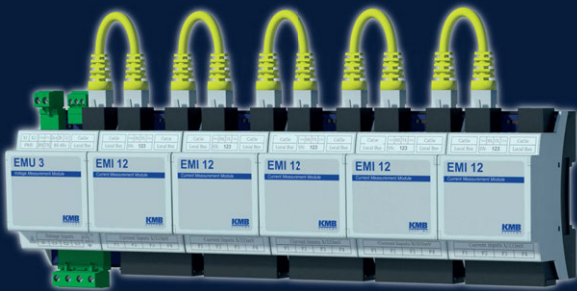
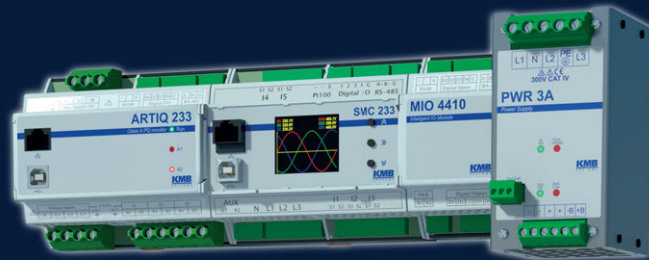


PRODUCT CATALOGUE

2020

BRANCH CIRCUIT POWER MONITORING
POWER FACTOR CORRECTION
SMART GRID MONITORING
POWER QUALITY EVALUATION



KMB
SYSTEMS

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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 SIMON 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

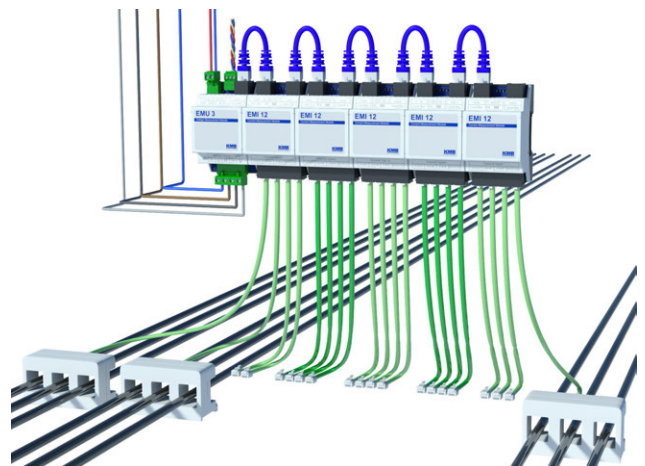
NOVAR presents a complete product line of automatic power factor controllers. It is reliable, efficient, fully automatic, precise and easy to install and maintain. In our portfolio we offer basic controllers for budgetary applications, classical controllers with broad range of communication options and 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.

Branch Circuit Power Monitoring

New advanced concept of very accurate modular system consisting of various modules for measuring the voltages, currents, evaluating PQ in class A or class S with datalogging, remote display and all easily connected and configured via LocalBus. Each system can measure from 12 to 60 currents in 1-phase or 3-phase networks. System will soon include also modules for DC current monitoring and residual current monitoring.



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 innovative 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 ferrores-

onance 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.

In 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.

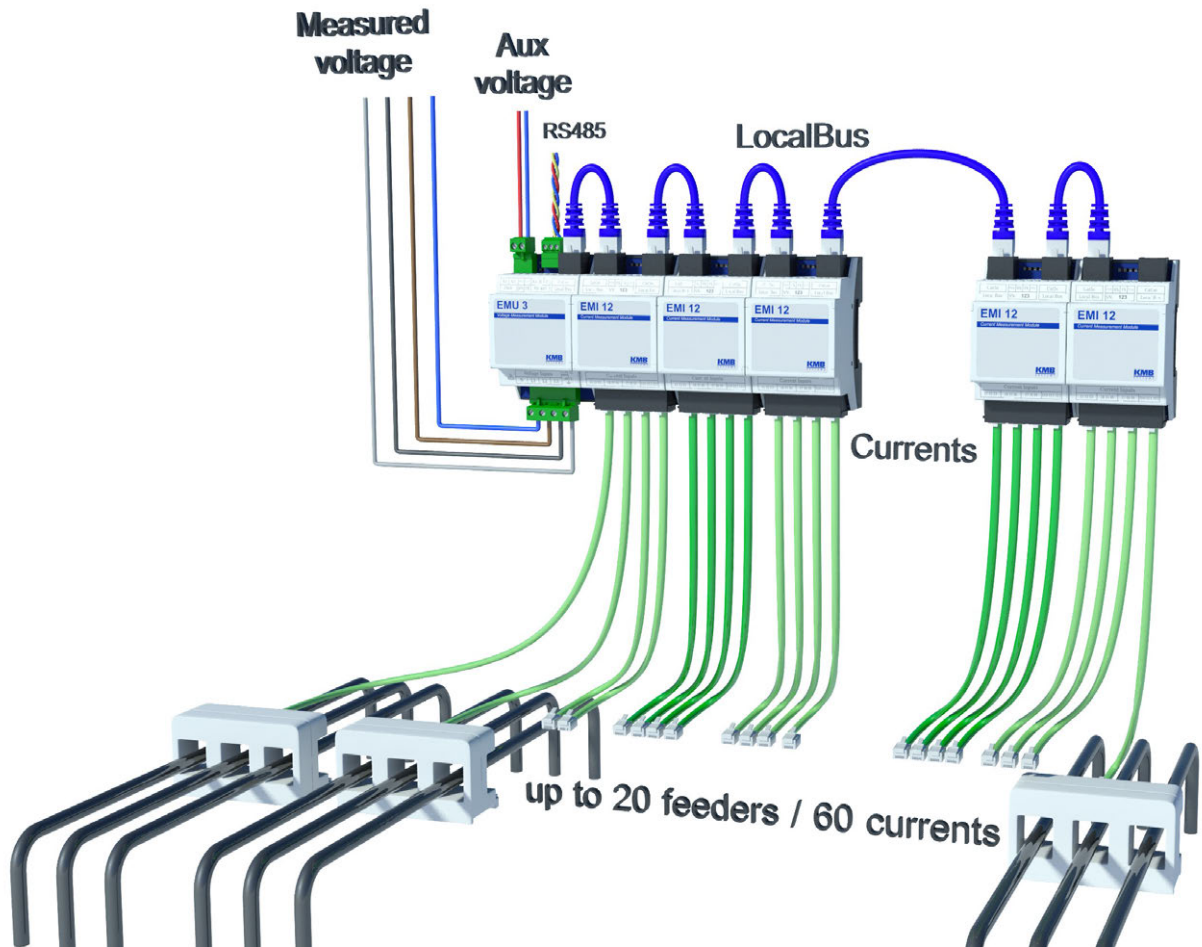
In years 2015-2017 we've received grant from TA ČR for project TH01020327 - Modular system for complex monitoring and management designed for DC and hybrid AC/DC smart grids. With it's help we've developed modular measuring device - analyser for more and more present DC and combined power supplies, networks and appliances.

In 2018 we've introduced many new products for measuring in power distribution and for use in CAT IV environments. Namely it's power analysers and energy meters ARTIQ 233, SMC 233 and SMP 133, with help of TA ČR developed CAT IV power supply and intelligent IO module MIO. We've also received grant from TA ČR for project TH03010462 - Fast reactive power correction system with easy-to-integrate features for plants with high degree of automation. Which should result in new generation of advanced thyristor switching modules and realtime power factor controllers.

For 2019 we've prepared new advanced modular **Branch Circuit Power Monitoring system** with **class A or S PQ evaluation** and measurement of **up to 60currents** per system consisting of EMU 3, EMI 12 and BCPM 233 modules. New class A power quality analyser **SMZ 244 with 5.7" color LCD screen**. Also family of SMY analyser have new member in form of **SMY 134** which can not only measure current in neutral but features also **2 RCM inputs** to detect any leakages.

The company is certificated by the quality assurance system according to the EN ISO 9001:2015 standard.

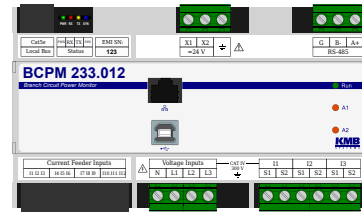
Branch Circuit Power Monitoring



Compact system designed for effective and accurate monitoring of multiple feeders (branches) in cost efficient and easy to install way. System consists of voltage measurement unit EMU 3 or power analyser BCPM 233.012 and current measurement modules EMI 12. Whole setup measures 3 voltages and up to 60 currents - 20 three-phase feeders. Furthermore kWh and kvarh per phase and total, W, var, VA, THDI, unbalance of voltage, THDU and 50 harmonics of voltage are measured. Live data are provided over Modbus or recorded to internal memory when BCPM 233.012 is used. System can also be extended for remote display with RS485-Ethernet gateway BC REDIS.

BCPM 233.012 - Analyser with multi-feeder monitoring

BCPM 233.012 is designed for remote energy monitoring and power quality evaluation. Instrument measures three voltages and three currents on main incomer and additionally it can measure up to 4 three-phase feeders (12currents). This concept is aimed for many different applications from power distribution, SmartGrid systems over industrial automation, production process monitoring, demand management and other energy management systems. All measured information are recorded to internal memory for further evaluation and processing. Analyser can be optionally extended class A power quality analyser using respective firmware modules. RS-485 and Ethernet are used for remote communication and USB for local setup and overview. Using up to 4 external EMI current measurement modules, number of measured feeders can be extended up to 20 (60 currents).



BCPM 233.012 system

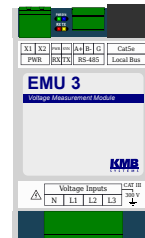
INPUTS 3U, 3I	INPUTS 12-60I	MEASUREMENT U,I,P,Q	PF,cos,THD	+/- Wh,varh	HARMONICS 128	SAMPLING 28kHz	CURRENT INPUT X/5A	CURRENT INPUT 333mV	STANDARDS class 0.2S IEC 62053-22
STANDARDS IEC 61557-12	STANDARDS EN 50160	FLASH 512MB	RS485	MODBUS	ETH	WEBSERVER	NTP	USB	

Optional

STANDARDS class A IEC 61000-4-30

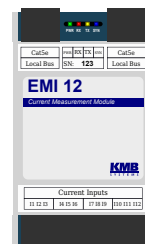
EMU 3 - voltage measurement module

EMU 3 is voltage measurement module which is used in combination with one to five EMI 12 modules connected over LocalBus to monitor 4 to 20 three-phase feeders. All measured data are provided over RS485 to ENVIS or to any other application via Modbus. Remote display such as BC REDIS can be connected to show instantaneous values and also act as gateway and provide measured data also over Ethernet.



EMI 12 - current measurement module

EMI 12 is extending current measurement module used in combination with EMU 3 voltage measurement module or with BCPM 233.012 analyser to extend number of measured current feeders. It features four RJ12 sockets for measurement of up to 4 three-phase feeders. Connection to other EMI 12 as well as to EMU 3 or BCPM is made via LocalBus. Thanks this intelligent bus system can measure up to 60 currents (20feeders).

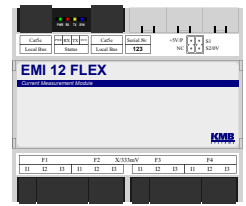


EMU 3, EMI 12 system

INPUTS 3U	INPUTS 12-60I	MEASUREMENT U,I,P,Q	PF,cos,THD	+/- Wh,varh	HARMONICS 50	CURRENT INPUT 333mV	STANDARDS IEC 61557-12	STANDARDS class 0.5S IEC 62053-22	RS485	MODBUS
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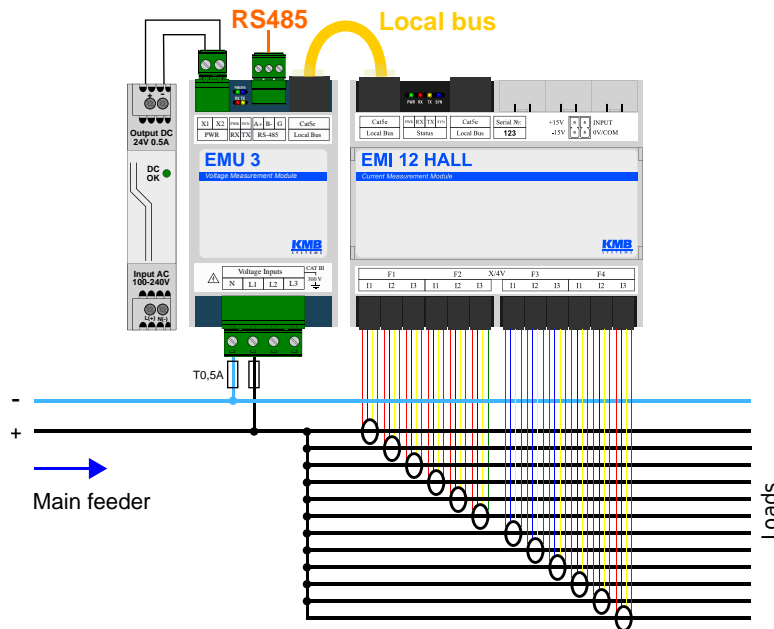
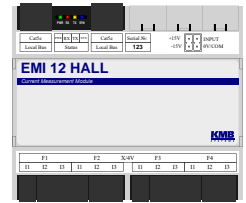
EMI 12 FLEX - current measurement module with rogowski coil support

EMI 12 FLEX disponuje stejně jako EMI 12 dvanácti proudovými vstupy pro snímače s výstupem 333mV. Provedení FLEX je ale navíc schopno všem připojeným snímačům poskytnout napájecí napětí 5VDC. To ho předurčuje k nasazení v aplikacích s pružnými proudovými snímači. Moduly EMI 12 FLEX je možné libovolně kombinovat s dalšími EMI moduly až do celkového počtu 5ks na lokální sběrnici.



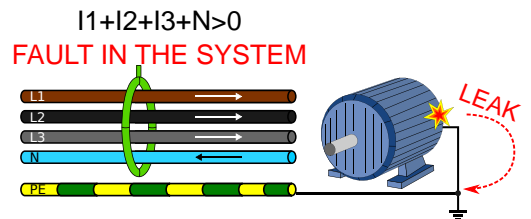
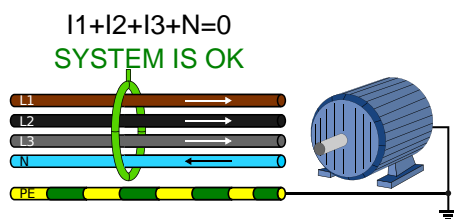
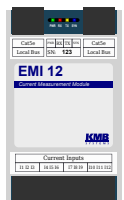
EMI 12 HALL - AC/DC current measurement module

EMI 12 HALL je nástupcem vícekanálového měřicího přístroje SMD 118, je schopno měřit až dvanáct stejnosměrných a střídavých proudů prostřednictvím Hallových snímačů s výstupním signálem ±4VDC. Stejně jako v případě modelu FLEX poskytuje i EMI 12 HALL napájecí napětí připojeným snímačům. V tomto případě je napájecí napětí ±15VDC. Kompletní systém může být sestaven až z 5 modulů EMI 12 HALL, které umožní měření až 60 stejnosměrných proudů.



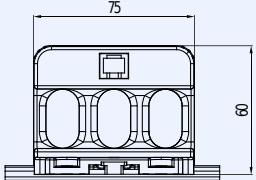
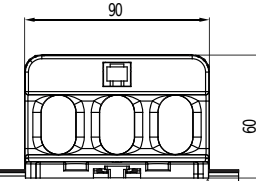
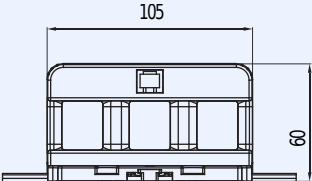
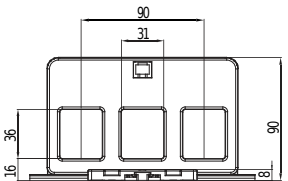
EMI 12 RCM - residual current monitoring module

EMI 12 RCM je nástupcem přístroje RCM 118 a je navrženo jako vícekanálový monitor unikajících proudů. Prostřednictvím speciálních transformátorů je schopný měřit jakékoliv úniky, poruchy izolace a jakékoliv další reziduální proudy. Kombinován může být s dalšími prvky systému jako EMU 3, EMI 12, BCPM 233.012 a další.

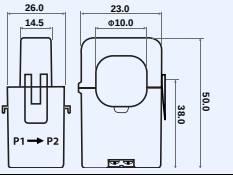
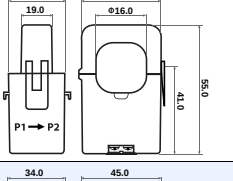
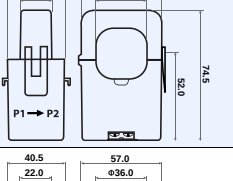
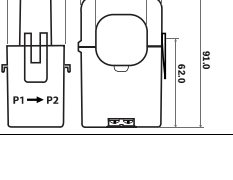


Accessories

Combined three-phase current transformers J3CT

Type	Model	Inom	Accuracy class	Window size	Size
J3CT075	J3CT075 – 030/333mV	30A	1	27×15.5mm	
	J3CT075 – 060/333mV	60A	0.5S		
	J3CT075 – 100/333mV	100A	0.2S		
J3CT090	J3CT090 – 125/333mV	125A	0.2S	27×17mm	
	J3CT090 – 160/333mV	160A			
J3CT105	J3CT105 – 160/333mV	160A	0.2S	25×21mm	
	J3CT105 – 250/333mV	250A			
J3CT140	J3CT140 – 400/333mV	400A	0.2S	36×31mm	
	J3CT140 – 630/333mV	630A			

Split-core current transformers

Type	Model	Inom	Accuracy class	Window diameter	Size
JC10F	JC10F - 333 5A	5A	3	10mm	
	JC10F - 333 20A	20A	1		
	JC10F - 333 30A	30A	1		
	JC10F - 333 50A	50A	1		
JC16F	JC16F - 333 70A	70A	1	16mm	
	JC16F - 333 100A	100A			
JC24F	JC24F - 333 200A	200A	1	24mm	
JC36S	JC36S - 333 300A	300A	1	36mm	
	JC36S - 333 600A	600A			

