3U, 3I	3U, 3I	1U, 8I	4U, 4I
Current Inputs	X/5A, X/1A, Sxxx, Pxxx	X/5A, Sxxx, Pxxx	X/5A, X/100mA, H20A	X/5A, X/100mA, 333mV	X/100mA, X/4V Sxxx, Pxxx	X/100mA, Sxxx, Pxxx
Quadrants	4	4	4A, 4R	4A, 4R	4A, 4R	4A, 4R
Sampling rate	6,4kHz	6,4kHz	6,4kHz	6,4kHz	6,4kHz	6,4kHz
Aggregation	80ms	80ms	200ms	200ms	200ms	200ms
Continuous meas.	●	●	●	●	●	●
Harmonics V/A	-	-	1 - 50	1 - 50	1 - 50	1 - 50
Interharmonics	-	-	-	-	○ PQ S	-
THD-U [%]	●	●	●	●	●	●
THD-I [%]	●	●	●	●	●	●
Unbalance	-	-	●	●	●	●
Flicker (Pst, Plt)	-	-	-	-	-	-
Voltage Events	-	-	-	-	-	-
Waveforms	-	-	-	-	-	-
Accuracy V/A	±0.5%rdg±0.5%rng	±0.5%rdg±0.5%rng	0.2	0.2	0.1/0.2	0.1/0.2
Active energy	-	-	1	0.5	1	1
Reactive energy	-	-	2	1	2	2
Digital I/O	-	-	-/1	1/2	2/1	2/1
Relay outputs	-	-	1	2	1	1
Analogue I/O	-	-	-/-	-/-	-/-	-/-
Temp. input	-	-	-	-	-	-
Internal temp.	●	●	●	●	●	●
Min/max memory	-	-	●	●	●	●
Memory size	-	-	-	-	512 MB	-
Clock	-	-	-	-	●	-
Software	ENVIS	ENVIS	ENVIS	ENVIS	ENVIS	ENVIS
EN 50160	-	-	-	-	-	-
IEC 61000-4-30	-	-	-	-	-	-
Interfaces						
RS 485	○	○	○	○	●	●
Ethernet	-	-	-	○	○	○
USB	-	-	-	-	○	○
Web server	-	-	-	○	○	○
Wifi	-	-	-	-	○	-
Gateway	-	-	-	-	○ ES	-
Protocols						
Modbus RTU	○	○	○	○	●	●
KMB	○	○	○	○	●	●
ModBus TCP	-	-	-	○	○	○
Construction						
Display	segment LED	segment LED	segment LED	segment LCD	○	○
Dimension	96×96×59	89×90×58	96×48×110	96×96×59	106×90×58	106×90×58
Mounting	panel	DIN35	panel	panel	DIN35	DIN35

●, ② - Standard
○, ② - Optional

SMC 144	SMY 133	SMC 133	SMZ 133	ARTIQ 144	
$11 \div 520V_{LL}$ $6 \div 300V_{LN}$	**230**: $8 \div 660V_{LL}$ $6 \div 375V_{LN}$ **100**: $5 \div 330V_{LL}$ $3 \div 190V_{LN}$ **400**: $20 \div 1090V_{LL}$ $10 \div 625V_{LN}$	**230**: $8 \div 720V_{LL}$ $6 \div 420V_{LN}$ **100**: $5 \div 310V_{LL}$ $3 \div 180V_{LN}$	**230**: $8 \div 660V_{LL}$ $6 \div 375V_{LN}$ **100**: $5 \div 330V_{LL}$ $3 \div 190V_{LN}$ **400**: $20 \div 1090V_{LL}$ $10 \div 625V_{LN}$	$1 \div 1470V_{LL}$ $1 \div 850V_{LN}$	Measuring Range
U:$75 \div 510V_{AC}$ $80 \div 350V_{DC}$ **S**: $10 \div 26V_{AC}$ $10 \div 36V_{DC}$ **L**: $20 \div 50V_{AC}$ $20 \div 75V_{DC}$	**U**: $100 \div 275V_{AC}$ $90 \div 350V_{DC}$ **S**: $10 \div 26V_{AC}$ $10 \div 36V_{DC}$ **L**: $20 \div 50V_{AC}$ $20 \div 75V_{DC}$	**S**: $10 \div 36V_{DC}$ **L**: $20 \div 75V_{DC}$	**H**: $75 \div 500V_{AC}$ $90 \div 600V_{DC}$	**U**:$85 \div 275V_{AC}$ $80 \div 350V_{DC}$ **S**: $10 \div 26V_{AC}$ $10 \div 36V_{DC}$ **L**: $20 \div 50V_{AC}$ $20 \div 75V_{DC}$	Auxiliary voltage
CAT III/ 300V	CAT III/ 300V	CAT IV/ 300V	CAT III/ 300V	CAT III/ 300V	Measurement cat.
4U, 4I	3U, 3I	3U, 3I	3U, 3I	4U, 4I	Measurement
X/100mA, Sxxx, Pxxx	X/5A, X/100mA, 333mV	X/5A, X/100mA	X/5A, X/1A, X/100mA	X/100mA, Sxxx, Pxxx	Current Inputs
4A, 4R	4A, 4R	4A, 4R	4A, 4R	4A, 4R	Quadrants
6,4kHz	6,4kHz	6,4kHz	6,4kHz	14,4kHz	Sampling rate
200ms	200ms	200ms	200ms	200ms	Aggregation
●	●	●	●	●	Continuous meas.
1 - 50	1 - 50	1 - 50	1 - 50	1 - 128	Harmonics V/A
○ PQ S	○ PQ S	○ PQ S	○ PQ S	○ PQ A	Interharmonics
●	●	●	●	●	THD-U [%]
●	●	●	●	●	THD-I [%]
●	●	●	●	●	Unbalance
○ PQ S	○ PQ S	○ PQ S	○ PQ S	○ PQ A	Flicker (Pst, Plt)
○ PQ S	○ PQ S	○ PQ S	○ PQ S	○ PQ A	Voltage Events
○ GO	○ GO	○ GO	○ GO	○ GO	Waveforms
0.1/0.2	0.2	0.2	0.2	0.05	Accuracy V/A
1	0.5	1	0.5	0.2	Active energy
2	1	2	1	1	Reactive energy
2/1	2/2	-/-	5/4	2/2	Digital I/O
1	2	-	4	-	Relay outputs
-/-	-/-	-/-	2/2	-/-	Analogue I/O
-	-	-	1	-	Temp. input
●	●	●	●	●	Internal temp.
●	●	●	●	●	Min/max memory
512 MB	512 MB	512 MB	512 MB	512 MB	Memory size
●	●	●	●	●	Clock
ENVIS	ENVIS	ENVIS	ENVIS	ENVIS	Software
○ PQ S	○ PQ S	○ PQ S	○ PQ S	○ PQ A	EN 50160
class S	class S	class S	class S	class A	IEC 61000-4-30
					Interfaces
●	○	●	○	●	RS 485
○	○	○	○	○	Ethernet
○	●	○	●	○	USB
○	○	○	○	○	Web server
○	-	-	-	-	Wifi
○ ES	○ ES	○ ES	○ ES	○ ES	Gateway
					Protocols
●	○	●	○	●	Modbus RTU
●	●	●	●	●	KMB
○	○	○	○	○	ModBus TCP
					Construction
○	colour LCD	-	mono. LCD	-	Display
106×90×58	96×96×59	106×99×58	144×144×59	106×90×58	Dimension
DIN35	panel	DIN35	panel	DIN35	Mounting

●, 2 - Standard

○, 2 - Optional

KMB SYSTEMS

ARTIQ 144

Advanced Power Quality Analyser for Smart Grids

ARTIQ 144 is an advanced compact power quality monitor for smart grids, distribution network monitoring, heavy duty industrial automation and larger energy management projects. Extremely precise power monitor and energy meter in combination with embedded data logger and event recorder makes it an ideal solution for higher added value projects.

Each ARTIQ can be equipped with optional Ethernet communication interface, USB or up to two RS 485 serial lines. Configuration and data management is provided with ENVIS application. In combination with ENVIS.Online service the archived data can be periodically stored to the SQL database and automatically processed.

Standards: measures according to EN 61000-4-30 ed. 3 Class A, EN 61000-4-7 ed. 2 class I, EN 61000-4-15 ed. 2.0 F1, reports power quality according to EN 50160 ed3, active energy measures in IEC 62053-22 class 0.2S, reactive in IEC 62053-22 class 2, conforms to IEC EN 61557-12.

Key features:

- four independent voltage and current inputs continuously sampled at 14,4 kHz/ch.

- precise active and reactive energy, 3 TOU tariffs, three- and single-phase meter readings

- embedded RS-485 interface, optional Ethernet, USB or secondary serial line

- IEC 61557-12: voltage and current in class 0.05, active power class 0.1, reactive class 1

- low consumption and heat dissipation, wide range operating temperature

Standard

INPUTS	MEASUREMENT		+/-	HARMONICS	SAMPLING
4U, 4I	**U,I,P,Q**	**PF,cos,THD**	**Wh,varh**	**128**	**14,4kHz**

INPUTS	OUTPUTS	STANDARDS	STANDARDS	STANDARDS	FLASH
2×DIGI	**2×PULSE**	**class 0.2S** IEC 62053-22	**IEC 61557-12**	**EN 50160**	**512MB**

BATTERY	RS485	MODBUS
		Modbus

Optional

SUPPLY	ETH	WEBSERVER
12V/24V/230V		

CURRENT INPUT	CURRENT INPUT	CURRENT INPUT	NTP
X/100mA	**Sxxx**	**Pxxx**	

STANDARDS
class A IEC 61000-4-30

Technical specifications

METERING	Voltage (ULN, ULL)	U1, U2, U3, UN, U12, U23, U31 [act, avg, avg$_{max}$, avg$_{min}$]
	Current (I)	IL1, IL2, IL3, ILN [act, avg, avg$_{max}$, avg$_{min}$]
	Power (P)	P1, P2, P3, PN, 3P (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Reactive Power (Q)	Q1, Q2, Q3, QN, 3Q (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Apparent Power (S)	S1, S2, S3, SN, 3S [act, avg, avg$_{max}$, avg$_{min}$]
	Harm. Distortion Power (D)	D1, D2, D3, DN [act, avg, avg$_{max}$, avg$_{min}$]
	Power Factor (PF), cosφ	PF1, PF2, PF3, PFN, 3PF, cosφ1, cosφ2, cosφ3, cosφN, 3cosφ [act, avg, avg$_{max}$, avg$_{min}$]
	Symmetrical Components	zero, negative and positive sequence components of voltage and current
	Unbalance Factor	unbI, unbU, φnsI
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDUN, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3, THDIN
	Individual Harmonics	Harmonics 1st to 128th of Voltage and Current and their angles
	Fundament. Harmonic (Ufh, Ifh)	U1fh, U2fh, U3fh, Unfh, I1fh, I2fh, I3fh, INfh
	Frequency (f)	f
	Active Energy	class 0.2S (62053-22), import/export, per phase, per tariff, total
	Reactive Energy	class 2 (62053-23), 4 quadrants, per phase, per tariff, total
DATALOG.	Main Archive	min., max., avg. values of ULN, ULL, I, P, Q, S, D, THDU, THDI, f, Avg. values of harmonics and their angles, Ufh, Ifh, Symmetrical components, Unb. factors, state of I/Os
	Electricity Meter Readings	Active and reactive imp. and exp. energy per phase (L1, L2, L3) and per tariff (T1, T2, T3)
	Voltage Event logging	Yes
	Waveforms recording	optional firmware module General Oscilogram
OTHERS	Alarms	Logical functions, under/over limit of U, I, P, Q, S, unbl, THD, cos, f
	Inputs/Outputs	2 digital inputs, 2 digital outputs
	Memory Size	512MB
	RTC	seconds, minutes, hours, days, months, years
	Communication	RS485, Ethernet, USB

POWER	aux. voltage	**U**: 85 ÷ 275 V$_{AC}$ / 80 ÷ 350 V$_{DC}$	
		S: 10 ÷ 26 V$_{AC}$ / 10 ÷ 36 V$_{DC}$	
		L: 20 ÷ 50 V$_{AC}$ / 20 ÷ 75 V$_{DC}$	
	power	10 VA / 5 W	
	meas. cat.	CAT III / 300 V	
INPUT	**VOLTAGE** meas. range	1 ÷ 1470 V$_{AC}$ / 1 ÷ 850 V$_{AC}$ (ln/ph)	
	input impedance	3,9 MΩ (L$_i$↔N)	
	connection	wye, delta, aron	
	overload	1300 V$_{AC}$ (perm.), 2210 V$_{RMS}$ (1s)	
	CURRENT meas. range	0,0005 ÷ 2 × I$_{NOM}$	
	overload	3 × I$_{NOM}$ (perm.), 5 ÷ 20 × I$_{NOM}$ (1s)	

I/O	**D** voltage levels	U$_L$ < 3 V, U$_H$ > 10 V, U$_{MAX}$ = 30 V	
	input current	3 mA @ 12V / 8 mA @ 24V	
	I SSR ratings	100 V$_{AC/DC}$, 100 mA	
OTHER	**TEMP** operating	-25 ÷ 60°C, <95% non-condens.	
	storage	-40 ÷ 85°C, <95% non-condens.	
	EMC emission	EN 61000 – 4 – 2, 3, 4, 5, 6, 11	
	immunity	EN 55011 - class A, EN 55022 - class A	
	protect. rating	IP 20	
	dimensions	105W × 90H × 58D mm / 0,2 kg	

COMMUNICATION	RS-485 (standard) galvanically isolated KMBlong, MODBUS RTU protocols 2400 ÷ 921600 baud
	Ethernet (opt. **E**) KMBlong, MODBUS TCP protocols
	USB 2.0 (opt. **U**) KMBlong, MODBUS RTU protocols Connector type Mini-B

ACCURACY (IEC 61557-12)	
voltage	0.05
current	0.05
active power	0.1
reactive power	1
apparent power	0.2
PF, cosφ	0.5
frequency	0.02
active energy	0.2
reactive energy	2
harm. and THD	1
unbalance	0.2
flicker	2 (F1)

KMB SYSTEMS

Ordering options

<table>
<tr><td colspan="2">ARTIQ 144 U X/100mA E</td></tr>
<tr><td>Instrument model
   ARTIQ = Class A instrument series, 4U, 4I, 2DO, 2DI, RS-485</td><td></td></tr>
<tr><td>Auxiliary power supply
   U = 75 V ÷ 275 VAC, 75 V ÷ 350 VDC
   S = 10 V ÷ 26 VAC, 10 V ÷ 36 VDC
   L = 20 V ÷ 50 VAC, 20 V ÷ 75 VDC</td><td></td></tr>
<tr><td>Current inputs
   X/100mA = 100mA AC (indirect measurement)
   Snnn   = with low current output CTs, split-core
   Pnnn   = with low current output CTs, through-hole
   NOCT   = without current inputs</td><td></td></tr>
<tr><td>Optional expanding module
   N = without expanding module
   U = USB
   E = Ethernet interface</td><td></td></tr>
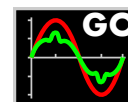</table>

Optional firmware modules

PQ A module

Enables detailed evaluation of power quality according to the EN 50160 into a separate PQ Main archive. It includes flicker, voltage and current inter-harmonics, a RCS voltage level and voltage events - dips, swells and interruptions. Special Modbus registers are activated so that the supervising SCADA system can continuously monitor the live PQ status.

GO module

Module for detection and precise recording of various waveform distortions. This module records the so called oscillograms of voltages and currents in extended detail, capacity and trigger options into the flash memory.

RCS module

The RCS module (ripple control signal or mains voltage) activates an ability to detect, evaluate, decode and store RCS messages transmitted over the distribution network. It precisely measures voltage on the selected frequency and stores the extracted information.

MM Module

The Modbus Master module enhances instruments data logging abilities. By using this module you can configure the instrument to read and store any Modbus registers from any instruments of any manufacturer connected to it's RS-485 line.

ES Module

The Ethernet to Serial module makes gateway between Ethernet and serial line (RS-485). By using this module you can access your RS-485 instruments over Ethernet.

Typical connection schema

20V ÷ 75 V DC
24V ÷ 48 V AC

10V ÷ 50 V DC
12V ÷ 24 V AC

ARTIQ 144
Power Quality Analyzer

ETH

MV/LV
Transformer

L1
L2
L3
N
PE

Mechanical dimensions

106

60.6

30.3

99.8

90

58

21.5   10

45

62

ARTIQ 144
Power Quality Analyzer

ARTIQ 144 U   P050 N   N   N
~ 75 - 400 V, 42 - 69 Hz,   7 VA
Serial: 001
Date: 08 | 2012
Made in Czech Republic
KMB systems, s.r.o. | http://www.kmb.cz
IP 20

KMB
SYSTEMS

SMC 133

Analyser and Data Logger for Smart Grid

SMC 133 is specially designed for remote monitoring of energy consumption and its quality. The DIN rail display-less design is suitable for a wide spectrum of tasks in substations and similar high demanding applications. Absence of local panel controls (display and keyboard) limits possibilities for hostile user interaction.

This instruments are an ideal source of data for any modern SCADA system with embedded support for ModBus protocol and it is also supported by our free ENVIS application. Its input and output set can be extended with additional IO modules for advanced control functionality.

SMC 133 features large internal memory for data logging of measured values. Quantities include a multitude of additional functions such as the storage of minimum, average and maximum values, energy consumption, logs of state changes and many other. All this information is available for later download by the supervising software.

Key features:

- three independent voltage and current inputs (3p-wye, 3p-delta, 3p-Aron)

- measurement category 300V / CAT IV

- internal 1 hour UPS

- electricity meter supports 3 tariffs, single- and three-phase measurement in four or six quadrants

- basic measurement interval 10/12 periods, 128 samples/period

- standard embedded RS-485 interface, optionally Ethernet, USB

- features can be upgraded via external I/O modules (with ModBus Master fw. module)

Standard | Optional

INPUTS 3U, 3I	**MEASUREMENT** U,I,P,Q	PF,cos,THD	+/- Wh,varh	**CURRENT INPUT** X/100mA	**CURRENT INPUT** X/5A	**USB**
HARMONICS 50	**SAMPLING** 6,4kHz	**FLASH** 512MB	**BATTERY**	**ETH**	**WEBSERVER**	**NTP**
RS485	**MODBUS** Modbus	**STANDARDS** IEC 61557-12	**STANDARDS** class 1 IEC 62053-21	**SUPPLY** 12V/24V	**STANDARDS** EN 50160	**STANDARDS** class S IEC 61000-4-30

Technical specification

METERING		
	Voltage (ULN, ULL)	U1, U2, U3, U12, U23, U31 [act, avg, avg$_{max}$, avg$_{min}$]
	Current (I)	IL1, IL2, IL3 [act, avg, avg$_{max}$, avg$_{min}$]
	Power (P)	P1, P2, P3, 3P (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Apparent Power (S)	S1, S2, S3, 3S [act, avg, avg$_{max}$, avg$_{min}$]
	Harm. Distortion Power (D)	D1, D2, D3 [act, avg, avg$_{max}$, avg$_{min}$]
	Power Factor (PF), cosφ	PF1, PF2, PF3, 3PF, cosφ1, cosφ2, cosφ3, 3cosφ [act, avg, avg$_{max}$, avg$_{min}$]
	Symmetrical Components	zero, negative and positive sequence components of voltage and current
	Unbalance Factor	unbI, unbU, φnsI
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3
	Individual Harmonics	Harmonics 1st to 50th of Voltage and Current and their angles
	Fundament. Harmonic (Ufh, Ifh)	U1fh, U2fh, U3fh, I1fh, I2fh, I3fh
	Frequency (f)	f
	Active Energy	class 0.5S (62053-22), import/export, per phase, per tariff, total
	Reactive Energy	class 2 (62053-23), 4 quadrants, per phase, per tariff, total
DATALOG.	Main Archive	min., max., avg. values of ULN, ULL, I, P, Q, S, D, THDU, THDI, f, Avg. values of harmonics and their angles, Ufh, Ifh,Symmetrical components, Unb. factors, state of I/Os
	Electricity Meter Readings	Active and reactive imp. and exp. energy per phase (L1, L2, L3) and per tariff (T1, T2, T3)
	Voltage Event logging	optional firmware module Power Quality S
	Waveforms recording	optional firmware module General Oscilogram
OTHERS	Alarms	Logical functions, under/over limit of U, I, P, Q, S, unbl, THD, cos, f
	Inputs/Outputs	-
	Memory Size	512MB
	RTC	seconds, minutes, hours, days, months, years (SMC 144)
	Communication	RS485, Ethernet, USB

POWER		
	aux. voltage	S: 10 ÷ 36 V$_{DC}$
		L: 20 ÷ 75 V$_{DC}$
	power	3,5 VA / 3,5 W

INPUT	VOLTAGE		
		measuring range	230: 8 ÷ 720 V$_{LL}$ / 6 ÷ 420 V$_{LN}$ (1820V$_{LN}$/1s)
			100: 5 ÷ 310 V$_{LL}$ / 3 ÷ 180 V$_{LN}$ (600V$_{LN}$/1s)
		measurement category	230: CAT III / 300V
			100: CAT III / 300V
		measuring range	X/100mA: 0,25mA÷0.15A (10A/1s) X/5A: 12,5mA ÷ 7,5A (90A/1s)

OTHER		
	Internal battery	up to 1hour of operation, 1000mAh
TEMP	operating	-25 ÷ 60°C, <95% non-condens.
	storage	-40 ÷ 85°C, <95% non-condens.
EMC	emission	EN 61000 – 4 – 2, 4, 5, 6, 11
	immunity	EN 55011 - class A EN 55022 - class A
	protection rating	IP 20
	dimensions	105W × 90H × 58D mm / 0,2 kg

COMMUNICATION
RS-485 (standard) galvanically isolated KMBlong, MODBUS RTU protocols 2400 ÷ 921600 baud
Ethernet 10Base-T (opt. E) KMBlong, MODBUS TCP protocols 10 Mbit/s
USB 2.0 (opt. U) KMBlong, MODBUS RTU protocols Connector type Mini-B

ACCURACY (IEC 61557-12)	
voltage	0.2
current	0.2
active power	1
reactive power	2
apparent power	1
PF, cosφ	0.5
frequency	0.05
active energy	1
reactive energy	2
harm. and THD	2
unbalance	0.5
Flicker	5

KMB SYSTEMS

Ordering options

```
                                  SMC 133 S 230 X/100mA E
Instrument Model
    SMC 133 = Power analyser and datalogger, RS485
Auxiliary Power Supply
    S = 10 V ÷  36 VDC
    L = 20 V ÷  75 VDC
Nominal Measuring Voltage
    230 = 230V/400V
    100 = 57,7V/100V
Current Inputs
    X/100mA = 100mA AC (indirect measurement with 100mA CT)
    X/5A    = 5A AC (standard indirect measurement)
Remote Communication Interface
    N = without expanding module
    U = USB
    E = Ethernet interface
```
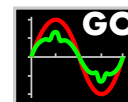
Optional firmware modules

PQ S module

Module for evaluation of power quality according to EN 50160 (class S). Enables measurement and recording of flicker indices, interharmonics and voltage events. Power quality is evaluated weekly and stored to special PQ Main archive for future processing.
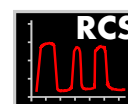
GO module

Module for detection and precise recording of various waveform distortions. This module records the so called oscillograms of voltages and currents in extended detail, capacity and trigger options into the flash memory.

RCS module

The RCS module (ripple control signal or mains voltage) activates an ability to detect, evaluate, decode and store RCS messages transmitted over the distribution network. It precisely measures voltage on the selected frequency and stores the extracted information.

MM Module

The Modbus Master module enhances instruments data logging abilities. By using this module you can configure the instrument to read and store any Modbus registers from any instruments of any manufacturer connected to it's RS-485 line.
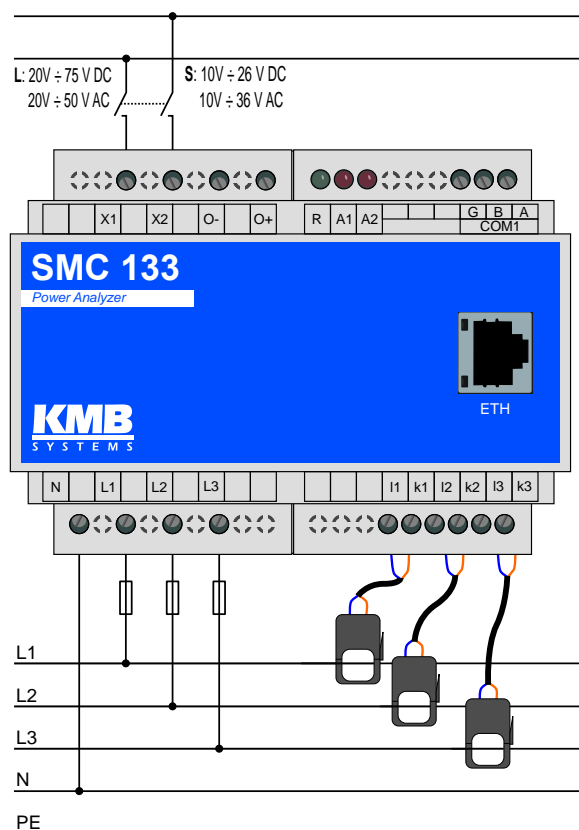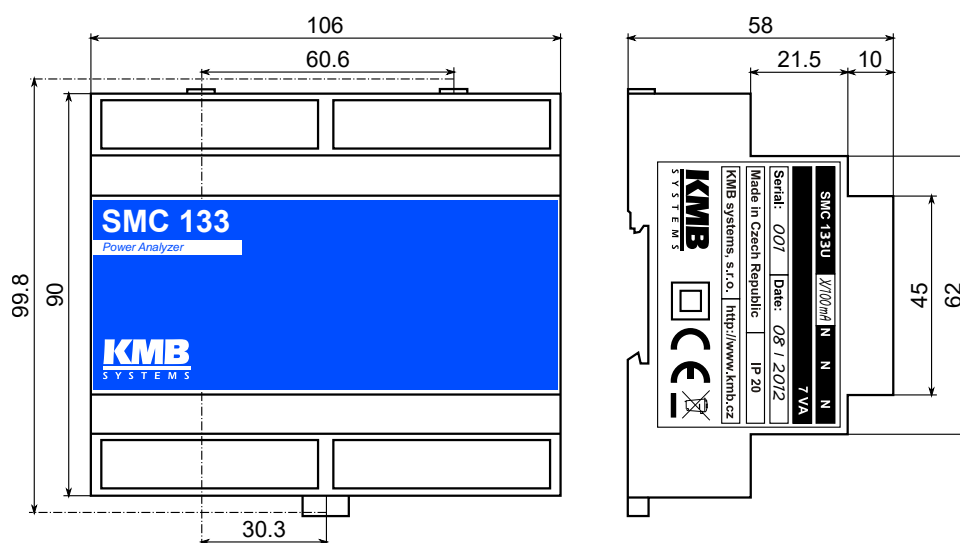
ES Module

The Ethernet to Serial module makes gateway between Ethernet and serial line (RS-485). By using this module you can access your RS-485 instruments over Ethernet.

Typical connection schema


Mechanical dimensions

SMY 133

Power Monitor and Data Logger

SMY 133 is an advanced 3-phase multimeter and data logger with large color LCD display. Instrument is designed for monitoring in single- and three-phase MV and HV distribution network stations as well as in regular LV cabinets. It includes per-phase and three phase active energy meter with separated generation / consumption readings and reactive energy, measured in all four quadrants.

Typical applications: wide area power quality monitoring in smart grids, live supervision with SCADA, industrial and commercial automation, sub-metering, energy and demand side management.

Programmable relays or pulse outputs can control other equipment based on measured values (fan control, over voltage/over current etc). S0 digital outputs translates embedded electricity meter energies to pulses.
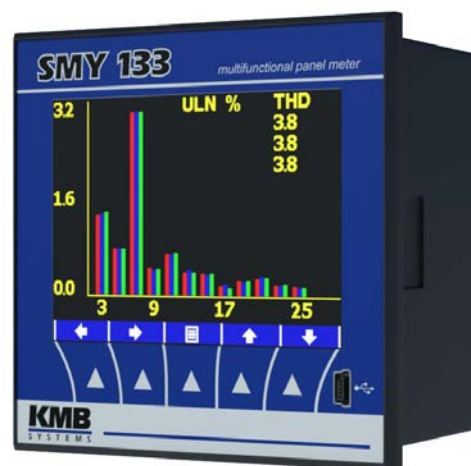
Key features:

- three-phase active and reactive energy meter (kWh, kvarh, L, C, +, -) measures in 4 quadrants

- energy: active 0.5S acc. IEC 62053-22, reactive class 2 (1) acc. IEC 62053-23

- voltage and current: class 0.2, active power 0.5 according to IEC 61557-12

- programmable pulse or relay outputs (option **RR**, **RI**, **II**), built-in temperature, binary input

- 512 MB of internal memory for data logging and energy recording

- continuous sampling 128 s./period, 6.4 kHz, direct & indirect measurement (with VT and CT)

- local USB, optional remote RS 485 or Ethernet communication

Standard

INPUTS	MEASUREMENT		+/-	HARMONICS
3U, 3I	**U,I,P,Q**	**PF,cos,THD**	**Wh,varh**	**50**

SAMPLING	FLASH	USB	STANDARDS	STANDARDS
6,4kHz	**512MB**		**IEC 61557-12**	**class 0.5S** IEC 62053-22

Optional

CURRENT INPUT	CURRENT INPUT	CURRENT INPUT	ETH	WEBSERVER	NTP
X/5A	**X/100mA**	**333mV**			

RS485	MODBUS	SUPPLY	STANDARDS	STANDARDS
	Modbus	**12V/24V/230V**	**EN 50160**	**class S** IEC 61000-4-30

OUTPUTS	OUTPUTS	INPUTS
2×RELAY	**2×PULSE**	**1×DIGI**

BUILT-IN POWER MONITORS

Technical specification

METERING	Voltage (ULN, ULL)	U1, U2, U3, U12, U23, U31 [act, avg, avg$_{max}$, avg$_{min}$]
	Current (I)	IL1, IL2, IL3 [act, avg, avg$_{max}$, avg$_{min}$]
	Power (P)	P1, P2, P3, 3P (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Apparent Power (S)	S1, S2, S3, 3S [act, avg, avg$_{max}$, avg$_{min}$]
	Harm. Distortion Power (D)	D1, D2, D3 [act, avg, avg$_{max}$, avg$_{min}$]
	Power Factor (PF), cosφ	PF1, PF2, PF3, 3PF, cosφ1, cosφ2, cosφ3, 3cosφ [act, avg, avg$_{max}$, avg$_{min}$]
	Symmetrical Components	zero, negative and positive sequence components of voltage and current
	Unbalance Factor	unbI, unbU, φnsI
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3
	Individual Harmonics	Harmonics 1st to 50th of U and I, their angles and interharm subgroups (PQ S)
	Fundament. Harmonic (Ufh, Ifh)	U1fh, U2fh, U3fh, I1fh, I2fh, I3fh
	Frequency (f)	f
	Active Energy	class 0.5S (62053-22), import/export, per phase, per tariff, total
	Reactive Energy	class 2 (62053-23), 4 quadrants, per phase, per tariff, total
DATALOGGING	Main Archive	min., max., avg. values of ULN, ULL, I, P, Q, S, D, THDU, THDI, f, Avg. values of harmonics and their angles, Ufh, Ifh, Symmetrical components, Unb. factors, state of I/Os
	Electricity Meter Readings	Active and reactive imp. and exp. energy per phase (L1, L2, L3) and per tariff (T1, T2, T3)
	Voltage Event logging	optional firmware module PQ S
	Waveforms recording	optional firmware module GO
OTHERS	Alarms	Logical functions, under/over limit of U, I, P, Q, S, unbl, THD, cos, f
	Inputs/Outputs	Optionally: 1 digital input, 2 relays or 2 digital outputs
	Memory Size	512MB
	RTC	seconds, minutes, hours, days, months, years
	Communication	USB, RS485, Ethernet

POWER	aux. voltage	**U**: 100 ÷ 275 V$_{AC}$ / 90 ÷ 350 V$_{DC}$
		S: 10 ÷ 26 V$_{AC}$ / 10 ÷ 36 V$_{DC}$
		L: 20 ÷ 50 V$_{AC}$ / 20 ÷ 75 V$_{DC}$
	power	8 VA / 3 W
	overvoltage cat.	CAT III / 300 V

INPUT	VOLTAGE	measuring range	**230**: 8÷660 V$_{LL}$ / 6÷375 V$_{LN}$ (1.2kV/1s)
			100: 5÷330 V$_{LL}$ / 3÷190 V$_{LN}$ (0,6kV$_{LN}$/1s)
			400: 20÷1090V$_{LL}$/10÷625V$_{LN}$ (2kV$_{LN}$/1s)
		measurement category	**230**, **400**: CAT III / 300V
			100: CAT IV / 150V
	CURRENT	measuring range	**X/5A**: 5 mA ÷ 7 A (70A/1s)
			X/100mA: 1 mA ÷ 390 mA (10A/1s)
			333mV: 2 mV ÷ 500 mV

I/O	D	voltage levels	U$_L$ < 3 V, U$_H$ > 10 V, U$_{MAX}$ = 60 V$_{AC}$ / 100 V$_{DC}$
		input current	1 mA @ 10V / 5 mA @ 24V 10 mA @ 48V
	I	ssr. ratings	60 V$_{AC}$ / 100 V$_{DC}$, 100 mA
	R	relay ratings	250 V$_{AC}$ / 30 V$_{DC}$, 5 A
OTHER	TEMP	operating	-25 ÷ 60°C, <95% non-condens.
		storage	-40 ÷ 80°C, <95% non-condens.
	EMC	emission	EN 61000 – 4 – 2, 4, 5, 6, 11
		immunity	EN 55011, EN 55022 - class A
		protection rating	IP 40 (optional IP 54) front panel
		dimensions	96W × 96H × 58D mm / 0,3 kg

COMMUNICATION	Local USB 2.0 (standard) KMBlong, MODBUS RTU protocols Connector type Mini-B
	RS-485 (opt. **4, E4**) galvanically isolated KMBlong, MODBUS RTU protocols 2400 ÷ 921600 baud
	Ethernet (opt. **E, E4**) KMBlong, MODBUS TCP protocols 100 Mbit/s

ACCURACY (IEC 61557-12)	voltage	0.2
	current	0.2
	active power	0.5
	reactive power	1
	apparent power	0.5
	PF, cosφ	0.5
	frequency	0.02
	active energy	0.5
	reactive energy	2
	harm. and THD	2
	unbalance	0.5
	flicker	5

KMB SYSTEMS

Ordering options

<pre>
                        SMY 133 U 230 X/5A RR E
Instrument Model
    SMY 133 = Power analyser, datalogger, 3U, 3I
Auxiliary Power Supply
    U = 100 V ÷ 275 VAC, 80 V ÷ 350 VDC
    S = 10 V ÷ 26 VAC, 10 V ÷ 36 VDC
    L = 20 V ÷ 50 VAC, 20 V ÷ 75 VDC
Nominal Measuring Voltage
    230 = 230V/400V
    100 = 57,7V/100V
    400 = 400V/690V
Current Inputs
    X/5A   = 5A and 1A AC (standard indirect measurement)
    X/100mA = 100mA AC (indirect measurement)
    X/333mV = input for sensors with 333mV output
Digital I/O
    N = without I/O
    RR = 2× relay output + 1× logical input 24V
    RI = 1× relay output + 1× pulse output + 1× logical input 24V
    II = 2× pulse output + 1× logical input 24V
    V = 2× pulse output + 2× logical input 24V (only with option E4)
Communication Interface
    N = USB, no remote comm. link
    4 = USB, RS-485
    E = USB, Ethernet 10BaseT
    E4 = USB, Ethernet, RS-485 (only with option V, 2×OUT 2×IN)
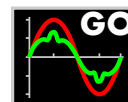</pre>

Optional firmware modules

PQ S module

Module for evaluation of power quality according to EN 50160 (class S). Enables measurement and recording of flicker indices, interharmonics and voltage events. Power quality is evaluated weekly and stored to special PQ Main archive for future processing.