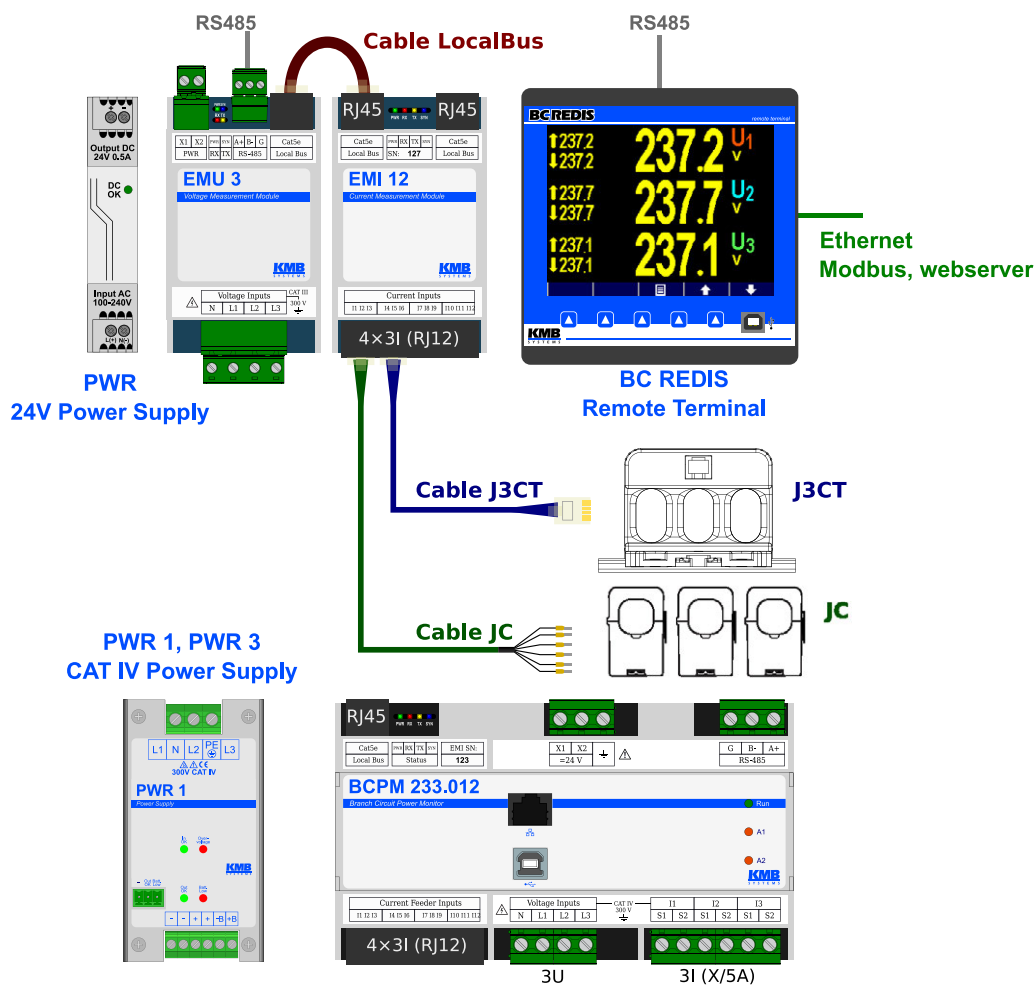
Residual current transformers

Type	Model	Inom	Accuracy class	Window diameter	Size
JC10F	JC10F - 333 5A	5A	3	10mm	
	JC10F - 333 20A	20A	1		
	JC10F - 333 30A	30A	1		
	JC10F - 333 50A	50A	1		
JC16F	JC16F - 333 70A	70A	1	16mm	
	JC16F - 333 100A	100A			
JC24F	JC24F - 333 200A	200A	1	24mm	
JC36S	JC36S - 333 300A	300A	1	36mm	
	JC36S - 333 600A	600A			

Rogowski coil sensors

Type	Model	Inom	Accuracy class	Window diameter	Size
JC10F	JC10F - 333 5A	5A	3	10mm	
	JC10F - 333 20A	20A	1		
	JC10F - 333 30A	30A	1		
	JC10F - 333 50A	50A	1		
JC16F	JC16F - 333 70A	70A	1	16mm	
	JC16F - 333 100A	100A			
JC24F	JC24F - 333 200A	200A	1	24mm	
JC36S	JC36S - 333 300A	300A	1	36mm	
	JC36S - 333 600A	600A			

Accessories



Cable LocalBus Used for routing LocalBus communication between individual modules (EMU, EMI, BCPM). Various lengths are available.

Cable J3CT Used for connection of currents from J3CT transformers to EMI 12 current measurement module. Cable features RJ12 connector on both ends and is available in various lengths.

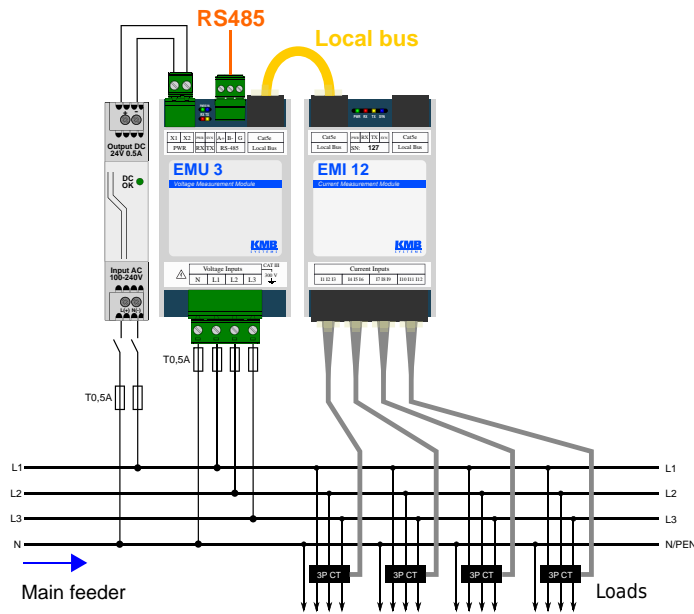
Cable JC Used for connection of currents from split-core and other compatible transformers with terminals to EMI 12 current measurement module. Cable features RJ12 connector on one side and cord end terminal on other. Cable is available in various lengths.

PWR - 24V power supply Compact 24V power supply used to supply EMU 3 and BCPM auxiliary power.

PWR 1, PWR 3- CAT IV 24V power supply Suitable for use in distribution substation because of high over-voltage category and wide range of input voltage. Output voltage can be backed up when external accumulator is used.

BC REDIS Programmable remote display extension for EMU 3 or BCPM 233.012. Connects over RS-485 and displays all available Modbus data. It also supports ES fw. modules and can operate as Ethernet to RS485 gateway for multiple EMU 3 units and others.

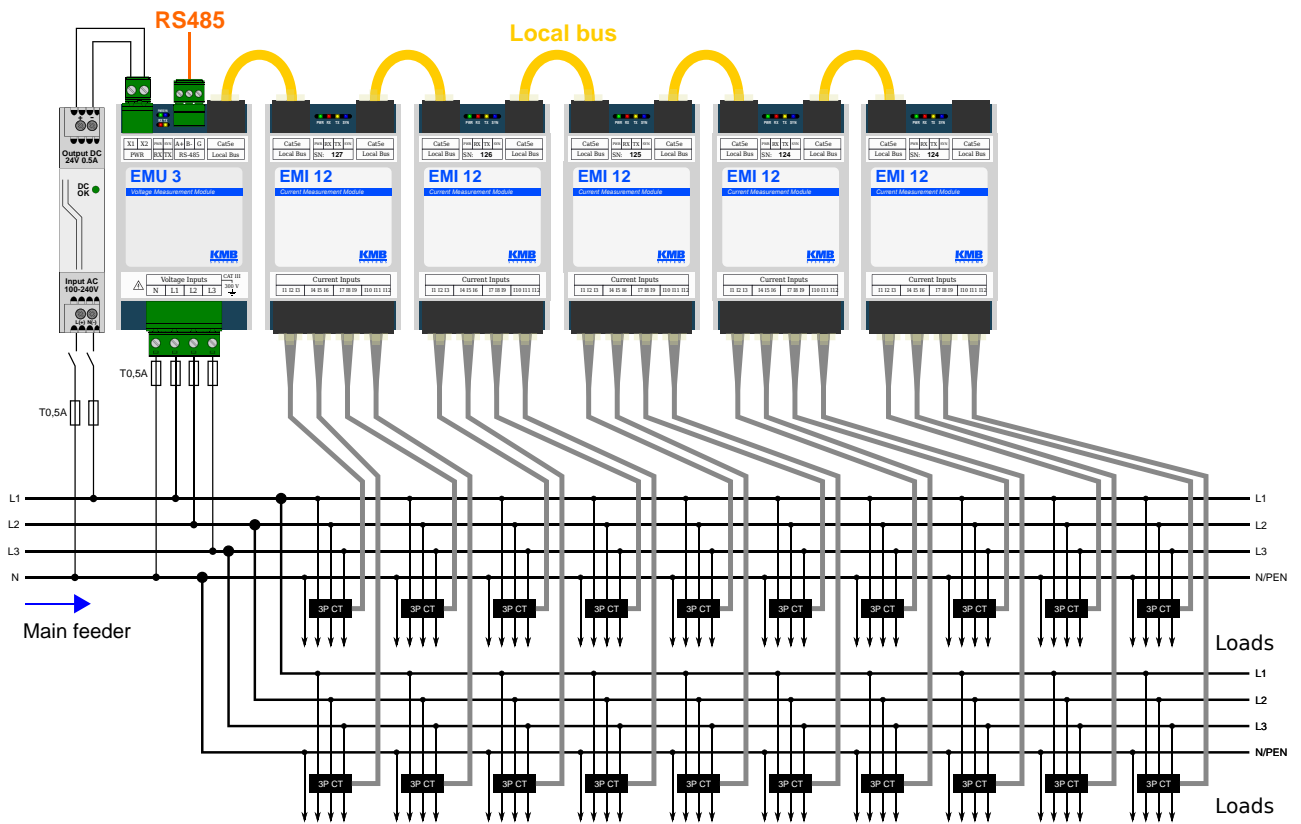
Connection schemes



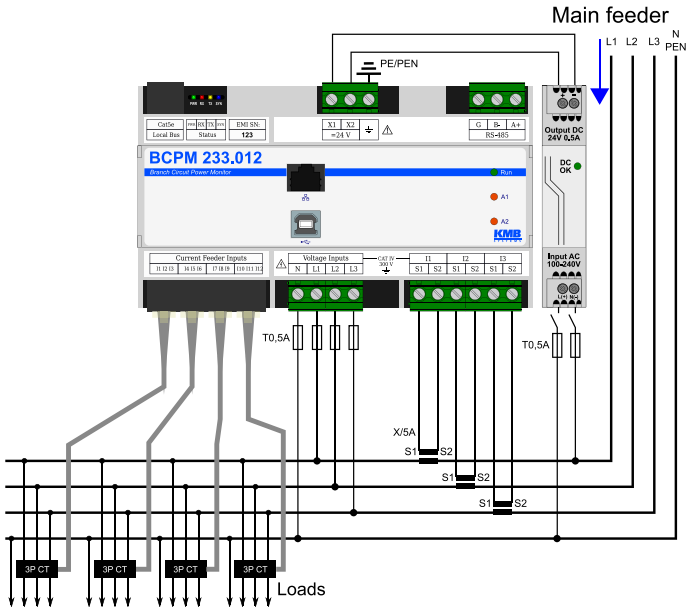
Voltages	$U_1, U_2, U_3, U_{12}, U_{23}, U_{31}$
Currents	IL_1, IL_2, IL_3 for each feeder
Active Power	+/-, $P_1, P_2, P_3, 3P$, for each feeder
Reactive Power	+/-, $L/C, Q_1, Q_2, Q_3, 3Q$, for each feeder
Apparent Power	$S_1, S_2, S_3, 3S$, for each feeder
Distortion Power	D_1, D_2, D_3 , for each feeder
PF, $\cos\phi$	$PF_1, PF_2, PF_3, 3PF$ $\cos\phi_1, \cos\phi_2, \cos\phi_3, 3\cos\phi$
Unbalance Factor	$unbl, unbU, \phi nsl$
Voltage THD	$THDU_1, THDU_2, THDU_3$ $THDU_{12}, THDU_{23}, THDU_{31}$
Current THD	$THDI_1, THDI_2, THDI_3$, for each feeder
Harmonics	1 st to 50 th of Voltage
Fund. Harmonic	$U_{1fn}, U_{2fn}, U_{3fn}, I_{1fn}, I_{2fn}, I_{3fn}$
Frequency	f
Active Energy	+/-, $EP_1, EP_2, EP_3, 3EP$, for each feeder
Reactive Energy	+/-, $L/C, EQ_1, EQ_2, EQ_3, 3EQ$, per feeder

Minimal Setup - 1x EMU 3, 1x EMI 12, 4 feeders (12currents)

Table of measured values



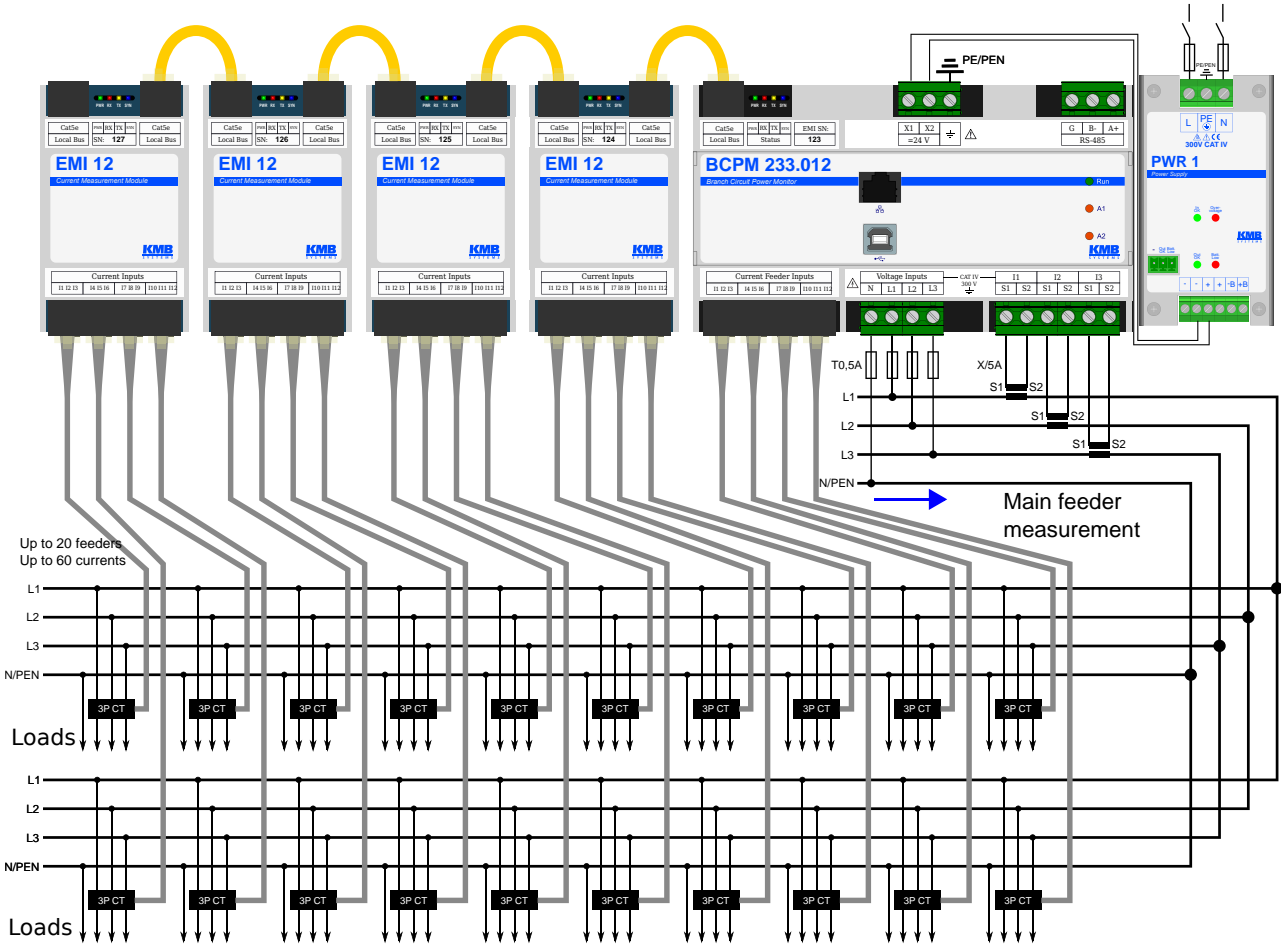
Maximal Setup - 1x EMU 3, 5x EMI 12, 20 feeders (60 currents)



Voltages	$U_1, U_2, U_3, U_{12}, U_{23}, U_{31}$
Currents	IL_1, IL_2, IL_3 for each feeder
Active Power	+/-, $P_1, P_2, P_3, 3P$, for each feeder
Reactive Power	+/-, $L/C, Q_1, Q_2, Q_3, 3Q$, for each feeder
Apparent Power	$S_1, S_2, S_3, 3S$, for each feeder
Distortion Power	D_1, D_2, D_3 , for each feeder
PF, $\cos\phi$	$PF_1, PF_2, PF_3, 3PF$ $\cos\phi_1, \cos\phi_2, \cos\phi_3, 3\cos\phi$
Unbalance Factor	unbl, unbU, ϕnsl
Voltage THD	$THDU_1, THDU_2, THDU_3$ $THDU_{12}, THDU_{23}, THDU_{31}$
Current THD	$THDI_1, THDI_2, THDI_3$, for each feeder
Harmonics	1 st to 128 th Voltage & Current of main f.
Fund. Harmonic	$U_{1fh}, U_{2fh}, U_{3fh}, I_{1fh}, I_{2fh}, I_{3fh}$
Frequency	f
Active Energy	+/-, $EP_1, EP_2, EP_3, 3EP$, for each feeder
Reactive Energy	+/-, $L/C, EQ_1, EQ_2, EQ_3, 3EQ$, per feed.
Datalogging	512MB of internal storage
Voltage Events	YES (PQ S, PQA)
Waveforms	voltage and current of main feeder (GO)

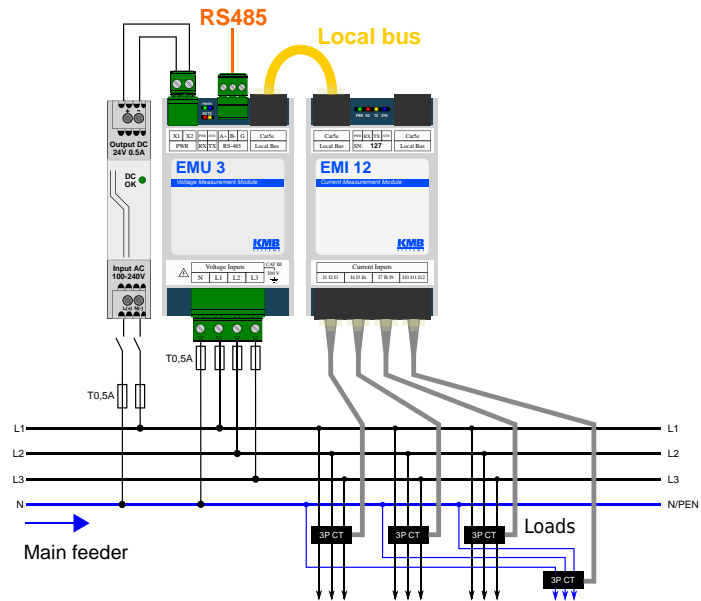
BCPM 233.012, mains + 4 feeders (3 + 12currents)

Table of measured values

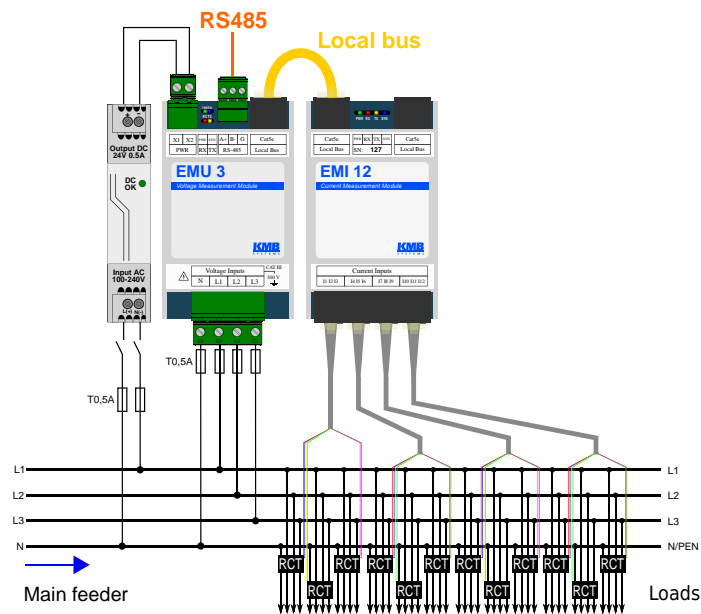


Maximal setup - BCPM 233.012, 4x EMI 12, mains + 20 feeders (3 + 60currents)