GO module

Module for detection and precise recording of various waveform distortions. This module records the so called oscillograms of voltages and currents in extended detail, capacity and trigger options into the flash memory.

MM Module

The Modbus Master module enhances instruments data logging abilities. By using this module you can configure the instrument to read and store any Modbus registers from any instruments of any manufacturer connected to it's RS-485 line.
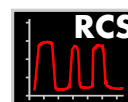

ES Module

The Ethernet to Serial module makes gateway between Ethernet and serial line (RS-485). By using this module you can access your RS-485 instruments over Ethernet.
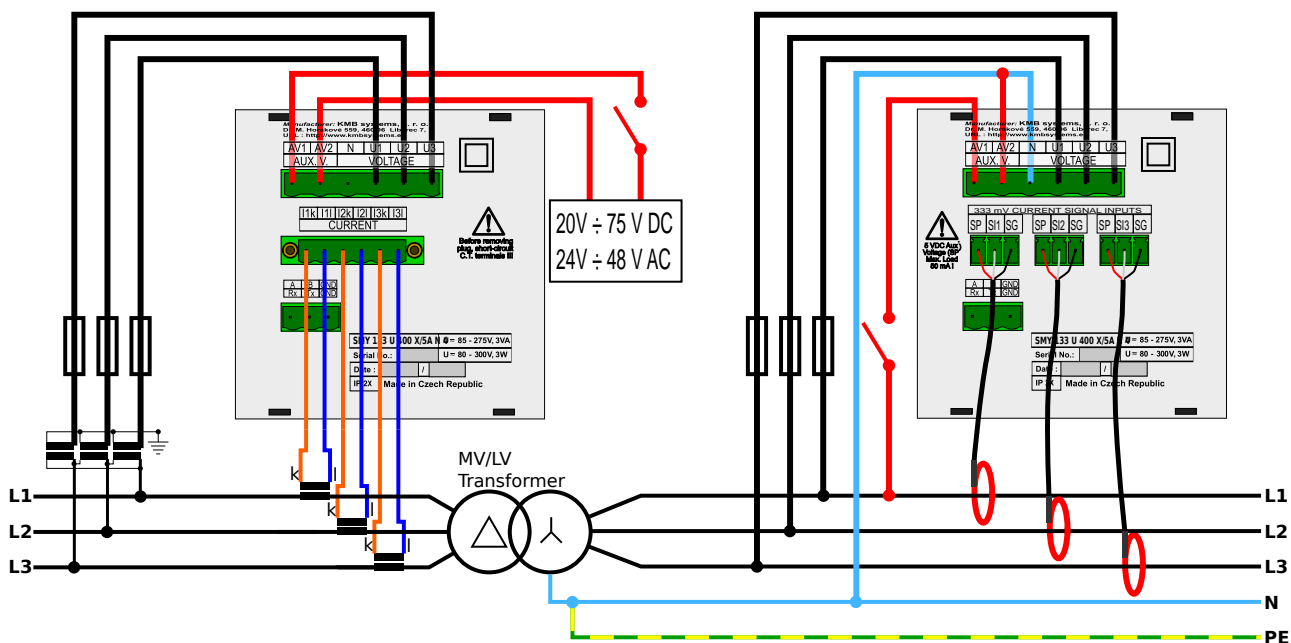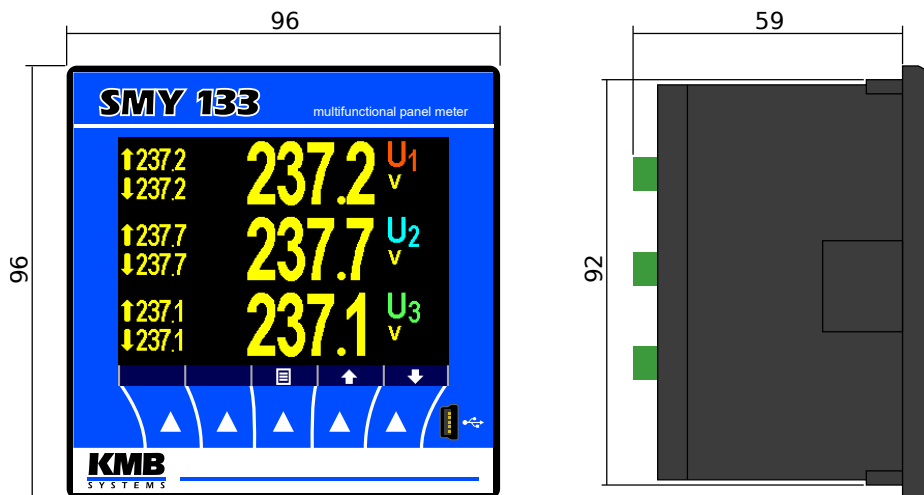

RCS module

The RCS module (ripple control signal or mains voltage) activates an ability to detect, evaluate, decode and store RCS messages transmitted over the distribution network. It precisely measures voltage on the selected frequency and stores the extracted information.

Typical connection schema

Mechanical dimensions

PA 144, SMC 144

Meters, Analysers and Data Loggers for Energy Management Systems

PA 144 and SMC 144 is specially designed for remote monitoring of energy consumption and its quality. The DIN rail display-less design with multiple communication options is suitable for a wide spectrum of automation tasks in modern buildings, remote supervision of the infrastructure and also remote load management. Absence of local panel controls (display and keyboard) limits possibilities for hostile user interaction.

This instruments are an ideal and cost-optimized source of data for any modern SCADA system with embedded support for ModBus protocol and it is also supported by our free ENVIS application. Its input and output set can be extended with additional IO modules for advanced control functionality.

PA 144 is sensor for measuring of actual values, SMC 144 furthermore features large internal memory for data logging of measured values.

Key features:

- four independent voltage and current inputs (4x1p, 3p-wye, 3p-delta)

- electricity meter supports 3 tariffs, single- and three-phase measurement in four or six quadrants

- basic measurement interval 10/12 periods, 128 samples/period

- optional bus for external modules or 2 digital inputs

- features can be upgraded via external I/O modules (with ModBus Master fw. module)

Standard

INPUTS	MEASUREMENT		+/-	HARMONICS
4U, 4I	U,I,P,Q	PF,cos,THD	Wh,varh	50

SAMPLING	FLASH	RS485	MODBUS	STANDARDS
6,4kHz	512MB		Modbus	IEC 61557-12

STANDARDS
class 1 IEC 62053-21

Optional

CURRENT INPUT	CURRENT INPUT	CURRENT INPUT	ETH	WEBSERVER	NTP
X/100mA	Sxxx	Pxxx			

USB	M-BUS	SUPPLY	STANDARDS	STANDARDS
	M-Bus	12V/24V/230V	EN 50160	class S IEC 61000-4-30

OUTPUTS	OUTPUTS	INPUTS
1×RELAY	1×PULSE	2×DIGI

KMB SYSTEMS

BUILT-IN POWER MONITORS

Technical specification

METERING		
	Voltage (ULN, ULL)	U1, U2, U3, UN, U12, U23, U31 [act, avg, avg$_{max}$, avg$_{min}$]
	Current (I)	IL1, IL2, IL3, ILN [act, avg, avg$_{max}$, avg$_{min}$]
	Power (P)	P1, P2, P3, PN, 3P (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Reactive Power (Q)	Q1, Q2, Q3, QN, 3Q (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Apparent Power (S)	S1, S2, S3, SN, 3S [act, avg, avg$_{max}$, avg$_{min}$]
	Harm. Distortion Power (D)	D1, D2, D3, DN [act, avg, avg$_{max}$, avg$_{min}$]
	Power Factor (PF), cosφ	PF1, PF2, PF3, PFN, 3PF, cosφ1, cosφ2, cosφ3, cosφN, 3cosφ [act, avg, avg$_{max}$, avg$_{min}$]
	Symmetrical Components	zero, negative and positive sequence components of voltage and current
	Unbalance Factor	unbI, unbU, φnsI
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDUN, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3, THDIN
	Individual Harmonics	Harmonics 1st to 50th of U and I, their angles and interharm subgroups (PQ S)
	Fundament. Harmonic (Ufh, Ifh)	U1fh, U2fh, U3fh, Unfh, I1fh, I2fh, I3fh, INfh
	Frequency (f)	f
	Active Energy	class 1 (62053-21), import/export, per phase, per tariff, total
	Reactive Energy	class 2 (62053-23), 4 quadrants, per phase, per tariff, total

DATALOG.	SMC 144		
		Main Archive	min., max., avg. values of ULN, ULL, I, P, Q, S, D, THDU, THDI, f, Avg. values of harmonics and their angles, Ufh, Ifh,Symmetrical components, Unb. factors, state of I/Os
		Electricity Meter Readings	Active and reactive imp. and exp. energy per phase (L1, L2, L3) and per tariff (T1, T2, T3)
		Voltage Event logging	optional firmware module Power Quality S
		Waveforms recording	optional firmware module General Oscilogram

OTHERS		
	Alarms	Logical functions, under/over limit of U, I, P, Q, S, unbl, THD, cos, f
	Inputs/Outputs	Optionally: 2 digital inputs, 1 relay or digital output, bus for external modules
	Memory Size	512MB (SMC 144)
	RTC	seconds, minutes, hours, days, months, years (SMC 144)
	Communication	RS485, Ethernet, USB, M-Bus

POWER		
	aux. voltage	**U**: 75 ÷ 510 V$_{AC}$ / 80 ÷ 350 V$_{DC}$
		S: 10 ÷ 26 V$_{AC}$ / 10 ÷ 36 V$_{DC}$
		L: 20 ÷ 50 V$_{AC}$ / 20 ÷ 75 V$_{DC}$
	power	7 VA / 3 W
	meas. cat.	CAT III / 300 V

INPUT	VOLTAGE	measuring range	11 ÷ 520 V$_{LL}$ / 6 ÷ 300 V$_{LN}$
		input impedance	2,7 MΩ (L$_i$↔N)
		connection	wye, delta, aron
		overload	1300 V$_{RMS}$, 1950 V$_{RMS}$ / 1s
	CURRENT	measuring range	0,02 ÷ 1,2 × I$_{NOM}$
		overload	2 × I$_{NOM}$, 10 × I$_{NOM}$ / 1s

I/O	D	voltage levels	U$_L$ < 3 V, U$_H$ > 10 V, U$_{MAX}$ = 30 V
		input current	3 mA @ 12V / 8 mA @ 24V
	I	ssr. ratings	60 V$_{AC}$ / 100 V$_{DC}$, 300 mA
	R	relay ratings	230 V$_{AC}$ / 30 V$_{DC}$, 3 A

OTHER	TEMP	operating	-25 ÷ 60°C, <95% non-condens.
		storage	-40 ÷ 85°C, <95% non-condens.
	EMC	emission	EN 61000 – 4 – 2, 3, 4, 5, 6, 11
		immunity	EN 55011, EN 55022 - class A
		protection rating	IP 20
		dimensions	105W × 90H × 58D mm / 0,2 kg

COMMUNICATION
RS-485 (standard), galvanically isolated KMBlong, MODBUS RTU protocols
RS-485 (secondary, **B**), galvanically isolated KMBlong, MODBUS RTU protocols
Ethernet (opt. **E**) KMBlong, MODBUS TCP, 100 Mbit/s
USB 2.0 (opt. **U**) KMBlong, MODBUS RTU protocols
Wi-Fi (opt. **W**) KMBlong, MODBUS
M-Bus (opt. **M**)

ACCURACY (IEC 61557-12)	
voltage	0.1
current	0.2
active power	1
reactive power	2
apparent power	1
PF, cosφ	0.5
frequency	0.05
active energy	1
reactive energy	2
harm. and THD	2
unbalance	0.5
flicker	5

KMB SYSTEMS

Ordering options

<pre>
                              SMC 144 U X/100mA R B E
Instrument model
    PA = power sensor & network monitor, RS485
    SMC = network analyser & datalogger, RS485
Measuring inputs
    144 = 4 voltage + 4 current inputs
Auxiliary power supply
    U = 75 V ÷ 510 VAC, 80 V ÷ 350 VDC
    S = 10 V ÷ 26 VAC, 10 V ÷ 36 VDC
    L = 20 V ÷ 50 VAC, 20 V ÷ 75 VDC
Current inputs
    X/100mA = 100mA AC (indirect measurement)
    Snnn   = with low current output CTs, split-core
    Pnnn   = with low current output CTs, through-hole
Optional digital output
    N = without output
    R = relay output
    I = pulse output
Optional peripheral
    N = without optional peripheral
    B = bus for connection of external modules
    D = two digital inputs
    M = M-Bus interface (not combinable with option E, W)
Optional expanding module
    N = without expanding module
    U = USB
    E = Ethernet interface (not combinable with option M)
    W = USB, WiFi (not combinable with option M)
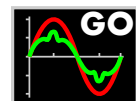</pre>

Optional firmware modules

PQ S module
Module for evaluation of power quality according to EN 50160 (class S). Enables measurement and recording of flicker indices, interharmonics and voltage events. Power quality is evaluated weekly and stored to special PQ Main archive for future processing.
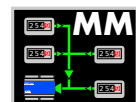
GO module
Module for detection and precise recording of various waveform distortions. This module records the so called oscillograms of voltages and currents in extended detail, capacity and trigger options into the flash memory.

MM Module
The Modbus Master module enhances instruments data logging abilities. By using this module you can configure the instrument to read and store any Modbus registers from any instruments of any manufacturer connected to it's RS-485 line.
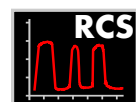
ES Module
The Ethernet to Serial module makes gateway between Ethernet and serial line (RS-485). By using this module you can access your RS-485 instruments over Ethernet.
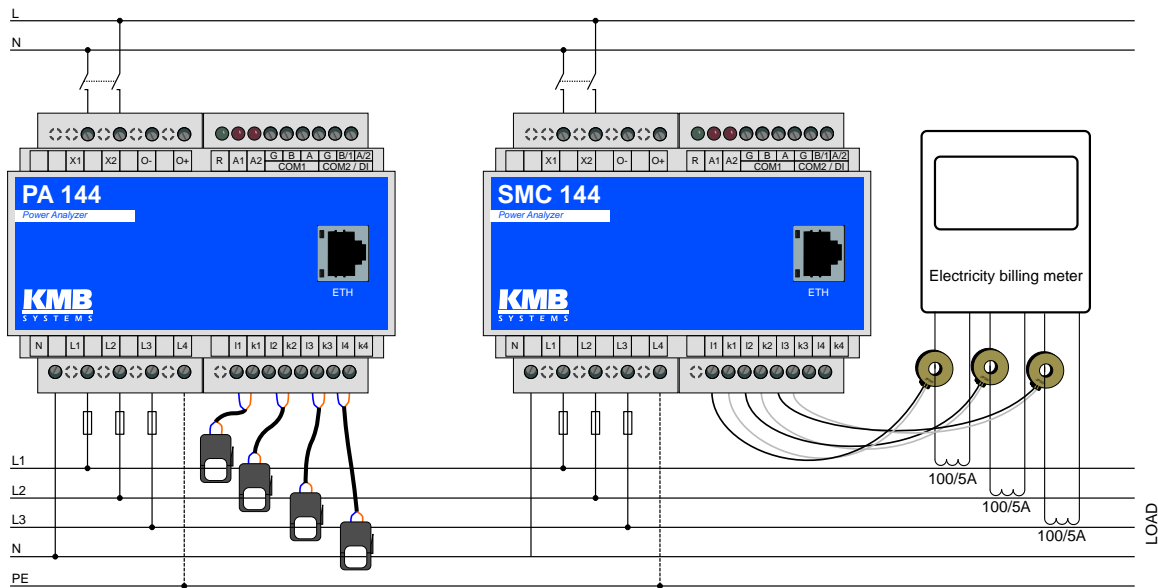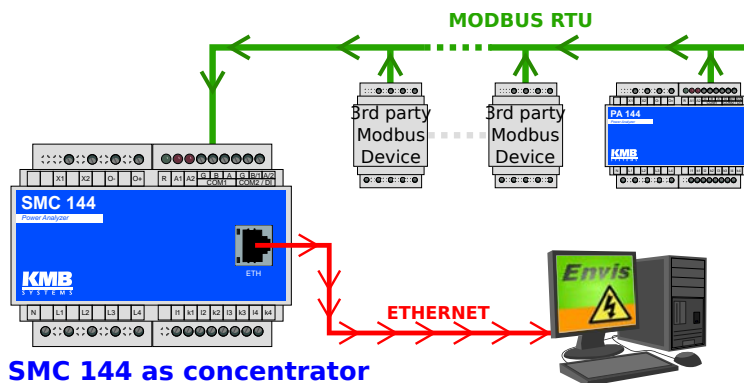
RCS module
The RCS module (ripple control signal or mains voltage) activates an ability to detect, evaluate, decode and store RCS messages transmitted over the distribution network. It precisely measures voltage on the selected frequency and stores the extracted information.
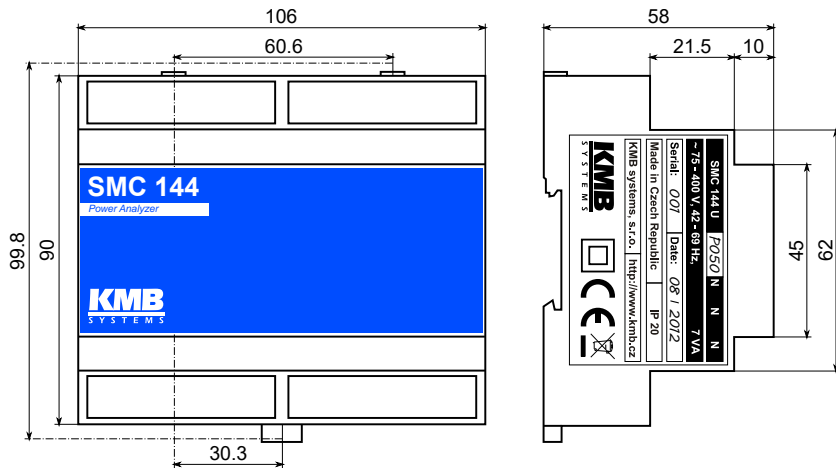
Typical connection schema

ModBus Master firmware option

MODBUS RTU

3rd party Modbus Device

3rd party Modbus Device

PA 144

SMC 144
Power Analyzer

ETHERNET

SMC 144 as concentrator

Mechanical dimensions

SML 133

Multifunctional Panel Meter

SML 133 is a basic 3-phase multimeter with large bright segment LCD display. Instrument is designed for load or generation monitoring in single-phase and three-phase low, medium and high voltage networks. Measurement of actual temperature within a control panel is also supported with an in-built temperature sensor.

Optional relay or impulse outputs can be programmed to control other equipment based on measured values (fan control, over voltage/over current etc). Impulse outputs can also work as an S0 pulse output for the embedded electricity meter. Optional communication interface allows it to be simply configured and managed via ENVIS application from a remote PC. In combination with EN-VIS.Online service its actual values can be also periodically downloaded and stored to the SQL database for further processing.

Typical applications: replacement of analog instrument, energy management, sub-metering, remote online energy and power monitoring, industrial automation.

Key features:

- measuring multimeter of actual network data
- three-phase energy meter (kWh, kvarh, +,-) measures in 4 or 6 quadrants
- single-phase, three-phase or Aron connection, direct & indirect measurement (with VT and CT)
- voltage and current: class 0.2 / 0.2 according to 61557-12
- energy: active 0.5, reactive class 2 according to 61557-12, 62053-22 resp. -23
- built-in PT100 temperature sensor, binary input

Standard

INPUTS	MEASUREMENT		+/-
3U, 3I	U,I,P,Q	PF,cos,THD	Wh,varh
HARMONICS	SAMPLING	STANDARDS	STANDARDS
50	6,4kHz	IEC 61557-12	class 0.5S IEC 62053-22

Optional

CURRENT INPUT	CURRENT INPUT	CURRENT INPUT	SUPPLY	RS485	MODBUS
X/5A	X/100mA	333mV	12V/24V/230V		Modbus
ETH	WEBSERVER	OUTPUTS	OUTPUTS	INPUTS	
		2×RELAY	2×PULSE	1×DIGI	

Technical specification

METERING	Voltage (ULN, ULL)	U1, U2, U3, UN, U12, U23, U31 [act, avg, avg$_{max}$, avg$_{min}$]
	Current (I)	IL1, IL2, IL3 [act, avg, avg$_{max}$, avg$_{min}$]
	Power (P)	P1, P2, P3, 3P (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Apparent Power (S)	S1, S2, S3, 3S [act, avg, avg$_{max}$, avg$_{min}$]
	Harm. Distortion Power (D)	D1, D2, D3 [act, avg, avg$_{max}$, avg$_{min}$]
	Power Factor (PF), cosφ	PF1, PF2, PF3, 3PF, cosφ1, cosφ2, cosφ3, 3cosφ [act, avg, avg$_{max}$, avg$_{min}$]
	Symmetrical Components	zero, negative and positive sequence components of voltage and current
	Unbalance Factor	unbI, unbU, φnsI
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3
	Individual Harmonics	Harmonics 1st to 50th of Voltage and Current and their angles
	Fundament. Harmonic (Ufh, Ifh)	U1fh, U2fh, U3fh, I1fh, I2fh, I3fh
	Frequency (f)	f
	Active Energy	class 0.5S (62053-22), import/export, per phase, per tariff, total
	Reactive Energy	class 2 (62053-23), 4 quadrants, per phase, per tariff, total
DATALOG	Main Archive	No
	Electricity Meter Readings	No
	Voltage Event logging	No
	Waveforms recording	No
OTHERS	Alarms	Logical functions, under/over limit of U, I, P, Q, S, unbl, THD, cos, f
	Inputs/Outputs	Optionally: 1 digital input, 2 relays or 2 digital outputs
	Memory Size	No
	RTC	No
	Communication	RS485, Ethernet

POWER	aux. voltage	**U**: 90 ÷ 275 V$_{AC}$ / 90 ÷ 350 V$_{DC}$
		S: 10 ÷ 26 V$_{AC}$ / 10 ÷ 36 V$_{DC}$
		L: 20 ÷ 50 V$_{AC}$ / 20 ÷ 75 V$_{DC}$
	power	8 VA / 3 W
	overvoltage cat.	CAT III / 300 V

INPUT	VOLTAGE	measuring range	**230**: 8÷660 V$_{LL}$ / 6÷375 V$_{LN}$ (1.2kV/1s)
			100: 5÷330 V$_{LL}$ / 3÷190 V$_{LN}$ (0,6kV$_{LN}$/1s)
			400: 20÷1090V$_{LL}$/10÷625V$_{LN}$ (2kV$_{LN}$/1s)
		measurement category	**230**, **400**: CAT III / 300V
			100: CAT IV / 150V
	CURRENT	measuring range	**X/5A**: 5 mA ÷ 7 A (70A/1s)
			X/100mA: 1 mA ÷ 390 mA (10A/1s)
			333mV: 2 mV ÷ 500 mV

I/O	D	voltage levels	U$_L$ < 3 V, U$_H$ > 10 V, U$_{MAX}$ = 60 V$_{AC}$ / 100 V$_{DC}$
		input current	1 mA @ 10V / 5 mA @ 24V 10 mA @ 48V
	I	ssr. ratings	60 V$_{AC}$ / 100 V$_{DC}$, 100 mA
	R	relay ratings	250 V$_{AC}$ / 30 V$_{DC}$, 5 A

OTHER	TEMP	operating	-25 ÷ 60°C, <95% non-condens.
		storage	-40 ÷ 80°C, <95% non-condens.
	EMC	emission	EN 61000 – 4 – 2, 4, 5, 6, 11
		immunity	EN 55011, EN 55022 - class A
		protection rating	IP 40 (optional IP 54) front panel
		dimensions	96W × 96H × 58D mm / 0,3 kg

COMMUNICATION	
	RS-485 (opt. **4**) galvanically isolated KMBlong, MODBUS RTU protocols 2400 ÷ 921600 baud
	Ethernet (opt. **E**) KMBlong, MODBUS TCP protocols
	M-Bus (opt. **M**)

ACCURACY (IEC 61557-12)	voltage	0.2
	current	0.2
	active power	0.5
	reactive power	1
	apparent power	0.5
	PF, cosφ	0.5
	frequency	0.02
	active energy	0.5
	reactive energy	2
	harm. and THD	2
	unbalance	0.5

KMB SYSTEMS

Ordering options

SML 133 U 230 X/5A RR E

Instrument Model
    SML 133 = Three-phase multimeter, 3U, 3I
Auxiliary Power Supply
    U = 90 V ÷ 275 VAC, 80 V ÷ 350 VDC
    S = 10 V ÷ 26 VAC, 10 V ÷ 36 VDC
    L = 20 V ÷ 50 VAC, 20 V ÷ 75 VDC
Nominal Measuring Voltage
    230 = 230V/400V
    100 = 57,7V/100V
    400 = 400V/690V
Current Inputs
    X/5A   = 5A and 1A AC (standard indirect measurement)
    X/100mA = 100mA AC (indirect measurement)
    333mV   = input for sensors with 333mV output
Digital I/O
    N = without I/O
    RR = 2× relay output + 1× logical input 24V
    RI = 1× relay output + 1× pulse output + 1× logical input 24V
    II = 2× pulse output + 1× logical input 24V
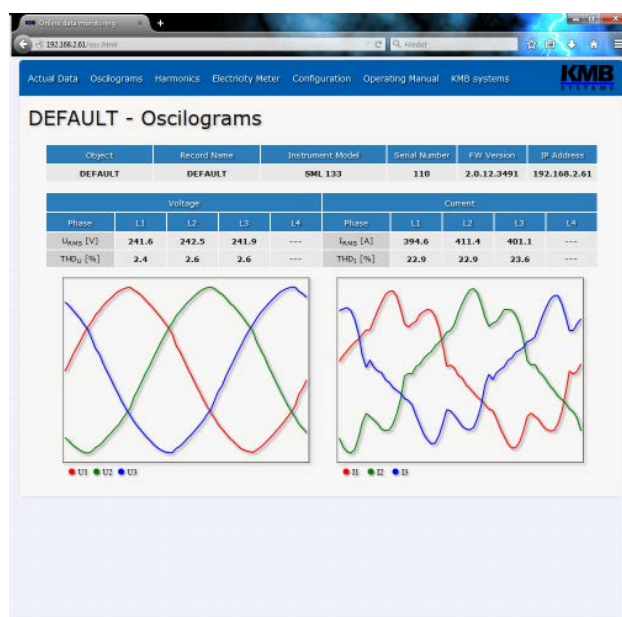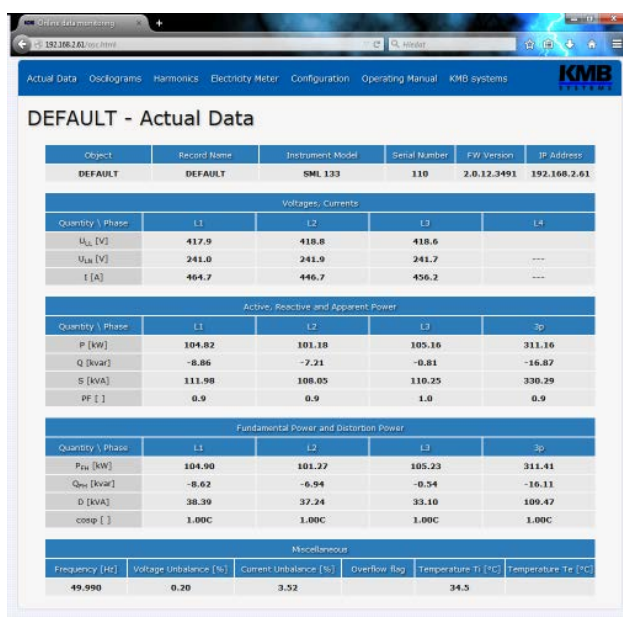**Remote Communication Interface**
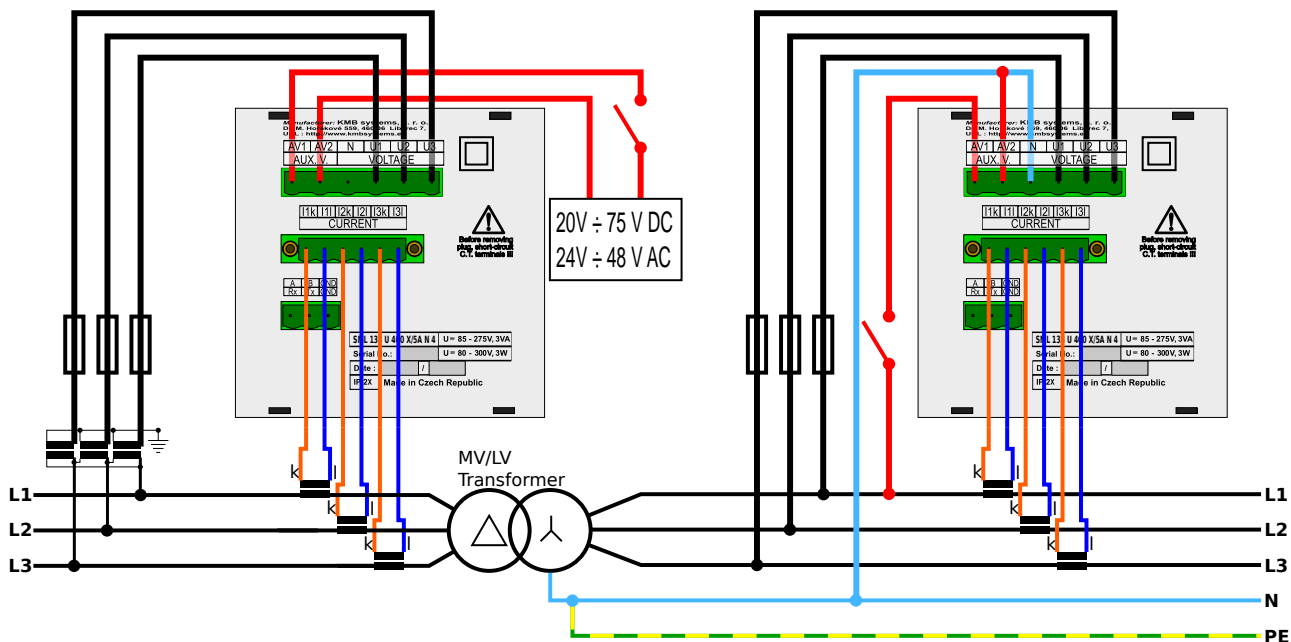   N = no remote comm. link
    M = M-Bus interface
    4 = RS-485
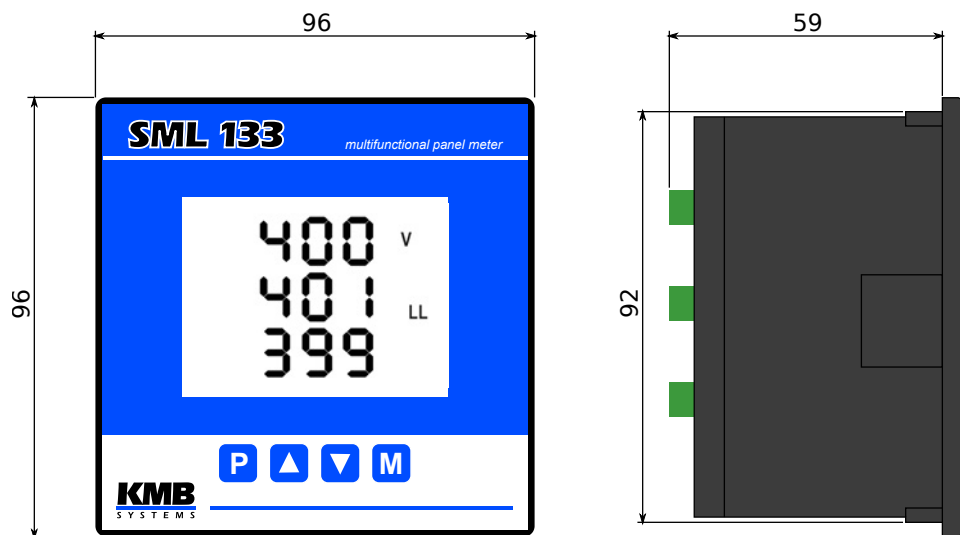   E = Ethernet 10BaseT