Special connections

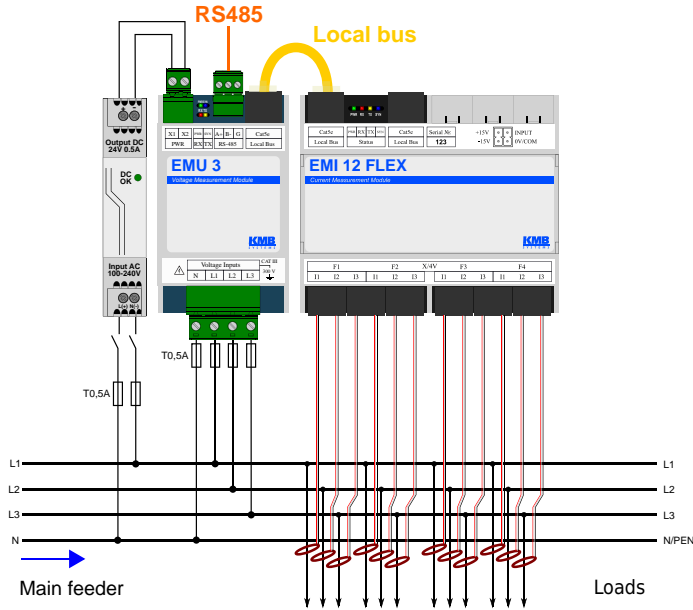


Measuring 3 feeders with in

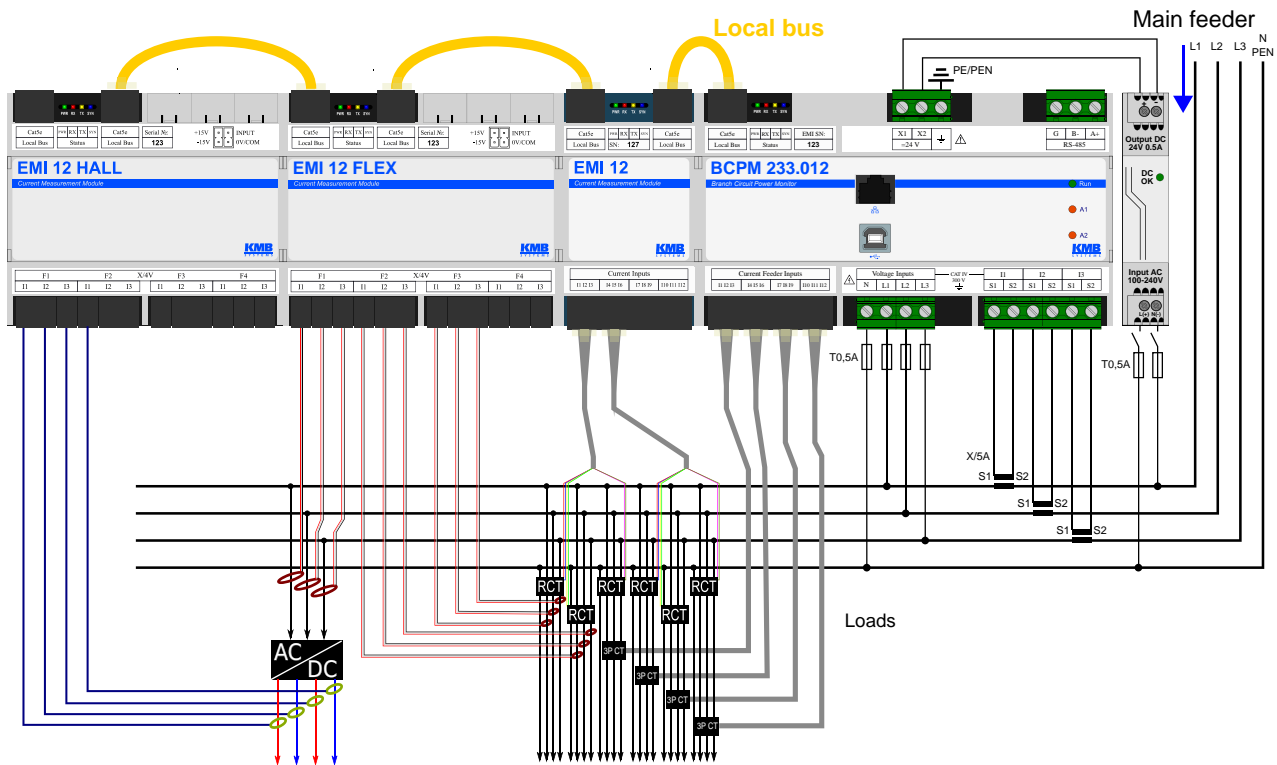


Measuring 12 residual currents using EMI 12 RCM

Special connections



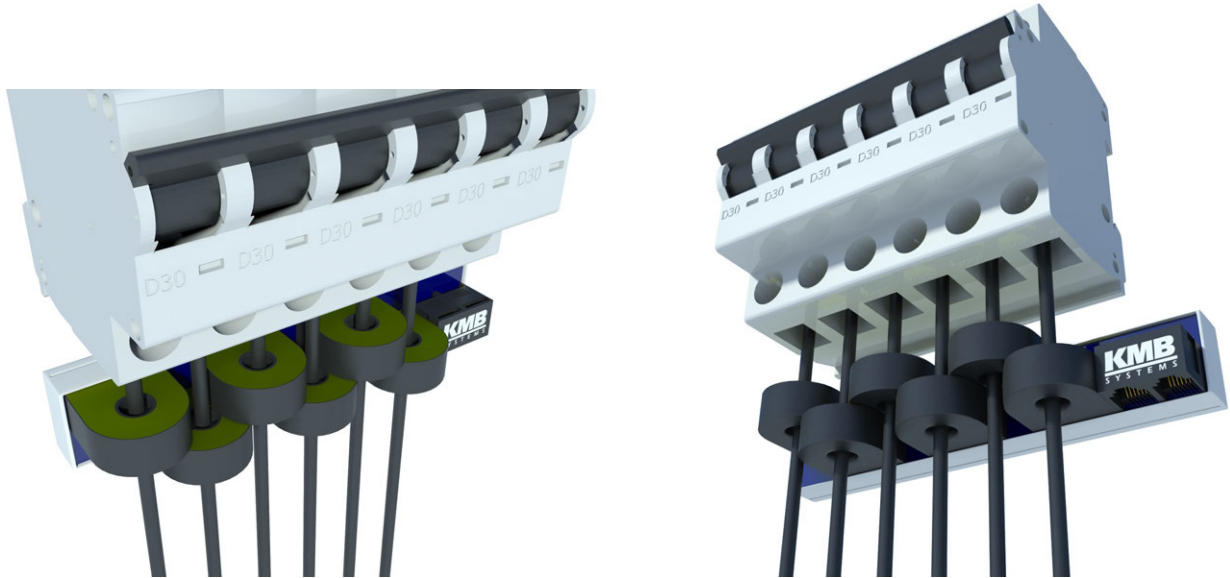
Measuring via flexible currents sensors using EMI 12 FLEX


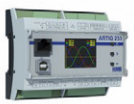




Combined measurements of AC, DC and residual currents using EMI and BCPM units

Compact precise multi-line CTs

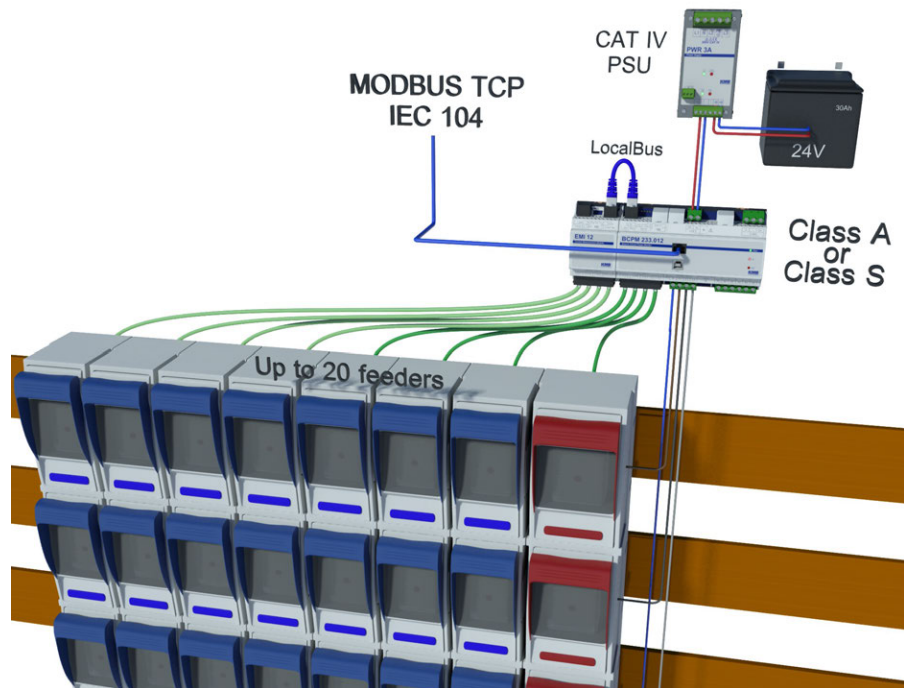
These CTs are designed for precise measurement of currents with EMI modules in branch circuit power monitoring applications. It can be fixed on cables, mounted on panel or DIN35 rail. It can measure primary current directly but also measurement on secondary side of regular CT is possible.



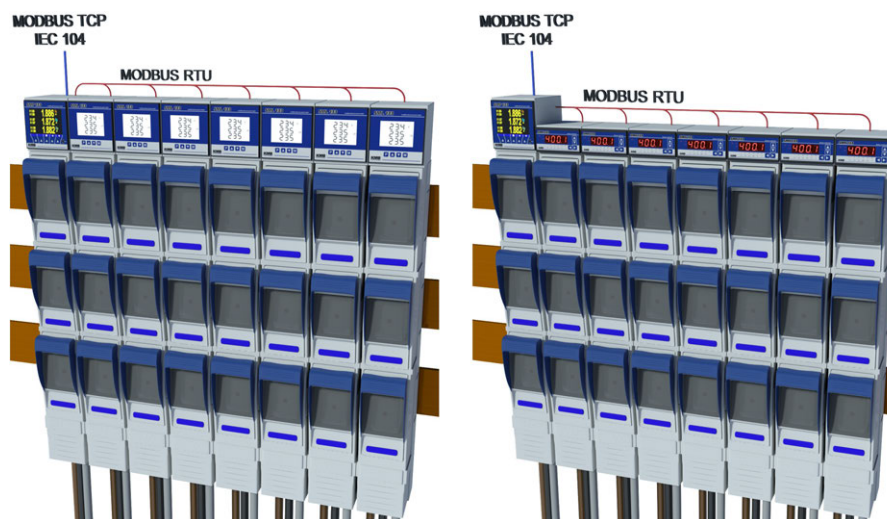
				
	SMC 233	ARTIQ 233	SMP 133	SMC 133
Measuring Range	5 ÷ 1470V _{LL} 3 ÷ 850V _{LN}	5 ÷ 1470V _{LL} 3 ÷ 850V _{LN}	11 ÷ 520V _{LL} 6 ÷ 300V _{LN}	7 ÷ 720V _{LL} 4 ÷ 420V _{LN}
Auxiliary voltage	S: 10 ÷ 30V _{DC}	S: 10 ÷ 30V _{DC}	S: 10 ÷ 26V _{AC} 10 ÷ 30V _{DC}	S: 10 ÷ 30V _{DC}
Measurement cat.	CAT IV / 300V	CAT IV / 300V	CAT IV / 300V	CAT IV / 300V
Measurement	3U, 4I	3U, 3I	3U, 3I	3U, 3I
Current Inputs	X/5A	X/5A	X/5A	X/5A
Quadrants	4A, 4R	4A, 4R	4A, 4R	4A, 4R
Sampling rate	28kHz	28kHz	25,6kHz	25,6kHz
Aggregation	200ms	200ms	200ms	200ms
Continuous meas.	●	●	●	●
Harmonics V/A	1 - 128	1 - 128	1 - 50	1 - 50
Interharmonics	○ PQ S	○ PQ A	○ PQ S	○ PQ S
THD-U [%]	●	●	●	●
THD-I [%]	●	●	●	●
Unbalance	●	●	●	●
Flicker (Pst, Plt)	○ PQ S	○ PQ A	○ PQ S	○ PQ S
Voltage Events	○ PQ S	○ PQ A	○ PQ S	○ PQ S
Waveforms	○ GO	○ GO	○ GO	○ GO
Accuracy V/A	0.1	0.1	0.2	0.1/0.2
Active energy	0.5S	0.2S	0.5S	1
Reactive energy	0.5S	0.2S	1	1
Digital I/O	4	4	2/1	-
Relay outputs	-	-	2	-
Analogue I/O	-	-	-	-
Temp. input	●	●	-	-
Internal temp.	●	●	●	●
Min/max memory	●	●	●	●
Memory size	512 MB	512 MB	512 MB	512 MB
Clock	●	●	●	●
Software	ENVIS	ENVIS	ENVIS	ENVIS
EN 50160	○ PQ S	○ PQ A	○ PQ S	○ PQ S
IEC 61000-4-30	class S	class A	class S	class S
Interfaces				
RS 485	●	●	●	●
Ethernet	●	●	●	●
USB	●	●	●	-
Web server	●	●	●	●
Gateway	○ ES	○ ES	○ ES	○ ES
Protocols				
Modbus RTU	●	●	●	●
KMB	●	●	●	●
ModBus TCP	●	●	●	●
Construction				
Display	color LCD	color LCD	color LCD	-
Dimension	108×98×62	108×98×62	96×96×59	106×90×58
Mounting	DIN35	DIN35	panel	DIN35

●, 2 - Standard
○, 2 - Optional

Monitoring of outgoing LV feeders and fuses in distribution substation



One of the most important information needed from LV side of distribution substation is information about status of outgoing feeders. Namely it is currents, status of the fuses, powers and energies. We've developed several products combined with fuse switches suitable for different levels of monitoring. From most basic modbus versions with current, voltage and power monitoring with or without local displays, over solutions with datalogging up to full power quality analysis in class A or S with datalogging of each feeder and CAT IV overvoltage category.



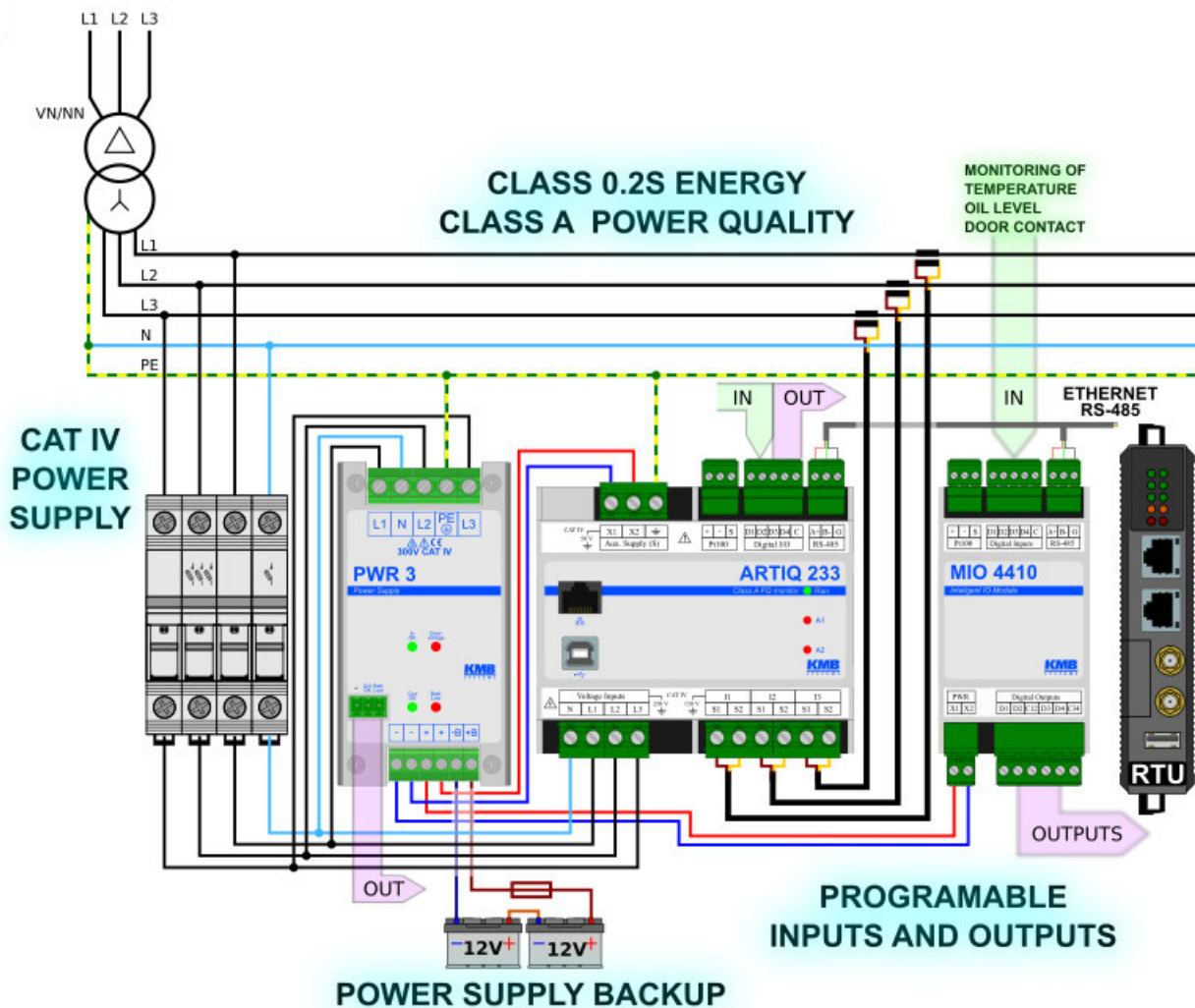
Current transformers, X/5A for regular or X/100mA for highly compact applications are integrated into fuse switch. Current transformers are then connected either into Local-Bus system consisting of BCPM 233 and EMI 12 which forms most advanced system or to setup consisting SMP 133 analyser with SML 133 or SMK 133 multimeters where SMP 133 works as concentrator or gateway. Most common is to measure 8 feeders which is

most typical setup of MV/LV distribution substation but with system like LocalBus we can measure up to 20 feeders simultaneously.

All measured data is usually being provided to SCADA system using IEC 104 or Modbus TCP protocol, but Modbus RTU is also available. There are no differences in installation of this smart fuse switches compared to regular one. All typical sizes such as 100mm and 185mm with 00, 1, 2, 3 fuses are available. Configuration of monitoring system is very simple as most of the parameters are already predefined from the factory.

SmartGrid

Energy and Power Quality monitoring



Our portfolio presents full range of products for remote monitoring of distribution substations. Instruments fulfill highest requirements for **use in CAT IV areas and harsh environments**. First part of the chain is range of power supplies PWR with 1- or 3-phase input voltage and optionally backed up output voltage. Measuring can be accomplished using one of the class A or class S power quality analysers mounted on panel or DIN-rail. Namely there are ARTIQ 233, SMC 233, SMC 133 and SMP 133. Basic automation tasks and monitoring of non-electrical values can be accomplished by intelligent IO module MIO. Whole system can be connected using RS-485 or Ethernet, conversions to IEC 60870-5-104 and IEC 61850 are possible. Remote communication can be managed by almost any kind of router/modem or RTU.