Webserver

Typical connection schema

Mechanical dimensions

KMB SYSTEMS

SMZ 133

Power monitor and data logger

SMZ 133 3-phase panel meter with large LCD display. Instrument is designed for load or generation monitoring in single-phase and three-phase LV, MV, HV networks.
Various outputs can be programmed to control other equipment based on input values and the actual measurements. Data naturally flow to any SCADA system. In combination with ENVIS Daq or .Online historical data can be also archived into a SQL database for further analysis.
Typical applications: remote online monitoring and control in industrial automation and smart buildings, energy management, sub-metering, demand side management (DSM), programmable logic or pulse counters

Key features:

- advanced power meter with programmable inputs and outputs, energy meter, data logger

- precise evaluation of 3 voltage and current inputs, 128 s./period, continuous ~6.4kHz sampling

- complete three-phase energy meter (kWh, kvarh), supports rates and TOU (time of use meter)

- Inputs - 1x 250 V DI, 4x 24V DI, 2x 10 V or 0÷20 mA AI, 1x Pt100

- Outputs - 4x 250 V relay DO, 4x 24 V SSR DO, 2x 0÷20 mA AO

- multiple simultaneous communication ports - local USB, remote 1-2x RS-485 or Ethernet

Standard

INPUTS	MEASUREMENT		+/-	HARMONICS
3U, 3I	**U,I,P,Q**	**PF,cos,THD**	**Wh,varh**	**50**

SAMPLING	FLASH	USB	STANDARDS	STANDARDS
6,4kHz	**512MB**		**IEC 61557-12**	**class 0.5S** IEC 62053-22

OUTPUTS	OUTPUTS	INPUTS
4×RELAY	**4×PULSE**	**5×DIGI**

Optional

CURRENT INPUT	CURRENT INPUT	ETH	WEBSERVER	NTP
X/5A	**X/100mA**			

RS485	MODBUS	SUPPLY	STANDARDS	STANDARDS
	Modbus	**12V/24V/230V**	**EN 50160**	**class S** IEC 61000-4-30

OUTPUTS	INPUTS	INPUTS
2×4÷20mA	**2×4÷20mA**	**Pt100**

Technical specification

METERING	Voltage (ULN, ULL)	U1, U2, U3, U12, U23, U31 [act, avg, avg_{max}, avg_{min}]
	Current (I)	IL1, IL2, IL3 [act, avg, avg_{max}, avg_{min}]
	Power (P)	P1, P2, P3, 3P (import, export, total, 1st harmonic) [act, avg, avg_{max}, avg_{min}]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1st harmonic) [act, avg, avg_{max}, avg_{min}]
	Apparent Power (S)	S1, S2, S3, 3S [act, avg, avg_{max}, avg_{min}]
	Harm. Distortion Power (D)	D1, D2, D3 [act, avg, avg_{max}, avg_{min}]
	Power Factor (PF), cosφ	PF1, PF2, PF3, 3PF, cosφ1, cosφ2, cosφ3, 3cosφ [act, avg, avg_{max}, avg_{min}]
	Symmetrical Components	zero, negative and positive sequence components of voltage and current
	Unbalance Factor	unbI, unbU, φnsI
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3
	Individual Harmonics	Harmonics 1st to 50th of Voltage and Current and their angles
	Fundament. Harmonic (Ufh, Ifh)	U1fh, U2fh, U3fh, I1fh, I2fh, I3fh
	Frequency (f)	f
	Active Energy	class 0.5S (62053-22), import/export, per phase, per tariff, total
	Reactive Energy	class 2 (62053-23), 4 quadrants, per phase, per tariff, total
DATALOGGING	Main Archive	min., max., avg. values of ULN, ULL, I, P, Q, S, D, THDU, THDI, f, Avg. values of harmonics and their angles, Ufh, Ifh, Symmetrical components, Unb. factors, state of I/Os
	Electricity Meter Readings	Active and reactive imp. and exp. energy per phase (L1, L2, L3) and per tariff (T1, T2, T3)
	Voltage Event logging	optional firmware module PQ S
	Waveforms recording	optional firmware module GO
OTHERS	Alarms	Logical functions, under/over limit of U, I, P, Q, S, unbl, THD, cos, f
	Inputs/Outputs	Optionally: 4 relays, 4 digital inputs, 2 analog inputs and outputs, 1 input for Pt100
	Memory Size	512MB
	RTC	seconds, minutes, hours, days, months, years
	Communication	USB, RS485, Ethernet

POWER	aux. voltage	**H**: 75 ÷ 500 V_{AC} / 90 ÷ 600 V_{DC}
	power	20 VA / 8 W
	overvoltage cat.	CAT III / 300 V

INPUT	VOLTAGE	measuring range	**230**: 8÷660 V_{LL}/6÷375 V_{LN} (1,2kV/1s)
			100: 5÷330 V_{LL}/3÷190 V_{LN} (0,6kV/1s)
			400: 20÷1090V_{LL}/10÷625V_{LN} (2kV$_{LN}$/1s)
		measurement category	**230**: CAT III / 300V
			100: CAT IV / 150V
			400: CAT III / 300V
	CURRENT	measuring range	**X/5A**: 5 mA ÷ 7 A (70A/1s)
			X/100mA: 1 mA ÷ 0.39 A (10A/1s)

I/O	D	24V input	U_L < 3 V, U_H > 10 V, 35V_{DC}
		230V input	U_L < 30 V, U_H > 90 V, 265V_{AC}
	I	ssr. ratings	60 V_{AC} / 100 V_{DC}, 100 mA
	R	relay ratings	250 V_{AC} / 30 V_{DC}, 5 A
	A	Analog input	0 ÷ 24 mA, impedance 120 Ω
		Analog output	0 ÷ 20 mA, max. 500 Ω
	T	Pt100 input	range -50 ÷ 150 °C
OTHER	TEMP	operating	-25 ÷ 60°C, <95% non-condens.
		storage	-40 ÷ 80°C, <95% non-condens.
	EMC	emission	EN 61000 – 4 – 2, 3, 4, 5, 6, 11
		immunity	EN 55011, EN 55022 - class A
		protection rating	IP 40 (optional IP 54) front panel
		dimensions	96W × 96H × 58D mm / 0,3 kg

COMMUNICATION	Local USB 2.0 (standard) KMBlong, MODBUS RTU protocols
	RS-485 (opt. **4, E4, 44**) galvanically isolated KMBlong, MODBUS RTU protocols 2400 ÷ 921600 baud
	Ethernet (opt. **E, E4**) KMBlong, MODBUS TCP protocols 100 Mbit/s

ACCURACY (IEC 61557-12)	voltage	0.2
	current	0.2
	active power	0.5
	reactive power	1
	apparent power	0.5
	PF, cosφ	0.5
	frequency	0.02
	active energy	0.5
	reactive energy	2
	harm. and THD	2
	unbalance	0.5

KMB SYSTEMS

Ordering options

SMZ	**133**	**H**	**400**	**X/5A**	**R**	**I**	**A**	**ET**

Instrument Model
    SMZ 133 = Power analyser with internal memory

Auxiliary Power Supply
    H = 75 V ÷ 500 VAC, 90 V ÷ 600 VDC
    S = 10 V ÷ 26 VAC, 10 V ÷ 36 VDC
    L = 20 V ÷ 50 VAC, 20 V ÷ 75 VDC

Nominal Measuring Voltage
    400 = 400V/690V
    230 = 230V/400V
    100 = 57,7V/100V

Current Inputs
    X/5A = 5A AC and 1A AC (standard indirect measurement)
    X/100mA = 100mA AC (indirect measurement)

Digital I/O 1
    R = 4× relay output + 1× logical input 100 ÷ 230VAC

Digital I/O 2
    I = 4× pulse output + 4× logical input 24V

Analog I/O
    N = No analog I/O
    A = 2× analog output 0/4÷20mA + 2× analog input 0/4÷20mA + 12VDC aux. supply

Communication Interface and External Thermometer Input
    N = USB, without remote communication and thermometer input
    4T = USB, RS-485, input for Pt100 thermometer
    ET = USB, Ethernet 10BaseT, input for Pt100 thermometer
    44 = USB, RS-485, RS-485
    E4 = USB, Ethernet 10BaseT, RS-485
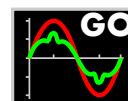
Optional firmware modules

PQ S module

Module for evaluation of power quality according to EN 50160 (class S). Enables measurement and recording of flicker indices, interharmonics and voltage events. Power quality is evaluated weekly and stored to special PQ Main archive for future processing.
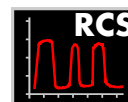

GO module

Module for detection and precise recording of various waveform distortions. This module records the so called oscillograms of voltages and currents in extended detail, capacity and trigger options into the flash memory.

RCS module

The RCS module (ripple control signal or mains voltage) activates an ability to detect, evaluate, decode and store RCS messages transmitted over the distribution network. It precisely measures voltage on the selected frequency and stores the extracted information.

MM Module

The Modbus Master module enhances instruments data logging abilities. By using this module you can configure the instrument to read and store any Modbus registers from any instruments of any manufacturer connected to it's RS-485 line.
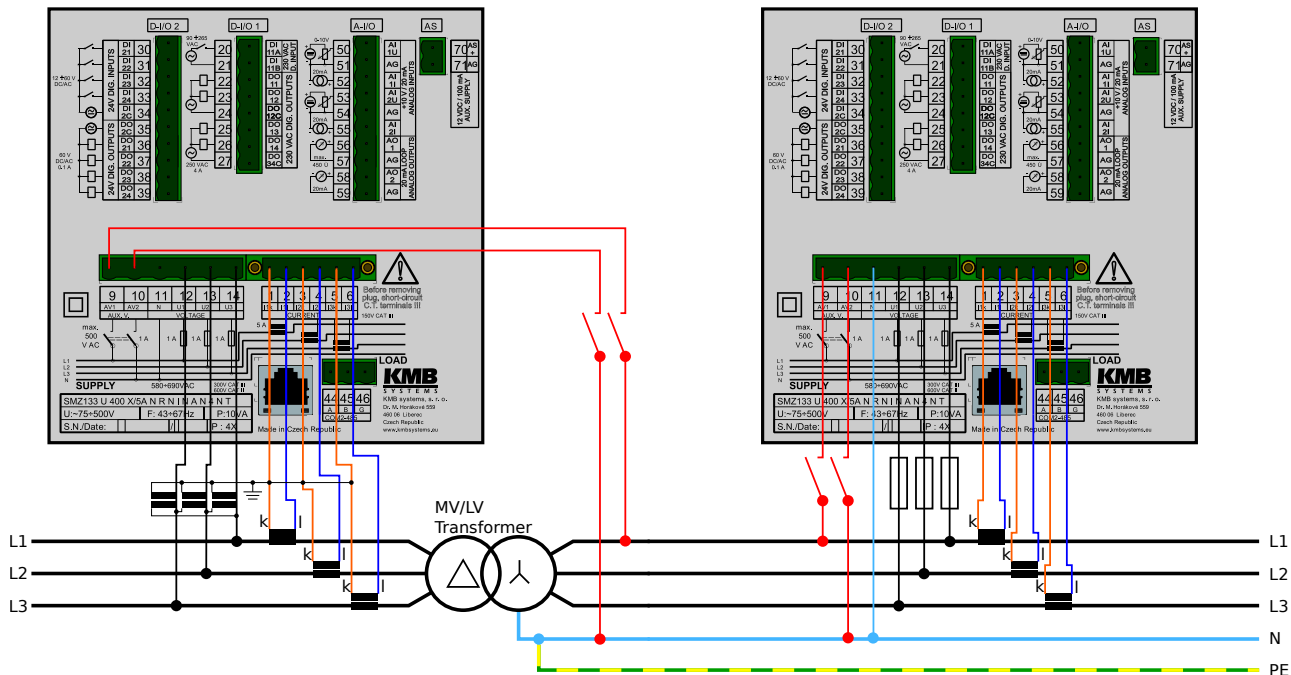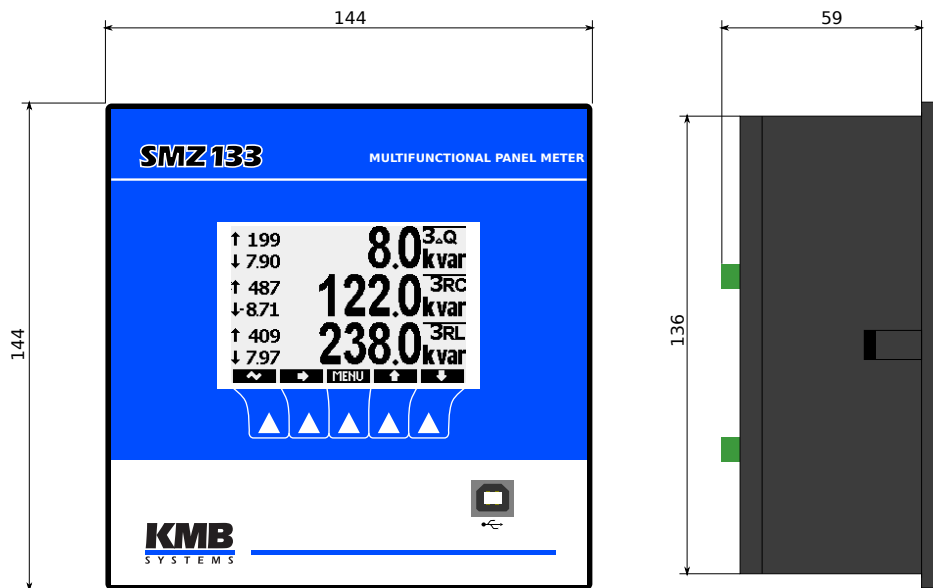

ES Module

The Ethernet to Serial module makes gateway between Ethernet and serial line (RS-485). By using this module you can access your RS-485 instruments over Ethernet.

Typical connection schema

Mechanical dimensions

SMC 118

Analyser and Data Logger
for Energy Management Systems

SMC 118 is designed for remote or standalone supervision of single phase loads and sources such as offices, households but also DC converters and chargers, photovoltaic systems etc. It supports measurement of 1 voltage and up to 8 AC or DC (X/4V) currents/powers. It is developed with fast and simple installation on din rail in mind. With split core current sensors the installation can be performed without necessary system decommissioning. Broad range of communication interfaces and protocols allows simple integration into the supervisor systems. Display less design minimizes the attention in places with general public access.

In complex energy management and automation systems the instrument can be well accompanied by other components like SMC 144 and PA 144.

Key features:

- 1 voltage and up to 8 current inputs (8×1 line)

- AC and/or DC measurement of current and voltage

- fully programmable digital output (relay or impulse)

- standard embedded RS-485 interface, optionally Ethernet, USB

- optional second BUS for external modules or 2 additional digital inputs

- features can be upgraded via external I/O modules (with ModBus Master fw. module)

Standard

INPUTS	MEASUREMENT		+/-	HARMONICS
1U, 8I	U,I,P,Q	PF,cos,THD	Wh,varh	50

SAMPLING	FLASH	RS485	MODBUS	STANDARDS
6,4kHz	512MB		Modbus	IEC 61557-12

STANDARDS
class 0.5S
IEC 62053-22

Optional

ETH	WEBSERVER	NTP	USB	M-BUS
				M-Bus

SUPPLY	CURRENT INPUT	CURRENT INPUT	MEASUREMENT
12V/24V/230V	±4V	X/100mA	AC/DC

OUTPUTS	OUTPUTS	INPUTS
1×RELAY	1×PULSE	2×DIGI

Technical specification

METERING	Voltage (ULN)	U [act, avg, avg_{max}, avg_{min}]
	Current (I)	I1, I2, I3, I4, I5, I6, I7, I8 [act, avg, avg_{max}, avg_{min}]
	Power (P)	P1, P2, P3, P4, P5, P6, P7, P8 (import, export, total, 1st harm.) [act, avg, avg_{max}, avg_{min}]
	Reactive Power (Q)	Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, (import, export, total, 1st harm.) [act, avg, avg_{max}, avg_{min}]
	Apparent Power (S)	S1, S2, S3, S4, S5, S6, S7, S8 [act, avg, avg_{max}, avg_{min}]
	Harm. Distortion Power (D)	D1, D2, D3, D4, D5, D6, D7, D8 [act, avg, avg_{max}, avg_{min}]
	Power Factor (PF), cosφ	PF1 ÷ PF8, cosφ1 ÷ cosφ8 [act, avg, avg_{max}, avg_{min}]
	Symmetrical Components	-
	Unbalance Factor	-
	Voltage THD (THDU)	THDU
	Current THD (THDI)	THDI1, THDI2, THDI3, THDI4, THDI5, THDI6, THDI7, THDI8
	Individual Harmonics	Harmonics 1st to 50th of Voltage and Current and their angles
	Fundament. Harmonic (Ufh, Ifh)	Ufh, I1fh, I2fh, I3fh, I4fh, I5fh, I6fh, I7fh, I8fh
	Frequency (f)	f
	Active Energy	Import (E1, E2, E3, E4, E5, E6, E7, E8, ΣE), Export (E1, E2, E3, E4, E5, E6, E7, E8, ΣE), Total Import (Tariff 1, Tariff 2, Tariff 3), Total Export (Tariff 1, Tariff 2, Tariff 3)
	Reactive Energy	Ind. (E1, E2, E3, E4, E5, E6, E7, E8, ΣE), Cap. (E1, E2, E3, E4, E5, E6, E7, E8, ΣE), Total Inductive (Tariff1, Tariff2, Tariff3), Total Capacitive (Tariff1, Tariff2, Tariff3)
DATALOGGING	Main Archive	min., max., avg. values of ULN, ULL, I, P, Q, S, D, THDU, THDI, f Avg. values of individual harmonics and their angles, Ufh, Ifh, Symmetrical components, Unbalance factors, state of I/Os
	Electricity Meter Readings	Active and reactive imp. and exp. energy
	Voltage Event logging	-
	Waveforms recording	optional firmware module GO
OTHERS	Alarms	Logical functions, under/over limit of U, I, P, Q, S, unbl, THD, cos, f
	Inputs/Outputs	Optionally: 2 digital inputs, 1 relay or 2 digital output
	Memory Size	512MB
	RTC	seconds, minutes, hours, days, months, years
	Communication	RS485, Ethernet, USB, M-Bus

POWER	aux. voltage	**U**: 75 ÷ 510 V_{AC} / 80 ÷ 350 V_{DC}
		S: 10 ÷ 26 V_{AC} / 10 ÷ 36 V_{DC}
		L: 20 ÷ 50 V_{AC} / 20 ÷ 75 V_{DC}
	power	14 VA / 6 W
	measurement cat.	CAT III / 300 V
INPUT — VOLTAGE	measuring range	**230**: 8 ÷ 360 $V_{AC/DC}$
	input impedance	3,24 MΩ ($L_i \leftrightarrow N$)
	connection	wye, delta, aron
	permanent overload	1500 V_{RMS}
	surge overload	2300 V_{RMS} for 1s
INPUT — CURRENT	measuring range	0,02 ÷ 1,2 × I_{NOM}
	permanent overload	2 × I_{NOM}
	surge overload	10 × I_{NOM} for 1s

I/O	D	voltage levels	U_L < 3 V, U_H > 10 V, U_{MAX} = 30 V
		input current	3 mA @ 12V / 8 mA @ 24V
	I	ssr. ratings	60 V_{AC} / 100 V_{DC}, 300 mA
	R	relay ratings	230 V_{AC} / 30 V_{DC}, 3 A
OTHER	TEMP	operating	-25 ÷ 60°C, <95% non-condens.
		storage	-40 ÷ 85°C, <95% non-condens.
	EMC	emission	EN 61000 – 4 – 2, 3, 4, 5, 6, 11
		immunity	EN 55011, EN 55022 - class A
		protection rating	IP 20
		dimensions	105W × 90H × 58D mm / 0,2 kg

COMMUNICATION
RS-485 (standard), galvanically isolated KMBlong, MODBUS RTU protocols
RS-485 (secondary, **B**), galvanically isolated KMBlong, MODBUS RTU protocols
Ethernet (opt. **E**) KMBlong, MODBUS TCP, 100 Mbit/s
USB 2.0 (opt. **U**) KMBlong, MODBUS RTU protocols
Wi-Fi (opt. **W**) KMBlong, MODBUS
M-Bus (opt. **M**)

ACCURACY (IEC 61557-12)		
	voltage	0.1
	current	0.2
	active power	1
	reactive power	2
	apparent power	1
	PF, cosφ	0.5
	frequency	0.05
	active energy	1
	reactive energy	2
	harm. and THD	2
	unbalance	0.5
	flicker	5

KMB SYSTEMS

Ordering options

```
                                   SMC 118 U X/4V R N E
Instrument model
    SMC = Power analyser and datalogger, RS-485
    PA  = Power meter and sensor, RS-485
Measuring inputs
    112 = 1 voltage + 2 current inputs
    114 = 1 voltage + 4 current inputs
    118 = 1 voltage + 8 current inputs
Auxiliary power supply
    U = 75 V ÷ 275 VAC, 75 V ÷ 350 VDC
    S = 10 V ÷  26 VAC, 10 V ÷  36 VDC
    L = 20 V ÷  50 VAC, 20 V ÷  75 VDC
Current inputs
    X/100mA = 100mA AC (indirect measurement)
    X/4V = input for sensors with ±4V output (AC and DC currents)
    Snnn    = with low current output CTs, split-core
    Pnnn    = with low current output CTs, through-hole
Optional digital output
    N = without output
    R = relay output
    I = pulse output
Optional peripheral
    N = without optional peripheral
    B = bus for connection of external modules
    D = two digital inputs
Optional expanding module
    N = without expanding module
    U = USB
    E = Ethernet interface (not combinable with option M)
    W = USB, WiFi
```

Optional firmware modules

GO module

Module for detection and precise recording of various waveform distortions. This module records the so called oscillograms of voltages and currents in extended detail, capacity and trigger options into the flash memory.
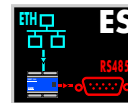
MM Module

The Modbus Master module enhances instruments data logging abilities. By using this module you can configure the instrument to read and store any Modbus registers from any instruments of any manufacturer connected to it's RS-485 line.
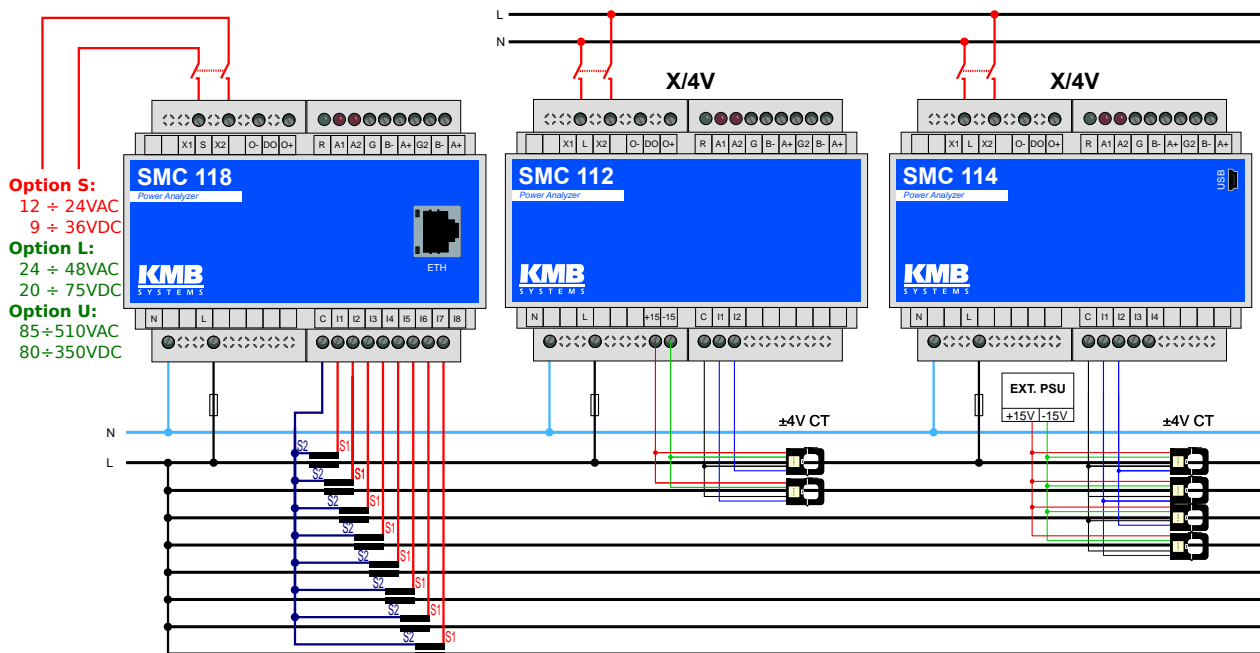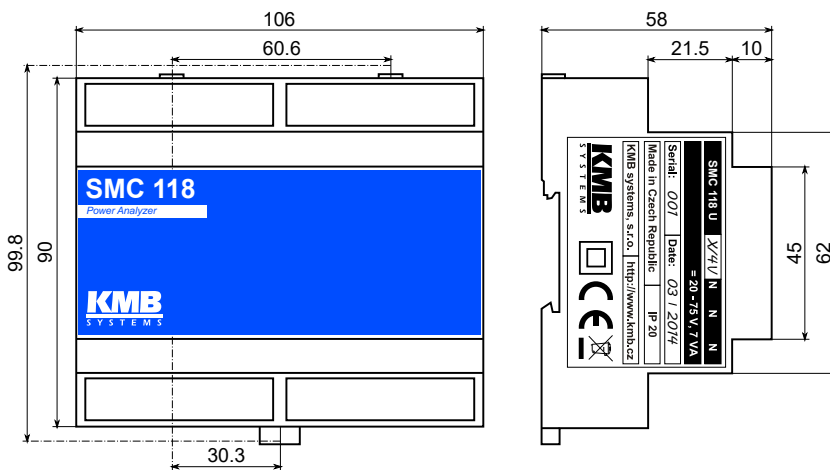
ES Module

The Ethernet to Serial module makes gateway between Ethernet and serial line (RS-485). By using this module you can access your RS-485 instruments over Ethernet.

KMB SYSTEMS

Typical connection schema

Option S:
12 ÷ 24VAC
9 ÷ 36VDC

Option L:
24 ÷ 48VAC
20 ÷ 75VDC

Option U:
85÷510VAC
80÷350VDC

Mechanical dimensions

Display

Option for DIN rail analysers

All models of our new generation of DIN-rail analysers can be optionally equipped with display. Nearly 2" color LCD display with high resolution provides all typical screens. It can show live values such as voltages, currents or powers, it can display waveforms of voltage and current and its phasor diagram. Displaying of active and reactive energy counter is matter of course. Display is accompanied by two buttons for basic configuration and switching of the screens, but screen auto-scroll is also option, where screen changes automatically in loop. Supported devices include ARTIQ 144, SMC 133, PA and SMC 144 and also PA and SMC 118.

Key features:

- local overview of measured values

- basic local configuration of the instrument

- overview of configured parameters

- faster debugging of connection problems

Ordering options

ARTIQ 144D U X/100mA E

Instrument model
ARTIQ = Class A instrument series, 4U, 4I, 2DO, 2DI, RS-485, LCD

Auxiliary power supply
U = 75 V ÷ 275 VAC, 75 V ÷ 350 VDC
S = 10 V ÷ 26 VAC, 10 V ÷ 36 VDC
L = 20 V ÷ 50 VAC, 20 V ÷ 75 VDC

Current inputs

SMC 133D S 230 X/100mA E

Instrument Model
SMC 133 = Power analyser and datalogger, RS485, LCD

Auxiliary Power Supply
S = 10 V ÷ 36 VDC
L = 20 V ÷ 75 VDC

Nominal Measuring Voltage
230 = 230V/400V

SMC 144D U X/100mA R B E

Instrument model
PA = power sensor & network monitor, LCD
SMC = network analyser & datalogger, LCD

Measuring inputs
144 = 4 voltage + 4 current inputs

Auxiliary power supply
U = 75 V ÷ 510 VAC, 80 V ÷ 350 VDC

SMC 118D U X/4V R N E

Instrument model
SMC = Power analyser and datalogger, RS-485, LCD
PA = Power meter and sensor, RS-485, LCD

Measuring inputs
112 = 1 voltage + 2 current inputs
114 = 1 voltage + 4 current inputs
118 = 1 voltage + 8 current inputs

KMB
S Y S T E M S

SMK 133

Multifunctional 3-phase Panel Meter

This instrument is simple 3-phase multimeter designed to measure and monitor line/phase voltages, currents, powers, energies, power factors, harmonics in single-phase and three-phase LV, MV and HV power systems. Measurement of temperatures within a control panel is also supported with an built-in temperature sensor. Optional communication interface allows it to be simply configured and managed via remote PC.

Typical applications: analog instrument replacement, online monitoring

Key features:

- basic measuring instruments for actual data

- 1-, 2-, 3-phase or Aron connection

- supports direct & indirect voltage connection

- optional RS 485 communication

Standard

INPUTS	MEASUREMENT		+/-	HARMONICS	STANDARDS
3U, 3I	U,I,P,Q	PF,cos,THD	Wh,varh	50	class 0.5S IEC 62053-22

Optional

CURRENT INPUT	CURRENT INPUT	OUTPUTS	RS485	MODBUS
X/5A	X/100mA	1×RELAY		Modbus

Typical connection schema

KMB SYSTEMS

Technical specification

METERING	Voltage (ULN, ULL)	U1, U2, U3, UN, U12, U23, U31 [act, avg, avg_{max}, avg_{min}]
	Current (I)	IL1, IL2, IL3 [act, avg, avg_{max}, avg_{min}]
	Power (P)	P1, P2, P3, 3P (import, export, total, 1st harmonic) [act, avg, avg_{max}, avg_{min}]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1st harmonic) [act, avg, avg_{max}, avg_{min}]
	Apparent Power (S)	S1, S2, S3, 3S [act, avg, avg_{max}, avg_{min}]
	Power Factor (PF), cosφ	PF1, PF2, PF3, 3PF, cosφ1, cosφ2, cosφ3, 3cosφ [act, avg, avg_{max}, avg_{min}]
	Unbalance Factor	unbI, unbU, φnsI
	Voltage, Current THD (THDU,I)	THDU1, THDU2, THDU3, THDI1, THDI2, THDI3
	Individual Harmonics	Harmonics 1st to 50th of Voltage and Current and their angles
	Frequency (f)	f
	Active Energy	Import (E1, E2, E3, ΣE), Export (E1, E2, E3, ΣE)
	Reactive Energy	Inductive (E1, E2, E3, ΣE), Capacitive (E1, E2, E3, ΣE)
OTHER	Alarms	Logical functions, under/over limit of U, I, P, Q, S, unbl, THD, cos, f
	Inputs/Outputs	Optionally: 1 relay output or 1 digital output
	Communication	RS485

SMK 133 N 230 X/5A R 4

Instrument Model
SMK = 3 phase multimeter, 96mm×48mm
Measuring Inputs
133 = three-phase multimeter
Power Supply
N = supply from 1. phase
U = 85 V ÷ 275 VAC, 80 V ÷ 350 VDC
S = 10 V ÷ 36 VAC, 10 V ÷ 36 VDC
Nominal Measuring Voltage
230 = 230V/400V
100 = 57,7V/100V
400 = 400V/690V
Current Inputs
X/5A   = 5A AC (standard indirect measurement with 5A CT)
X/1A   = 1A AC (standard indirect measurement with 1A CT)
X/100mA = 100mA AC (indirect measurement with 100mA CT)
H20A   = direct measurement up to 20A, through-hole connection
Digital Output
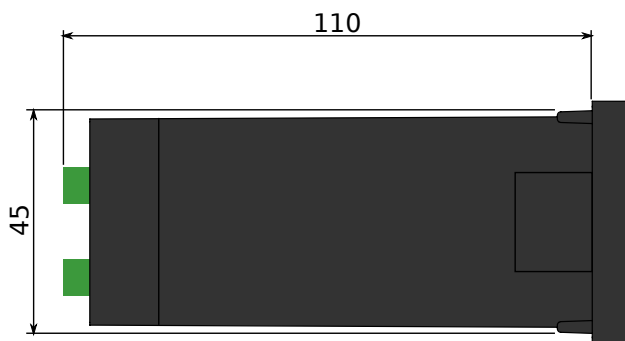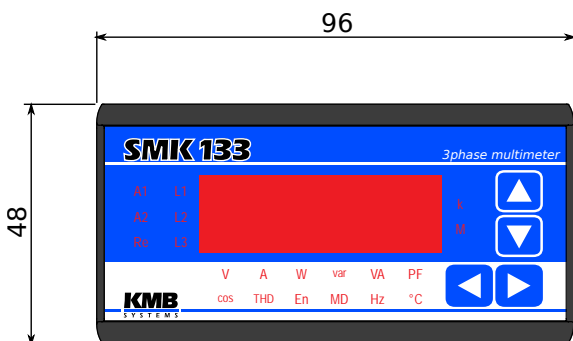N = without output
R = 1× relay output
I = 1× pulse output
Remote Communication Interface
N = no remote comm. link
4 = RS-485

Mechanical dimensions

SML and SMM

Multifunctional Panel Meters

These instruments are simple 3-phase multimeters which are designed to measure and monitor line/phase voltages, currents, active and reactive power, power factors, THD and frequency in three-phase LV, MV, HV power systems. Optional communication interface allows it to be simply configured and managed via ENVIS from a remote PC.

Typical applications: analog instrument replacement, remote online monitoring, industrial automation

Key features:

- basic measuring instruments for actual data

- 1-, 2-, 3-phase or Aron connection

- supports direct & indirect voltage connection
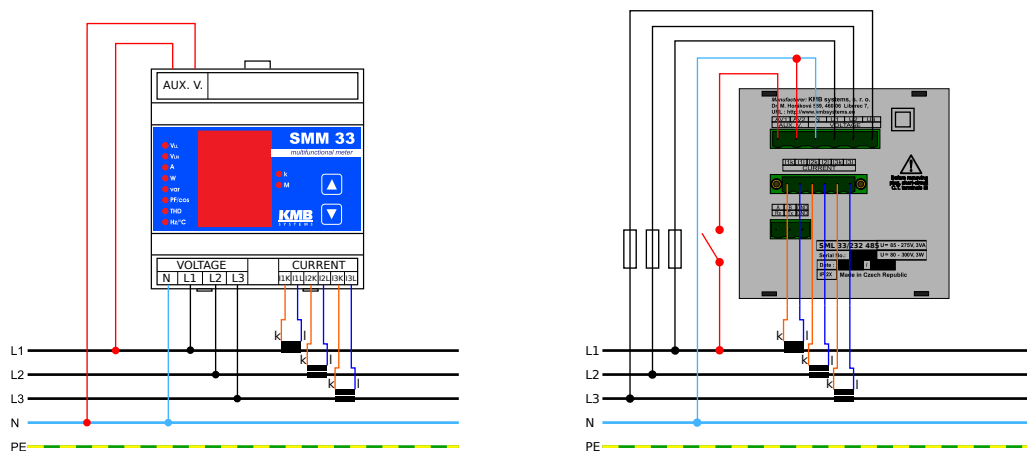
- optional RS 485 communication

Standard

INPUTS	MEASUREMENT	
3U, 3I	**U,I,P,Q**	**PF,cos,THD**

Optional

CURRENT INPUT	SUPPLY	RS485	MODBUS
X/5A	**12V/24V/230V**		Modbus

Typical connection schema

Technical specification

<table>
<tr><td rowspan="16">METERING</td><td>Phase Voltage (ULN)</td><td>U1, U2, U3</td></tr>
<tr><td>Line Voltage (ULL)</td><td>U12, U23, U31</td></tr>
<tr><td>Current (I)</td><td>IL1, IL2, IL3</td></tr>
<tr><td>Power (P)</td><td>P1, P2, P3, 3P</td></tr>
<tr><td>Reactive Power (Q)</td><td>Q1, Q2, Q3, 3Q</td></tr>
<tr><td>Apparent Power (S)</td><td>S1, S2, S3, 3S</td></tr>
<tr><td>Power Factor (PF)</td><td>PF1, PF2, PF3, 3PF</td></tr>
<tr><td>cosφ</td><td>cosφ1, cosφ2, cosφ3</td></tr>
<tr><td>Voltage THD (THDU)</td><td>THDU1, THDU2, THDU3, THDU12, THDU23, THDU31</td></tr>
<tr><td>Current THD (THDI)</td><td>THDI1, THDI2, THDI3</td></tr>
<tr><td>Individual Harmonics</td><td>No</td></tr>
<tr><td>Frequency (f)</td><td>f</td></tr>
<tr><td>Active Energy</td><td>No</td></tr>
<tr><td>Reactive Energy</td><td>No</td></tr>
<tr><td rowspan="3">OTHER</td><td>Inputs/Outputs</td><td>No</td></tr>
<tr><td>RTC</td><td>No</td></tr>
<tr><td>Communication</td><td>RS485</td></tr>
</table>

Ordering options

SML 33 U 230 X/5A 4

Instrument model
  SML 33 = 3×V + 3×I, panel
  SMM 33 = 3×V + 3×I, DIN 35

Auxiliary voltage range
  U = 75 ÷ 275 V_{AC}, 75 ÷ 350 V_{DC}
  24 = 18 ÷ 36 V_{DC}, 24 V_{AC}
  48 = 36 ÷ 72 V_{DC}, 48 V_{AC}

Nominal measuring voltage
  230 = 230/400V
  400 = 400/690V
  100 = 57,7/100V

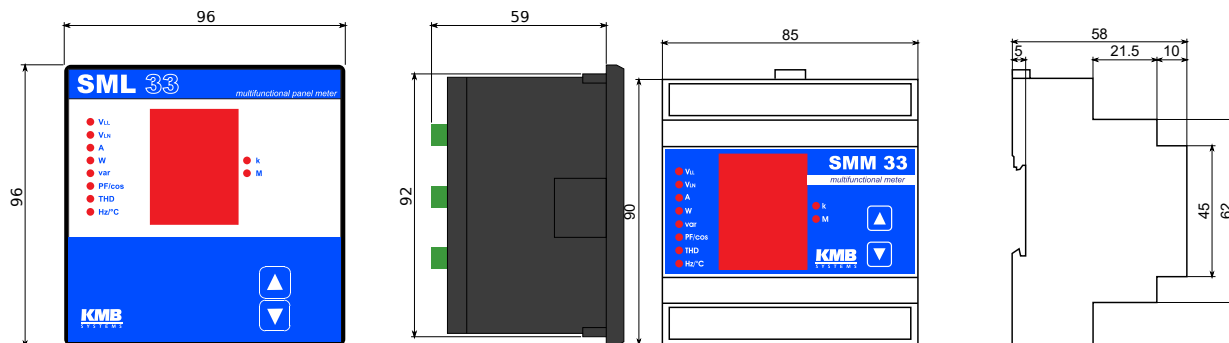**Measuring current input type**
  X/5A = 5A AC (standard indirect measurement)
  X/1A = 1A AC (standard indirect measurement)

Remote comm. interface
  N = no remote comm. link
 4 = RS-485

Mechanical dimensions

KMB SYSTEMS

Built-in instruments accessories

Option X/5A

Instruments with this option features standard 5A AC current input for normal current transformers. Current transformers with 5A or 1A AC nominall secondary current can be used.

Supported instruments: SMC 133, SMY 133, SML 133, SMZ 133, SMK 133

| Split-Core Model	Inom [A]	d [mm]	Connection	Dimmension [mm]	Overvoltage Category
JS17S– Inom/5A	150	17	Terminal	64×33×34	600V CAT III
JS24S – Inom/5A	100, 150, 200 250,300,400	24	Terminal	75×45×34	600V CAT III
JS36S – Inom/5A	200, 250, 300 400, 500, 600	36	Terminal	75×45×34	600V CAT III
JSC-01 – Inom/5A	100, 150, 200 250, 300, 400	38×32	Wire	93×92×39	600V CAT III
JSC-02 – Inom/5A	400, 500, 600 750, 800, 1000	73×62	Wire	128×124×39	600V CAT III
JSC-03 – Inom/5A	800, 1000, 1200 1250, 1500, 1600, 2000, 2400	141×62	Wire	196×124×39	600V CAT III

5A AC

1A AC
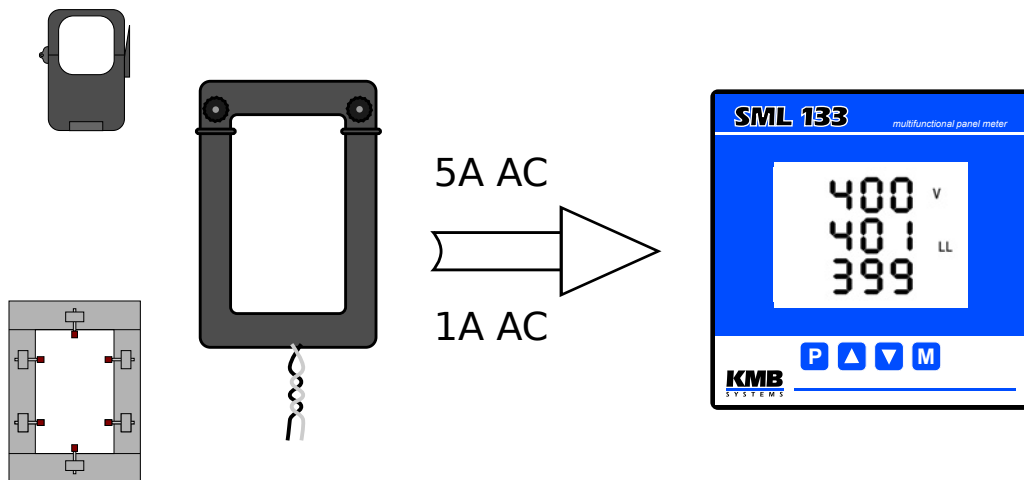
Option X/100mA

Instruments with this option features 100mA AC current input for special current transformers. This option provides higher survivability during over-current compared to standard 5A AC inputs.

Supported instruments: SMC 133, SMC 144, PA 144, SMY 133, SML 133, ARTIQ

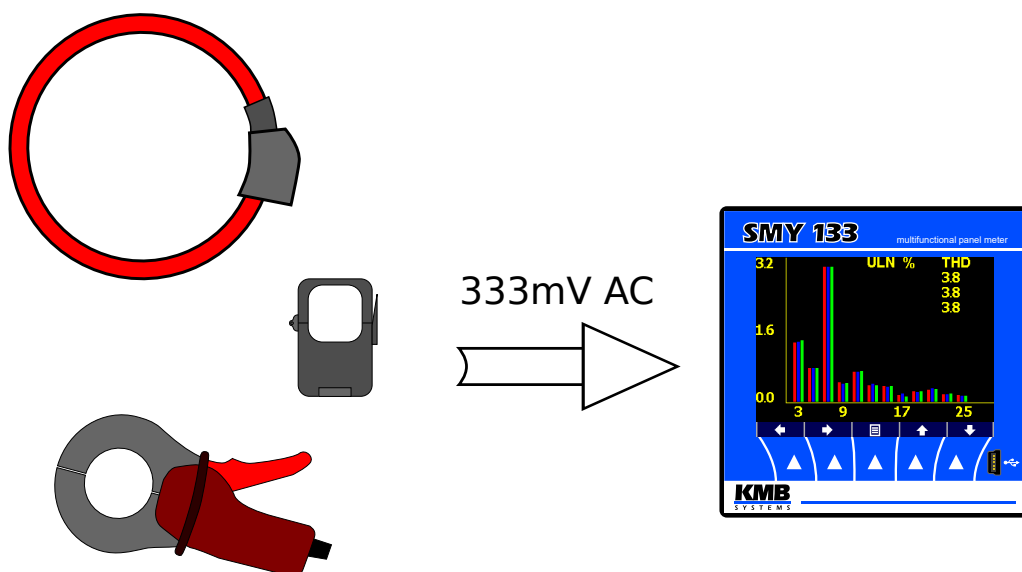| Split-Core Model	Inom [A]	d [mm]	Connection	Dimmension [mm]	Overvoltage Category
JS17F – Inom/100mA	050, 100 125, 150	17	Terminal	64×33×34	600V CAT III
JS17S – Inom/100mA	200	17	Terminal	64×33×34	600V CAT III
JS24F – Inom/100mA	200	24	Terminal	75×45×34	600V CAT III
JS24S – Inom/100mA	250, 300	24	Terminal	75×45×34	600V CAT III
JS36S – Inom/100mA	300, 400 500, 600	36	Terminal	91×57×40	600V CAT III
JSC-01 – Inom/100mA	250, 400	38×32	Wire	93×92×39	600V CAT III
JSC-02 – Inom/100mA	400, 600, 800 1000, 1200	73×62	Wire	128×124×39	600V CAT III
JSC-03 – Inom/100mA	800, 1000, 1200 1600, 2000, 2400	141×62	Wire	196×124×39	600V CAT III
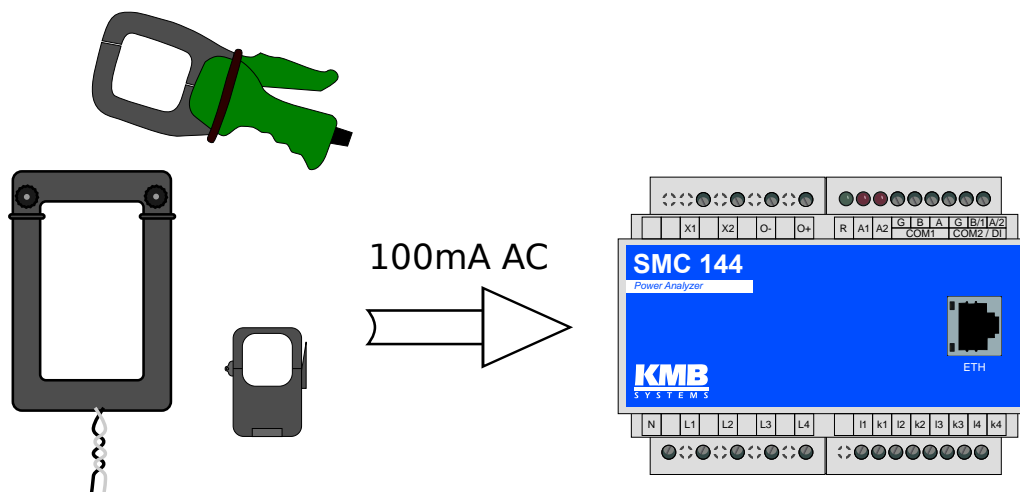
100mA AC

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Option X/333mV

Instruments with this option features 333mV AC input for measuring current using special current transformers. This special input supports various flexible rogowski coil current transformers as well as other kind of transformers with 333mV AC output such as split-core CTs or clamps.

Supported instruments: SMY 133, SML 133

Rogowski Coil Model	Inom [A]	d [mm]	Connection	Aux. Supply	Overvoltage Category
JRF MOI 333M-40 Inom	100, 150, 200, 250 300, 400, 500, 600 800, 1000, 1200 1500, 2000, 2400	40	Wire	5VDC 15mA max	600V CAT IV
JRF MOI 333M-80 Inom		80	Wire		600V CAT IV
JRF MOI 333M-115 Inom		115	Wire		600V CAT IV

| Split-Core Model	Inom [A]	d [mm]	Connection	Dimmension [mm]	Overvoltage Category
JS17F – Inom/333mV	050, 100 125, 150	17	Terminal	64×33×34	600V CAT III
JS17S – Inom/333mV	200	17	Terminal	64×33×34	600V CAT III
JS24F – Inom/333mV	200	24	Terminal	75×45×34	600V CAT III
JS24S – Inom/333mV	250, 300	24	Terminal	75×45×34	600V CAT III
JS36S – Inom/333mV	300, 400 500, 600	36	Terminal	91×57×40	600V CAT III
JSC-01 – Inom/333mV	250, 400	38×32	Wire	93×92×39	600V CAT III
JSC-02 – Inom/333mV	400, 600, 800 1000, 1200	73×62	Wire	128×124×39	600V CAT III
JSC-03 – Inom/333mV	800, 1000, 1200 1600, 2000, 2400	141×62	Wire	196×124×39	600V CAT III

Option Sxxx

Instrument with this option is delivered with 3/4 (depends on current inputs) split-core current transformers. Instrument is calibrated to current range specified in order. Provides robust solution for tougher environments. Because of split-core construction, instrument can be easily retrofitted into most of existing installations.

Supported instruments: SMC 144, PA 144, ARTIQ

| Option	Model	Inom [A]	d [mm]	Connection	Dimmension [mm]
S005	JC10F	5A	10mm	Terminal	50×23×26
S015	JC10F	15A	10mm	Terminal	50×23×26
S025	JC10F	25A	10mm	Terminal	50×23×26
S035	JC10F	35A	10mm	Terminal	50×23×26
S050	JC10F	50A	10mm	Terminal	50×23×26
S075	JC16F	75A	16mm	Terminal	55×30×31
S100	JC16F	100A	16mm	Terminal	55×30×31
S150	JC24F	150A	24mm	Terminal	75×45×34
S200	JC24F	200A	24mm	Terminal	75×45×34
S250	JC24F	250A	24mm	Terminal	75×45×34
S300	JC36S-3	300A	36mm	Terminal	91×57×41
S400	JC36S-3	400A	36mm	Terminal	91×57×41
S500	JC36S-3	500A	36mm	Terminal	91×57×41
S600	JC36S-3	600A	36mm	Terminal	91×57×41
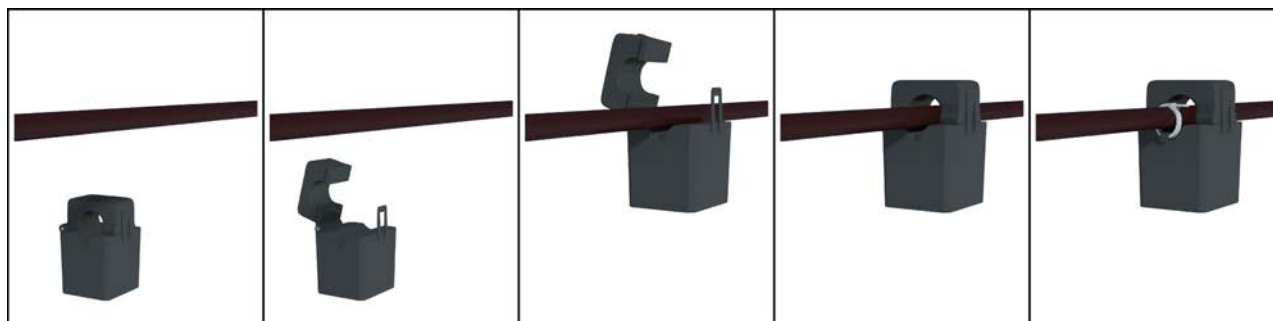
Option Pxxx

Instrument with this option is delivered with 3/4 (depends on current inputs) through-hole current transformers. Instrument is calibrated to current range specified in order. Provides very good accuracy and is aimed for less demanding environments. Option P005 is specially fine-tuned for measuring on secondary side of X/5A current transformers.

Supported instruments: SMC 144, PA 144, ARTIQ

Option	Model	Inom [A]	d [mm]	Connection	Dimmension [mm]
P005	JP3W	5A	7	Wire	27×24×11
P015	JP3W	15A	7	Wire	27×24×11
P025	JP5W	25A	13	Wire	41×37×14
P035	JP5W	35A	13	Wire	41×37×14
P050	JP5W	50A	13	Wire	41×37×14
P075	JP5W	75A	13	Wire	41×37×14
P100	JP5W	100A	13	Wire	41×37×14
P150	JP5W	150A	13	Wire	41×37×14
P200	JP6W	200A	19	Wire	51×49×20
P250	JP6W	250A	19	Wire	51×49×20
P300	JP6W	300A	19	Wire	51×49×20
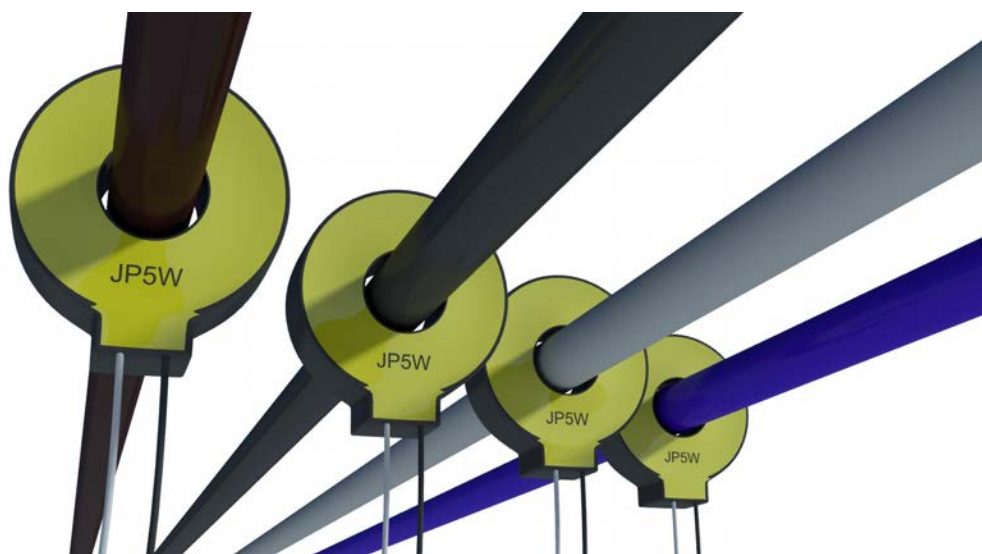
Option X/4V

Instruments with this option features ±4V input for measuring mainly DC currents. This special input supports any kind of sensors with this output, which is mostly Hall sensors.

Supported instruments: SMC 112, SMC 114, SMC 118

Model	Inom [A]	d [mm]	Connection	Dimmension [mm]	Construction
JS10NH – Inom	5,10,15,20,25,50	10	Wire	41×24×27	Split-core
JS16NH – Inom	75,100	16	Wire	45×30×32	Split-core
JS24NH – Inom	150, 200	24	Wire	65×45×34	Split-core
JS24SH – Inom	250, 300	24	Wire	65×45×34	Split-core
JS36SH – Inom	400, 500	36	Wire	83×57×40	Split-core

Model	Inom [A]	d [mm]	Connection	Dimmension [mm]	Construction
JHAO – InomCA	50, 75, 100, 150, 200, 300, 400, 500, 600	22	MOLEX 5045-04AG	70×40×20	Through-Hole
JHAO – InomCB	50, 75, 100, 150, 200, 300, 400, 500, 600	30	MOLEX 5045-04AG	78×48×20	Through-Hole
JHAO – InomGA	50, 75, 100, 150, 200, 300, 400, 500, 600	20	MOLEX 5045-04AG	40×30×30	Through-Hole
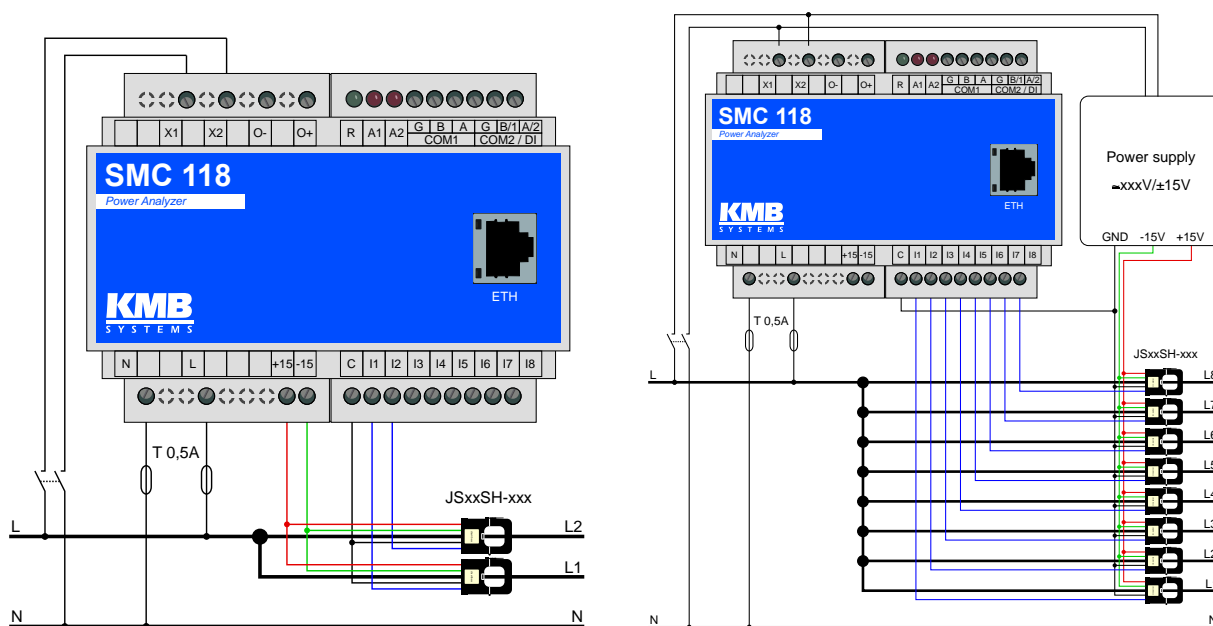
Optional Firmware Modules

PQ S, PQ A Module (Power Quality Class S, Power Quality Class A)

Module for evaluation of power quality according to EN 50160. Enables measurement and recording of flicker indices, interharmonics and voltage events. Power quality is evaluated weekly and stored to special PQ Main archive for future processing. Separate archive for logging of voltage event (sag, swell, dip) parameters is created. Instruments with this module installed becomes class S, respectively class A power quality analysers according to IEC 61000-40-30.

Supported Instruments
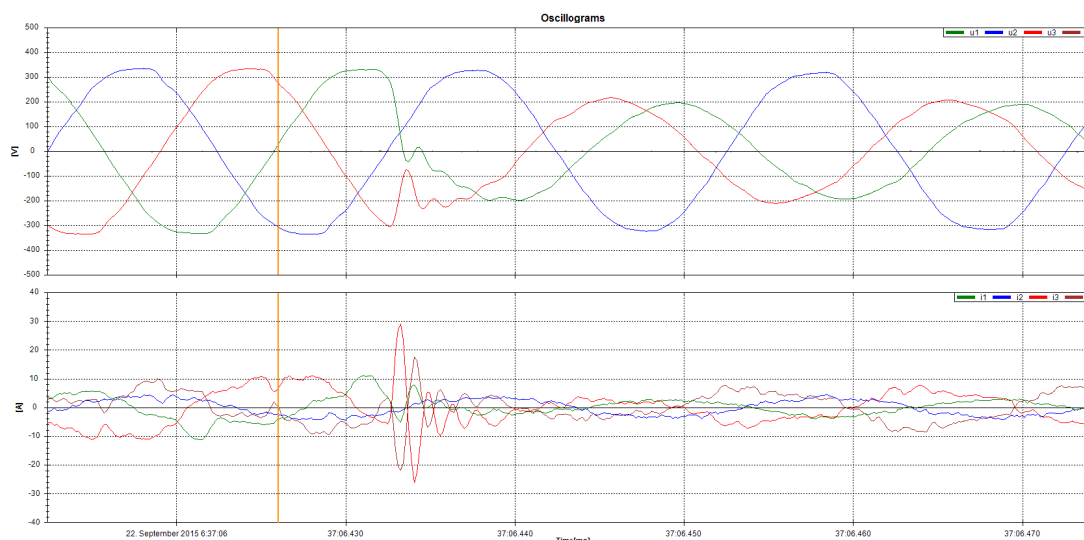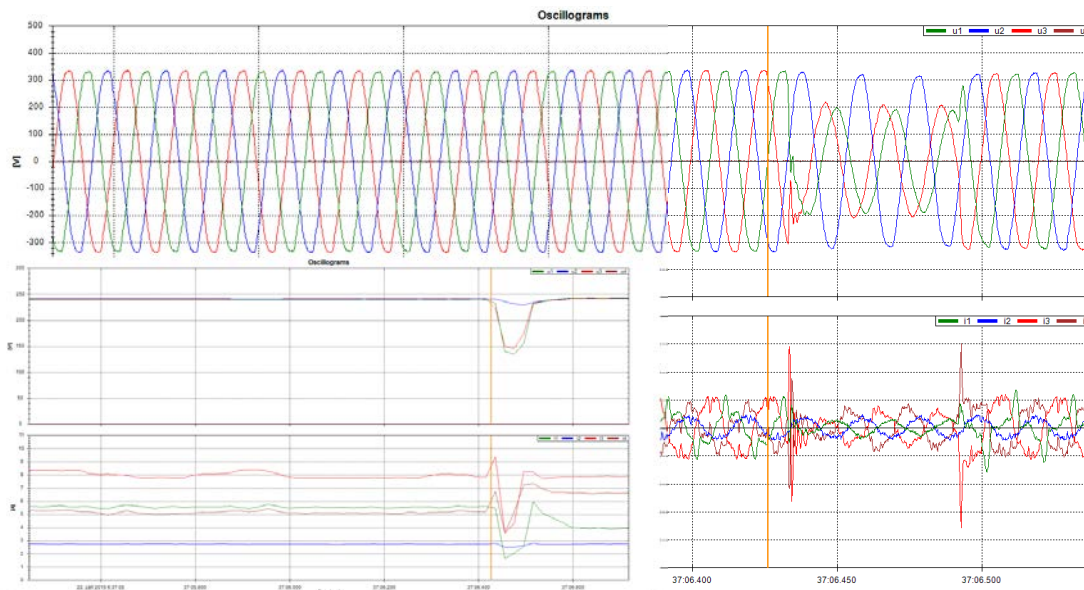
**PQ S:** SMC 133, SMC 144, SMY 133, SMZ 133

PQ A: ARTIQ 144
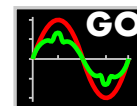
GO Module (General Oscillograms)

Module for detection and precise recording of various waveform distortions. This module records the so called oscillograms (raw samples) of voltages and currents in extended detail, capacity and trigger options into the flash memory. Stored data can be processed in ENVIS or exported to .xls or .csv files for processing in any 3rd party app. ENVIS not only allow to calculate RMS value of voltage and current but also harmonics, THDs and some other. Aggregation of calculated data can be configured from as low as 1 period.
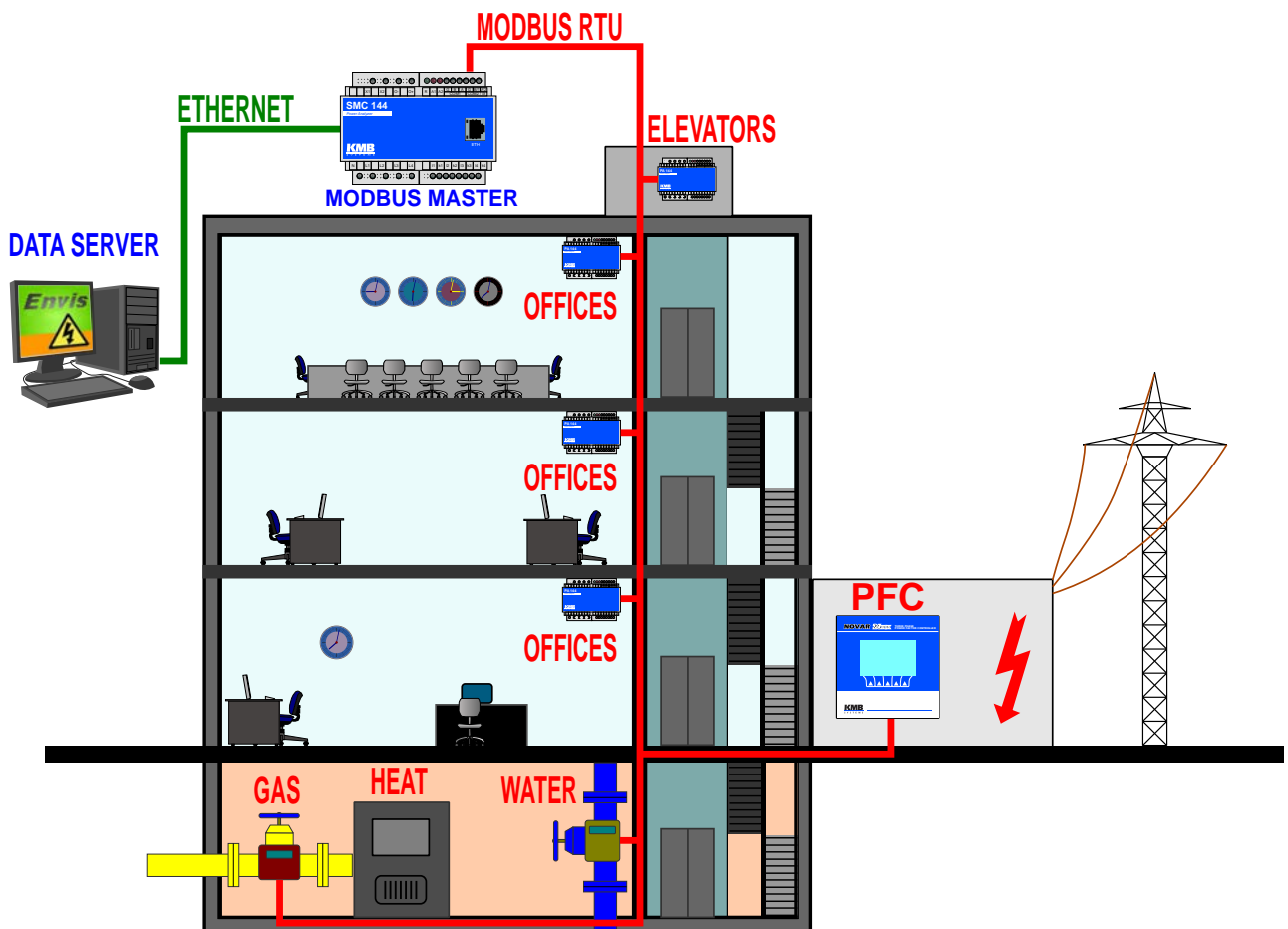

Supported Instruments

ARTIQ 144, SMC 133, SMC 144, SMY 133, SMZ 133, NEMO 104, NEMO 332, SMY-CA

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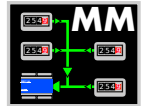
MM Module (ModBus Master)

ModBus Master module enhances instruments data logging abilities. By using this module you can configure the instrument to read any ModBus registers from any instruments of any manufacturer connected to it's RS-485 line. Downloaded values are stored into it's memory including a timestamp. ModBus archive created from stored values can then be downloaded into file or SQL database using ENVIS.Daq or ENVIS.Online. ENVIS allows than to do the evaluation, create graphs, tables etc. from these values. Collected values are not limited to electrical only. It's also possible to collect data from water-meters, gas-meters, HVAC and any other devices with ModBus.
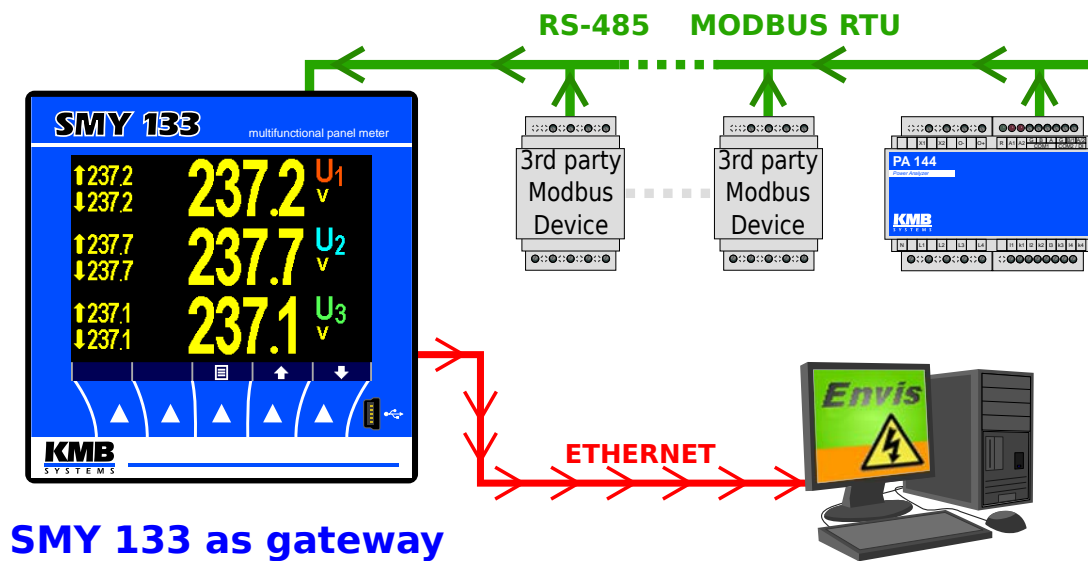

Supported Instruments

ARTIQ 144, SMC 133, SMC 144, SMZ 133
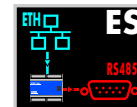
ES Module (Ethernet to Serial)

Ethernet to Serial module enables gateway functionality of the instrument. By using this module you can connect any RS-485 instrument to Ethernet. Instrument simply transmits all incoming data from Ethernet to RS-485 and all replies are transmitted back. Data from RS-485 devices can be acquired using ENVIS application or any Modbus enabled SCADA system. When Modbus protocol is used, instrument can convert optionally Modbus TCP to Modbus RTU.