ARTIQ 233 - Class A power quality analyser, energy 0.2S

Class A power quality analyser according to IEC 61000- 4 - 30 ed3, certified by IEC 62586-1 & -2 and energy counter **class 0.2S**. All measured data are stored to large internal memory (512MB) for future processing. Evaluation of quality is according EN 50160 ed3. Extreme accuracy, high sampling rate, measurement category CAT IV and wide range of communication interfaces predetermines use in most demanding applications.



Standard

INPUTS 3U, 3I	MEASUREMENT U,I,P,Q	PF,cos,THD	Wh,varh	+/-	SAMPLING 28kHz	HARMONICS 128	STANDARDS class 0.2S IEC 62053-22	FLASH 512MB	RS485	ETH	USB
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Optional

STANDARDS class A IEC 61000-4-30	STANDARDS EN 50160
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SMC 233 - Class S power quality analyser, energy 0.5S



Class S power quality analyser according IEC 61000 - 4 - 30 ed2 and energy counter class 0.5S. Targeted for application where robust, powerful and compact solution with accurate measurement is necessary. Features wide range of interfaces for remote and local communication like RS-485, USB or Ethernet. Power quality evaluation according to EN50160 ed3 with PQ S is matter of course.

Standard

INPUTS 3U, 3I	MEASUREMENT U,I,P,Q	PF,cos,THD	Wh,varh	+/-	SAMPLING 28kHz	HARMONICS 128	STANDARDS class 0.5S IEC 62053-22	FLASH 512MB	RS485	ETH	USB
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Optional

STANDARDS class S IEC 61000-4-30	STANDARDS EN 50160
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SMP 133 -Panel mounted class S power quality analyser

Construction is based on SMY 133 analyser but with improved durability, higher measurement category (CAT IV), more accurate measurement and power supply backup. Suitable for applications where local visualization via LCD is necessary. Instrument can be used also as remote display for other devices with use of Modbus Master firmware module.



Standard

INPUTS 3U, 3I	MEASUREMENT U,I,P,Q	PF,cos,THD	Wh,varh	+/-	SAMPLING 25,6kHz	HARMONICS 50	STANDARDS class 0.5S IEC 62053-22	BATTERY	FLASH 512MB	RS485	ETH	USB
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Optional

STANDARDS class S IEC 61000-4-30	STANDARDS EN 50160
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SMC 133 - Class S power quality analyser



Instrument in configuration SMC 133 S (low aux. power supply) is designed for high demanding environments of distribution substations. Instrument is equipped with internal accumulator for uninterrupted operation during power supply failure. Matter of course is presence of RS-485 communication interface and optional Ethernet for easy integration to any kind of SCADA system. Instrument can be extended by PQ S module to class S power quality analyser and also waveforms recorder using GO module.

Standard

INPUTS 3U, 3I	MEASUREMENT U, I, P, Q	PF, cos, THD	+/- Wh, varh	SAMPLING 25,6kHz	HARMONICS 50	STANDARDS class 0.5S IEC 62053-22	BATTERY	FLASH 512MB	RS485	ETH
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Optional

STANDARDS class S IEC 61000-4-30	STANDARDS EN 50160
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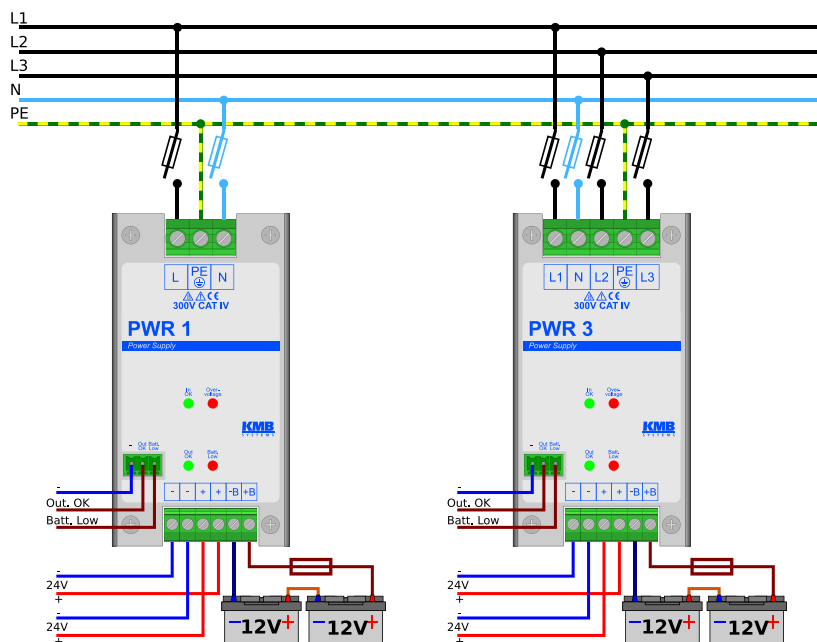
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PWR - 300V CAT IV power supply

Suitable for use in distribution substation because of high over-voltage category and wide range of input voltage. Output voltage can be backed up when external accumulator is used. PWR power supplies can be supplied using single-phase AC or DC voltage in case of PWR 1 and three-phase voltage in case of PWR3 (two lines serve as backup). Output of PWR power supply is galvanically isolated with SELV output voltage. It's possible to use multiple PWR units to increase output voltage, current or increase reliability (redundant connection).



Model	Input Voltage	Input	Output	Power	Overtoltage Cat	Backup
PWR 1 N 65W 24V	90÷265÷460V~ / 127÷340V=	1 phase	2×24V	65W	300V CAT IV	No
PWR 1 A 60W 24V	90÷265÷460V~ / 127÷340V=	1 phase	2×24V	60W	300V CAT IV	Yes
PWR 3 N 35W 24V	90÷265÷460V~ / 127÷340V=	3 phase	2×24V	35W	300V CAT IV	No
PWR 3 A 30W 24V	90÷265÷460V~ / 127÷340V=	3 phase	2×24V	30W	300V CAT IV	Yes



MIO 4410- Intelligent IO module

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Č R

Robust solution for advanced automation in cooperation with measuring instruments and analysers. Features digital inputs for processing of discrete values like door contacts, oil level, fuse signaling or counter of pulse information. Digital outputs allow control of other devices or transmission of signals to other systems. Outputs can also be controlled remotely over RS-485. Input for temperature monitoring using Pt100 is also present.



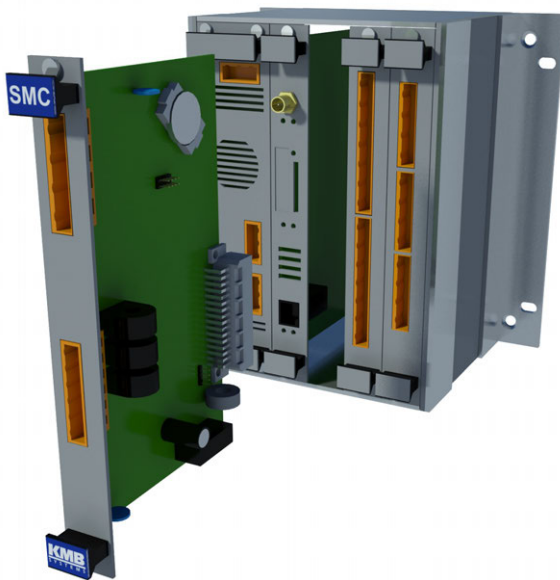
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INPUTS 4xDIGI	OUTPUTS 4xRELAY	INPUTS Pt100	SUPPLY 12V/24V	RS485
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MIO 4000 - IO module with active inputs

Shares similar platform and form factor to MIO 4410 but presents 4 active digital inputs. Huge benefit of this solution is that you don't need any power supply connected between output device and MIO. MIO will provide needed voltage to set logical levels by itself. Reduction in complexity and Cost saving on labor of whole connection is imminent.

SMC 133 card - Analyser, energy meter and datalogger for modular RTU



Based on SMC 133 analyser but modified to needs for RTU7M modular remote terminal unit. Thanks to the high integration of analyser, resulting setup of RTU and analyser is always most compact. Solution is targeted for many different applications which needs combination of automation, control and accurate monitoring of energy, power quality evaluation and fault recording. Compactness and flexibility of this solution allow deployment not only in new projects but is suitable also for retrofit.

RTU7M system usually contains processor module/card and 1 to 15 extending cards. Different kinds of communication cards, such as RS-485, Ethernet, GPRS, LTE and others are available. Cards providing various kind of auxiliary power supplies with or without backup or cards with analog or binary inputs and outputs are also present. Communication between all cards is managed by processor module, which provides all information and values over wide range of communication protocols, such as IEC 61850, IEC 101, IEC 104 or Modbus. For measuring of multiple feeders it's possible to use more SMC-RTU7M cards in one RTU7M unit.

Standard

INPUTS 3U, 3I	MEASUREMENT U,I,P,Q	PF,cos,THD	+/- Wh,varh	SAMPLING 25,6kHz	HARMONICS 50	STANDARDS class 0.5S IEC 62053-22	FLASH 512MB
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Optional

STANDARDS class S IEC 61000-4-30	STANDARDS EN 50160
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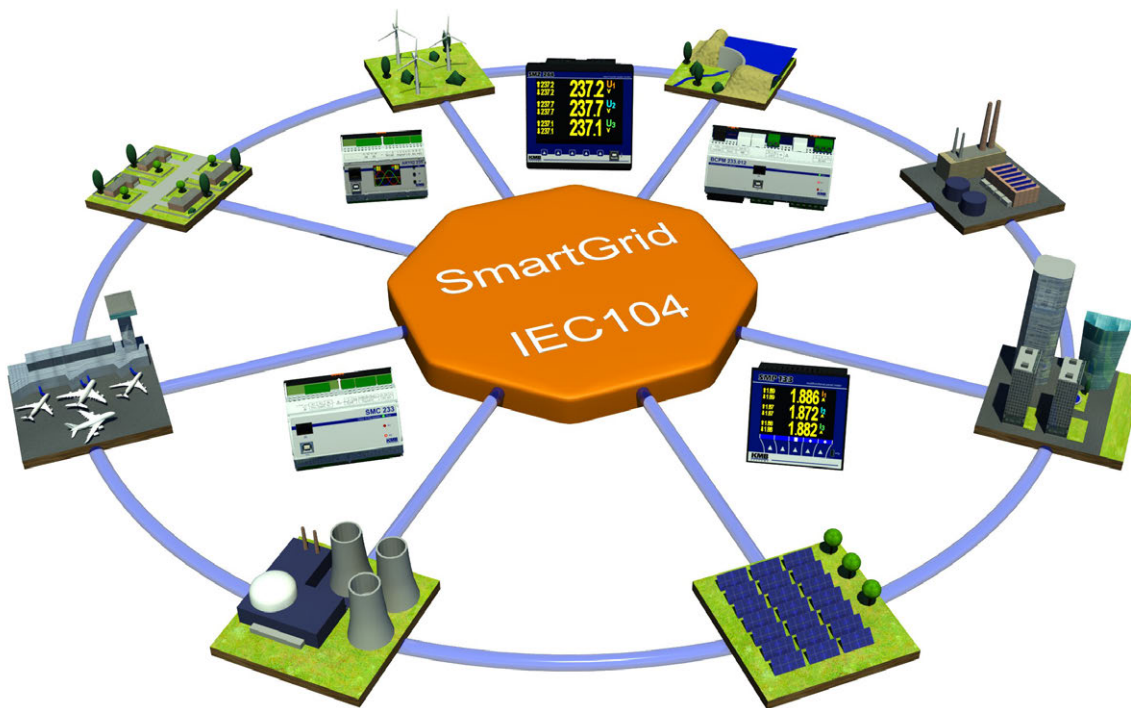
IEC 60870 - 5 - 104





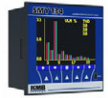

Smart-grid ready line of analysers optionally supports an IEC 60870-5-104 telecontrol protocol. The so called IEC-104 is one of the most common vendor independent communication protocol used to deliver periodic data as well as events to the supervising SCADA system in modern utility and industrial applications.

This protocol uses Ethernet and TCP/IP for communication and requires just a simple configuration of trigger criterias for the basic quantities to be served through it. Each quantity can be independently configured to be sent periodically, with a delta criterium or as a result of an event. For a more complex functionality our flexible IO configuration subsystem can be also used or even extended to implement even more challenging requirements. Standard data types and options are supported.



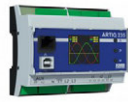


Each instrument also can cooperate with an RTU unit to implement another popular smart grid and smart metering communication protocols such the DLMS and the 61850.

For the IT infrastructure management and specifically for the IoT and building or datacenter energy monitoring the SNMP and MQTT protocols are being actively developed and will be introduced as part of the firmware update during 2019.



							
	SML 133	PA 144	SMC 144	SMY 133	SMY 134	SMZ 133	
Nominal Measuring Range	230: 312 ÷ 433V _{LL} 180 ÷ 250V _{LN}	312 ÷ 433V _{LL} 180 ÷ 250V _{LN}	312 ÷ 433V _{LL} 180 ÷ 250V _{LN}	230: 312 ÷ 433V _{LL} 180 ÷ 250V _{LN}	230: 312 ÷ 433V _{LL} 180 ÷ 250V _{LN}	230: 312 ÷ 433V _{LL} 180 ÷ 250V _{LN}	
	100: 100 ÷ 216V _{LL} 57,7 ÷ 125V _{LN}			100: 100 ÷ 216V _{LL} 57,7 ÷ 125V _{LN}	100: 100 ÷ 216V _{LL} 57,7 ÷ 125V _{LN}	100: 100 ÷ 216V _{LL} 57,7 ÷ 125V _{LN}	100: 100 ÷ 216V _{LL} 57,7 ÷ 125V _{LN}
	400: 500 ÷ 718V _{LL} 300 ÷ 415V _{LN}			400: 500 ÷ 718V _{LL} 300 ÷ 415V _{LN}	400: 500 ÷ 718V _{LL} 300 ÷ 415V _{LN}	400: 500 ÷ 718V _{LL} 300 ÷ 415V _{LN}	400: 500 ÷ 718V _{LL} 300 ÷ 415V _{LN}
Rated Auxiliary Voltage	U: 110 ÷ 250V _{AC}	U: 85 ÷ 460V _{AC} 90 ÷ 315V _{DC}	U: 85 ÷ 460V _{AC} 90 ÷ 315V _{DC}	U: 110 ÷ 250V _{AC}	U: 110 ÷ 250V _{AC}	H: 100 ÷ 415V _{AC}	
	S: 12 ÷ 24V _{DC}	S: 12 ÷ 23V _{AC} 12 ÷ 32V _{DC}	S: 12 ÷ 23V _{AC} 12 ÷ 32V _{DC}	S: 12 ÷ 24V _{DC}	S: 12 ÷ 24V _{DC}		
	L: 24 ÷ 48V _{DC}	L: 23 ÷ 45V _{AC} 23 ÷ 68V _{DC}	L: 23 ÷ 45V _{AC} 23 ÷ 68V _{DC}	L: 24 ÷ 48V _{DC}	L: 24 ÷ 48V _{DC}		
Measurement cat.	CAT III/ 300V	CAT III/ 300V	CAT III/ 300V	CAT III/ 300V	CAT III/ 300V	CAT III/ 300V	
Measurement	3U, 3I	4U, 4I	4U, 4I	3U, 3I	3U, 4I, 2×RCM	3U, 3I	
Current Inputs	X/5A, X/100mA, 333mV	X/100mA, Sxxx, Pxxx	X/100mA, Sxxx, Pxxx	X/5A, X/100mA, 333mV	X/5A + 2×RCM	X/5A, X/1A, X/100mA	
Quadrants	4A, 4R	4A, 4R	4A, 4R	4A, 4R	4A, 4R	4A, 4R	
Sampling rate	25,6kHz	25,6kHz	25,6kHz	6,4kHz	25,6kHz	25,6kHz	
Aggregation	200ms	200ms	200ms	200ms	200ms	200ms	
Continuous meas.	●	●	●	●	●	●	
Harmonics V/A	1 - 50	1 - 50	1 - 50	1 - 50	1 - 50	1 - 50	
Interharmonics	-	-	○ PQ S	○ PQ S	○ PQ S	○ PQ S	
THD-U [%]	●	●	●	●	●	●	
THD-I [%]	●	●	●	●	●	●	
Unbalance	●	●	●	●	●	●	
Flicker (Pst, Plt)	-	-	○ PQ S	○ PQ S	○ PQ S	○ PQ S	
Voltage Events	-	-	○ PQ S	○ PQ S	○ PQ S	○ PQ S	
Waveforms	-	-	○ GO	○ GO	○ GO	○ GO	
Accuracy V/A	0.5	0.1/0.2	0.1/0.2	0.5	0.2	0.5	
Active energy	0.5	1	1	0.5	0.5	0.5	
Reactive energy	1	2	2	1	1	1	
Digital I/O	1/2	2/1	2/1	2/2	4	5/4	
Relay outputs	2	1	1	2	-	4	
Analogue I/O	-/-	-/-	-/-	-/-	2/-	2/2	
Temp. input	-	-	-	-	1	1	
Internal temp.	●	●	●	●	●	●	
Min/max memory	●	●	●	●	●	●	
Memory size	-	-	512 MB	512 MB	512 MB	512 MB	
Clock	-	-	●	●	●	●	
Software	ENVIS	ENVIS	ENVIS	ENVIS	ENVIS	ENVIS	
EN 50160	-	-	○ PQ S	○ PQ S	○ PQ S	○ PQ S	
IEC 61000-4-30	-	-	class S	class S	class S	class S	
Interfaces							
RS 485	○	●	●	○	●	○	
Ethernet	○	○	○	○	●	○	
USB	-	○	○	●	●	●	
Web server	○	○	○	○	●	○	
Gateway	-	-	○ ES	○ ES	○ ES	○ ES	
Protocols							
Modbus RTU	○	●	●	○	●	○	
KMB	○	●	●	●	●	●	
ModBus TCP	○	○	○	○	●	○	
Construction							
Display	segment. LCD	color LCD	color LCD	color LCD	color LCD	mono. LCD	
Dimension	96×96×59	106×90×58	106×90×58	96×96×59	96×96×59	144×144×59	
Mounting	panel	DIN35	DIN35	panel	panel	panel	

●, 2 - Standard
○, 2 - Optional

					
SMC 133	SMC 235	ARTIQ 235	BC 235	SMZ 244	
230: 312 ÷ 485V _{LL} 180 ÷ 280V _{LN}	87 ÷ 762V _{LL} 50 ÷ 440V _{LN}	87 ÷ 762V _{LL} 50 ÷ 440V _{LN}	87 ÷ 762V _{LL} 50 ÷ 440V _{LN} 12÷750V _{DC}	87 ÷ 762V _{LL} 50 ÷ 440V _{LN}	Nominal Measuring Range
U: 100 ÷ 420V _{AC} 80 ÷ 350V _{DC}	U: 85 ÷ 275V _{AC} 85 ÷ 300V _{DC}	U: 85 ÷ 275V _{AC} 85 ÷ 270V _{DC}	U: 85 ÷ 250V _{AC} 85 ÷ 270V _{DC}	U: 100 ÷ 415V _{AC} 100 ÷ 500V _{DC}	Rated Auxiliary voltage
S: 12 ÷ 24V _{DC}					
L: 24 ÷ 48V _{DC}					
CAT III/ 300V	CAT III/ 300V	CAT III/ 300V	CAT III/ 300V	CAT IV/300V	Measurement cat.
3U, 3I	3U, 4I, RCM	3U, 4I, RCM	3U, 5I	4U, 4I, 2RCM	Measurement
X/5A, X/100mA	X/5A, RCM	X/5A, RCM	X/4V	X/5A, 2×RCM	Current Inputs
4A, 4R	4A, 4R	4A, 4R	4A, 4R	4A, 4R	Quadrants
25,6kHz	28,8kHz	28,8kHz	28,8kHz	28,8kHz	Sampling rate
200ms	200ms	200ms	200ms	200ms	Aggregation
•	•	•	•	•	Continuous meas.
1 - 50	1 - 128	1 - 128	1 - 128	1 - 128	Harmonics V/A
○ PQ S	○ PQ S	○ PQ A	○ PQ S	○ PQ A	Interharmonics
•	•	•	•	•	THD-U [%]
•	•	•	•	•	THD-I [%]
•	•	•	•	•	Unbalance
○ PQ S	○ PQ S	○ PQ A	○ PQ S	○ PQ A	Flicker (Pst, Plt)
○ PQ S	○ PQ S	○ PQ A	○ PQ S	○ PQ A	Voltage Events
○ GO	○ GO	○ GO	○ GO	○ GO	Waveforms
0.1 / 0.2	0.1	0.1	0.1	0.1	Accuracy V/A
1	0.5S	0.2S	0.5S	0.2S	Active energy
2	0.5S	0.2S	0.5S	0.5S	Reactive energy
-/-	4	4	4	4/4	Digital I/O
-	-	-	-	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 A	○ PQ S	○ PQ A	EN 50160
class S	class S	class A	class S	class A	IEC 61000-4A-30
					Interfaces
•	•	•	•	•	RS 485
○	•	•	•	•	Ethernet
○	•	•	•	•	USB
○	•	•	•	•	Web server
○ ES	○ ES	○ ES	○ ES	○ ES	Gateway
					Protocols
•	•	•	•	•	Modbus RTU
•	•	•	•	•	KMB
○	•	•	•	•	ModBus TCP
					Construction
-	color LCD	color LCD	color LCD	color LCD	Display
106×99×58	108×98×62	108×98×62	108×98×62	144×144×52	Dimension
DIN35	DIN35	DIN35	DIN35	panel	Mounting

•, 2 - Standard
○, 2 - Optional

ARTIQ 235

Class A Power Quality Analyser, 0.2S energy meter

ARTIQ 235 is an advanced compact power quality monitor for 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. Display-less version is available for tough and demanding environments.