SMY 133 as gateway

Supported Instruments

ARTIQ 144, SMC 133, SMC 144, SMY 133, SMZ 133

Portable Analysers

Comparison table of portable instruments							
	Memory [MB]	Meter	Communication	IEC 61000-4-30	EN 50160	Mesurement	Dimensions
NEMO 332	512	✓	USB, WiFi, RS-485	S	✓	4×U, 32×I	250 x 210 x 70 mm
NEMO 104	512	✓	USB, WiFi	S	✓	4×U, 4×I (24×I[a])	138 x 53 x 78 mm
NEMO 101	512	✓	USB, WiFi	S	✓	2×U, 2×I	138 x 53 x 78 mm
SMY-CA	512	✓	USB, Ethernet	S	✓	3×U, 3×I	210 x 166 x 90 mm

[a]with SPQ-IMPX6 multiplexer.

NEMO products represent main line of portable power quality analysers and network monitors for unattended measuring and recording campaigns of energy consumption. Voltage, current, power factor, frequency, flicker, harmonics and interharmonics and other parameters of the distribution network or local installation are recorded and analysed. SMY-CA and NEMO instruments can also record disturbances, spot and record voltage events and analyse the overall power quality in the point of measurement. Large internal memory and flexible record option configuration allows users to perform long measurements in field.

	SMY CA	NEMO 101	NEMO 104	NEMO 332
Measuring Range	$173 \div 476V_{LL}$ $100 \div 275V_{LN}$	$3 \div 480V_{LN}$	$5 \div 1380V_{LL}$ $3 \div 800V_{LN}$	$5 \div 1380V_{LL}$ $3 \div 800V_{LN}$
Auxiliary voltage	same as measuring	$85 \div 480V_{AC}$	$85 \div 480V_{AC}$ $100 \div 600V_{DC}$	$85 \div 480V_{AC}$ $100 \div 600V_{DC}$
Measurement cat.	CAT III/ 300V	CAT III/ 300V	CAT IV/ 600V	CAT IV/ 600V
Measurement	3U, 3I	1U, 1I	4U, 4I	4U, 32I
Current Inputs	X/333mV	SPQ-I	SPQ-I	SPQ-I
Quadrants	4	4	4	4
Sampling rate	6,4kHz	6,4kHz	6,4kHz	6,4kHz
Aggregation	200ms	200ms	200ms	200ms
Continuous meas.	●	●	●	●
Harmonics V/A	1 - 50	1 - 63	1 - 63	1 - 63
Interharmonics	●	●	●	●
THD-U [%]	●	●	●	●
THD-I [%]	●	●	●	●
Unbalance	●	●	●	●
Flicker (Pst, Plt)	●	●	●	●
Waveforms	●	●	●	●
Voltage Events	●	●	●	●
Accuracy V	class 0.2	±0.1%rdg±0.1V	±0.1%rdg±0.1V	±0.1%rdg±0.1V
Accuracy A	class 0.2	±0.3%rdg±0.06%rg	±0.3%rdg±0.06%rg	±0.3%rdg±0.06%rg
Active energy	0.5S	0.5S	0.5S	0.5S
Reactive energy	2	2	2	2
Digital I/O	-	-	-	2/-
Relay outputs	-	-	-	-
Analogue I/O	-	-	-	1/-
Temp. input	-	-	-	1
Internal temp.	●	●	●	●
Min/max memory	●	●	●	●
Memory size	512 MB	512 MB	512 MB	512 MB
Clock	●	●	●	●
Software	ENVIS	ENVIS	ENVIS	ENVIS
EN 50160	●	●	●	●
IEC 61000-4-30	class S	class S	class S	class S
Interfaces				
RS 232	-	-	-	-
RS 485	-	-	-	○
Ethernet	●	-	-	-
USB	●	●	●	●
Web server	●	-	-	-
Wifi	-	○	○	○
Protocols				
Modbus RTU	-	-	-	○
KMB	●	●	●	●
ModBus TCP	●	-	-	-
Construction				
Display	colour LCD	-	-	-
Dimension	220×190×110	138×73×58	138×73×58	250x210x70

●, 2 - Standard
○, 2 - Optional

KMB
S Y S T E M S

SMY-CA

Robust Waterproof Compact Analyser

Analyser of electric network parameters SMY-CA is a measuring and data logging instrument for single- and three phase low voltage (up to 230/400V) distribution networks in substations, switchgear boxes, cubicles or directly at the consumers premises such as smart buildings, hospitals, industrial infrastructures etc.

Core of the instrument is a modified SMY 133 analyser. Its features and functions closely corresponds to IP65 mini case version -CA.

With PQ S firmware module instrument becomes a fully featured power quality analysers with support for flicker indices (Pst, Plt), record of voltage events and weekly power quality evaluations according to EN 50160.

Standard | Optional

INPUTS	MEASUREMENT		+/-	HARMONICS	SAMPLING	CURRENT INPUT	STANDARDS
3U, 3I	U,I,P,Q	PF,cos,THD	Wh,varh	50	6,4kHz	333mV	EN 50160

FLASH	STANDARDS	USB	ETH	WEBSERVER	NTP	STANDARDS
512MB	IEC 61557-12					class S IEC 61000-4-30

SMY-CA

Technical specification

METERING	Voltage (ULN, ULL)	U1, U2, U3, U12, U23, U31 [act, avg, avg$_{max}$, avg$_{min}$]
	Current (I)	IL1, IL2, IL3 [act, avg, avg$_{max}$, avg$_{min}$]
	Power (P)	P1, P2, P3, 3P (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Apparent Power (S)	S1, S2, S3, 3S [act, avg, avg$_{max}$, avg$_{min}$]
	Harm. Distortion Power (D)	D1, D2, D3 [act, avg, avg$_{max}$, avg$_{min}$]
	Power Factor (PF), cosφ	PF1, PF2, PF3, 3PF, cosφ1, cosφ2, cosφ3, 3cosφ [act, avg, avg$_{max}$, avg$_{min}$]
	Symmetrical Components	zero, negative and positive sequence components of voltage and current
	Unbalance Factor	unbI, unbU, φnsI
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3
	Individual Harmonics	Harmonics 1st to 50th of Voltage and Current and their angles
	Fundament. Harmonic (Ufh, Ifh)	U1fh, U2fh, U3fh, I1fh, I2fh, I3fh
	Frequency (f)	f
	Active Energy	class 0.5S (62053-22), import/export, per phase, per tariff, total
	Reactive Energy	class 2 (62053-23), 4 quadrants, per phase, per tariff, total
DATALOGGING	Main Archive	min., max., avg. values of ULN, ULL, I, P, Q, S, D, THDU, THDI, f, Avg. values of harmonics and their angles, Ufh, Ifh,Symmetrical components, Unb. factors, state of I/Os
	Electricity Meter Readings	Active and reactive imp. and exp. energy per phase (L1, L2, L3) and per tariff (T1, T2, T3)
	Voltage Event logging	optional firmware module PQ S
	Waveforms recording	optional firmware module GO
OTHERS	Alarms	Logical functions, under/over limit of U, I, P, Q, S, unbl, THD, cos, f
	Inputs/Outputs	-
	Memory Size	512MB
	RTC	seconds, minutes, hours, days, months, years
	Communication	USB, Ethernet

POWER		
	aux. voltage	10 ÷ 275 V$_{AC}$ / 90 ÷ 350 V$_{DC}$
	power	8 VA / 3 W
	overvoltage cat.	CAT III / 300 V
INPUT VOLTAGE	measuring range	173 ÷ 476 V$_{LL}$ / 100 ÷ 275 V$_{LN}$
	measurement category	CAT III / 300V
INPUT CURRENT	measuring range	2 mV ÷ 500 mV

| OTHER		
TEMP	operating	-25 ÷ 60°C, <95% non-condens.
	storage	-40 ÷ 80°C, <95% non-condens.
EMC	emission	EN 61000 – 4 – 2, 3, 4, 5, 6, 11
	immunity	EN 55011, EN 55022 - class A
	protection rating	IP 65 (when top lid is closed)
	dimensions	96W × 96H × 58D mm / 0,3 kg

COMMUNICATION	
Local USB 2.0 KMBlong, MODBUS RTU protocols Connector type Mini-B	
Ethernet KMBlong, MODBUS TCP protocols	

ACCURACY (IEC 61557-12)	
voltage	0.2
current	0.2
active power	0.5
reactive power	1
apparent power	0.5
PF, cosφ	0.5
frequency	0.02
active energy	0.5
reactive energy	2
harm. and THD	2
unbalance	0.5

KMB SYSTEMS

Current sensors

Instruments with this option features 333mV AC input for measuring current using special current transformers. This special input supports various flexible rogowski coil current transformers as well as other kind of transformers with 333mV AC output such as split-core CTs or clamps.

Rogowski Coil Model	Inom [A]	d [mm]	Connection	Aux. Supply	Overvoltage Category
JRF MOI 333M-40 Inom	100, 150, 200, 250 300, 400, 500, 600 800, 1000, 1200 1500, 2000, 2400	40	Wire	5VDC 15mA max	600V CAT IV
JRF MOI 333M-80 Inom		80	Wire		600V CAT IV
JRF MOI 333M-115 Inom		115	Wire		600V CAT IV

* Unit : mm
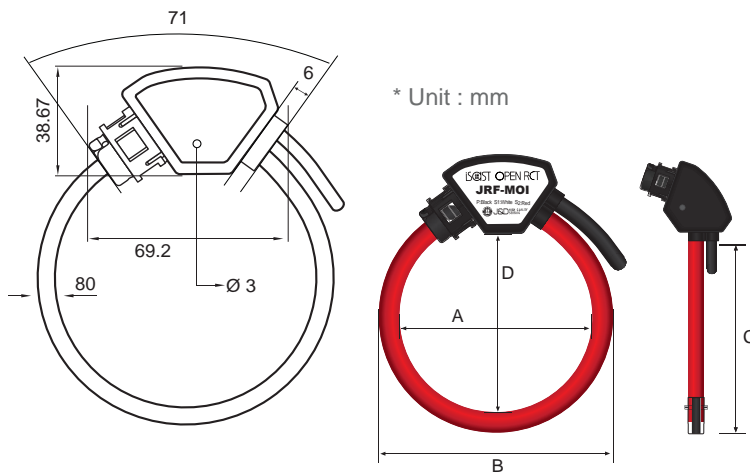
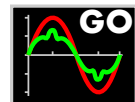| Model	A	B	C	D
JRF MOI 333M-40	58	66	185	40
JRF MOI 333M-80	80	96	285	80
JRF MOI 333M-115	115	141	385	115

Optional firmware modules

PQ S module
Module for evaluation of power quality according to EN 50160 (class S). Enables measurement and recording of flicker indices, interharmonics and voltage events. Power quality is evaluated weekly and stored to special PQ Main archive for future processing.
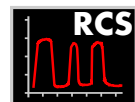
GO module
Module for detection and precise recording of various waveform distortions. This module records the so called oscillograms of voltages and currents in extended detail, capacity and trigger options into the flash memory.
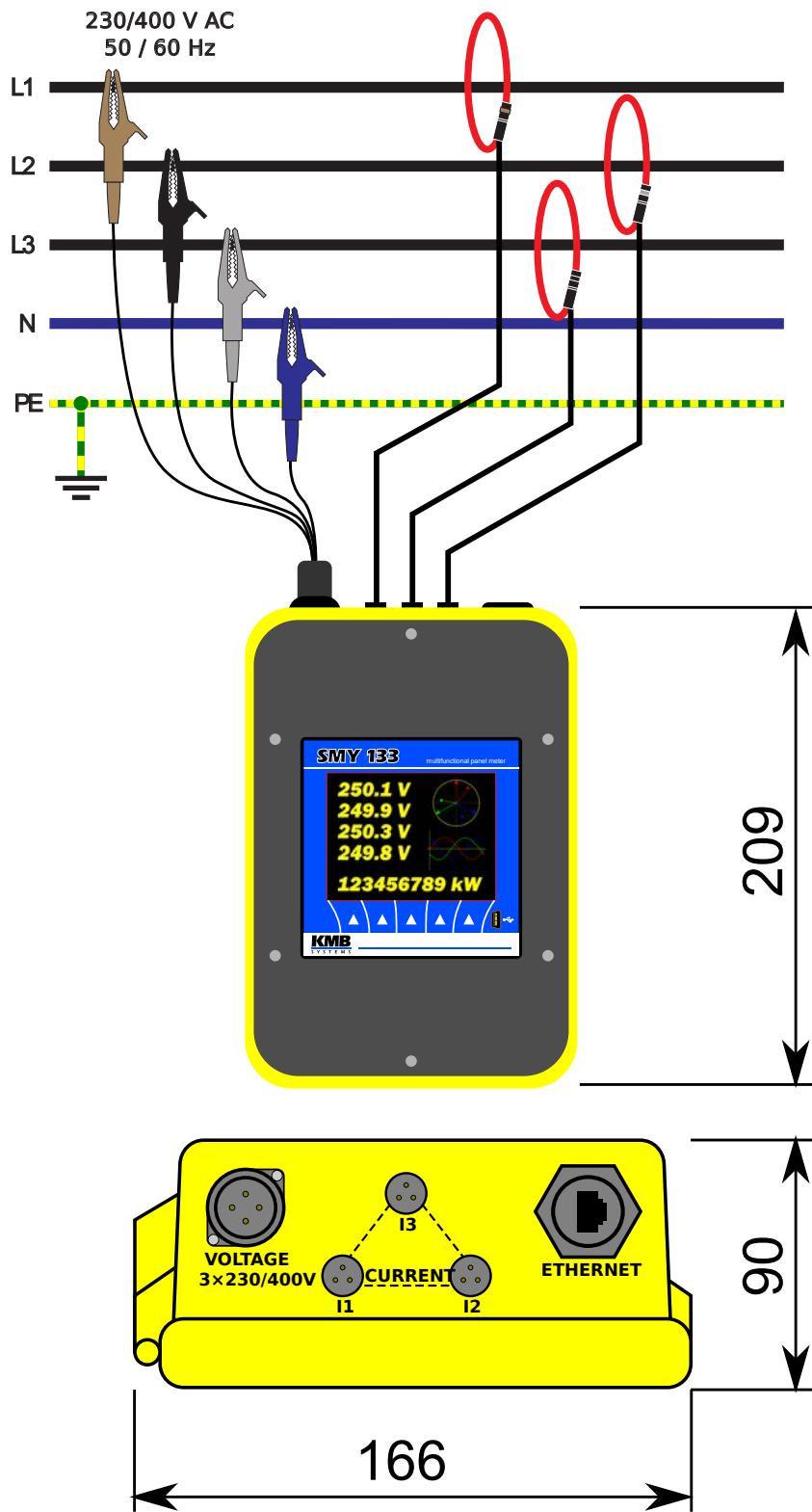
RCS module
The RCS module (ripple control signal or mains voltage) activates an ability to detect, evaluate, decode and store RCS messages transmitted over the distribution network. It precisely measures voltage on the selected frequency and stores the extracted information.

Typical connection schema

230/400 V AC
50 / 60 Hz

L1

L2

L3

N

PE

SMY 133   multifunctional panel meter

250.1 V
249.9 V
250.3 V
249.8 V

123456789 kW

KMB
SYSTEMS

209

VOLTAGE
3×230/400V

I3

CURRENT

I1   I2

ETHERNET

90

166

KMB
SYSTEMS

NEMO 332

Multi-channel Power Quality Analyser

NEMO 332 is a portable multifunctional power analyser with data logger functions. It is suitable for measurement in all types of power distribution networks (LV, HV measured via voltage transformer). Its large internal memory can store months of measured power parameters. Disturbance data such as transients, voltage events, ripple control signals and other variations, system log, electricity meter reading + load profiles and other interesting information is also recorded.

It can measure up to 8 different feeders (32 currents and powers, 4 common voltages) and thus it is suitable for monitoring campaigns where several separated loads should be measured concurrently. ENVIS application is used for analysis and report generation of the recorded data.

Typical use: power quality troubleshooting, load monitoring, substation data logger, energy efficiency, portable analyser.

Key features:

- 4 voltage inputs, up to 8×4 current inputs to connect SPQ-I current probe (32 currents)

- class S power monitoring according to the international standard IEC 61000-4-30, ed. 2.

- power quality evaluation according to EN 50160

- power supply - external voltage $100 \div 400 V_{AC}$, through USB interface

- built-in lithium accumulator to cover power outages

- internal memory for archives with capacity of 512 MB

- USB interface and optional WiFi and RS-485 interface for remote communication

Standard | Optional

INPUTS	MEASUREMENT		+/-	HARMONICS		WIFI	RS485	MODBUS
4U, 32I	U,I,P,Q	PF,cos,THD	Wh,varh	64				Modbus

BATTERY	SAMPLING	FLASH	USB	STANDARDS		INPUTS	INPUTS	INPUTS
	6,4kHz	512MB		EN 50160		2×DIGI	1×4÷20mA	Pt100

Technical specification

METERING	Voltage (ULN, ULL)	U1, U2, U3, UN, U12, U23, U31 [act, avg, avg$_{max}$, avg$_{min}$]
	Current (I)	IL1, IL2, IL3, ILN [act, avg, avg$_{max}$, avg$_{min}$]
	Power (P)	P1, P2, P3, PN, 3P (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Reactive Power (Q)	Q1, Q2, Q3, QN, 3Q (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Apparent Power (S)	S1, S2, S3, SN, 3S [act, avg, avg$_{max}$, avg$_{min}$]
	Harm. Distortion Power (D)	D1, D2, D3, DN [act, avg, avg$_{max}$, avg$_{min}$]
	Power Factor (PF), cosφ	PF1, PF2, PF3, PFN, 3PF, cosφ1, cosφ2, cosφ3, cosφN, 3cosφ [act, avg, avg$_{max}$, avg$_{min}$]
	Symmetrical Components	zero, negative and positive sequence components of voltage and current
	Unbalance Factor	unbI, unbU, φnsI
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDUN
	Current THD (THDI)	THDI1, THDI2, THDI3, THDIN
	Individual Harmonics	Harmonics 1st to 63rd of Voltage and Current and their angles
	Fundament. Harmonic (Ufh, Ifh)	U1fh, U2fh, U3fh, Unfh, I1fh, I2fh, I3fh, INfh
	Frequency (f)	f
	Active Energy	Import (E1, E2, E3, ΣE), Export (E1, E2, E3, ΣE), Total Import (Tariff 1, Tariff 2, Tariff 3), Total Export (Tariff 1, Tariff 2, Tariff 3)
	Reactive Energy	Inductive (E1, E2, E3, ΣE), Capacitive (E1, E2, E3, ΣE), Total Inductive (Tariff1, Tariff2, Tariff3), Total Capacitive (Tariff1, Tariff2, Tariff3)
DATALOG.	Main Archive	min., max., avg. values of ULN, ULL, I, P, Q, S, D, THDU, THDI, f, Avg. values of individual harmonics and their angles, Ufh, Ifh, Symmetrical components, Unbalance factors, state of I/Os
	Electricity Meter Readings	Active and reactive imp. and exp. energy per phase (L1, L2, L3) and per tariff (T1, T2, T3)
	Voltage Event logging	Yes
	Waveforms recording	Yes
OTHERS	Alarms	Logical functions, under/over limit of U, I, P, Q, S, unbl, THD, cos, f
	Inputs/Outputs	Optionally: 2 digital inputs, input for thermometer, analog input
	Memory Size	512MB
	RTC	seconds, minutes, hours, days, months, years
	Communication	USB, WiFi, RS-485

POWER	aux. voltage	85 ÷ 480 V$_{AC}$ / 80 ÷ 680 V$_{DC}$
	power	8 VA / 8 W
	meas. cat.	CAT IV / 600 V
INPUT — VOLTAGE	meas. range	5 ÷ 1380 V$_{LL}$ / 3 ÷ 800 V$_{LN}$
	input imp.	15 MΩ (L$_i$↔N)
	connection	wye, delta, aron
	overload	800 V$_{RMS}$, 1200 V$_{RMS}$ for 1s
INPUT — CURRENT	measuring range	up to 10kA, depends on probe
	overload	-

I/O	D	24V input	U$_L$ < 3 V, U$_H$ > 10 V, <0,4VA (Ri = 1,5 kΩ)
	A	Analog input	2 ÷ 22 mA, impedance 120 Ω
	T	Pt100 input	range -50 ÷ 150 °C
OTHER	TEMP — operating		-25 ÷ 60°C, <95% non-condens.
	TEMP — storage		-40 ÷ 85°C, <95% non-condens.
	EMC — emission		EN 61000 – 4 – 2, 3, 4, 5, 6, 11
	EMC — immunity		EN 55011, EN 55022 - class A
	protection rating		IP 40
	dimensions		250W × 210H × 65D mm / 1 kg

COMMUNICATION	USB 2.0 (standard) KMBlong protocol Connector type Mini-B 2400 ÷ 921600 baud
	WiFi (opt. **W, X**) KMBlong protocol IEEE 802.11 b,g
	RS-485 (opt. **4**) KMBlong, MODBUS RTU protocols 2400 ÷ 921600 baud

ACCURACY	voltage	0.10%
	current	0.50%
	active power	1.00%
	reactive power	2.00%
	apparent power	1.00%
	PF, cosφ	0.02
	frequency	0.20%
	active energy	1.00%
	reactive energy	2.00%
	harm. and THD	0.50%/1.00%
	unbalance	0.15%
	flicker	5%

KMB SYSTEMS

Ordering options

```
                              NEMO 332 - 1 A W N
```

Instrument Type
    NEMO 332 = Portable Network Monitor

Current Inputs
    1 = 1 input for SPQ-I current probe (up to 4 currents)
    2 = 2 inputs for SPQ-I current probes (up to 8 currents)
    4 = 4 inputs for SPQ-I current probes (up to 1 currents)
    8 = 8 inputs for SPQ-I current probes (up to 32 currents)

Analog Inputs
    N = Without inputs
    A = O(4) - 20 mA current loop input, 2 logical inputs
    T = Input for temperature sensor, 2 logical inputs

Remote Communication Interface
    N = Without communication interface
    W = Wi-Fi with integrated antenna
    X = Wi-Fi, SMA-M connector for external antenna
    4 = RS-485

Wireless Communication Interface 2
    N = Without communication interface

Current sensor options

```
                          SPQ - I3000 - 4 JRF1
```

Current Probe Type
    SPQ - Probe for NEMO class instruments

Current Ranges
    I10000 = Inom 10000A/3000A/1000A/300A
    I3000 = Inom 3000A/1000A/300A/100A
    I1000 = Inom 1000A/300A/100A/30A
    I300   = Inom 300A/100A/30A/10A

Number of Current Sensors
    3 = Three sensors
    4 = Four sensors

Current Sensor Type
    JRF1 = Rogowski coil (Ø12mm), latch lock, length 40cm (Ø12,7cm)
    JRF2 = Rogowski coil (Ø12mm), latch lock, length 60cm (Ø19,1cm)
    JRF3 = Rogowski coil (Ø12mm), latch lock, length 100cm (Ø32,0cm)
    MFC0 = Rogowski coil (Ø8,3mm), bayonet lock, length 25cm (Ø8,0cm)
    MFC1 = Rogowski coil (Ø8,3mm), bayonet lock, length 40cm (Ø12,7cm)
    MFC2 = Rogowski coil (Ø8,3mm), bayonet lock, length 60cm (Ø19,1cm)
    MFC3 = Rogowski coil (Ø8,3mm), bayonet lock, length 100cm (Ø32,0cm)

```
                          SPQ - I250 - 4 JCLA
```

Current Probe Type
    SPQ - Probe for NEMO class instruments

Current Ranges
    I250   = Inom 250A/50A/10A/2A

Number of Current Sensors
    3 = Three sensors
    4 = Four sensors

Current Sensor Type
    JCLA = Clamp-on CT, max. conductor Ø13mm

Typical connection schema
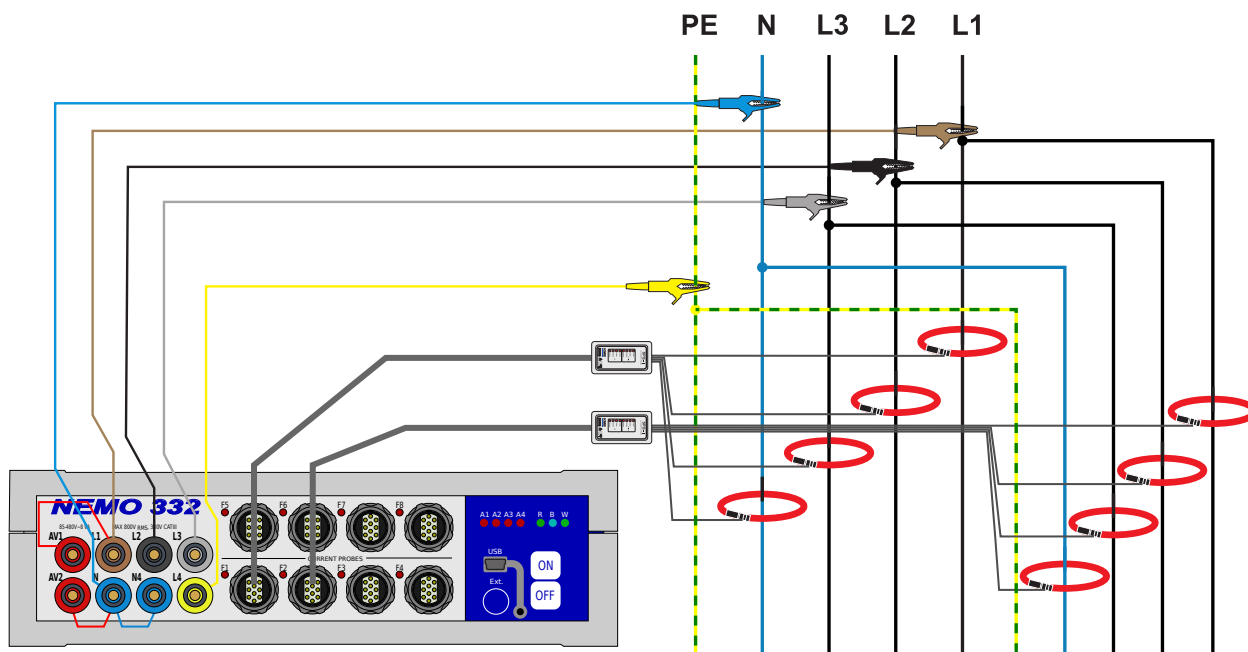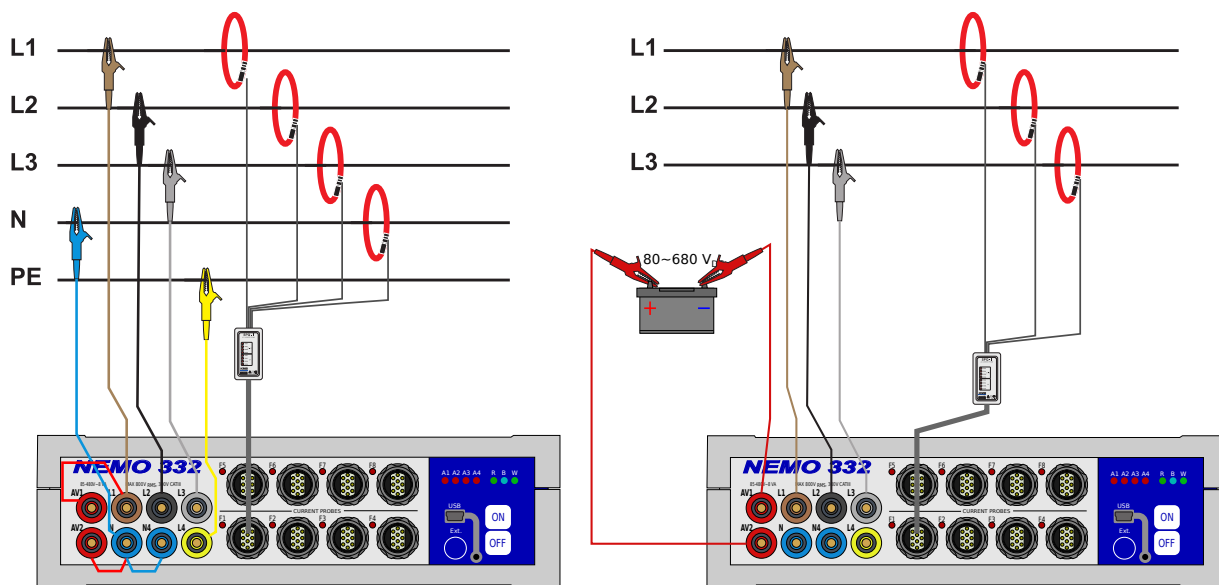
Mechanical dimensions

KMB SYSTEMS
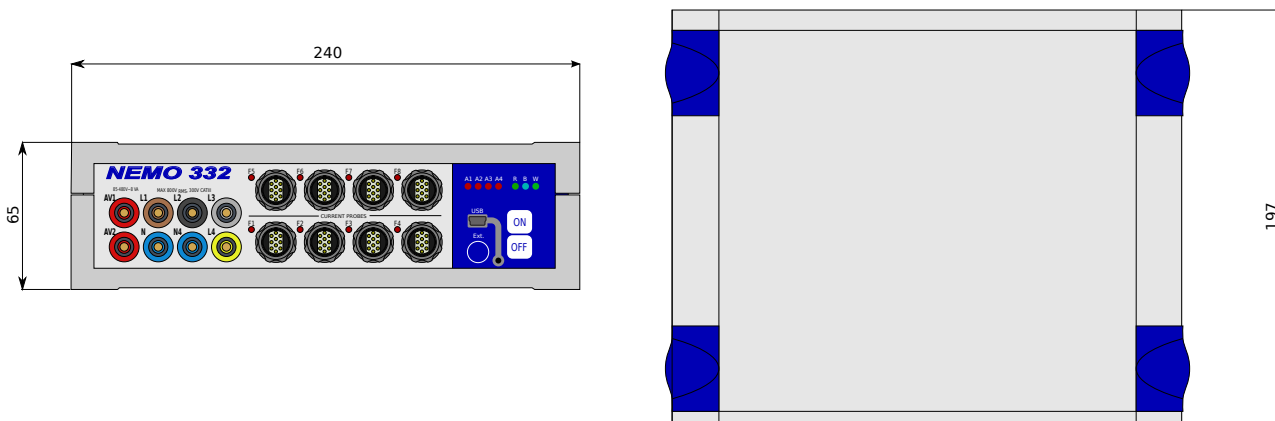
NEMO 104

Compact Power Quality Analyser

NEMO 104 is a modular analyser of power quality. In the basic package it is intended for continuous monitoring of four voltages and currents (in three phase AC networks). The device shares many features and parameters with its built-in predecessor SMPQ.