ARTIQ is equipped with Ethernet communication interface, USB and RS 485 serial line. Configuration and data management are 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:

- three independent voltage and four current inputs continuously sampled at 28 kHz/ch.
- precise active and reactive energy, 3 TOU tariffs, three- and single-phase meter readings
- embedded RS-485, Ethernet and USB interface
- IEC 61557-12: voltage and current in class 0.1, active power class 0.2, reactive class 2
- low consumption and heat dissipation, wide range operating temperature
- LCD display as option
- input for Pt100 temperature sensor

Standard

INPUTS 3U, 4I	MEASUREMENT U,I,P,Q	PF,cos,THD	+/- Wh,varh	HARMONICS 128	SAMPLING 28kHz	CURRENT INPUT X/5A
INPUTS OUTPUTS 4xDIGI	INPUTS Pt100	STANDARDS class 0.2S IEC 62053-22	STANDARDS IEC 61557-12	STANDARDS EN 50160	FLASH 512MB	MEASUREMENT RCM
RS485	MODBUS	ETH	WEBSERVER	NTP	USB	SUPPLY 230V

Optional

STANDARDS
class A
IEC 61000-4-30

Technical specifications

METERING	Voltage (ULN, ULL)	U1, U2, U3, U12, U23, U31 [act, avg, avg _{max} , avg _{min}]
	Current (I)	IL1, IL2, IL3, ILN, Ircm [act, avg, avg _{max} , avg _{min}]
	Power (P)	P1, P2, P3, 3P (import, export, total, 1 st harmonic) [act, avg, avg _{max} , avg _{min}]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1 st 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	unbl, unbU, φnsl
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3, THDIN
	Individual Harmonics	Harmonics 1 st to 127 th of Voltage and Current and their angles
	Fundament. Harmonic (U _{fh} , I _{fh})	U1fh, U2fh, U3fh, I1fh, I2fh, I3fh, INfh
	Frequency (f)	f
	Active Energy	class 0.2S (62053-22), import/export, per phase, per tariff, total
Reactive Energy	class 0.5S (62053-24), 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, U _{fh} , I _{fh} , 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	4 universal DIO, input for Pt100
	Memory Size	512MB
	RTC	seconds, minutes, hours, days, months, years
	Communication	RS485, Ethernet, USB

WEPO R	aux. voltage	U: 75 ÷ 275 V _{AC} / 75 ÷ 300 V _{DC}	I/O	voltage levels	U _L < 3 V, U _H > 7 V, U _{MAX} = 30 V	
	power	10 VA / 5 W		input current	5 mA @ 12V / 13 mA @ 24V	
	meas. cat.	CAT III / 300 V		SSR ratings	30 V _{DC} , 40 mA _{DC}	
UTINP	AGEVOLT	meas. range	3 ÷ 1470 V _{AC} / 3 ÷ 850 V _{AC} (ln/ph)	TEMP	operating	-20 ÷ 60°C, <95% non-condens.
		input impedance	3,9 MΩ (L _i ↔ N)		storage	-30 ÷ 80°C, <95% non-condens.
		connection	wye, delta, aron	EMC	emission	EN 61000 – 4 – 2, 3, 4, 5, 6, 11
	overload	1300 V _{AC} (perm.), 2210 V _{RMS} (1s)	immunity		EN 55011 - class A, EN 55022 - class A	
CURRENT	meas. range	0,0005 ÷ 10 A _{AC}	protect. rating	IP 20, IP40 (front panel)		
	overload	15 A _{AC} (perm.), 70 A _{AC} (1s)	dimensions	108W × 98H × 62D mm / 0,3 kg		

COMMUNICATION	RS-485 galvanically isolated KMBlong, MODBUS RTU protocols 2400 ÷ 921600 baud	ACCURACY (IEC 61557-12)	voltage	0.1
	Ethernet KMBlong, MODBUS TCP protocols		current	0.1
	USB 2.0 KMBlong, MODBUS RTU protocols Connector type Mini-B		active power	0.2
		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 (F3/F1)	

Ordering options

	ARTIQ 235	U	X/5A	E
Instrument model	ARTIQ 235 = Class A instrument series, 3U, 4I, RCM ARTIQ 235D = Class A instrument series, 3U, 4I, RCM, LCD			
Auxiliary power supply	U = 75 V ÷ 275 VAC, 75 V ÷ 350 VDC			
Current inputs	X/5A = input for 5A AC and 1A AC MTP (indirect measurement) + 1xRCM			
Communication interface	E = Ethernet interface, RS485, USB			

Optional firmware modules

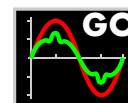
PQ A module

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.



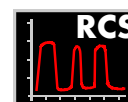
GO module

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.



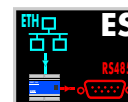
MM Module

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.



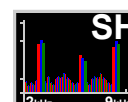
ES Module

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.



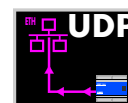
SH Module

The SH module allows instrument to measure harmonics in the range of 2 kHz to 9 kHz. So called Supra Harmonics of voltage and current are measured in accordance to the standard EN 61000-4-7 ed.2.

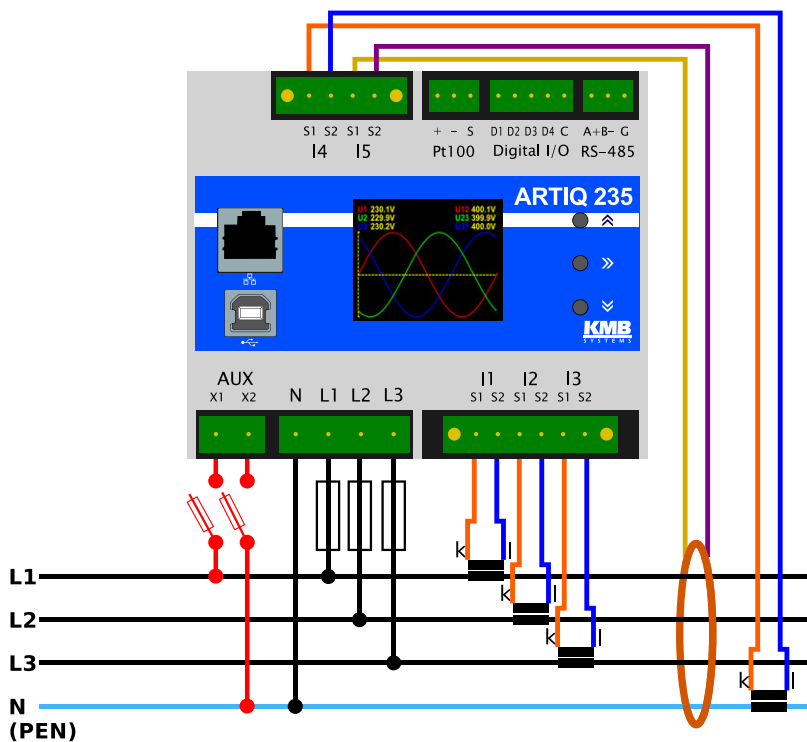


UP Module

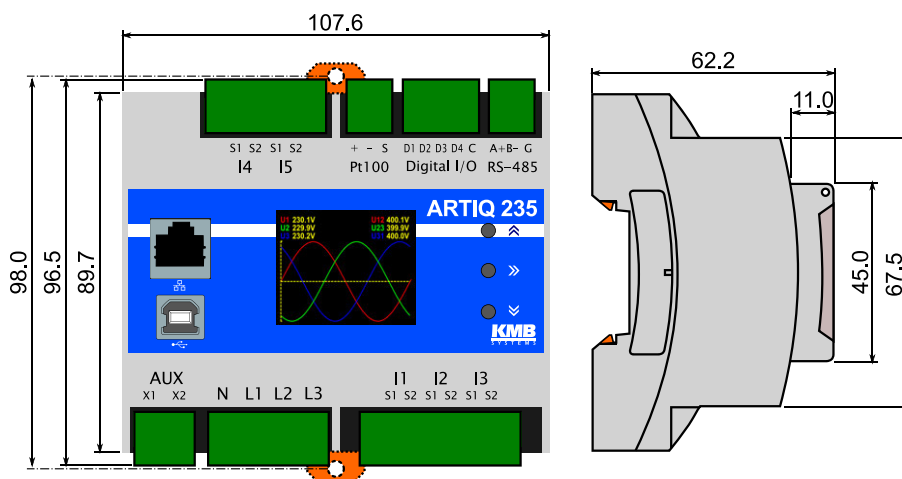
The UP Module allows instrument to send data over Ethernet using UDP protocol to dedicated server. Control of the communication from server side is not necessary. Acquisition of the archived data from instruments memory over Modbus is also possible with this module.



Typical connection schema



Mechanical dimensions



SMC 235

Class S Power Quality Analyser, 0.5S energy meter

SMC 235 is an advanced compact power quality monitor for industrial automation, larger energy management projects and distribution network monitoring. Precise power monitor and energy meter in combination with embedded data logger and event recorder makes it an ideal solution for various projects of energy monitoring and power quality evaluation. Version with and without display is available to cover widest possible spectrum of applications and therefore is suitable for standard and also tough environments.

SMC 235 is equipped with Ethernet communication interface, USB and RS 485 serial line. Configuration and data management are 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 S**, EN 61000-4-7 ed. 2 class I, EN 61000-4-15 ed. 2.0 F3/F1, reports power quality according to EN 50160 ed3, active energy measures in IEC 62053-22 class 0.5S, reactive in IEC 62053-22 class 2, conforms to IEC EN 61557-12.



Key features:

- three independent voltage and four current inputs continuously sampled at 28 kHz/ch.
- precise active and reactive energy, 3 TOU tariffs, three- and single-phase meter readings
- embedded RS-485, Ethernet and USB interface
- IEC 61557-12: voltage and current in class 0.2, active power class 0.5, reactive class 2
- low consumption and heat dissipation, wide range operating temperature
- input for Pt100 temperature sensor

Standard

INPUTS 3U, 4I	MEASUREMENT U, I, P, Q	PF, cos, THD	+/- Wh, varh	HARMONICS 128	SAMPLING 28kHz	CURRENT INPUT X/5A
INPUTS OUTPUTS 4xDIGI	INPUTS Pt100	STANDARDS class 0.5S IEC 62053-22	STANDARDS IEC 61557-12	STANDARDS EN 50160	FLASH (512MB)	MEASUREMENT RCM
RS485	MODBUS	ETH	WEBSERVER	NTP	USB	SUPPLY 230V

Optional

STANDARDS class S IEC 61000-4-30

Technical specifications

METERING	Voltage (ULN, ULL)	U1, U2, U3, U12, U23, U31 [act, avg, avg _{max} , avg _{min}]
	Current (I)	IL1, IL2, IL3, ILN, Ircm [act, avg, avg _{max} , avg _{min}]
	Power (P)	P1, P2, P3, 3P (import, export, total, 1 st harmonic) [act, avg, avg _{max} , avg _{min}]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1 st 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	unbl, unbU, φnsl
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3, THDIN
	Individual Harmonics	Harmonics 1 st to 63 rd of Voltage and Current and their angles
	Fundament. Harmonic (U _{fh} , I _{fh})	U1fh, U2fh, U3fh, I1fh, I2fh, I3fh, INfh
	Frequency (f)	f
	Active Energy	class 0.5S (62053-22), import/export, per phase, per tariff, total
Reactive Energy	class 0.5S (62053-24), 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, U _{fh} , I _{fh} , 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	4 universal DIO, input for Pt100
	Memory Size	512MB
	RTC	seconds, minutes, hours, days, months, years
	Communication	RS485, Ethernet, USB

WEPO R	aux. voltage	U: 75 ÷ 275 V _{AC} / 75 ÷ 300 V _{DC}	I/O	voltage levels	U _L < 3 V, U _H > 7 V, U _{MAX} = 30 V	
	power	10 VA / 5 W		input current	5 mA @ 12V / 13 mA @ 24V	
	meas. cat.	CAT III / 300 V		SSR ratings	30 V _{DC} , 40 mA _{DC}	
UTINP	AGEVOLT	meas. range	3 ÷ 1470 V _{AC} / 3 ÷ 850 V _{AC} (ln/ph)	TEMP	operating	-20 ÷ 60°C, <95% non-condens.
		input impedance	3,9 MΩ (L _i ↔ N)		storage	-30 ÷ 80°C, <95% non-condens.
		connection	wye, delta, aron	EMC	emission	EN 61000 – 4 – 2, 3, 4, 5, 6, 11
	overload	1300 V _{AC} (perm.), 2210 V _{RMS} (1s)	immunity		EN 55011 - class A, EN 55022 - class A	
CURRENT	meas. range	0,0005 ÷ 10 A _{AC}	protect. rating	IP 20, IP40 (front panel)		
	overload	15 A _{AC} (perm.), 70 A _{AC} (1s)	dimensions	108W × 98H × 62D mm / 0,3 kg		

COMMUNICATION	RS-485 galvanically isolated KMBlong, MODBUS RTU protocols 2400 ÷ 921600 baud	ACCURACY (IEC 61557-12)	voltage	0.2
	Ethernet KMBlong, MODBUS TCP protocols		current	0.2
	USB 2.0 KMBlong, MODBUS RTU protocols Connector type Mini-B		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	1	
		unbalance	0.2	
		flicker	2 (F3/F1)	

Ordering options

		SMC 235	U	X/5A	E
Instrument model					
SMC 235	= Class S instrument series, 3U, 4I, RCM				
SMC 235D	= Class S instrument series, 3U, 4I, RCM, LCD				
Auxiliary power supply					
U = 75 V ÷ 275 VAC, 75 V ÷ 350 VDC					
Current inputs					
X/5A = input for 5A AC and 1A AC MTP (indirect measurement) + 1xRCM					
Communication interface					
E = Ethernet interface, RS485, USB					

Optional firmware modules

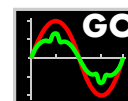
PQ S module

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.



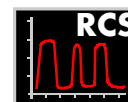
GO module

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.



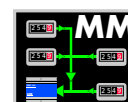
RCS module

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.



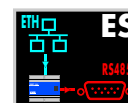
MM Module

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.



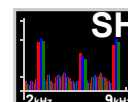
ES Module

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.



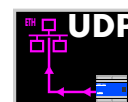
SH Module

The SH module allows instrument to measure harmonics in the range of 2 kHz to 9 kHz. So called Supra Harmonics of voltage and current are measured in accordance to the standard EN 61000-4-7 ed.2.

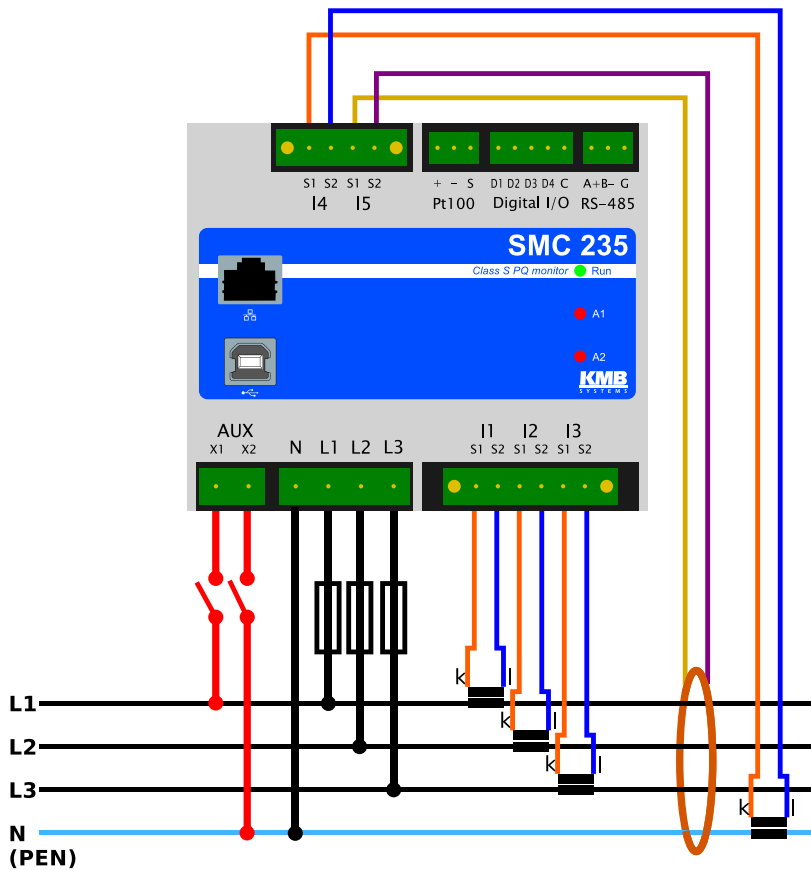


UP Module

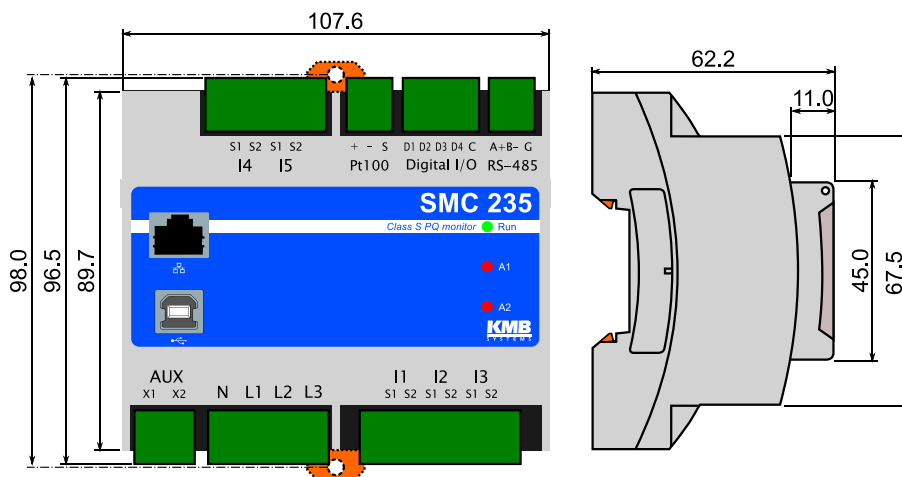
The UP Module allows instrument to send data over Ethernet using UDP protocol to dedicated server. Control of the communication from server side is not necessary. Acquisition of the archived data from instruments memory over Modbus is also possible with this module.



Typical connection schema



Mechanical dimensions



SMZ 244

Hi-End power quality analyser

SMZ 244 is most advanced 3-phase power quality analyser, energy meter and data logger with large color LCD display. Instrument is designed for most demanding energy monitoring applications of three-phase LV, MV and HV distribution networks.

It measures four voltages and four currents which includes also monitoring of neutral wire. Two inputs for residual current monitoring are present to detect any kind of leakage through PE or ground. 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, hospitals, data-centers, hi-tech industrial and commercial automation, high accuracy energy monitoring



Key features:

- energy: active 0.2S acc. IEC 62053-22, reactive class 0.5S acc. IEC 62053-23
- measuring according to class A, IEC 61000-4-30
- three-phase active and reactive energy meter (kWh, kvarh, L, C, +, -) measures in 4 quadrants
- voltage and current: class 0.1, active power 0.2 according to IEC 61557-12
- 512 MB of internal memory for data logging and energy recording
- continuous sampling 256 s./period, 28.8 kHz, direct & indirect measurement (with VT and CT)
- local USB, remote RS 485 and Ethernet communication

Standard

INPUTS 4U, 4I	MEASUREMENT U, I, P, Q	PF, cos, THD	+/- Wh, varh	HARMONICS 128	SAMPLING 28kHz
FLASH 512MB	USB	STANDARDS IEC 61557-12	STANDARDS class 0.2S IEC 62053-22	CURRENT INPUT X/5A	MEASUREMENT RCM
ETH	WEBSERVER	NTP	RS485	MODBUS Modbus	INPUTS-OUTPUTS 4xDIGI

Optional

STANDARDS EN 50160	STANDARDS class A IEC 61000-4-30
OUTPUTS 4xRELAY	INPUTS Pt100
INPUTS 2x4÷20mA	OUTPUTS 2x4÷20mA

Technical specification

METERING	Voltage (ULN, ULL)	U1, U2, U3, U4, U12, U23, U31 [act, avg, avg _{max} , avg _{min}]
	Current (I)	IL1, IL2, IL3, IL4, Ircm1, Ircm2 [act, avg, avg _{max} , avg _{min}]
	Power (P)	P1, P2, P3, P4, 3P (import, export, total, 1 st harmonic) [act, avg, avg _{max} , avg _{min}]
	Reactive Power (Q)	Q1, Q2, Q3, Q4, 3Q (import, export, total, 1 st harmonic) [act, avg, avg _{max} , avg _{min}]
	Apparent Power (S)	S1, S2, S3, S4, 3S [act, avg, avg _{max} , avg _{min}]
	Harm. Distortion Power (D)	D1, D2, D3, D4 [act, avg, avg _{max} , avg _{min}]
	Power Factor (PF), cosφ	PF1, PF2, PF3, PF4, 3PF, cosφ1, cosφ2, cosφ3, cosφ4, 3cosφ [act, avg, avg _{max} , avg _{min}]
	Symmetrical Components	zero, negative and positive sequence components of voltage and current
	Unbalance Factor	unbl, unbU, φnsl
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU4, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3, THDI4
	Individual Harmonics	Harmonics 1 st to 128 th of Voltage and Current and their angles
	Fundament. Harmonic (Ufh, Ifh)	U1fh, U2fh, U3fh, U4fh, I1fh, I2fh, I3fh, I4fh
	Frequency (f)	f
Active Energy	import/export, per phase, per tariff, total	
Reactive Energy	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	5DI, 4DO, 4RO, 2AO, 2AI, input for Pt100
	Memory Size	512MB
	RTC	seconds, minutes, hours, days, months, years
	Communication	RS485, Ethernet, USB

POWER	aux. voltage	U: 100 ÷ 415 V _{AC} / 100 ÷ 500 V _{DC}	I/O	24V input	U _L < 3 V, U _H > 10V, 35V _{DC}
	power	30 VA / 12 W		230V input	U _L < 30 V, U _H > 90V, 265V _{AC}
	meas. cat.	CAT III / 300 V		ssr. ratings	35V _{DC} , 100 mA
INPUT	VOLTAGE	meas. range	5 ÷ 1530 V _{AC} / 3 ÷ 880 V _{AC} (ln/ph)	relay ratings	250V _{AC} / 30V _{DC} , 4A
		input impedance	2,7 MΩ (L _i ↔ N)	Analog input	0 ÷ 24 mA, impedance 120 Ω
		connection	wye, delta, aron	Analog output	0 ÷ 20 mA, max. 500 Ω
		overload	1300 V _{AC} (perm.), 2210 V _{RMS} (1s)	Pt100 input	range -50 ÷ 150 °C
	CURRENT	meas. range	0,0025 ÷ 10 A _{AC}	OTHER	operating
overload	7.5 A _{AC} (perm.), 70 A _{AC} (1s)	storage	-30 ÷ 80°C, <95% non-condens.		
		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	144W × 144H × 70D mm / 0,9 kg	

COMMUNICATION	RS-485 galvanically isolated KMBlong, MODBUS RTU protocols 2400 ÷ 921600 baud	ACCURACY (IEC 61557-12)	voltage	0.1
	Ethernet KMBlong, MODBUS TCP protocols		current	0.1
	USB 2.0 KMBlong, MODBUS RTU protocols Connector type Mini-B		active power	0.2
			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 (F3/F1)

Ordering options

SMZ 244 H 400 X/5A N E4

Instrument Model

SMZ 244 = Power analyser and datalogger, 4U, 4I, 2×RCM, 4DIO

Auxiliary Power Supply

H = 100 V ÷ 415 VAC, 90 V ÷ 600 VDC

Nominal Measuring Voltage

400 = 50V/86,5V ÷ 400V/690V

Current Inputs

X/5A = 1A - 5A AC (standard indirect measurement) + 2×RCM input

Optional Peripherals

N = no optional peripherals

F = 4×R0, 1×DI(230V), 2×A0, 2×AI, 1×Pt100

Communication Interface

E4 = Ethernet, RS-485, USB

Optional firmware modules

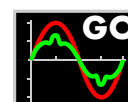
PQ A module

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.



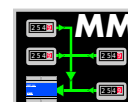
GO module

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.



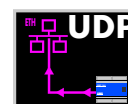
MM Module

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.



UP Module

The UP Module allows instrument to send data over Ethernet using UDP protocol to dedicated server. Control of the communication from server side is not necessary. Acquisition of the archived data from instruments memory over Modbus is also possible with this module.



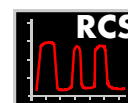
ES Module

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.

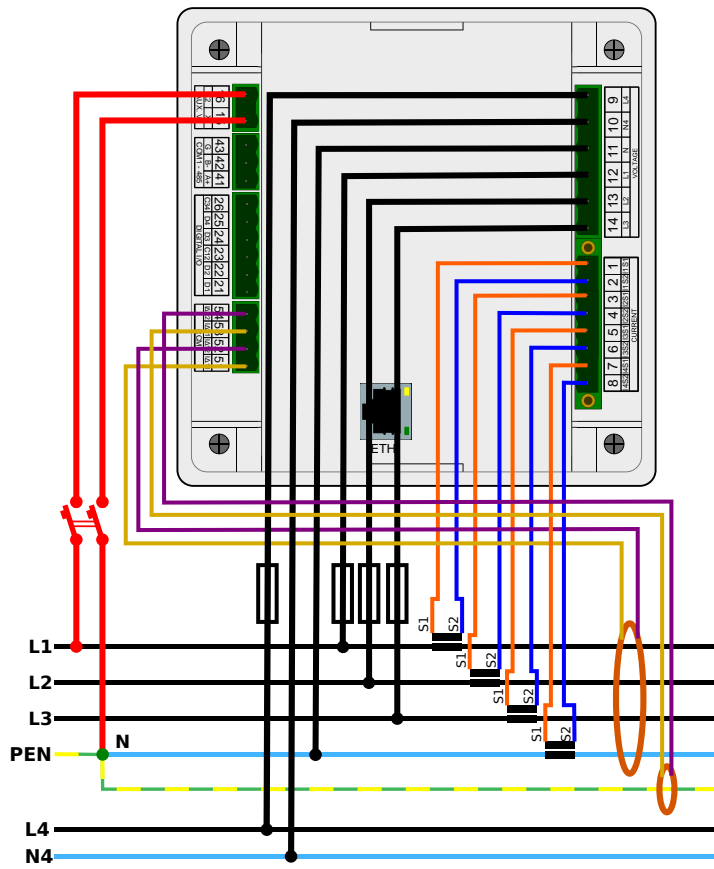


RCS module

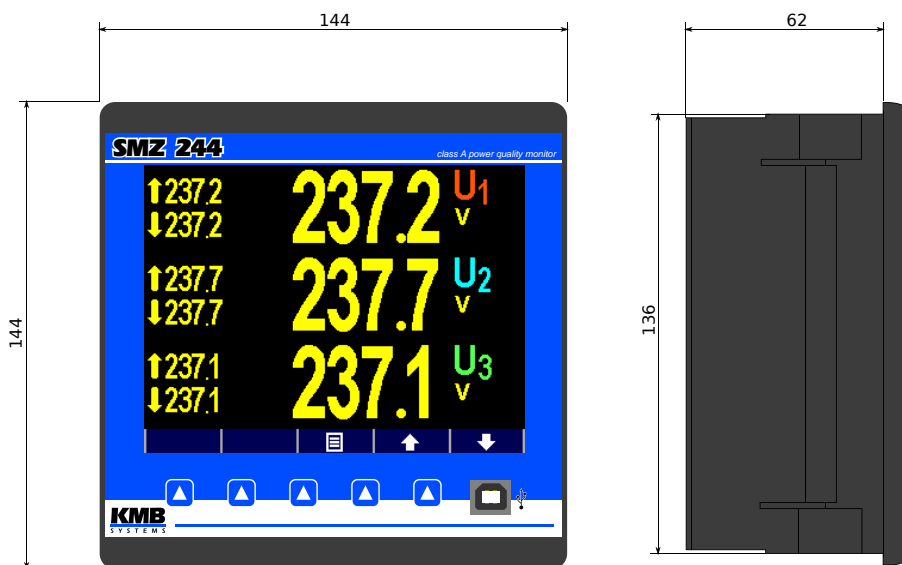
The RCS module (ripple control signal or mains voltage) activates an ability to detect, evaluate, decode and store RCS messages transmitted over the distribution network. It precisely measures voltage on the selected frequency and stores the extracted information.



Typical connection schema



Mechanical dimensions



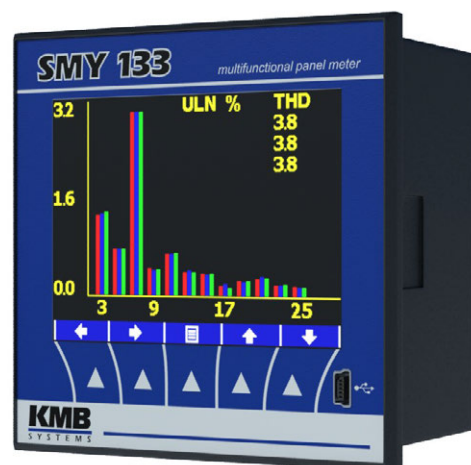
SMY 133

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 3U, 3I	MEASUREMENT U, I, P, Q	PF, cos, THD	+/- Wh, varh	HARMONICS 50
SAMPLING 6,4kHz	FLASH 512MB	USB	STANDARDS IEC 61557-12	STANDARDS class 0.5S IEC 62053-22

Optional

CURRENT INPUT X/5A	CURRENT INPUT X/100mA	CURRENT INPUT 333mV	ETH	WEBSERVER	NTP
RS485	MODBUS	SUPPLY 12V/24V/230V	STANDARDS EN 50160	STANDARDS class S IEC 61000-4-30	
OUTPUTS 2×RELAY	OUTPUTS 2×PULSE	INPUTS 1×DIGI			

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, 1 st harmonic) [act, avg, avg _{max} , avg _{min}]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1 st 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	unbl, unbU, φnsl
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3
	Individual Harmonics	Harmonics 1 st to 50 th of U and I, their angles and interharm subgroups (PQ S)
	Fundament. Harmonic (U _{fh} , I _{fh})	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 1S (62053-24), 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, U _{fh} , I _{fh} , 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}
	I	input current	1 mA @ 10V / 5 mA @ 24V 10 mA @ 48V
	R	ssr. ratings	60 V _{AC} / 100 V _{DC} , 100 mA
OTHER	TEMP	operating	-25 ÷ 60°C, <95% non-condens.
	TEMP	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	0.5
	current	0.5
	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	

Ordering options

SMY 133 U 230 X/5A RI E

Instrument Model

SMY 133 = Power analyser, datalogger, 3U, 3I

Auxiliary Power Supply

U = 110 - 250 V_{AC/DC}

S = 12 - 24V_{AC/DC}

L = 24 - 48V_{AC/DC}

Nominal Measuring Voltage

230 = 180 - 250V_{AC} (L-N) / 312 - 433V_{AC} (L-L)

100 = 57,7 - 125V_{AC} (L-N) / 100 - 216V_{AC} (L-L)

400 = 300 - 415V_{AC} (L-N) / 520 - 718V_{AC} (L-L)

Current Inputs

X/5A = 1 - 5A_{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× digital input 24V

RI = 1× relay output + 1× digital output + 1× digital input 24V

II = 2× digital output + 1× digital input 24V

V = 4× digital input/output (only with option E4)

Communication Interface

N = USB, no remote comm. link

4 = USB, RS-485

E = USB, Ethernet

E4 = USB, Ethernet, RS-485 (only with option V, 4×IN/OUT)

Optional firmware modules

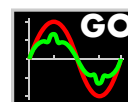
PQ S module

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.



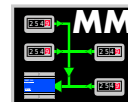
GO module

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.



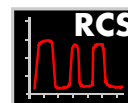
ES Module

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.



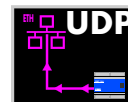
RCS module

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.

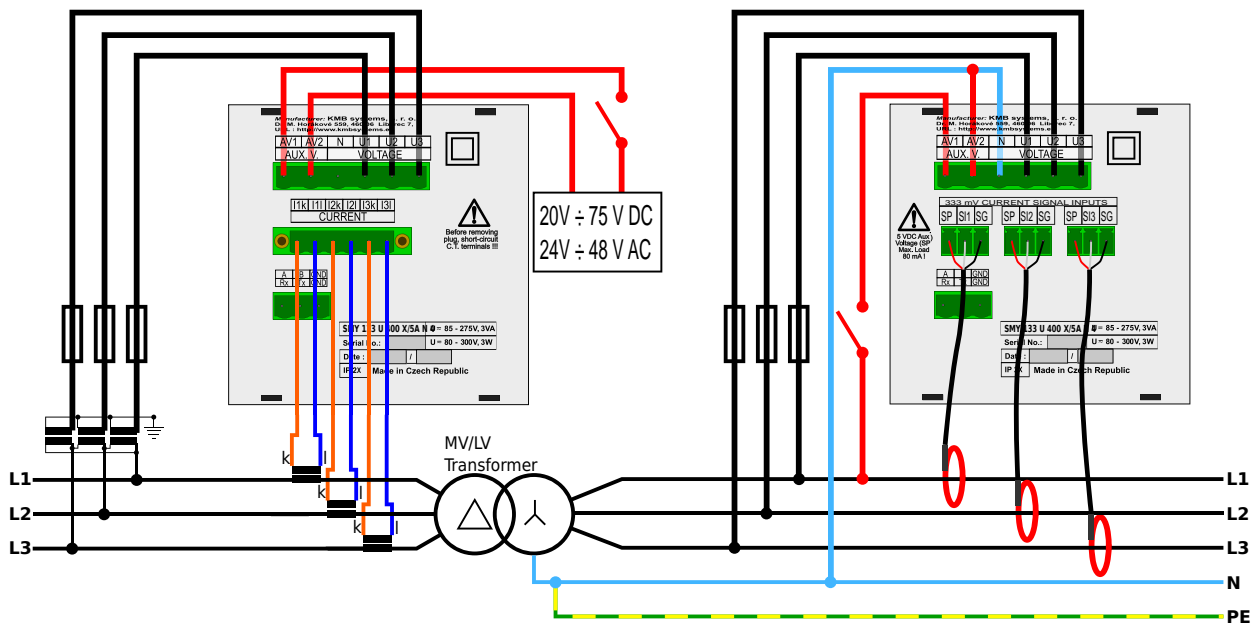


UP Module

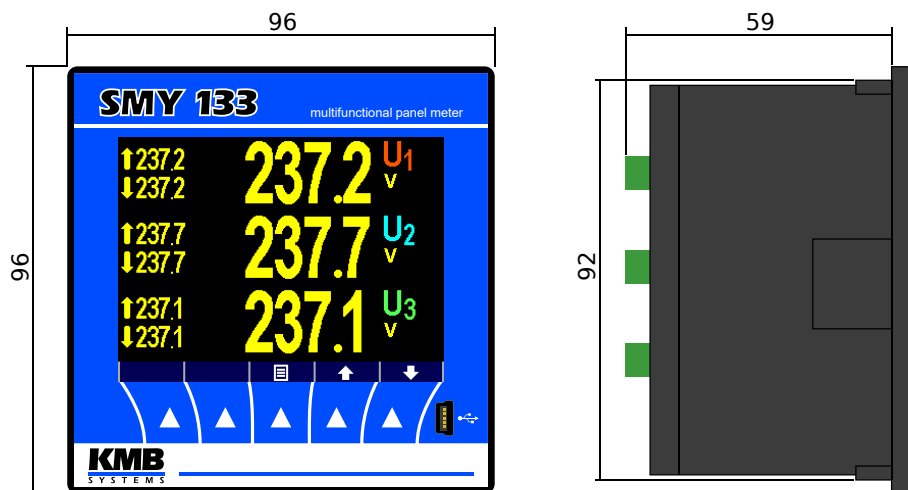
The UP Module allows instrument to send data over Ethernet using UDP protocol to dedicated server. Control of the communication from server side is not necessary. Acquisition of the archived data from instruments memory over Modbus is also possible with this module.