Compared to the basic SIMON 341 line of analysers it can additionally evaluate flicker severity indexes, inter-harmonics and handles voltage measurement fully according to IEC EN 61000-4-30 ed. 2. The power quality in NEMO 104 is evaluated according to EN 50160. It also records voltage events and other predefined phe-nomena. Its ultra compact case and IP50 case is making this monitor an ideal choice for measurements in rough space limited environments.

Key features:

- 4 voltage inputs, 4 current inputs

- ultra compact housing with silicone protectors

- class S power monitoring according to the international standard IEC 61000-4-30, ed. 2.

- power quality evaluation according to EN 50160

- supply voltage separated from measured

- built-in lithium accumulator to cover power outages

- internal memory for archives with capacity of 512 MB

- USB communication interface and optional WiFi interface

Standard

INPUTS	MEASUREMENT		+/-	HARMONICS	BATTERY	SAMPLING	FLASH	USB	STANDARDS
4U, 4I	U,I,P,Q	PF,cos,THD	Wh,varh	64		6,4kHz	512MB		EN 50160

Optional

WIFI

Technical specification

METERING	Voltage (ULN, ULL)	U1, U2, U3, UN, U12, U23, U31 [act, avg, avg$_{max}$, avg$_{min}$]
	Current (I)	IL1, IL2, IL3, ILN [act, avg, avg$_{max}$, avg$_{min}$]
	Power (P)	P1, P2, P3, PN, 3P (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Reactive Power (Q)	Q1, Q2, Q3, QN, 3Q (import, export, total, 1st harmonic) [act, avg, avg$_{max}$, avg$_{min}$]
	Apparent Power (S)	S1, S2, S3, SN, 3S [act, avg, avg$_{max}$, avg$_{min}$]
	Harm. Distortion Power (D)	D1, D2, D3, DN [act, avg, avg$_{max}$, avg$_{min}$]
	Power Factor (PF), cosφ	PF1, PF2, PF3, PFN, 3PF, cosφ1, cosφ2, cosφ3, cosφN, 3cosφ [act, avg, avg$_{max}$, avg$_{min}$]
	Symmetrical Components	zero, negative and positive sequence components of voltage and current
	Unbalance Factor	unbI, unbU, φnsI
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDUN
	Current THD (THDI)	THDI1, THDI2, THDI3, THDIN
	Individual Harmonics	Harmonics 1st to 63rd of Voltage and Current and their angles
	Fundament. Harmonic (Ufh, Ifh)	U1fh, U2fh, U3fh, Unfh, I1fh, I2fh, I3fh, INfh
	Frequency (f)	f
	Active Energy	Import (E1, E2, E3, ΣE), Export (E1, E2, E3, ΣE), Total Import (Tariff 1, Tariff 2, Tariff 3), Total Export (Tariff 1, Tariff 2, Tariff 3)
	Reactive Energy	Inductive (E1, E2, E3, ΣE), Capacitive (E1, E2, E3, ΣE), Total Inductive (Tariff1, Tariff2, Tariff3), Total Capacitive (Tariff1, Tariff2, Tariff3)
DATALOG.	Main Archive	min., max., avg. values of ULN, ULL, I, P, Q, S, D, THDU, THDI, f, Avg. values of individual harmonics and their angles, Ufh, Ifh, Symmetrical components, Unbalance factors, state of I/Os
	Electricity Meter Readings	Active and reactive imp. and exp. energy per phase (L1, L2, L3) and per tariff (T1, T2, T3)
	Voltage Event logging	Yes
	Waveforms recording	Yes
OTHERS	Alarms	Logical functions, under/over limit of U, I, P, Q, S, unbl, THD, cos, f
	Inputs/Outputs	-
	Memory Size	512MB
	RTC	seconds, minutes, hours, days, months, years
	Communication	USB, WiFi

POWER	aux. voltage	85 ÷ 480 V$_{AC}$ / 80 ÷ 680 V$_{DC}$
	power	8 VA / 8 W
	meas. cat.	CAT IV / 600 V
INPUT — VOLTAGE	meas. range	5 ÷ 1380 V$_{LL}$ / 3 ÷ 800 V$_{LN}$
	input imp.	15 MΩ (L$_i$↔N)
	connection	wye, delta, aron
	overload	800 V$_{RMS}$, 1200 V$_{RMS}$ for 1s
INPUT — CURRENT	measuring range	up to 10kA, depends on probe
	overload	-

OTHER — TEMP	operating	-25 ÷ 60°C, <95% non-condens. environ.
	storage	-40 ÷ 85°C, <95% non-condens. environ.
OTHER — EMC	emission	EN 61000 – 4 – 2, 3, 4, 5, 6, 11
	immunity	EN 55011, EN 55022 - class A
OTHER	protection rating	IP 40
	dimensions	138W × 73H × 58D mm / 0.25 kg

COMMUNICATION	USB 2.0 (standard) KMBlong protocol Connector type Mini-B 2400 ÷ 921600 baud
	WiFi (opt. **W, X**) KMBlong protocol IEEE 802.11 b,g

ACCURACY	voltage	0.10%
	current	0.50%
	active power	1.00%
	reactive power	2.00%
	apparent power	1.00%
	PF, cosφ	0.02
	frequency	0.20%
	active energy	1.00%
	reactive energy	2.00%
	harm. and THD	0.50%/1.00%
	unbalance	0.15%
	flicker	5%

KMB SYSTEMS

Ordering options

NEMO 104 - 1 W

Instrument Type
    NEMO 104 = Portable Network Monitor
Current Inputs
    O = Without input for current probe
    1 = 1 input for SPQ-I current probe (up to 4 currents)
Wireless Communication Interface
    N = Without communication interface
    W = Wi-Fi with integrated antenna
    X = Wi-Fi, SMA-M connector for external antenna

Current probe options

SPQ - I3000 - 4 JRF1

Current Probe Type
    SPQ - Probe for NEMO class instruments
Current Ranges
    I10000 = Inom 10000A/3000A/1000A/300A
    I3000 = Inom 3000A/1000A/300A/100A
    I1000 = Inom 1000A/300A/100A/30A
    I300   = Inom 300A/100A/30A/10A
Number of Current Sensors
    3 = Three sensors
    4 = Four sensors
Current Sensor Type
    JRF1 = Rogowski coil (Ø12mm), latch lock, length 40cm (Ø12,7cm)
    JRF2 = Rogowski coil (Ø12mm), latch lock, length 60cm (Ø19,1cm)
    JRF3 = Rogowski coil (Ø12mm), latch lock, length 100cm (Ø32,0cm)
    MFC0 = Rogowski coil (Ø8,3mm), bayonet lock, length 25cm (Ø8,0cm)
    MFC1 = Rogowski coil (Ø8,3mm), bayonet lock, length 40cm (Ø12,7cm)
    MFC2 = Rogowski coil (Ø8,3mm), bayonet lock, length 60cm (Ø19,1cm)
    MFC3 = Rogowski coil (Ø8,3mm), bayonet lock, length 100cm (Ø32,0cm)

SPQ - I250 - 4 JCLA

Current Probe Type
    SPQ - Probe for NEMO class instruments
Current Ranges
    I250   = Inom 250A/50A/10A/2A
Number of Current Sensors
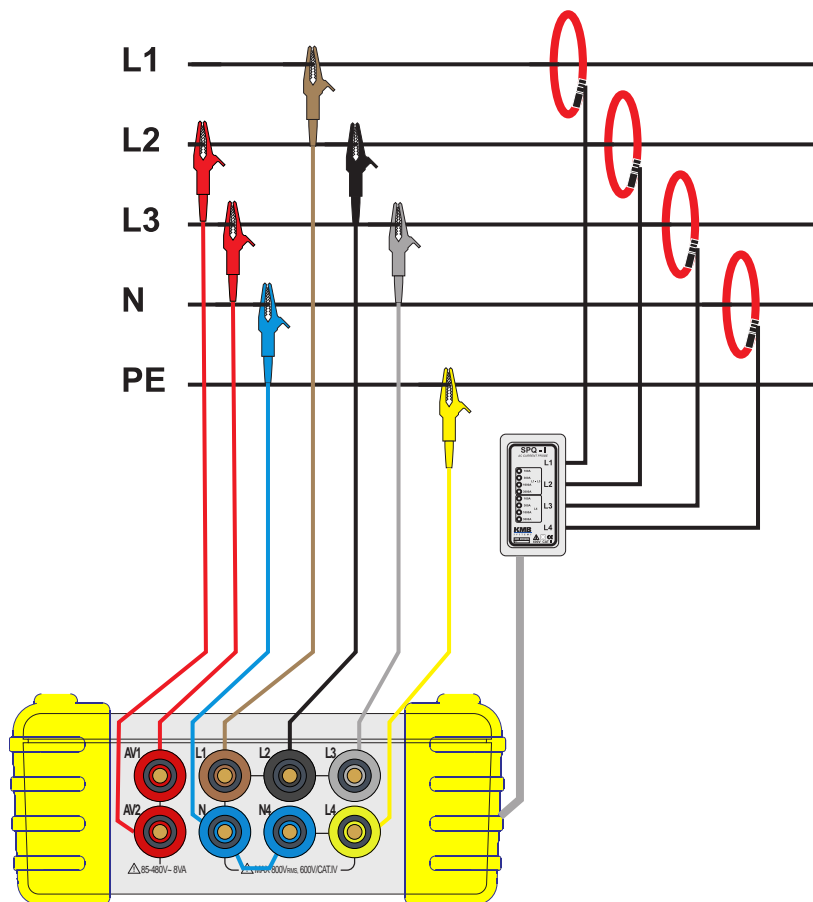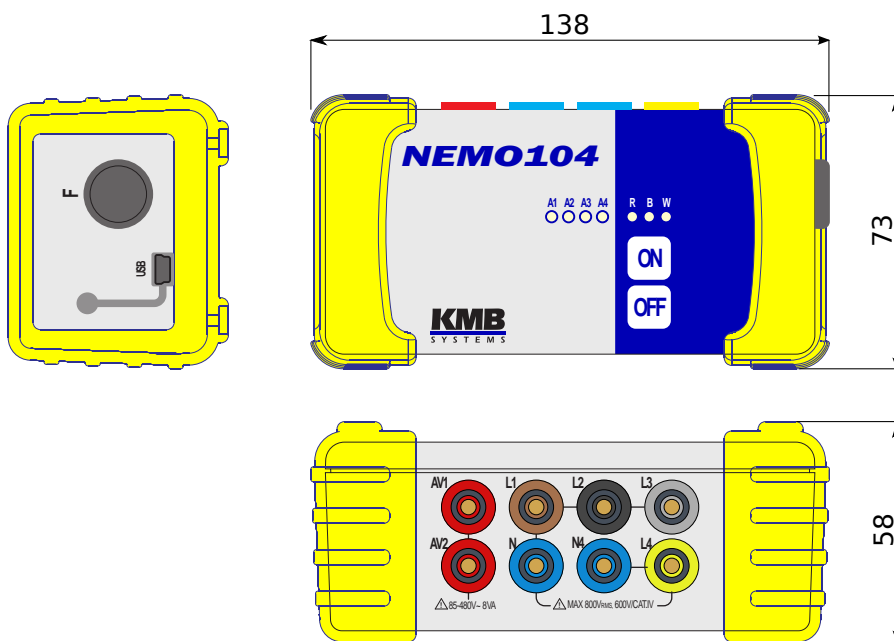   3 = Three sensors
    4 = Four sensors
Current Sensor Type
    JCLA = Clamp-on CT, max. conductor Ø13mm

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SYSTEMS

Typical connection schema

Mechanical dimensions

KMB SYSTEMS

NEMO 101

Single Phase Power Quality Data Logger

NEMO 101 is a modular analyser of power quality. Its primary purpose is easy measuring, monitoring and data logging of power quality directly in wall socket. The device shares many features and parameters with its built-in predecessor SMPQ.

Instrument may be connected directly between power supply and measured device, Compared to the basic SIMON 341 line of analysers it can additionally evaluate flicker severity indexes, inter-harmonics and handles voltage measurement fully according to IEC EN 61000-4-30 ed. 2. The power quality in NEMO 101 is evaluated according to EN 50160. It also records voltage events and other predefined phenomena.

Key features:

- 1 voltage and 1 current input, measures according to EN 61000-4-30 ed.2

- ultra compact housing with silicone protectors

- power quality evaluation according to EN 50160

- built-in lithium accumulator to cover power outages

- internal memory for archives with capacity of 512 MB

- USB communication interface and optional WiFi interface

Standard									Optional
INPUTS	MEASUREMENT		+/-	HARMONICS	BATTERY	SAMPLING	FLASH	USB	STANDARDS	WIFI
1U, 2I	U,I,P,Q	PF,cos,THD	Wh,varh	64		6,4kHz	512MB		EN 50160	

Ordering options

NEMO 1O1 - 1 W

Instrument Type
    NEMO 1O1 = Portable Network Monitor, 1-phase, wall socket
Current Inputs
    O = Without current measurement
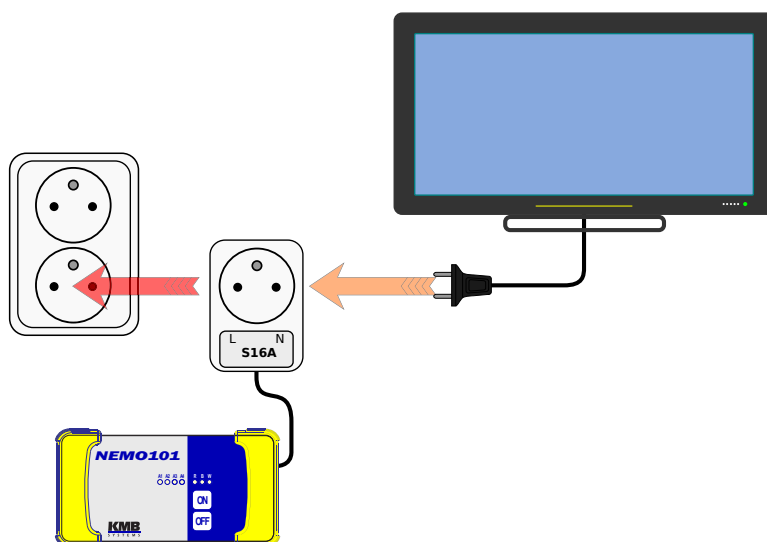   1 = 2 currents In and I1 through wall socket adapter
Wireless Communication Interface
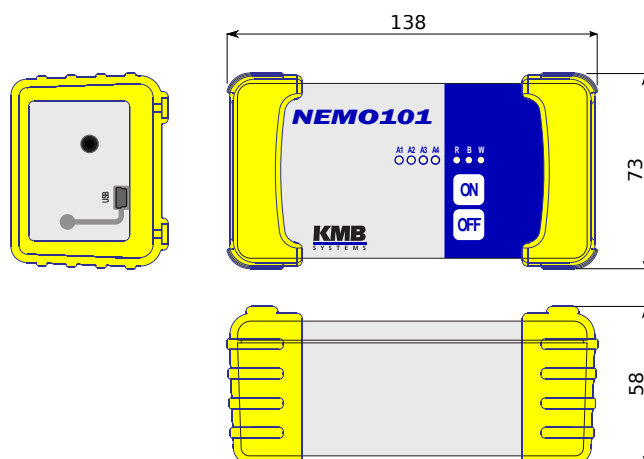   N = Without communication interface
    W = Wi-Fi with integrated antenna
    X = Wi-Fi, SMA-M connector for external antenna

Typical connection schema
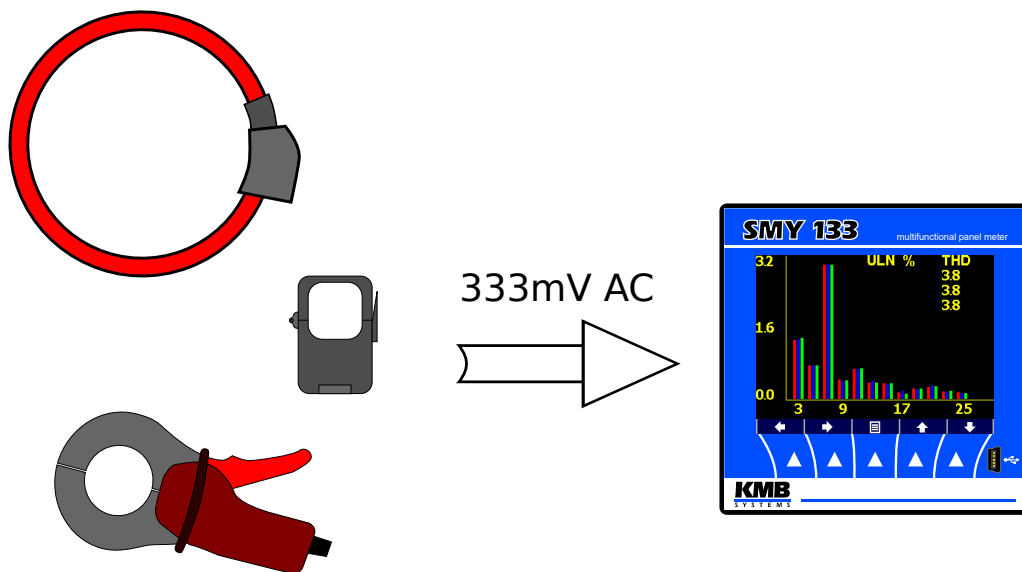

Mechanical dimensions

Portable instruments accessories

Option X/333mV

Instruments with this option features 333mV AC input for measuring current using special current transformers. This special input supports various flexible rogowski coil current transformers as well as other kind of transformers with 333mV AC output such as split-core CTs or clamps.

Supported instruments: SMY 133, SML 133, SMY - CA

Rogowski Coil Model	Inom [A]	d [mm]	Connection	Aux. Supply	Overvoltage Category
JRF MOI 333M-40 Inom	100, 150, 200, 250 300, 400, 500, 600 800, 1000, 1200 1500, 2000, 2400	40	Wire	5VDC 15mA max	600V CAT IV
JRF MOI 333M-80 Inom		80	Wire		600V CAT IV
JRF MOI 333M-115 Inom		115	Wire		600V CAT IV

Split-Core Model	Inom [A]	d [mm]	Connection	Dimmension [mm]	Overvoltage Category
JS17F – Inom/333mV	050, 100 125, 150	17	Terminal	64×33×34	600V CAT III
JS17S – Inom/333mV	200	17	Terminal	64×33×34	600V CAT III
JS24F – Inom/333mV	200	24	Terminal	75×45×34	600V CAT III
JS24S – Inom/333mV	250, 300	24	Terminal	75×45×34	600V CAT III
JS36S – Inom/333mV	300, 400 500, 600	36	Terminal	91×57×40	600V CAT III
JSC-01 – Inom/333mV	250, 400	38×32	Wire	93×92×39	600V CAT III
JSC-02 – Inom/333mV	400, 600, 800 1000, 1200	73×62	Wire	128×124×39	600V CAT III
JSC-03 – Inom/333mV	800, 1000, 1200 1600, 2000, 2400	141×62	Wire	196×124×39	600V CAT III

SPQ-I intelligent current probes

Digitally calibrated intelligent current probe with four current ranges. Suitable for measurements from mA (clamp-on CTs) up to 10kA (rogowski coils). Range is set through software during configuration before measurement. Produced with 3 or 4 rogowski coil sensors or clamp-on CTs.

Supported instruments: NEMO 104, NEMO 332

SPQ - I3000 - 4 JRF1

Current Probe Type
    SPQ - Probe for NEMO class instruments
Current Ranges
    I10000 = Inom 10000A/3000A/1000A/300A
    I3000 = Inom 3000A/1000A/300A/100A
    I1000 = Inom 1000A/300A/100A/30A
    I300   = Inom 300A/100A/30A/10A
Number of Current Sensors
    3 = Three sensors
    4 = Four sensors
Current Sensor Type
    JRF1 = Rogowski coil (Ø12mm), latch lock, length 40cm (Ø12,7cm)
    JRF2 = Rogowski coil (Ø12mm), latch lock, length 60cm (Ø19,1cm)
    JRF3 = Rogowski coil (Ø12mm), latch lock, length 100cm (Ø32,0cm)
    MFC0 = Rogowski coil (Ø8,3mm), bayonet lock, length 25cm (Ø8,0cm)
    MFC1 = Rogowski coil (Ø8,3mm), bayonet lock, length 40cm (Ø12,7cm)
    MFC2 = Rogowski coil (Ø8,3mm), bayonet lock, length 60cm (Ø19,1cm)
    MFC3 = Rogowski coil (Ø8,3mm), bayonet lock, length 100cm (Ø32,0cm)

SPQ - I250 - 4 JCLA

Current Probe Type
    SPQ - Probe for NEMO class instruments
Current Ranges
    I250   = Inom 250A/50A/10A/2A
Number of Current Sensors
    3 = Three sensors
    4 = Four sensors
Current Sensor Type
    JCLA = Clamp-on CT, max. conductor Ø13mm

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Power Factor Controllers

Comparison table of power factor controllers												
NOVAR Model	Outputs R=relay T=transistor	Sensitivity [mA]	2nd tarif Input	Supply Volt. Up To 500V	Relay common pole Separated	Temp. Meas. & fan Control	Fast Compensation	Optional Remote Comm.	Panel 144×144	Panel 96×96	DIN-rail	3-phase Controller
1005	5+1 R	20	✗	✗	✗	✓	✗	✗	✗	✓	✗	✗
1007	7+1 R	20	✗	✗	✗	✓	✗	✗	✗	✓	✗	✗
1005D	5+1 R	20	✗	✗	✗	✓	✗	✗	✗	✗	✓	✗
1007D	7+1 R	20	✗	✗	✗	✓	✗	✗	✗	✗	✓	✗
1106	6 R	2	✗	✗	✗	✓	✗	✓	✓	✗	✗	✗
1114	14 R	2	✗	✗	✗	✓	✗	✓	✓	✗	✗	✗
1206	6 R	2	✓	✗	✗	✓	✗	✓	✓	✗	✗	✗
1214	14 R	2	✓	✗	✗	✓	✗	✓	✓	✗	✗	✗
1106/S400	6 R	2	✗	✓	✓	✓	✗	✓	✓	✗	✗	✗
1114/S400	14 R	2	✗	✓	✓	✓	✗	✓	✓	✗	✗	✗
1206/S400	6 R	2	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗
1214/S400	14 R	2	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗
1312	12 T+2 R	2	✓	✗	✗	✓	✓	✓	✓	✗	✗	✗
1312-3	12 T+2 R	2	✓	✗	✗	✓	✓	✓	✓	✗	✗	✓
1414	14 R	2	✓	✗	✗	✓	✗	✓	✓	✗	✗	✓
2200	18	5	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗
2400	18	5	✓	✓	✓	✓	✗	✓	✓	✗	✗	✓
2600	18	5	✓	✓	✓	✓	✗	✓	✓	✗	✗	✓

Development and production of NOVAR power factor controllers is one of company's most important activities. In the following overview the devices for fully automated and optimal compensation of reactive power are presented. Portfolio includes classic power factor controllers operation with electromechanical contactors as well as components for fast compensation systems - fast power factor controller and thyristor switching blocks.

PFC's are produced in three different housings. Typical enclosure type is panel mountable housing. It can be equipped with an optional communication line[1] and monitored in ENVIS application. For less demanding applications we designed compact line of PFC's (NOVAR 1006/1007/1006D/1007D) in 96x96 panel housing and for DIN35-rail.

NOVAR 11xx/12xx with "/S400" option can be used at isolated networks (without neutral wire). It has increased maximum power supply voltage up to 500 V, both AC and DC and the common contacts of relays are isolated and connected to additional terminals.

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[1]Please consider using this feature for all new designs where possible as the software alerts are much faster reaction to any problem with the compensation then the billing system of a customer. The communication and control feature leads to significant cost savings during operation of the cabinet.

Measurement Principles

- high current and power factor measurement accuracy are achieved by utilizing precise converter and digital signal processing using a microprocessor and FFT algorithm

- precise measurement and control functions even under conditions of voltage or current waveform distortion by higher harmonic components

- evaluation of total harmonic distortion (THD) level by up to the nineteenth harmonic component

- evaluation of current harmonic load of capacitors

Control Principles

- governor's speed of response independently programmable for conditions of under-compensation and overcompensation, respectively

- adjustable control range to reduce the number of control interventions in systems with a wide control range at high loads

- mains decompensation option

- two-rate operation controlled by energy flow direction

- any output can be set as fixed, heating, cooling or alarm can also be controlled via relays

Automatic Connection Detection

- any combination of measuring voltage and current

- automatic detection of connection and compensation systems, nominal voltage on governor setup

Automatic Control Section Recognition

- when switching it on, the governor automatically recognizes the sections power ratings

- it is possible to connect any combination of the control sections

Specifying Section Value, Disabling Faulty Sections

- continuous specification of section value recognized in the control process

- continuous checking of control sections in the control process and in case of repeated failure detection, temporary disablement of the faulty section and possibly concurrent alarm actuation

- periodic recheck of the temporarily disabled sections in five days and on positive test results (for example when replacing a section's burnt fuse link), enabling them again

Programmable Alarm

independently settable alarm's warning and actuation functions

KMB
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NOVAR 2600

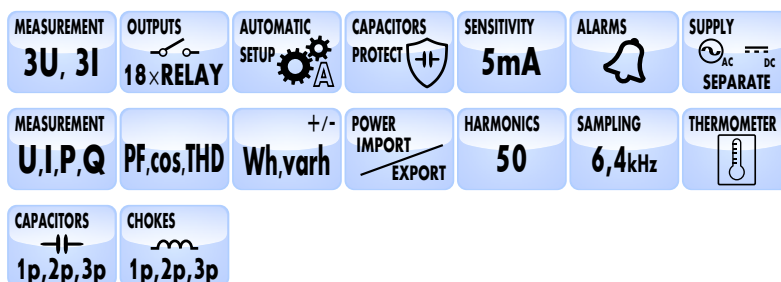## Three Phase PFC and Data Logger

The NOVAR 2600 is the first model of the innovated new PFC line. These controllers are based on precise and powerful three-phase measurement and combine multi-functional panel meter and power quality analyser with power factor control functionality in the same box. The built-in meter can be optionally equipped with memory for data logging of measured quantities and various events in the network. The instrument can be used for long time network data recording. For on-line monitoring, the controllers can be provided with remote communication interface.

Key features:

- up to 18 output sections, relay or solid-state

- measures and controls power factor and other quantities in each line separately

- supports both low and high voltage applications (direct or VT and CT connection)

- unlimited support for single-, two- and three-phase capacitors and chokes

- combined mains compensation & decompensation capability

- optional 512 MB of internal memory for data logging

- embedded four quadrant active and reactive energy meter class 0.5S and data logger

Standard

MEASUREMENT 3U, 3I	OUTPUTS 18×RELAY	AUTOMATIC SETUP	CAPACITORS PROTECT	SENSITIVITY 5mA	ALARMS	SUPPLY AC DC SEPARATE
MEASUREMENT U,I,P,Q	PF,cos,THD	+/- Wh,varh	POWER IMPORT EXPORT	HARMONICS 50	SAMPLING 6,4kHz	THERMOMETER
CAPACITORS 1p,2p,3p	CHOKES 1p,2p,3p					

Optional

ETH	WEBSERVER	USB
RS485	MODBUS Modbus	FLASH 512MB
INPUTS 2nd RATE	INPUTS Pt100	

Ordering Options

<pre>
                        NOVAR 2600 R18 H L U 4T
Instrument class
   NOVAR 2600 = 3-ph automatic PF controller, 144×144mm, LCD
Outputs
   RO9 = 9 relay outputs
   R16 = 16 relay outputs + 1 digital input
   R18 = 18 relay outputs
   T7R9 = 7 transistor and 9 relay outputs + 1 digital input
   T9R9 = 9 transistor and 9 relay outputs
   T16 = 16 transistor outputs + 1 digital input
   T18 = 18 transistor outputs
Relay Voltage Rating
   N = max. 250 VAC
   H = max. 400 VAC / 220 VDC
Data logging
   N = max. & min. values registering, electricity meter readout
   L = programable datalogging, 512MB of internal memory
Local communication interface
   N = without local communication
   U = USB communication interface
Remote communication interface and ext. thermometer input
   N = without remote comm. & external thermometer input
   4 = RS-485
   44 = RS-485 + RS-485
   4T = RS-485 + Pt100 external thermometer input
   E = Ethernet 10BaseT
   E4 = Ethernet 10BaseT + RS-485
   ET = Ethernet 10BaseT + Pt100 external thermometer input
</pre>

Typical connection schema
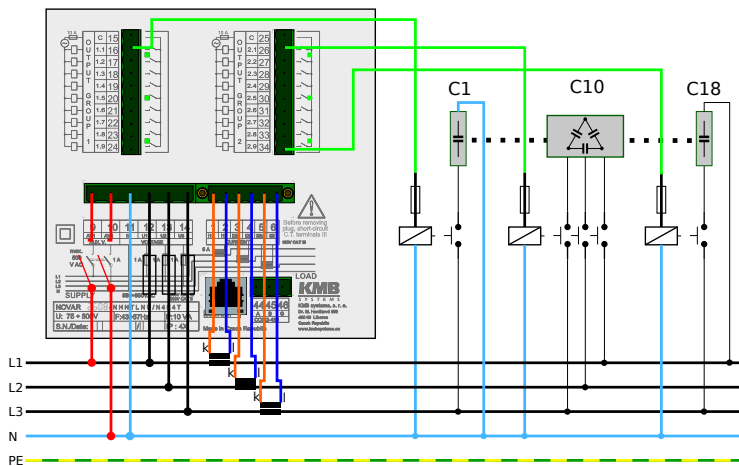
Mechanical dimensions

KMB
S Y S T E M S
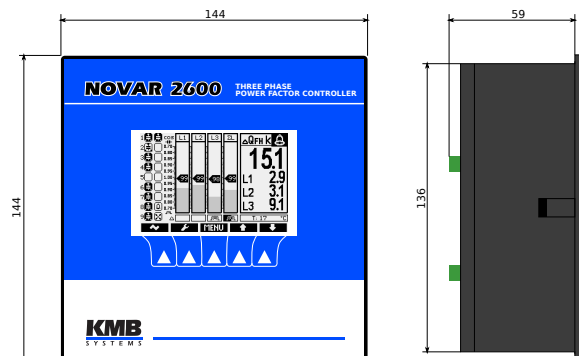
NOVAR 2400

Three Phase PFC and Multimeter

NOVAR 2400 represents basic type of a new product line of three phase APFCR with advanced functions and parameters. All important control and compensation information is available in real time on its screen.

This controller includes **complete digital power monitor** and precise **four-quadrant electricity meter**. It is fully automatic and it has a simple installation. Up to 18 relay outputs can control combinations of 1-, 2- and 3-phase steps with booth capacitors and chokes.

Optional remote communication offers **RS-485 or Ethernet**. These interfaces allows the controller to be fully supervised and managed from remote ENVIS application or any **ModBus** enabled SCADA system.