Typical connection schema



Mechanical dimensions



SMY 134

Robust Power Monitor and Data Logger with RCM

SMY 134 is an advanced 3-phase multimeter and data logger with ability of residual current monitoring. Instrument measures current in neutral wire with option to trigger alarm when overloaded. Additional monitoring of two separate residual currents to detect any kind of leakage. 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: data centers, large scale commercial buildings, hospitals, hi-tech industry, power quality monitoring



Key features:

- residual currents monitoring
- three-phase active and reactive energy meter (kWh, kvarh, L, C, +, -) measures in 4 quadrants
- energy: active 0.5S acc. IEC 62053-22, reactive clas 1S acc. IEC 62053-23
- voltage and current: class 0.2, active power 0.2 according to IEC 61557-12
- programmable pulse outputs, digital inputs, optional Pt100
- 512 MB of internal memory for data logging and energy recording
- continuous sampling 128 s./period, 25,6 kHz , direct & indirect measurement (with VT and CT)
- local USB, and remote RS 485 and Ethernet communication

Standard

INPUTS 3U, 4I	MEASUREMENT U, I, P, Q	PF, cos, THD	+/- Wh, varh	HARMONICS 50	MEASUREMENT RCM
SAMPLING 25,6kHz	FLASH 512MB	USB	STANDARDS IEC 61557-12	STANDARDS class 0.5S IEC 62053-22	INPUTS/OUTPUTS 1xUNI
CURRENT INPUT X/5A	ETH	WEBSERVER	NTP	RS485	MODBUS

Optional

INPUTS Pt100	STANDARDS EN 50160	STANDARDS class S IEC 61000-4-30
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Technical specification

METERING	Voltage (ULN, ULL)	U1, U2, U3, U12, U23, U31 [act, avg, avg _{max} , avg _{min}]
	Current (I)	IL1, IL2, IL3, ILN, Ircm1, Ircm2 [act, avg, avg _{max} , avg _{min}]
	Power (P)	P1, P2, P3, 3P (import, export, total, 1 st harmonic) [act, avg, avg _{max} , avg _{min}]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1 st 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	unbl, unbU, φnsI
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3, THDIN
	Individual Harmonics	Harmonics 1 st to 50 th of U and I, their angles and interharm subgroups (PQ S)
	Fundament. Harmonic (U _{fh} , I _{fh})	U1fh, U2fh, U3fh, I1fh, I2fh, I3fh, INfh
	Frequency (f)	f
	Active Energy	class 0.5S (62053-22), import/export, per phase, per tariff, total
Reactive Energy	class 1S (62053-24), 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, U _{fh} , I _{fh} , 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	1 universal DIO, optional input for Pt100
	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}	I/O	voltage levels	U _L < 3 V, U _H > 10 V, U _{MAX} = 35 V _{DC}	
	power	8 VA / 4 W		input current	3 mA @ 10V / 13 mA @ 24V 20 mA @ 35V	
	overvoltage cat.	CAT III / 300 V		ssr. ratings	35 V _{DC} , 100 mA	
INPUT	VOLTAGE	measuring range		230 : 8÷660 V _{LL} / 6÷375 V _{LN} (1.2kV/1s)	TEMP	operating
		measurement category	230 : CAT III / 300V	storage		-40 ÷ 80°C, <95% non-condens.
	CURRENT	measuring range	X/5A : 5 mA ÷ 7 A (70A/1s)	EMC	emission	EN 61000 – 4 – 2, 4, 5, 6, 11
OTHER	TEMP	Temperature	Pt100, -40 ÷ 80°C		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	ACCURACY (IEC 61557-12)	voltage	0.2
	RS-485 galvanically isolated KMBlong, MODBUS RTU protocols 2400 ÷ 460000 baud		current	0.2
	Ethernet KMBlong, MODBUS TCP protocols 100 Mbit/s		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

Ordering options

	SMY 134	U	230	X/5A	AA	E4
Instrument Model	SMY 134 = Power analyser, datalogger, 3U, 4I					
Auxiliary Power Supply	U = 110 - 250V _{AC/DC}					
Nominal Measuring Voltage	230 = 180 - 250V _{AC} (L-N) / 312 - 433V _{AC} (L-L)					
Current Inputs	X/5A = 1 - 5A _{AC} (standard indirect measurement)					
Optional Peripherals	AA = 2× RCM or 2× input 0/4-20mA, 1× universal input/output AT = 1× RCM or 1× input 0/4-20mA, 1× input for Pt100, 1× universal input/output					
Communication Interface	E4 = USB, Ethernet, RS-485					

Optional firmware modules

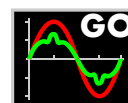
PQ S module

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.



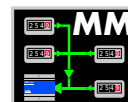
GO module

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.



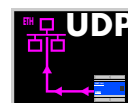
MM Module

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.



UP Module

The UP Module allows instrument to send data over Ethernet using UDP protocol to dedicated server. Control of the communication from server side is not necessary. Acquisition of the archived data from instruments memory over Modbus is also possible with this module.



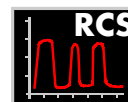
ES Module

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.

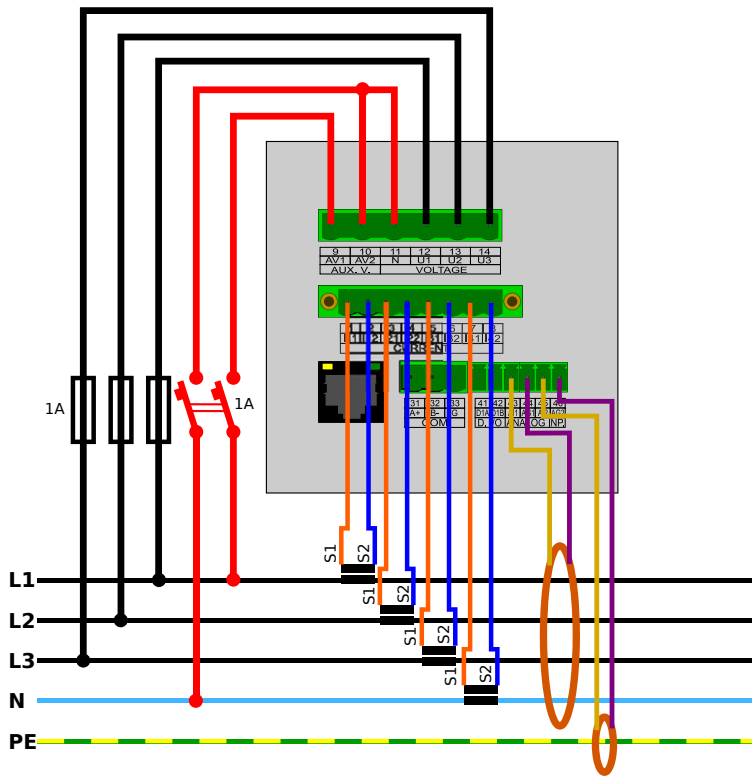


RCS module

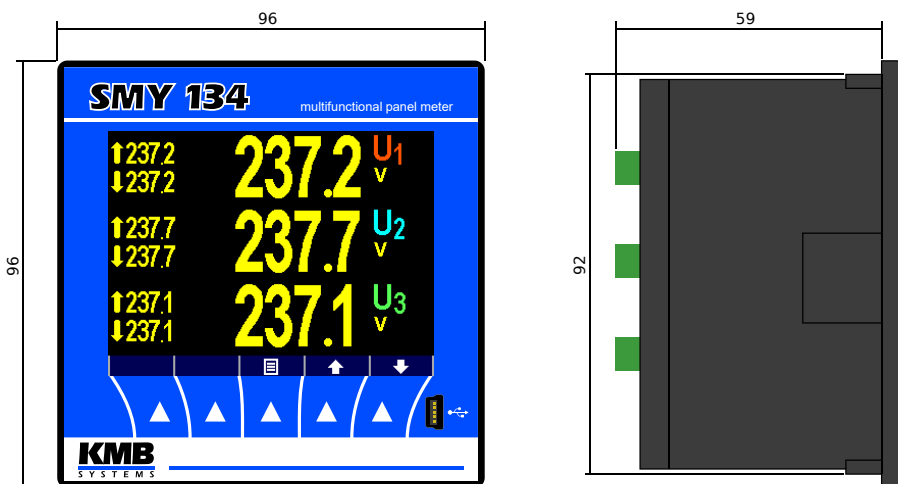
The RCS module (ripple control signal or mains voltage) activates an ability to detect, evaluate, decode and store RCS messages transmitted over the distribution network. It precisely measures voltage on the selected frequency and stores the extracted information.



Typical connection schema



Mechanical dimensions



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, but optionally it can be equipped with color display.

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 (option S and L)
- electricity meter supports 3 tariffs, single- and three-phase measurement in four or six quadrants
- basic measurement interval 10/12 periods, 512 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

INPUTS 3U, 3I	MEASUREMENT U, I, P, Q	PF, cos, THD	+/- Wh, varh
HARMONICS 50	SAMPLING 25,6kHz	FLASH 512MB	STANDARDS class 1 IEC 62053-21
RS485	MODBUS	STANDARDS IEC 61557-12	

Optional

CURRENT INPUT X/100mA	CURRENT INPUT X/5A	DISPLAY	BATTERY
USB	ETH	WEBSERVER	NTP
SUPPLY 12V/24V/230V	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, 1 st harmonic) [act, avg, avg _{max} , avg _{min}]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1 st 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	unbl, unbU, φnsl
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3
	Individual Harmonics	Harmonics 1 st to 50 th of Voltage and Current and their angles
	Fundament. Harmonic (U _{fh} , I _{fh})	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, U _{fh} , I _{fh} , 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	U: 90 ÷ 275 V _{AC} / 85 ÷ 350 V _{DC}
		S: 11 ÷ 36 V _{DC}
		L: 20 ÷ 75 V _{DC}
power	7 VA / 3 W	
overvoltage cat.	CAT III / 300 V	
UTPIN VOLTAGE	measuring range	230: 7÷720 V _{LL} / 4÷420 V _{LN} (2,73kV/1s) 100: 5÷330 V _{LL} / 3÷190 V _{LN} (0,6kV _{LN} /1s)
	meas. cat.	CAT III / 300V
CURRENT	measuring range	X/5A: 12.5 mA ÷ 7.5 A (90A/1s) X/100mA: 0.25 mA ÷ 150 mA (10A/1s)

OTHER	TEMP	Internal battery	up to 1 hour of operation, 1000mAh
		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

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	

Ordering options

	SMC 133	U	230	X/5A	E
Instrument Model	SMC 133 = Power analyser and datalogger, 3U, 3I SMC 133D = Power analyser and datalogger, 3U, 3I, LCD				
Auxiliary Power Supply	U = 90 V ÷ 275 VAC, 85 V ÷ 350 VDC, 2 universal DIO S = 11 V ÷ 36 VDC, internal UPS L = 20 V ÷ 75 VDC, internal UPS				
Nominal Measuring Voltage	230 = 230 V/400 V 100 = 57,7 V/100 V				
Current Inputs	X/5A = 5A AC a 1A AC (standard indirect measurement) X/100mA = 100 mA AC (indirect measurement with 100 mA CT)				
Remote Communication Interface	N = RS-485 E = Ethernet, RS-485				

Optional firmware modules

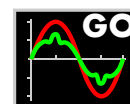
PQ S module

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.



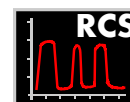
GO module

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.



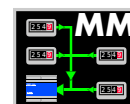
RCS module

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.



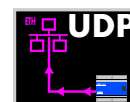
ES Module

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.



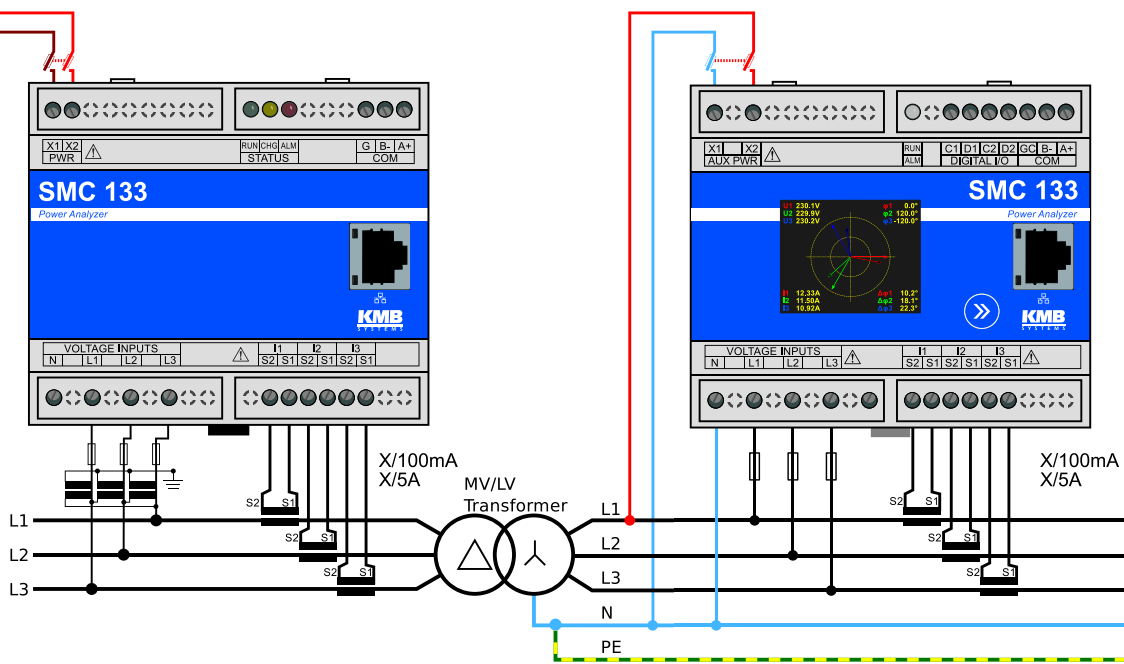
UP Module

The UP Module allows instrument to send data over Ethernet using UDP protocol to dedicated server. Control of the communication from server side is not necessary. Acquisition of the archived data from instruments memory over Modbus is also possible with this module.

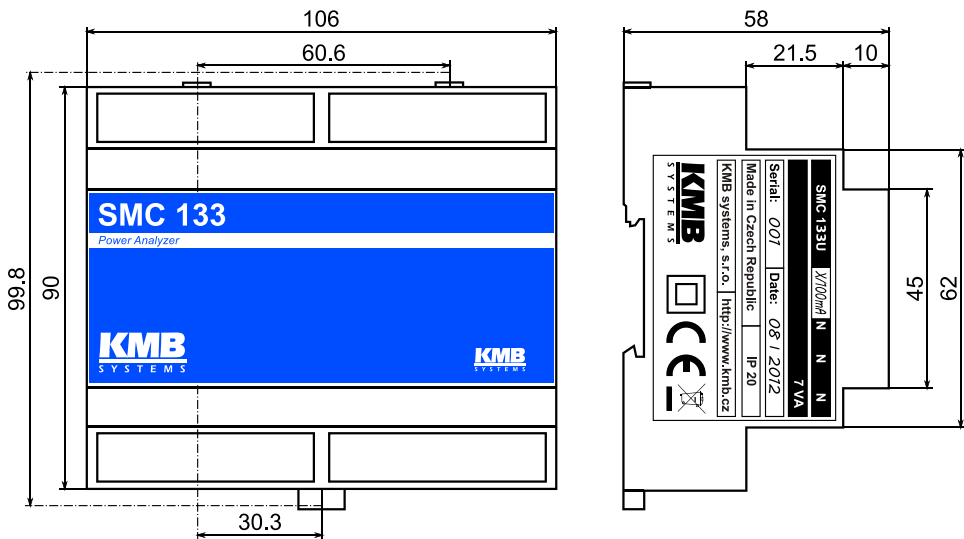


Typical connection schema

S: 10 ÷ 36VDC
L: 20 ÷ 75VDC



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

Optional

CURRENT INPUT X/5A	CURRENT INPUT X/100mA	CURRENT INPUT 333mV	SUPPLY 12V/24V/230V	RS485	MODBUS
M-BUS 	ETH 	WEBSERVER 	OUTPUTS 2xRELAY	OUTPUTS 2xPULSE	INPUTS 1xDIGI

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, 1 st harmonic) [act, avg, avg _{max} , avg _{min}]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1 st 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	unbl, unbU, φnsl
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3
	Individual Harmonics	Harmonics 1 st to 50 th of Voltage and Current and their angles
	Fundament. Harmonic (U _{fh} , I _{fh})	U1fh, U2fh, U3fh, I1fh, I2fh, I3fh
	Frequency (f)	f
	DATALOG.	Active Energy
Reactive Energy		class 1S (62053-24), 4 quadrants, per phase, per tariff, total
Main Archive		No
Electricity Meter Readings		No
OTHERS	Voltage Event logging	No
	Waveforms recording	No
	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}
	I	input current	1 mA @ 10V / 5 mA @ 24V 10 mA @ 48V
	R	ssr. ratings	60 V _{AC} / 100 V _{DC} , 100 mA
OTHER	R	relay ratings	250 V _{AC} / 30 V _{DC} , 5 A
	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	

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)

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

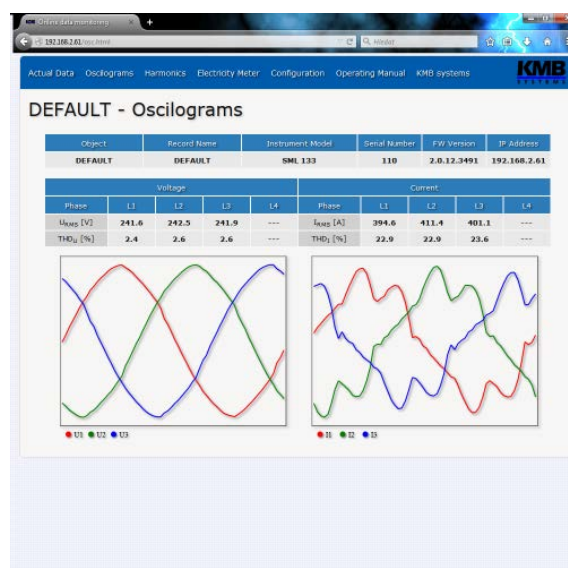
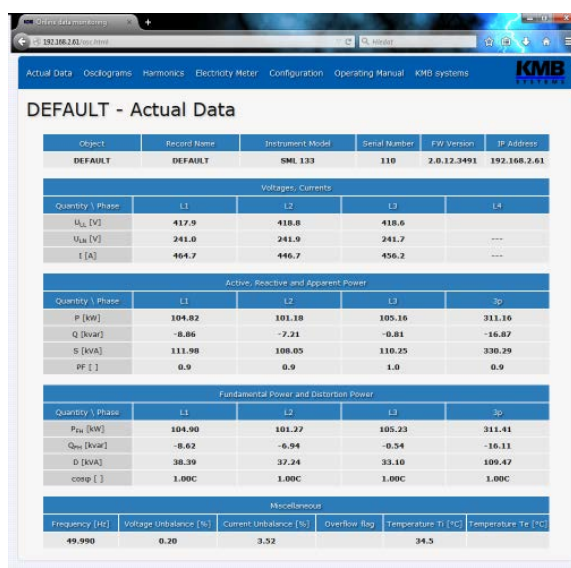
Remote Communication Interface