Typical applications: power factor correction in three phase unbalanced networks, to compensate frequent load changes (18 steps) also in single phase applications

Key features:

- up to 18 output sections, relay or solid-state

- measures and controls power factor and other quantities in each line separately

- unlimited support for single-, two- and three-phase capacitors and reactors

- combined mains compensation & decompensation capability (supports booth capacitors and reactors)

- RS-485 and Ethernet communication options

- embedded four quadrant electricity meter with TOU and power meter (class 0.5)

Standard

MEASUREMENT 3U, 3I	OUTPUTS 18×RELAY	AUTOMATIC SETUP	CAPACITORS PROTECT	SENSITIVITY 5mA	ALARMS	CAPACITORS 1p,2p,3p	CHOKES 1p,2p,3p
SUPPLY AC DC SEPARATE	MEASUREMENT U,I,P,Q	PF,cos,THD	+/- Wh,varh	POWER IMPORT EXPORT	HARMONICS 50	SAMPLING 6,4kHz	THERMOMETER

Optional

ETH	WEBSERVER	INPUTS 2nd RATE
RS485	MODBUS	
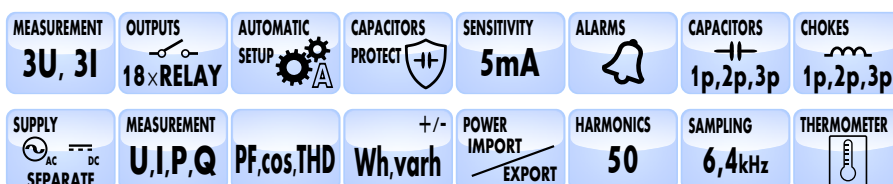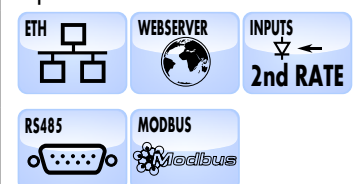
Ordering Options

			NOVAR 2400	R18	E

Instrument class
    NOVAR 2400 = Automatic power factor controller

Outputs
    R09 = 9 relay outputs
    R16 = 16 relay outputs + 1 digital input
    R18 = 18 relay outputs
    T7R9 = 7 transistor and 9 relay outputs + 1 digital input
    T9R9 = 9 transistor and 9 relay outputs
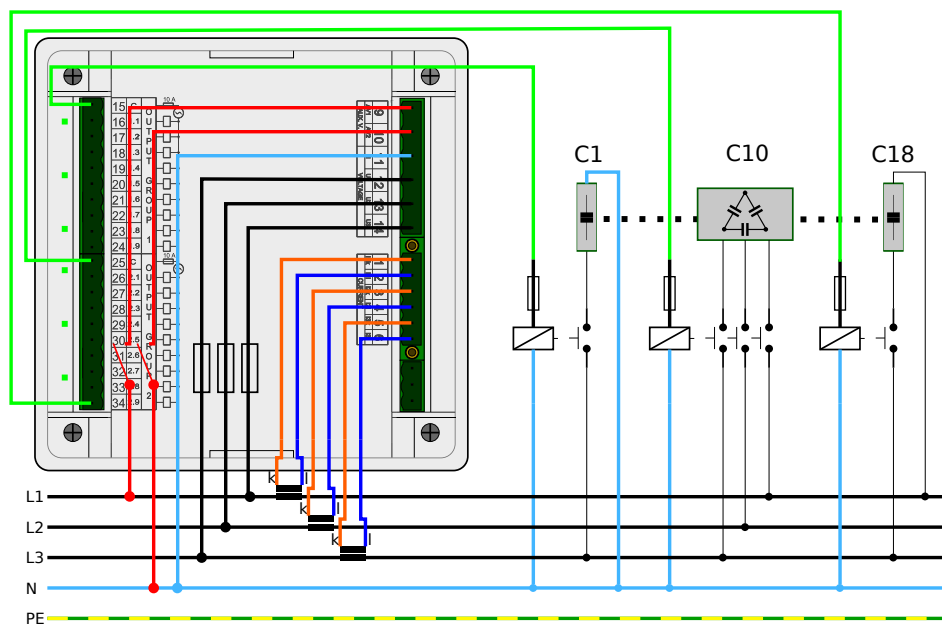   T16 = 16 transistor outputs + 1 digital input
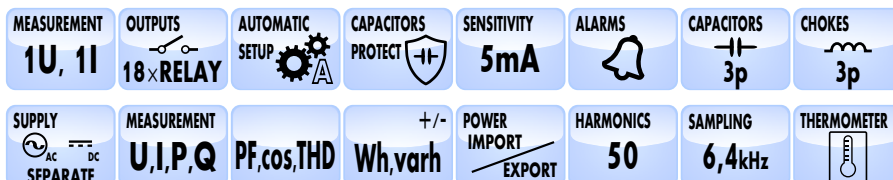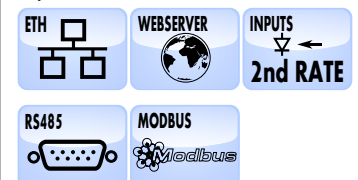   T18 = 18 transistor outputs

Remote communication interface
    N = without remote communication
    4 = RS-485
    E = Ethernet 10BaseT

Typical connection schema

Mechanical dimensions

KMB
SYSTEMS
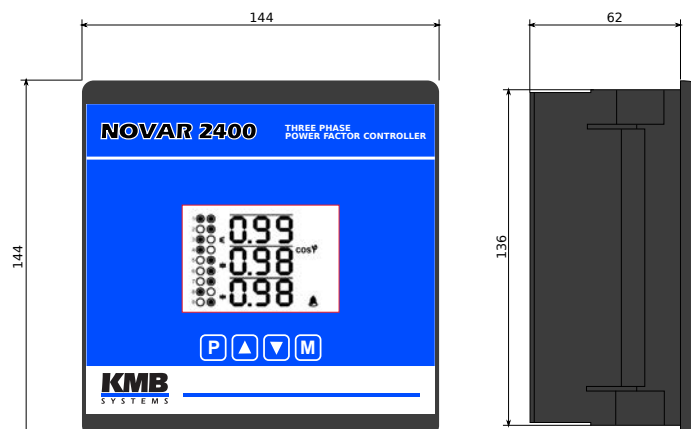
NOVAR 2200

Advanced Power Factor Controller

NOVAR 2200 represents our new line of single phase APFCR with advanced functions and parameters. All important control and compensation information is available in real time on its screen.

This controller builds on success of its predcessor of series of NOVAR 11xx and NOVAR 12xx. It contains advanced measurement principles and provides large scale of measured quantities. It is fully automatic and it has a simple installation. Up to 18 relay outputs can control combinations of 3-phase capacitors and chokes.

Optional remote communication offers **RS-485 or Ethernet**. These interfaces allows the controller to be fully supervised and managed from remote ENVIS application or any **ModBus** enabled SCADA system.

Typical applications: power factor correction in three phase networks, to compensate frequent load changes (18 steps)

Key features:

- up to 18 output sections, relay or solid-state

- measures and controls power factor and other quantities

- supports three-phase capacitors and reactors

- combined mains compensation & decompensation capability (supports booth capacitors and reactors)

- RS-485 and Ethernet communication options

- embedded electricity meter

Standard								Optional		
MEASUREMENT 1U, 1I	OUTPUTS 18×RELAY	AUTOMATIC SETUP	CAPACITORS PROTECT	SENSITIVITY 5mA	ALARMS	CAPACITORS 3p	CHOKES 3p	ETH	WEBSERVER	INPUTS 2nd RATE
SUPPLY AC DC SEPARATE	MEASUREMENT U,I,P,Q	PF,cos,THD	+/- Wh,varh	POWER IMPORT EXPORT	HARMONICS 50	SAMPLING 6,4kHz	THERMOMETER	RS485	MODBUS	

Ordering Options

	NOVAR 2200 R09 E

Instrument class
    NOVAR 2200 = Automatic power factor controller, 1U, 1I, 144x144

Outputs
    RO9 = 9 relay outputs
    R16 = 16 relay outputs + 1 digital input
    R18 = 18 relay outputs
    T7R9 = 7 transistor and 9 relay outputs + 1 digital input
    T9R9 = 9 transistor and 9 relay outputs
    T16 = 16 transistor outputs + 1 digital input
    T18 = 18 transistor outputs

Remote communication interface
    N = without remote communication
    4 = RS-485
    E = Ethernet 10BaseT

Typical connection schema
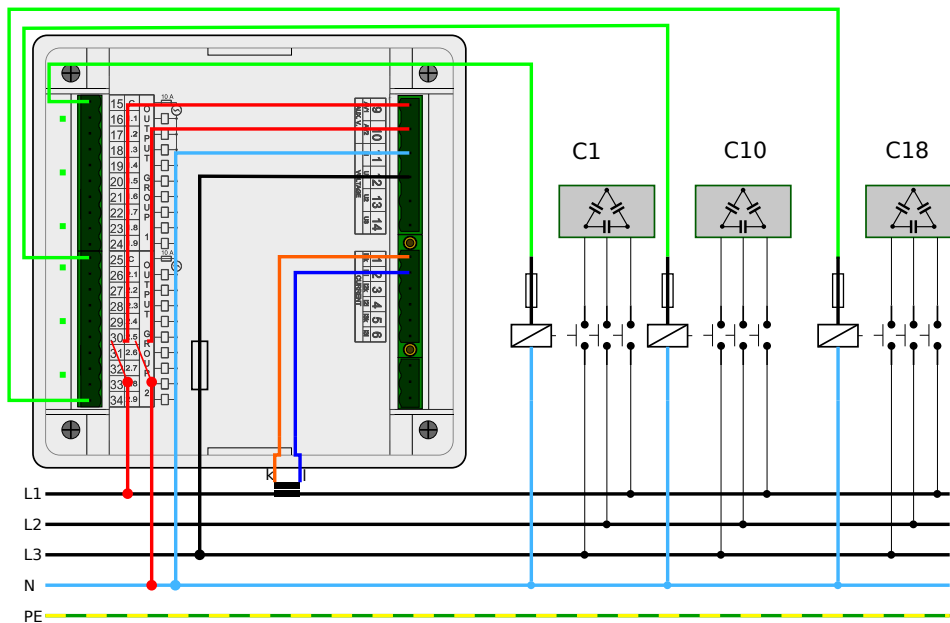
Mechanical dimensions

KMB SYSTEMS
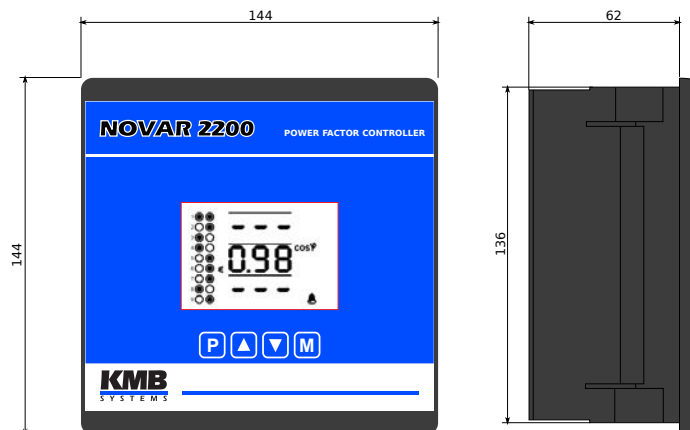
NOVAR 1106/1114
NOVAR 1206/1214

NOVAR 11 and 12 reactive power controllers are fully automatic instruments that allow optimum control of reactive power compensation. They take their design concepts from the NOVAR 1xx/2xx line of instruments, bringing up a number of improvements and new features while keeping the way of operation.

The instruments features precise voltage and current measurement circuits, and the digital processing of values measured provides high evaluation accuracy of both true root–mean–square values of voltage, current and power factor values. The built-in temperature sensor measures the temperature inside the distribution board cabinet.

The instrument's installation is fully automatic. The controller automatically detects both the connection configuration and the value of each compensation section connected. Entering these parameters manually is also possible.

Key features:

- up to 14 outputs (1114/1214) and 1 alarm relay

- current measurement sensitivity 2 mA

- optional RS485 or Ethernet remote communication interface

- input for 2nd tariff (1206/1214)

- optional supply voltage up to 500 V (/S400 models)

- separated common pole of relays on additional terminals (/S400 models)

Standard (NOVAR 11xx)

| MEASUREMENT 1U, 1I | OUTPUTS 14×RELAY | AUTOMATIC SETUP | CAPACITORS PROTECT | SENSITIVITY 2mA | ALARMS SPECIAL RELAY | THERMOMETER |
| CAPACITORS 3p | CHOKES 3p | MEASUREMENT U,I,P,Q | PF,cos,THD | POWER IMPORT EXPORT | HARMONICS 19 | |

(NOVAR 12xx)

| INPUTS 2nd RATE |
| SUPPLY AC DC SEPARATE |

Optional

| ETH | MODBUS Modbus |
| RS485 | |
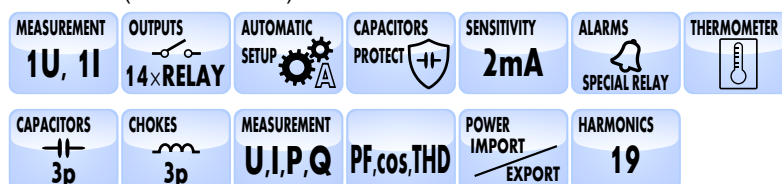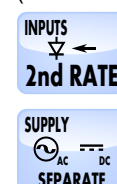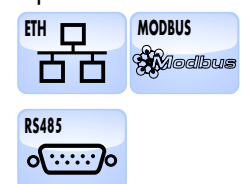
Ordering Options

NOVAR 1214   E

Instrument Class
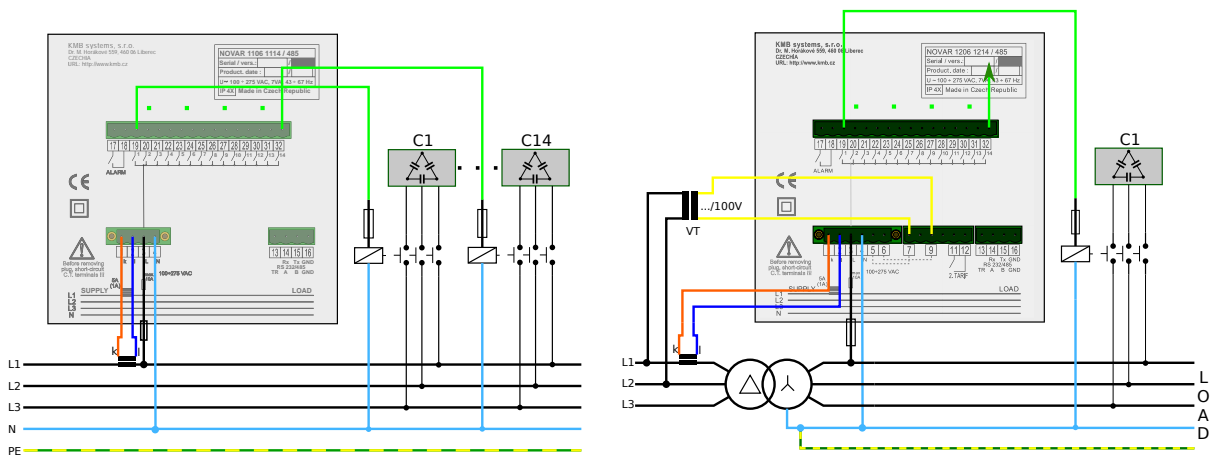   NOVAR = Automatic power factor controller
NOVAR model
    11 = common terminal for meas. and supply voltage
    12 = separated terminals for meas. and supply voltage
Outputs
    O6 = 6 relay outputs + 1 alarm relay
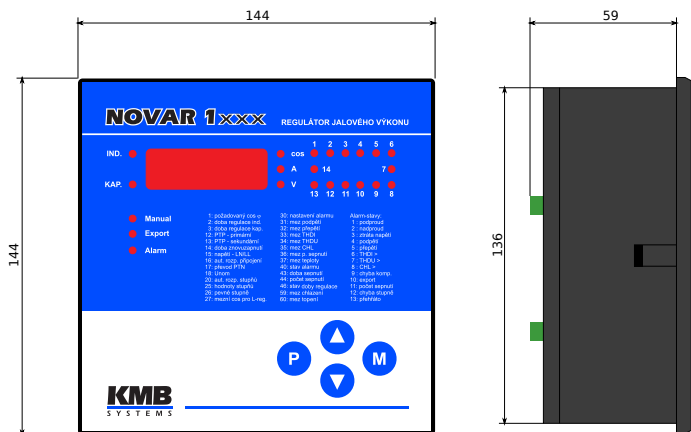   14 = 14 relay outputs + 1 alarm relay
Supply voltage
    _____ = Supply voltage up to 275V
    /S400 = Supply voltage up to 500V, relays common pole separated
Remote Communication Interface
    _ = Without remote communication interface
    4 = RS-485
    E = Ethernet

Typical connection schema

Mechanical dimensions

KMB SYSTEMS

NOVAR 1005/1007
NOVAR 1005D/1007D

NOVAR 1005 and NOVAR 1007 power factor controllers are enhanced successors of very popular compact NOVAR 5 controller. These models are primarily intended for smaller and less demanding applications with budgetary constraints. The current sensitivity was increased in this innovated line. The NOVAR 1005 controller if fully backward compatible with the NOVAR 5 model (terminal, wiring). Furthermore, the NOVAR 1007 has 8 output relays.

Both models are produced in two different housings. Standard model is determined for panel mounting. Models marked with D, such as NOVAR 1005D or NOVAR 1007D features different housing which is determined for DIN-rail installation.

Key features:

- compact 96 x 96 mm panel footprint (NOVAR 1005/1007)

- DIN-rail mountable box (NOVAR 1005D/1007D)

- 6 (NOVAR 1005) or 8 (NOVAR 1007) control outputs

- current measurement sensitivity 0.02 A

- aimed for smaller less demanding applications

- features Automatic Control Section Recognition

- independent alarm warnings

- precise measurement and control even under conditions of voltage or current waveform distortion

Standard

MEASUREMENT 1U, 1I	OUTPUTS 7×RELAY	AUTOMATIC SETUP	CAPACITORS PROTECT	SENSITIVITY 20mA	CAPACITORS 1p,2p,3p	CHOKES 1p,2p,3p
ALARMS	MEASUREMENT U,I,P,Q	PF,cos,THD	POWER IMPORT EXPORT	HARMONICS 19	THERMOMETER	
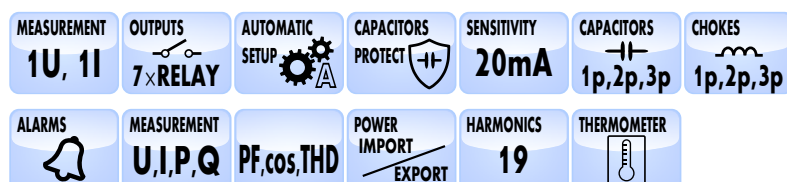
Ordering Options

NOVAR 1005D

Instrument Class
    NOVAR = Automatic power factor controller
NOVAR model
    10 = compact, common terminal for meas. and supply voltage
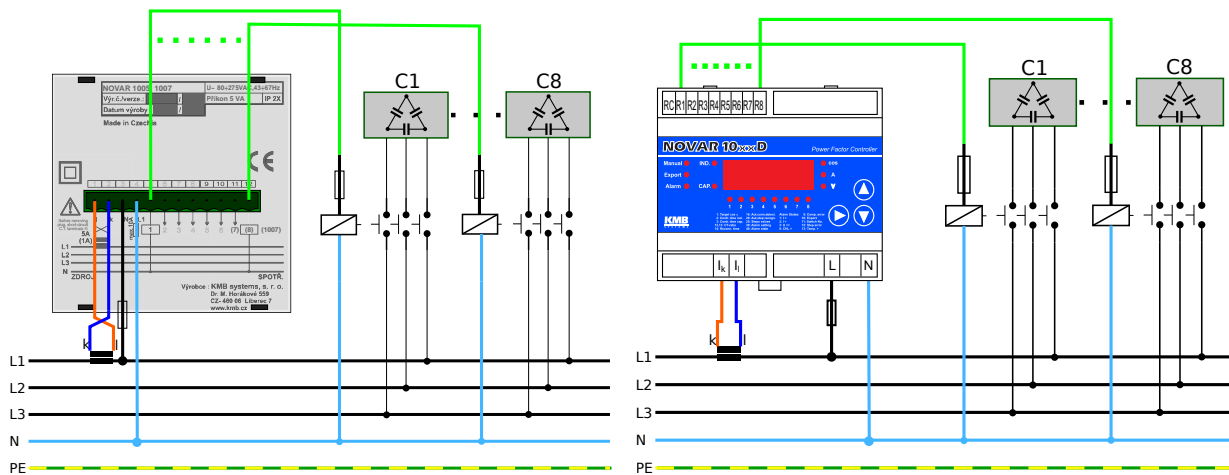**Outputs**
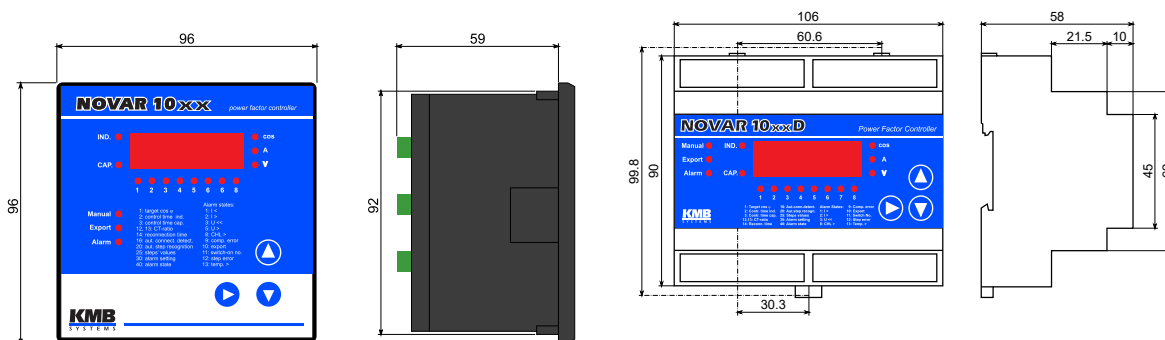   05 = 6 relay outputs
    07 = 8 relay outputs
Construction design
    _ = panel mounted, 96×96mm
    D = DIN-rail mounted, 6 modul width

Typical connection schema

Mechanical dimensions

KMB SYSTEMS

NOVAR 1414

PFC with Three Phase Measurement

NOVAR 1414 is based on NOVAR 1214 and shares most of it's features but despite of other models, this controller model has three current measurement inputs and one voltage measurement input. It is capable to measure load in each of three phases separately and then evaluates three-phase power factor from measured values from each phase for the control. Therefore, it is suitable especially for applications with great or variable load unbalance.

It features one voltage measurement input and expects that amplitude of other two is the same. It evaluates PF in each phase from measured currents and then three-phase PF which is used for operation. Three-phase capacitors and reactors are used for power factor correction.

Key features:

- measures power factor in each line separately

- improves three phase PFC for unbalanced loads

- 14 independent compensation section + alarm relay

- fully automatic control section recognition

- embedded temperature sensor and relay for temperature control

- standard case for 144 x 144 mm cut-out

- 2 mA current sensitivity

- optional RS-485 or Ethernet communication interface

Standard   Optional

| MEASUREMENT 1U, 3I | OUTPUTS 14×RELAY | AUTOMATIC SETUP | CAPACITORS PROTECT | SENSITIVITY 2mA | ALARMS SPECIAL RELAY | THERMOMETER | SUPPLY AC DC SEPARATE | ETH |
| CAPACITORS 3p | CHOKES 3p | MEASUREMENT U,I,P,Q | PF,cos,THD | POWER IMPORT EXPORT | HARMONICS 19 | INPUTS 2nd RATE | | RS485 |
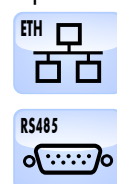
Ordering Options

NOVAR 1414 E

Instrument Class
    NOVAR = Automatic power factor controller
NOVAR model
    14 = 3-phase, panel 144×144mm
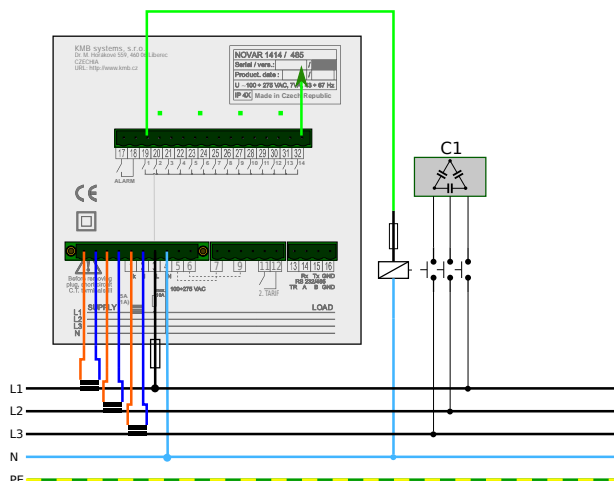**Outputs**
    14 = 14 relay outputs + 1 alarm relay
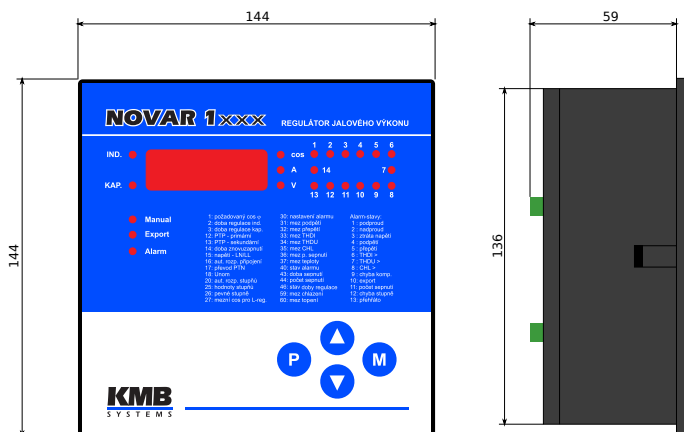**Remote Communication Interface**
    _ = Without remote communication interface
    4 = RS-485
    E = Ethernet

Typical connection schema

Mechanical dimensions

KMB
SYSTEMS

NOVAR 1312

Real-time Power Factor Controller

NOVAR 1312 power controllers are designed for dynamic compensation systems. These are typically systems with rapid changes in reactive power (elevators, welding machines etc.). Other typical application is a system with strict requirements on power quality and EMC. The controller has fast transistor outputs to control dedicated switching modules. Its processor and algorithm allows up to 25 control interventions in one second. Together with KATKA thyristor switching modules it provides perfect control of fast PFC cabinet.

The controller also supports combined system by combining both KATKA thyristor switching modules and classical electromechanical contactors. Optional RS-485 or Ethernet communication port allows to monitor all measurement values and set instrument's parameters using a remote PC.

NOVAR 1312-3 is a special modification. It provides 3 independent current inputs and measures sum of all three phase current signals instead of 1. Therefore, it allows fast compensation according to a more precise three-phase power factor.

Typical applications: real time compensation, thyristor switched capacitors (TSC), combined compensation systems with fast thyristor modules and classic mechanical relays.
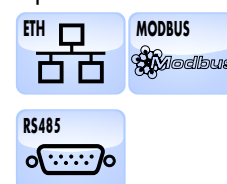
Key features:

- up to 25 control intervention per second

- 12 transistor switched outputs and 2 conventional relay outputs + alarm

- current measurement sensitivity 2 mA

- compatible with KATKA Thyristor Switching Modules

- allows combined compensation systems for both thyristor switching modules and contactors

- optional RS485 or Ethernet remote communication interface

Standard

MEASUREMENT 1U, 1I	OUTPUTS 12×SSR	OUTPUTS 2×RELAY	AUTOMATIC SETUP	CAPACITORS PROTECT	SENSITIVITY 2mA	ALARMS SPECIAL RELAY	SUPPLY AC DC SEPARATE
CAPACITORS 3p	CHOKES 3p	MEASUREMENT U,I,P,Q	PF,cos,THD	POWER IMPORT EXPORT	HARMONICS 19	INPUTS 2nd RATE	THERMOMETER

Optional

ETH	MODBUS
RS485	
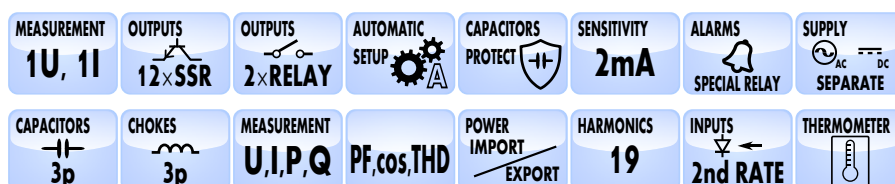
Ordering Options

NOVAR 1312 E

Instrument Class
    NOVAR = Automatic power factor controller
NOVAR model
    13 = Real time (fast) power factor controller
Outputs
    12 = 12 transistor outputs, 2 relay outputs + 1 alarm relay
Current inputs
    __ = 1 input for CT
    -3 = 3 inputs for CT, three phase PFC

Remote Communication Interface
    _ = Without remote communication interface
    4 = RS-485 (KMB short communication protocol only)
    E = Ethernet (KMB short communication protocol only)

Typical connection schema
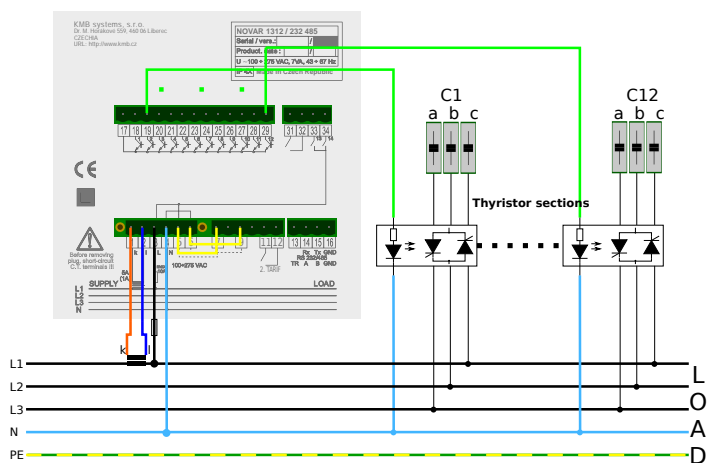
Mechanical dimensions

KMB
S Y S T E M S
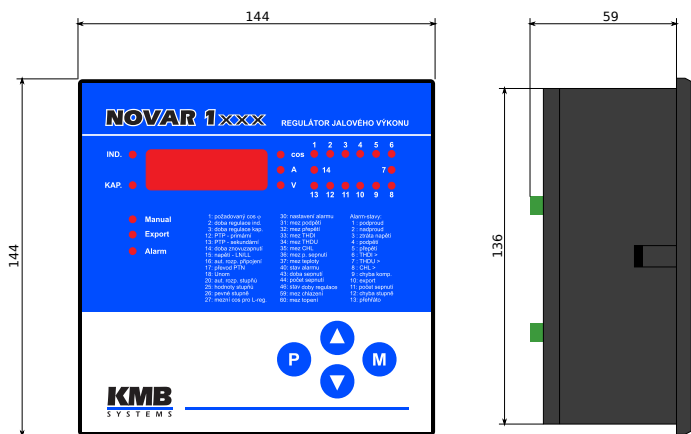
KATKA 20 & KATKA 80

Thyristor switching modules

KATKA line of the thyristor switching (SSR) modules have been designed especially for switching power factor correction capacitors (TSC, thyristor switched capacitor) in real time reactive power compensation systems in cooperation with our fast power factor controller NOVAR 1312. KATKA is a solid state relay which can be also used in other applications for contact-less load switching with low EMC impact. In RT-APFC applications it handles up to 25 control interventions in one second.

Key features:

- for switching capacitors during fast PFC

- with passive cooling KATKA 20T, ST up to 26 kvar and KATKA 20D up to 20 kvar

- with active cooling KATKA 80T, ST up to 80 kvar and KATKA 80D up to 60 kvar

- two-phase (D), three-phase (T) and three-phase with individual phase switching (ST)

- thermal protection (KATKA 80T, 80ST and 80D)

- works with real-time PFC NOVAR 1312 a 1312-3

Ordering options

KATKA 80T 400

Instrument Class
    KATKA = Thyristor switching module
Construction and power
    20 = passive cooling, up to 22A (T, ST)/up to 29A(D)
    80 = active cooling, up to 67A (T, ST)/up to 87A(D)
Switching method
    D = two-phase, two thyristors
    T = three-phase, three thyristors
   ST = individual switching of each phase, three thyristors
System Voltage
    400 = 400/230V up to 440/250V
   690 = 690/400V (available only for option T and ST)

Technical specification

Parameter	KATKA 20D 400	KATKA 20T 400 KATKA 20ST 400	KATKA 20T 690 KATKA 20ST 690	KATKA 80D 400	KATKA 80T 400 KATKA 80ST 400	KATKA 80T 690 KATKA 80ST 690
nom. operating volt.	400V/230V±10%	400V/230±10% 440V/250V±10%	690V/400V±10%	400V/230V±10%	400/230±10% 440/250±10%	690V/400V±10%
max. block. voltage	1600V					
max. oper. current	29A	22A		87A	67A	
max. rate of I rise	50A/us					
conductor x-section	10mm^2			25mm^2		
number of switches	2	3		2	3	
load character	C/R/L					
fan aux. voltage	-			230±10%		
fan power	-			32		
aux. cond. x-section	-			2.5mm^2		
fan threshold temp.	-°C			60°C±5°C		
ctrl. volt. / current	24 V$_{DC}$/ 10mA					
ctrl. cond. x-section	2.5mm^2					
thermal protection	-			100°C±5°C		
overvolt. protection	C					
IP rating	IP20					
operating temp.	-20 ÷ 45°C					
oper. humidity	5 ÷ 95% non-condensing					
dimensions	122W×192H×117Dmm			122W×245H×157Dmm		
mass	2.05kg	2.15kg		3.35kg	3.45kg	

Mechanical dimensions
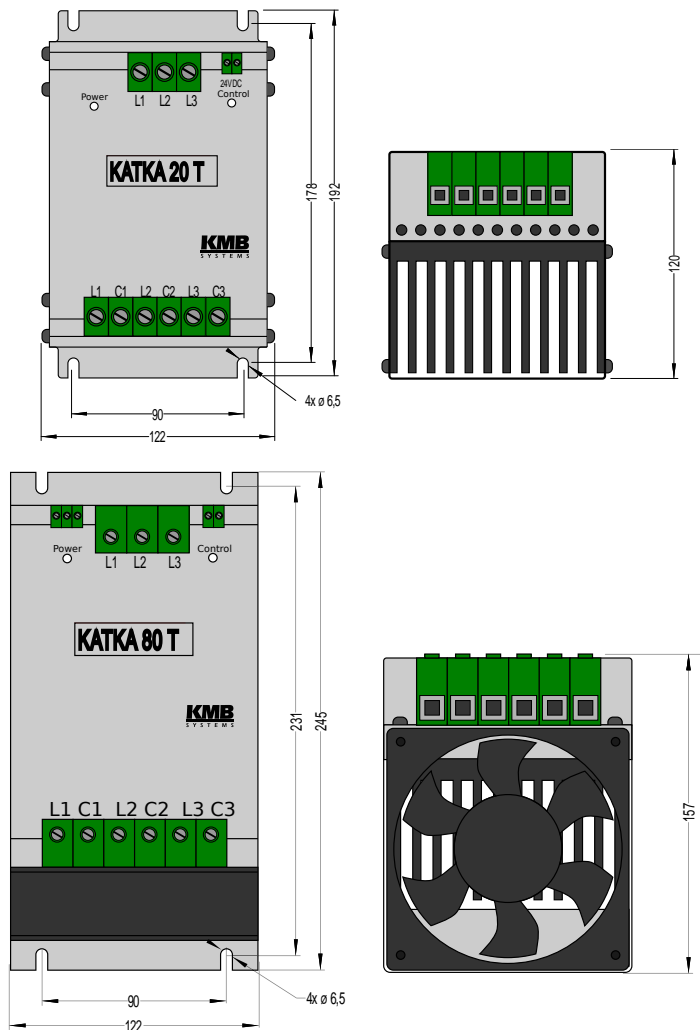
ENVIS Application for NOVAR PFC
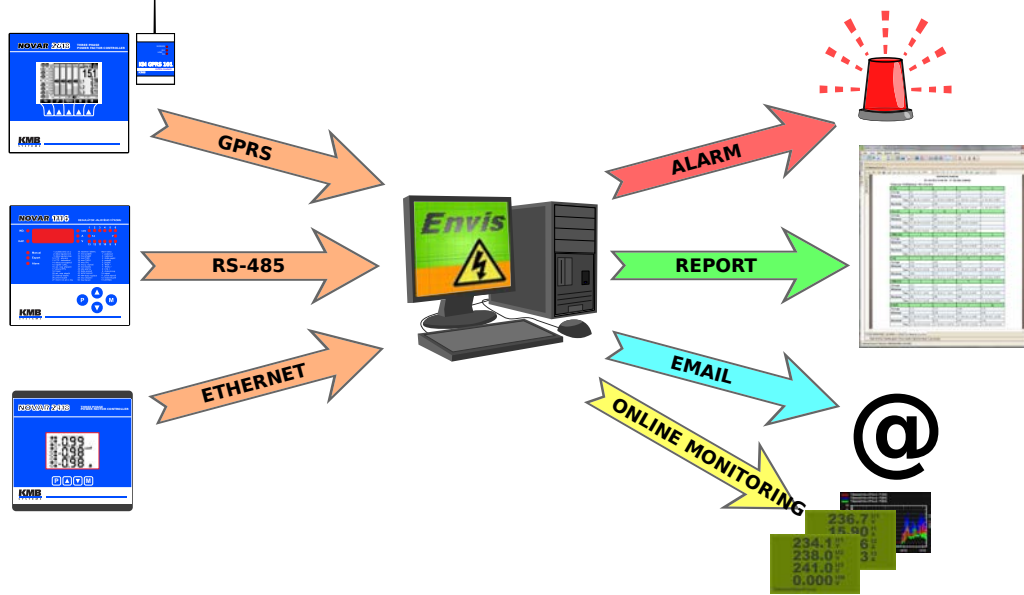
Key features:

- supported by any panel mounted 144×144 mm NOVAR PFC

- broad range of communication interfaces like USB, RS-485, Ethernet, GPRS with KMGPRS 101

- online monitoring over power factor correction

- alarms and warning during abnormal behavior

- you will learn from display of your PC, on time, about issue with your PFC and not from invoice received from utility
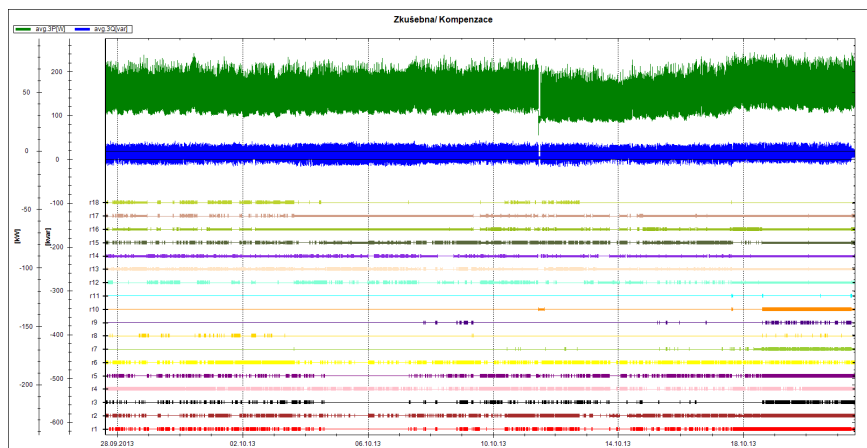

Figure 1: Record of power factor correction trend of NOVAR 2618 in ENVIS software

Distribution of Power Factor Correction components

We are not only developing and manufacturing measuring instruments and power factor controllers. We are supplementing mainly our line of PFC NOVAR for other components necessary for power factor correction. Our portfolio contains detuned filter reactors, isolation transformers, shunt reactors, PFC capacitors, PFC contactors etc.

Detuned Filter Reactors
- 2,5 to 100 kVAr
- detuning factor p = 5.6%, 7%, 14%
- voltage 400V, 440V, 480V, 525V
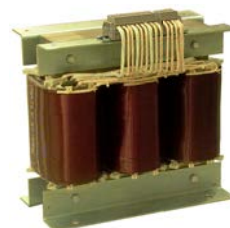
LV Isolation Transformers
- up to900 kVA
- also for medical applications, according to IEC 61558-2-15

Shunt Reactors
- all parameters of ELEKTRA products can be custom adjusted according to customer needs

PFC LV Capacitors
- MKP
- filled with ecological gel or gas
- voltage 130V to 1000V, 0,5-50 kVAr

PFC Contactors
- power 12,5 kVAr to 100 kVAr
- switching voltage 400 V až 690 V
- control voltage 24V -400 V

Fuse switches
- vertical and horizontal design
- 160A to 1600A
- fuse check without switching off

Power factor controller NOVAR
- up to 18 outputs
- designed for panel or DIN-rail mounting
- fully automatic setup
- 1p and 3p measurement, relay and thyristor control

Thyristor switching modules KATKA
- up to 87 kVAr

KMB HARD & SOFT
Tř. Dr. M. Horákové 559, 460 06 Liberec 7
+420 485 130 314
kmb@kmb.cz   www.kmb.cz

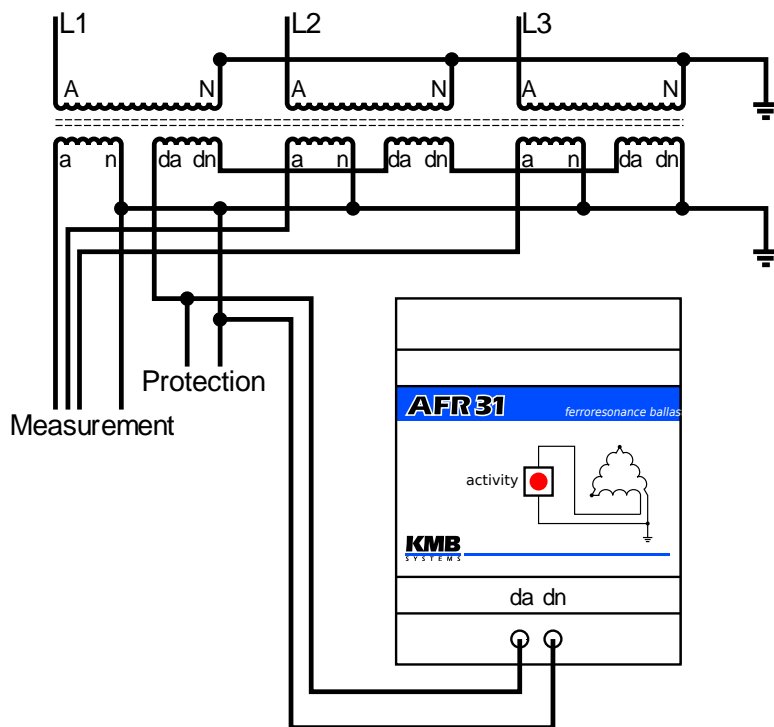# AFR 31

Smart Load to Reduce VT Ferroresonance

The AFR 31 Smart Load is an instrument designed to protect metering voltage transformers against adverse effects of ferroresonance in medium voltage power distribution systems with ungrounded or indirectly grounded neutral wire. Ferroresonance comes up between transformer inductance and conductors' or switching elements' capacitance. Connecting, disconnecting, ground faults or other transitional effects may be the trigger events. Ferroresonance oscillations cause significant over-voltage and current surges as a result of transformer magnetic circuit saturation. This most often leads to metering transformer destruction. AFR 31 Smart Load acts as metering voltage transformer protection against such effects. Unlike other methods, it is purposely enabled only when ferroresonance occurs, being passive in common operation or with asymmetric loads. Magnitude of trigger voltage can be adjusted to 20, 25 or 30 volts. For selectivity with ground connection protection devices an activation time delay circuit (4 seconds as default) is used. This is suitable at installations where a voltage transformer is used not only for measuring but as power supply for protection devices too (ground connection detection, automatic reconnection circuits etc.).
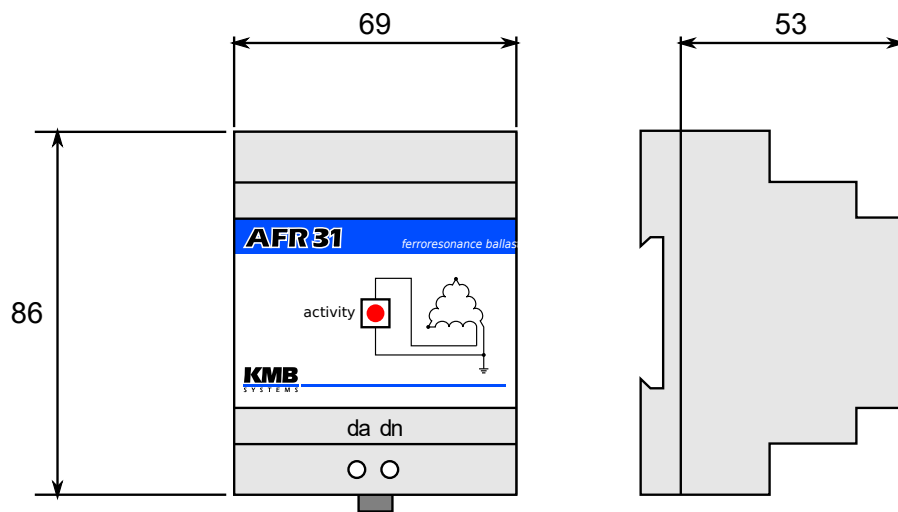
Key features:

- protects instrument transformers against effects of ferroresonance

- instrument transformer is loaded only when ferroresonance is present

- simple installation

- automatic operation without any configuration

- applicable for 3 phase open-delta connected VTs

Typical connection schema

L1   L2   L3

A   N   A   N   A   N

a   n   da   dn   a   n   da   dn   a   n   da   dn

Protection

Measurement

AFR 31   *ferroresonance ballast*

activity ●

KMB
SYSTEMS

da   dn

Mechanical dimensions

69   53

86

AFR 31   *ferroresonance ballast*

activity ●

KMB
SYSTEMS

da   dn

KMB
SYSTEMS

AFR 111 and 131

Advanced Smart Load to Reduce VT Ferroresonance

AFR 1xx smart load is an instrument designed to monitor and protect measuring voltage transformers (VT) against the potentially harmful effects of ferroresonance in a high voltage distribution network. Ferroresonance occurs between the inductance of the transformer and the capacitance of the MV lines or switching equipments. Ferroresonance can be initialized by switching, disconnection, ground connections or by other transient events.

During the ferroresonance a significant over-voltage and concurrent current peaks can occur due to the saturation of the magnetic circuit of the VT. This often leads to a fatal destruction of the VT. AFR 1xx acts as a protection of the VT against the unwanted effects of such events.

In comparison with other protection methods AFR 1xx is only selectively activated during the occurrence of ferroresonance and stays inactive during the normal operation. AFR 11x is intended for alone operated VTs, i.e. for single phase measuring, V connection measuring or for one pole power feeders. Whereas, the variant AFR 13x is intended for connection into open delta of auxiliary secondary windings of three VTs.

Key features:

- protects instrument transformers against effects of ferroresonance

- optional memory for events recording

- optional auxiliary power supply

- applicable for 1 pole VTs (AFR 111) and for 3 phase open-delta connected VTs (AFR 131)

- optional RS-485 communication interface with MODBUS support

Ordering options

AFR 131 V L 100/V3

Instrument Class
AFR 1 = Smart load to reduce ferroresonance
Connection of protected VT
11 = 1 pole VT, V connection (2 AFRs)
31 = 3 phase measuring with open delta secondary
Auxiliary supply
N = supply from protected VT
V = separate 10 ÷ 265 VAC, 10 ÷ 265 VDC
Accessories
N = no extension
L = memory for events, RS-485 communication interface
Nominal voltage
100 = Nominal secondary voltage of VT Un = 100 VAC
110 = Nominal secondary voltage of VT Un = 110 VAC
120 = Nominal secondary voltage of VT Un = 120 VAC
100/V3 = Nominal secondary voltage of VT Un = 100/√3 VAC
110/V3 = Nominal secondary voltage of VT Un = 110/√3 VAC
120/V3 = Nominal secondary voltage of VT Un = 120/√3 VAC
Other voltages on request.

Typical connection schema
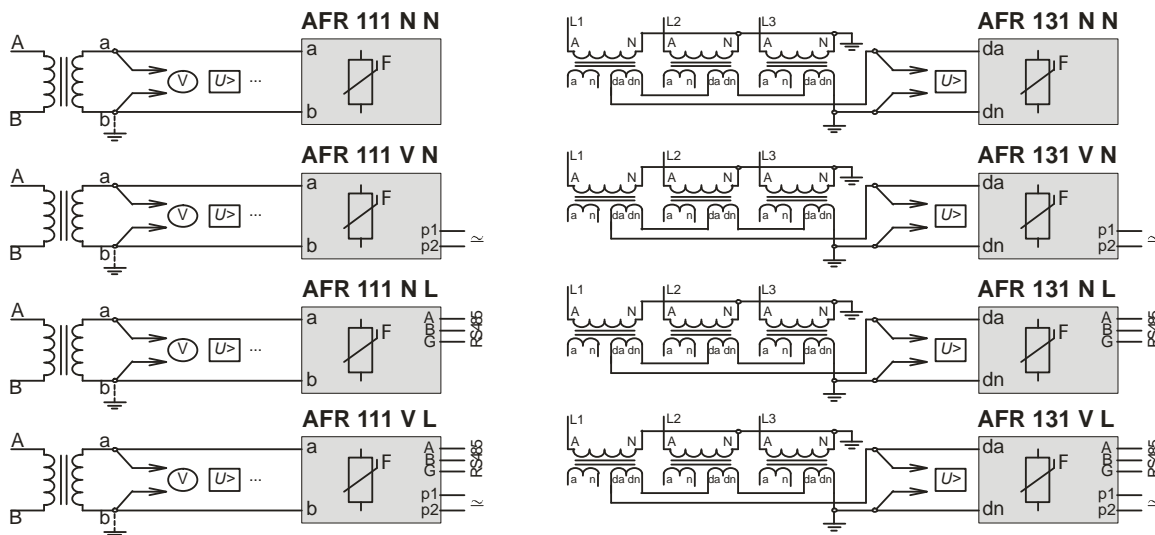
Mechanical dimensions

KMB
S Y S T E M S
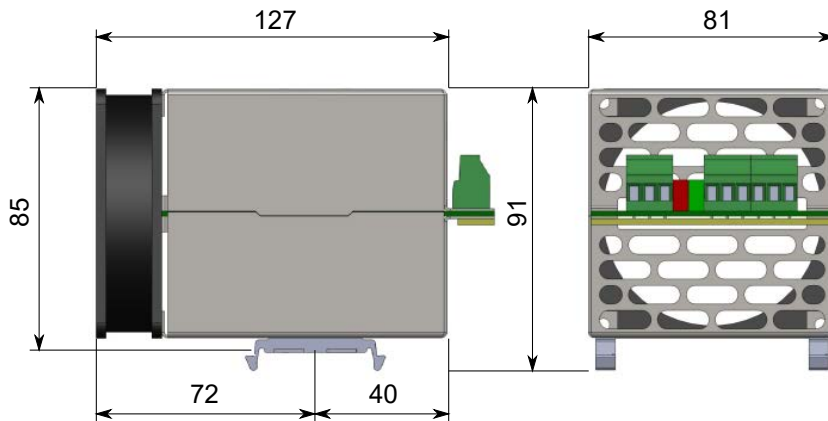
ENVIS Software Suite

Energy Management and PQ Evaluation Tool

ENVIS software is a framework for evaluation and supervision of power quality monitoring and energy efficiency data records. It retrieves, stores and serves the measured information from supported instruments and analysers. ENVIS is a basic tool for configuration, management and data acquisition for our instruments. The software also provides on-line presentation of the actual device status and allows for simple and comfortable visualization and analysis of the archived historical data.

Key audience:

• energy billing and accounting personnel

• Smart building operators

• advanced facility management

• power quality technicians

• maintenance crew

Main Functions and Features:

• Data acquisition and storage in binary files or SQL server

• Online visualization of actual values, trends, input states, transients, energies....

• Analysis of records - charts, statistics, exports (PDF, XML, ...).

• Evaluation of power quality according to EN 50160.

• Analysis of energy consumption, energy profiles...

• Simple manual or automated reporting on recorded data.

• Support for many different measuring and control devices.

KMB SYSTEMS
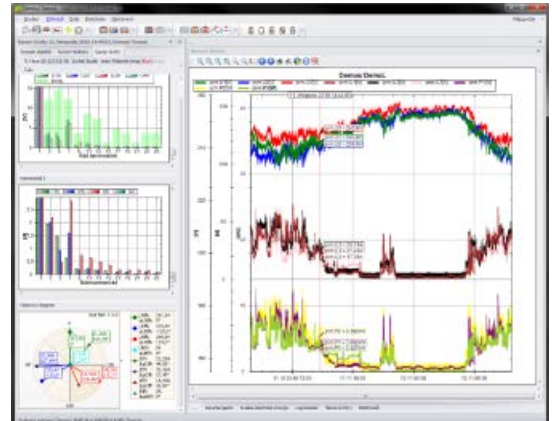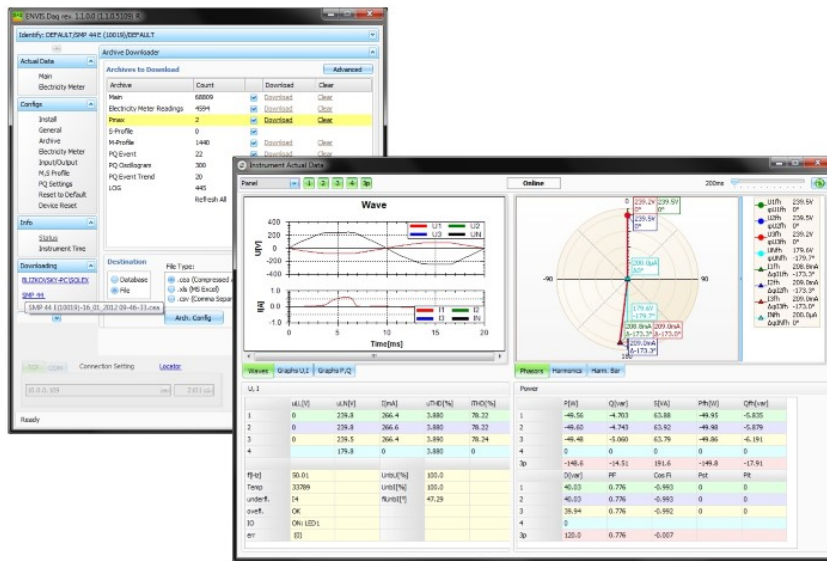
Content of ENVIS Application Suite

The installation package contains complete tool set for monitoring of energy efficiency, power quality and other related parameters. The tools for basic device management and data evaluation are available free of charge and can be downloaded from http://www.kmb.cz/.

ENVIS application   is the key SCADA and data analysis tool for administration and evaluation of the archived data – this program visualizes trends, exports/imports and archives data, generates custom reports etc. EN-VIS version 1.1+ supports all our recent instruments with communication or memory options such as: power factor controllers NOVAR, built-in power meters and analysers - PA, SMM, SML, SMN, SMC, SMV, SMP, SMPQ, SMY, portable analysers NEMO and several 3-rd party instruments.

ENVIS.Daq (Data Acquisition)   for instrument handling. Daq provides features for remote device configuration/programming, archive acquisition (download records) and saves it to various formats. This tool can be run as a standalone Windows application or initiated directly from ENVIS application. Meters can be managed over a broad range of communication lines such as RS485, USB, Ethernet, WiFi or GPRS.

ENVIS.Online   is a system service for standalone data retrieval. As such it needs no human interaction to perform pre-configured periodical tasks. It supports memory-less panel instruments as well as various 3-rd party electricity meters and smart meters, NOVAR power factor controllers and also the built-in analysers. ENVIS.Online can download data periodically, check the status of instrument, generate reports automatically and distribute various preset alarms vie e-mail, SNMP, SMS or directly to desktop.

KMB
SYSTEMS
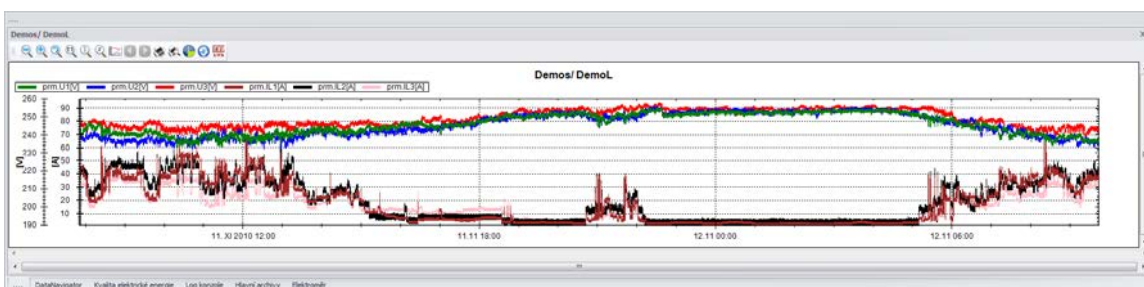
ENVIS application manages archive of energy consumption data and power quality data. Sources for this data warehouse are measuring instruments, power quality analysers, energy meters (also some 3rd party ModBus and M-Bus meters) and power factor controllers manufactured by KMB systems. A destination is typically SQL server database or binary file.

ENVIS is also a data analysis tool - in the sample figure some of the features for analysis can be seen - namely the visualized consumption profile, trends for various quantities, a specific power quality report analysis and a detail of single recorded voltage event.
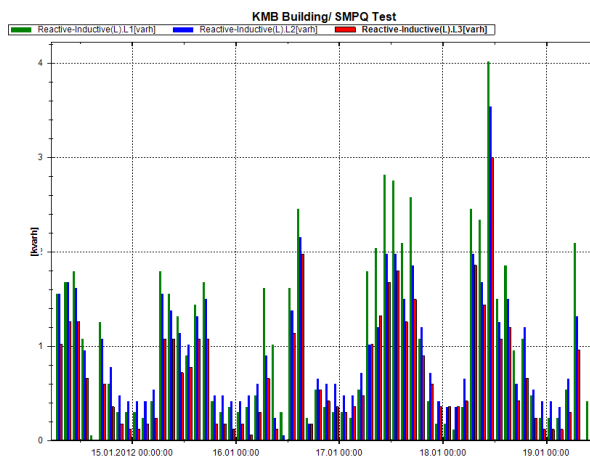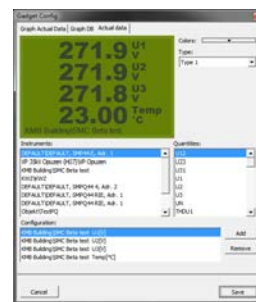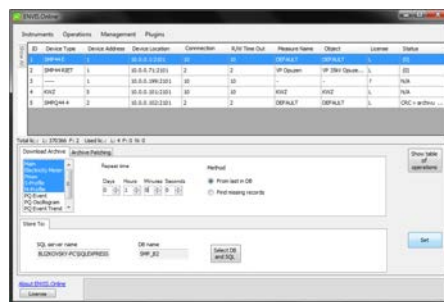

ENVIS is also a SCADA application for specific instruments - the **ENVIS.Online system service is a reliable and transparent tool to handle instruments** connected to your PC. It manages periodical downloads of the instrument. Also it monitors actual values of selected quantities or inputs and generate events/alarms based on the situation. Least but not last the service periodically generates and distributes reports, analysis or alerts to given e-mails. ENVIS.Online monitoring covers single instrument connected to the PC as well as multiple instruments geographically distributed over different communication networks such as Ethernet or GSM/GPRS.

Flexible plug-in architecture of EN-VIS provides foundation for extending of the functionality of the core application. We have already developed several custom plug-ins. The basic application can be extended with some features which are only selfdomly required. For specific projects we can also add special functions.

In the past we have helped the EN-VIS users to **modify its visual appearance, modified reports, amended the actual content of the existing reports or added a completely new reports**.

We have supported the only power quality IEEE file format (PQDIF) through plug-in as well. The provided sample figure (right) shows Graphical plug-in with advanced visual and statistical data analysis functions. This specific plug-in contains scatter plot features, histogram generation options and similar.
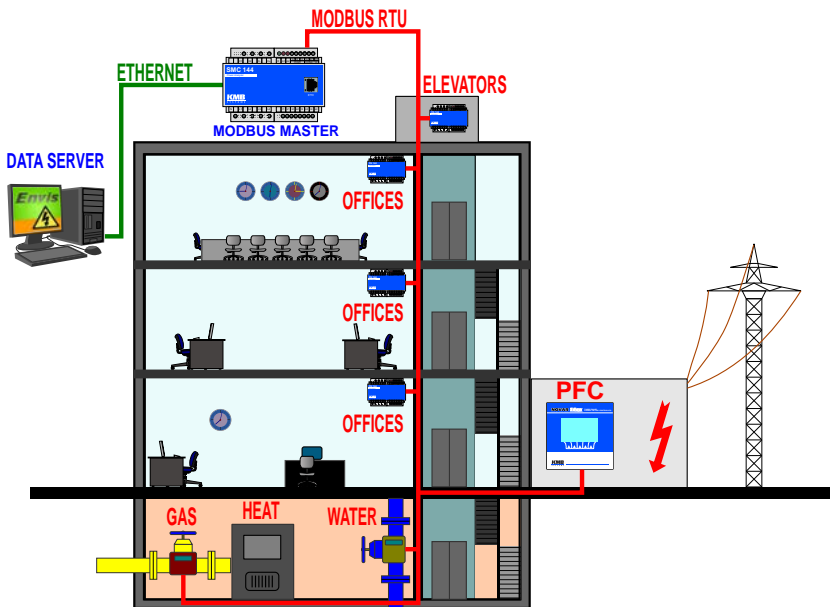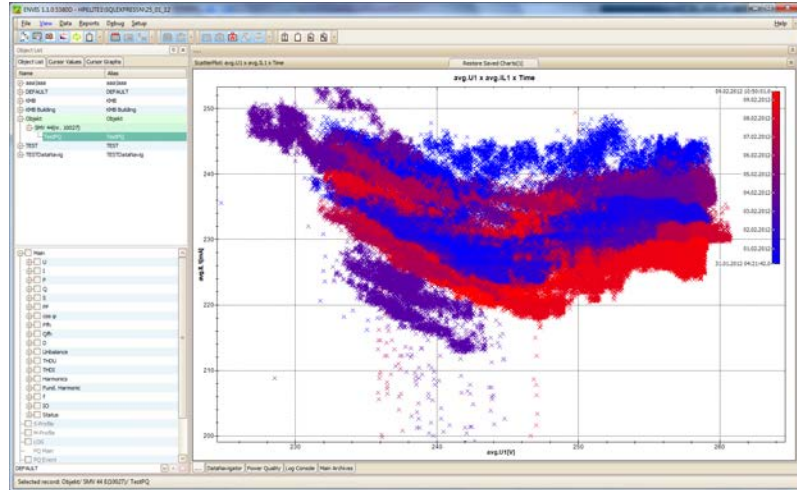
Module Modbus Master is combination of plugins for ENVIS software and selected instruments. By using this module you can configure the instrument to read any Modbus registers from any instruments of any manufacturer connected to it's RS-485 line. Downloaded values are stored into it's memory including an actual timpestamp. Archived readings can be downloaded into a CEA file or to the SQL database with ENVIS.Daq or Online. All archived Modbus readings can be analysed and visualised in ENVIS - users can create graphs, tables, reports and other out of these archive readings. It's also possible to collect data from electric-, water- and gas-meters, power factor controlles (we used NOVAR for testing), HVAC, GPS, weather and any other device supporting Modbus.

Do you think you need to handle obtained data in a special way or to get custom outputs?

Contact our R&D dept. and discus how the plug-in architecture can help you.
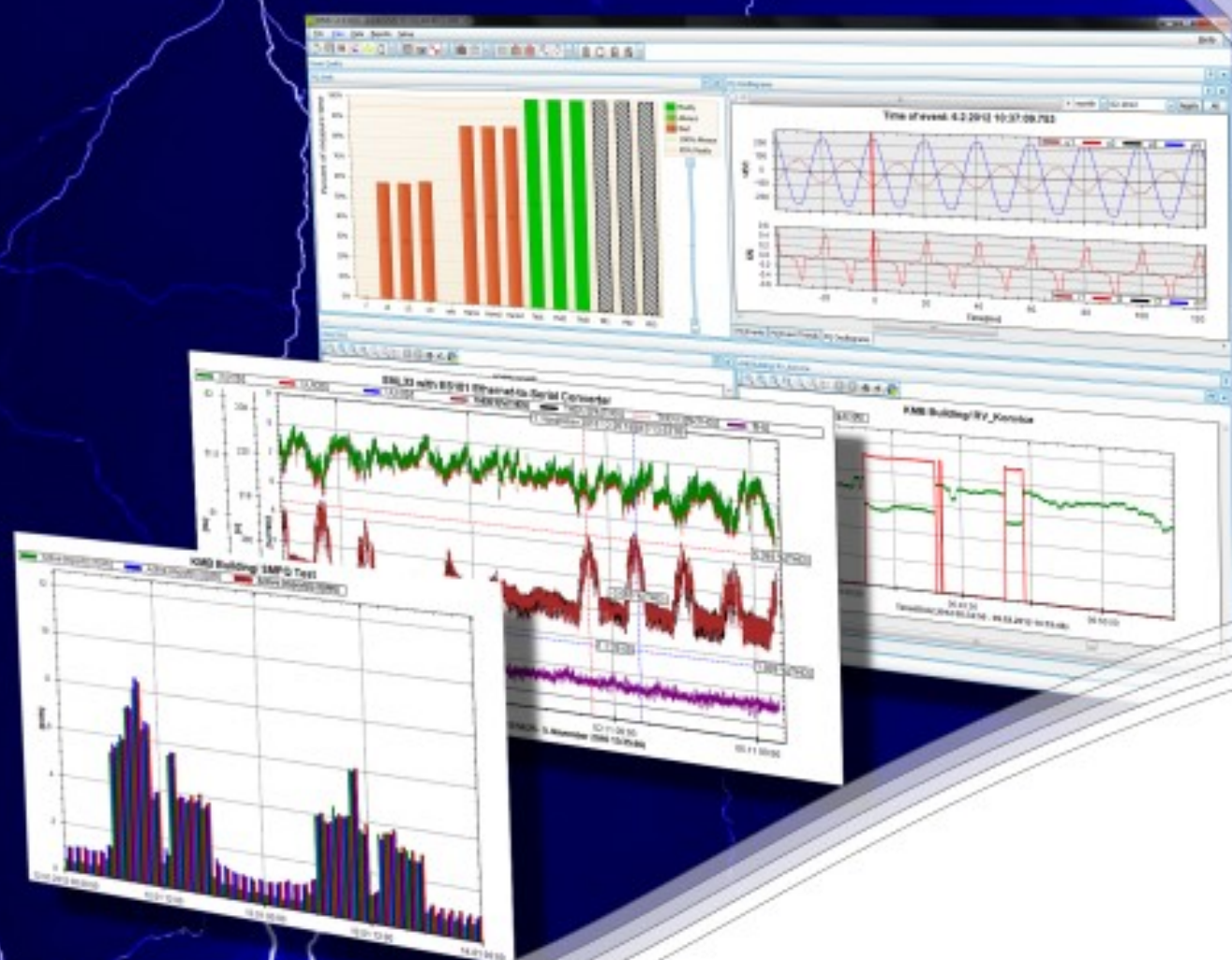
KMB SYSTEMS

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