N = no remote comm. link

M = M-Bus interface

4 = RS-485

E = Ethernet

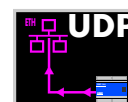


Webserver

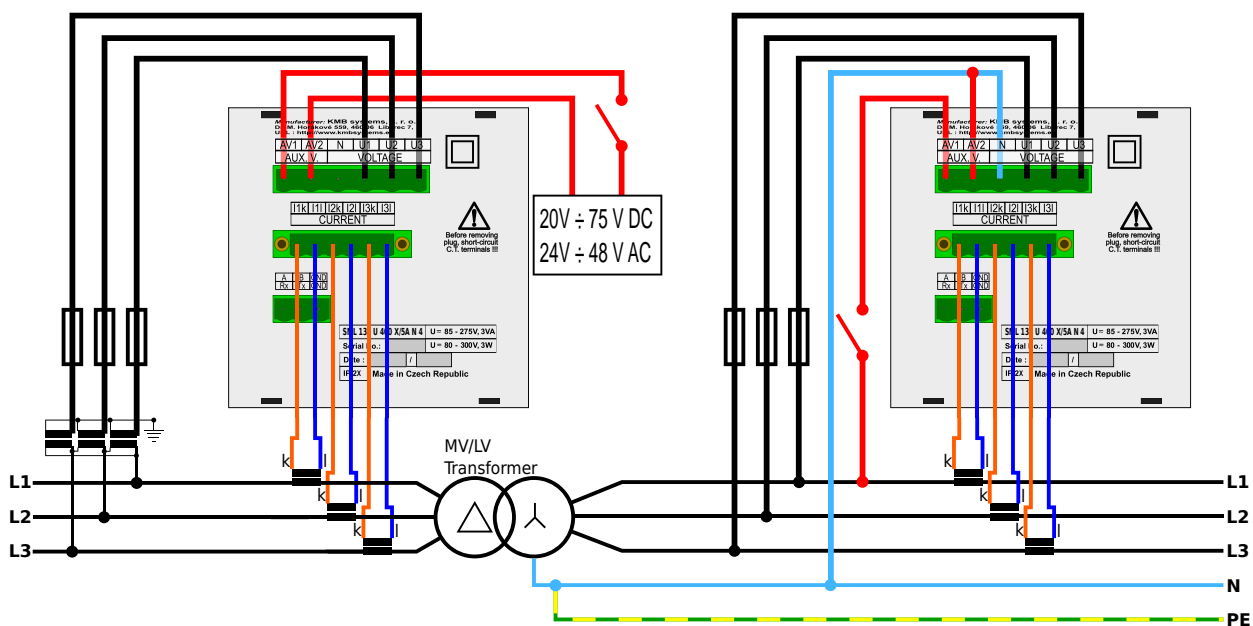
Optional firmware modules

UDP Push

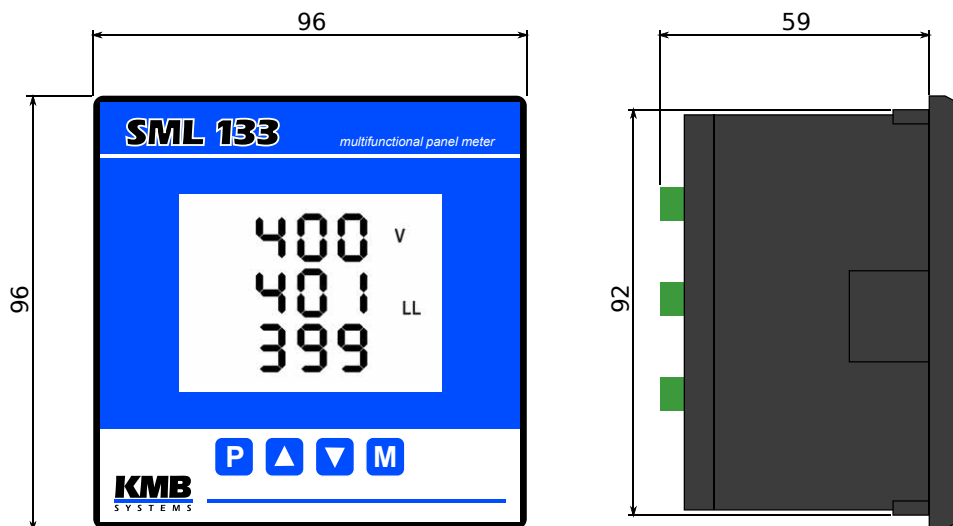
The UDP Push module allows instrument to send data over Ethernet using UDP protocol to dedicated server. Control of the communication from server side is not necessary.



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, 512 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 4U, 4I	MEASUREMENT U, I, P, Q	PF, cos, THD	Wh, varh	50
SAMPLING 25,6kHz	FLASH 512MB	RS485	MODBUS	STANDARDS IEC 61557-12
STANDARDS class 1 IEC 62053-21				

Optional

CURRENT INPUT X/100mA	CURRENT INPUT Sxxx	CURRENT INPUT Pxxx	ETH	WEBSERVER	NTP
USB	M-BUS	SUPPLY 12V/24V/230V	STANDARDS EN 50160	STANDARDS class S IEC 61000-4-30	
OUTPUTS 1x RELAY	OUTPUTS 1x PULSE	INPUTS 2x 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, ILN [act, avg, avg _{max} , avg _{min}]	
	Power (P)	P1, P2, P3, PN, 3P (import, export, total, 1 st harmonic) [act, avg, avg _{max} , avg _{min}]	
	Reactive Power (Q)	Q1, Q2, Q3, QN, 3Q (import, export, total, 1 st 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	unbl, unbU, φnsI	
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDUN, THDU12, THDU23, THDU31	
	Current THD (THDI)	THDI1, THDI2, THDI3, THDIN	
	Individual Harmonics	Harmonics 1 st to 50 th 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 ₁ ↔N)
		connection	wye, delta, aron
		overload	1300 V _{RMS} , 1950 V _{RMS} / 1s
CURRENT	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	
		I	input current	3 mA @ 12V / 8 mA @ 24V
		R	ssr. ratings	60 V _{AC} / 100 V _{DC} , 300 mA
OTHER	TEMP	relay ratings	230 V _{AC} / 30 V _{DC} , 3 A	
		operating	-25 ÷ 60°C, <95% non-condens.	
	EMC	storage	-40 ÷ 85°C, <95% non-condens.	
		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
	Ethernet (opt. E) KMBLong, MODBUS TCP, 100 Mbit/s
	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	

Ordering options

SMC 144 U X/100mA R B E

Instrument model

PA = power sensor & network monitor, 4U, 4I, RS485
SMC = network analyser & datalogger, 4U, 4I, RS485

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
E = Ethernet interface (not combinable with option M)

Optional firmware modules

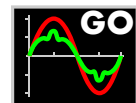
PQ S module

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.



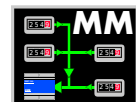
GO module

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

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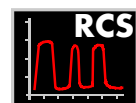
ES Module

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.

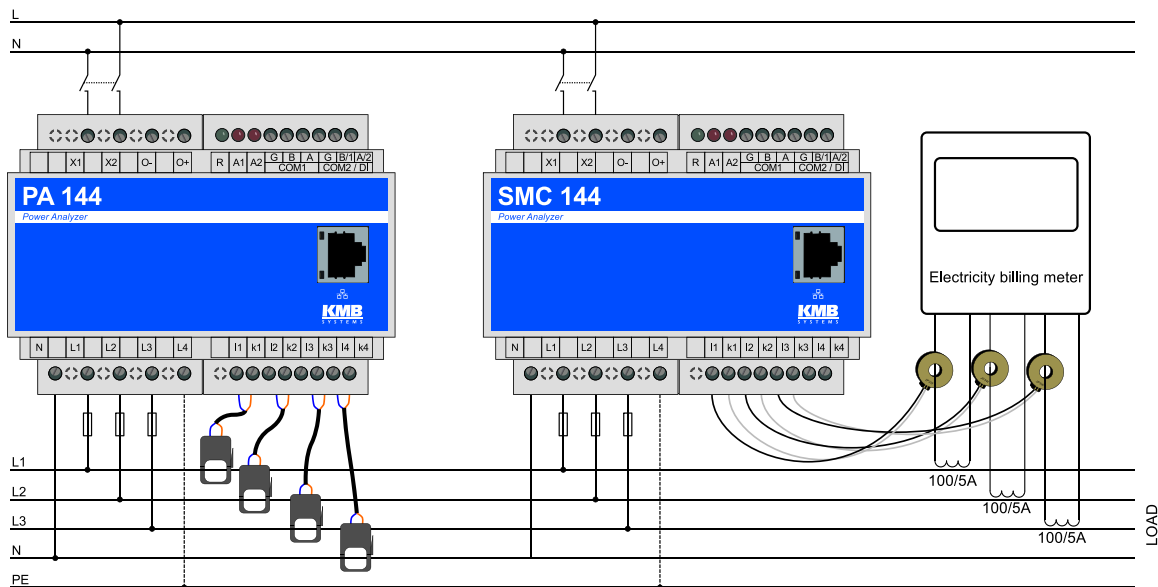


RCS module

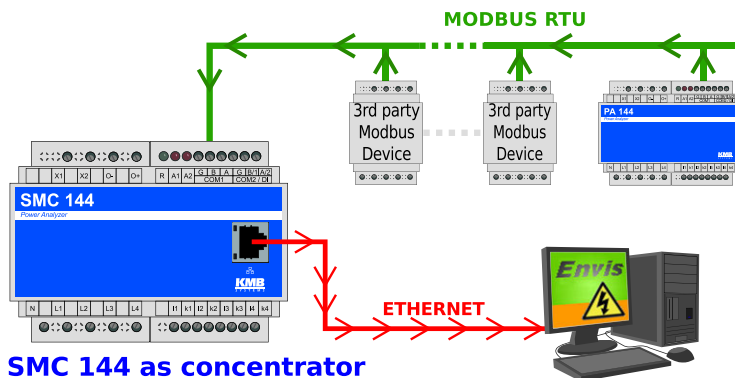
The RCS module (ripple control signal or mains voltage) activates an ability to detect, evaluate, decode and store RCS messages transmitted over the distribution network. It precisely measures voltage on the selected frequency and stores the extracted information.



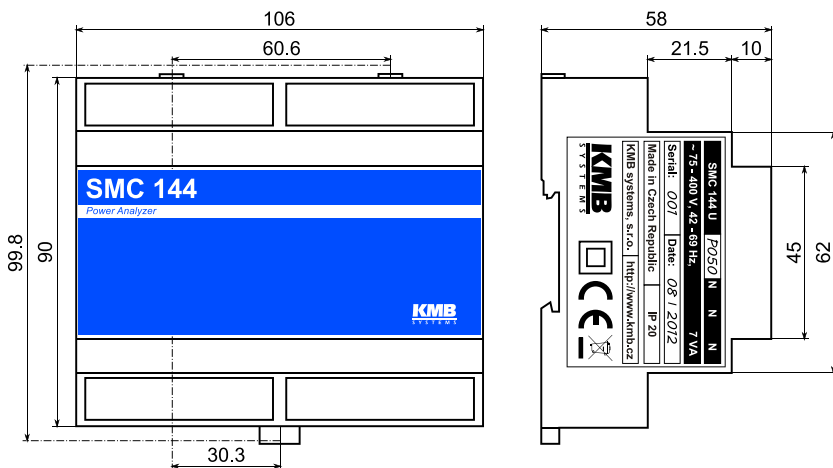
Typical connection schema



ModBus Master firmware option



Mechanical dimensions



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 3U, 3I	MEASUREMENT U, I, P, Q	PF, cos, THD	+/- Wh, varh	HARMONICS 50
SAMPLING 25,6kHz	FLASH 512MB	USB	STANDARDS IEC 61557-12	STANDARDS class 0.5S IEC 62053-22
OUTPUTS 4x RELAY	OUTPUTS 4x PULSE	INPUTS 5x DIGI		

Optional

CURRENT INPUT X/5A	CURRENT INPUT X/100mA	ETH	WEBSERVER	NTP
RS485	MODBUS	SUPPLY 12V/24V/230V	STANDARDS EN 50160	STANDARDS class S IEC 61000-4-30
OUTPUTS 2x 4÷20mA	INPUTS 2x 4÷20mA	INPUTS 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, 1 st harmonic) [act, avg, avg _{max} , avg _{min}]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1 st 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	unbl, unbU, φnsl
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3
	Individual Harmonics	Harmonics 1 st to 50 th of Voltage and Current and their angles
	Fundament. Harmonic (U _{fh} , I _{fh})	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 1S (62053-24), 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, U _{fh} , I _{fh} , 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	A R I 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}
		ssr. ratings	60 V _{AC} / 100 V _{DC} , 100 mA
	A	relay ratings	250 V _{AC} / 30 V _{DC} , 5 A
		Analog input	0 ÷ 24 mA, impedance 120 Ω
	T	Analog output	0 ÷ 20 mA, max. 500 Ω
OTHER	EMC TEMP	Pt100 input	range -50 ÷ 150 °C
		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	144W × 144H × 58D mm / 0,6 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	

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

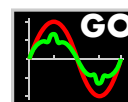
PQ S module

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.



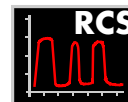
GO module

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.



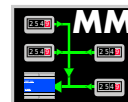
RCS module

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.



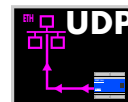
ES Module

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.

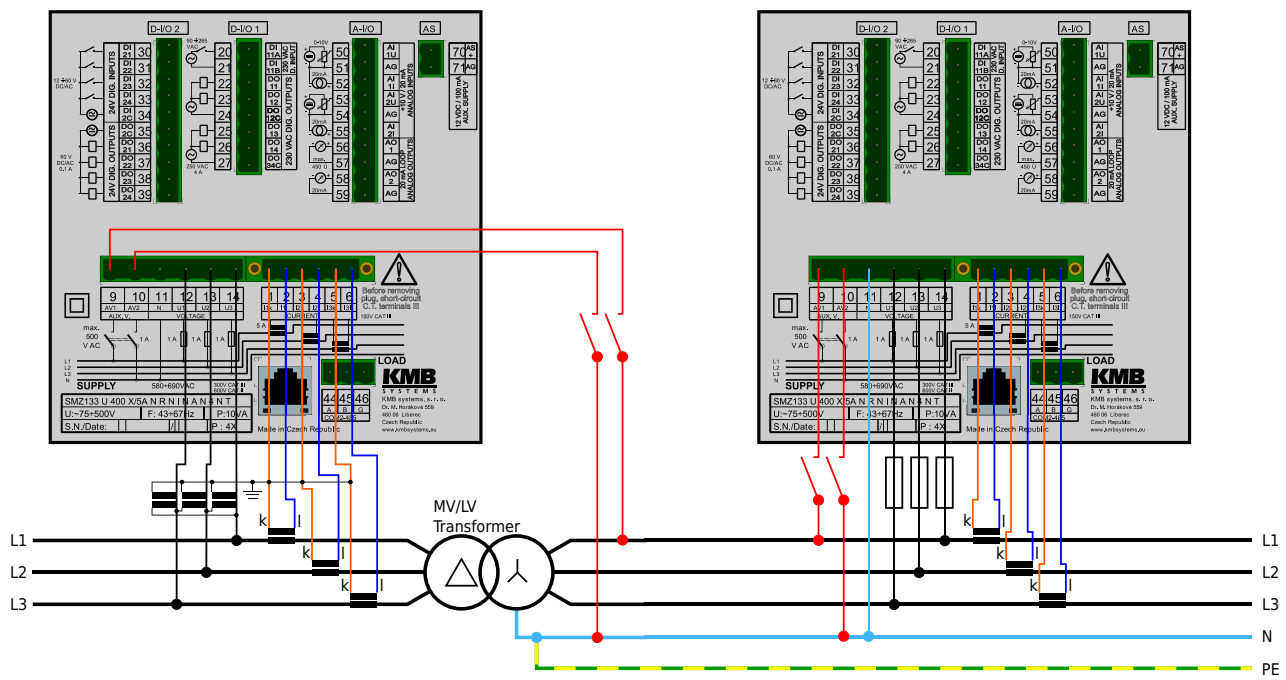


UP Module

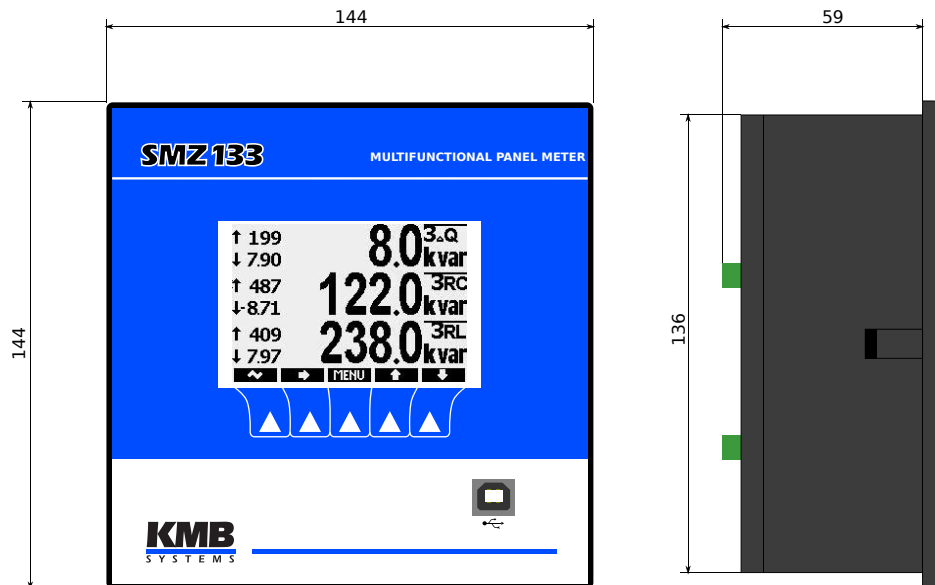
The UP Module allows instrument to send data over Ethernet using UDP protocol to dedicated server. Control of the communication from server side is not necessary. Acquisition of the archived data from instruments memory over Modbus is also possible with this module.



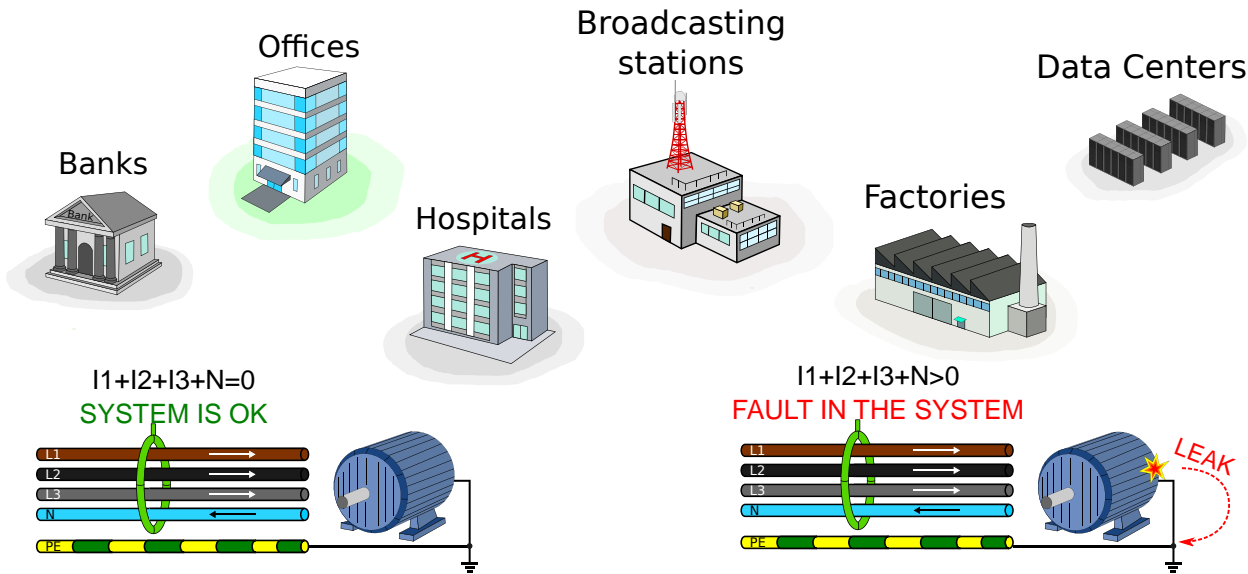
Typical connection schema



Mechanical dimensions

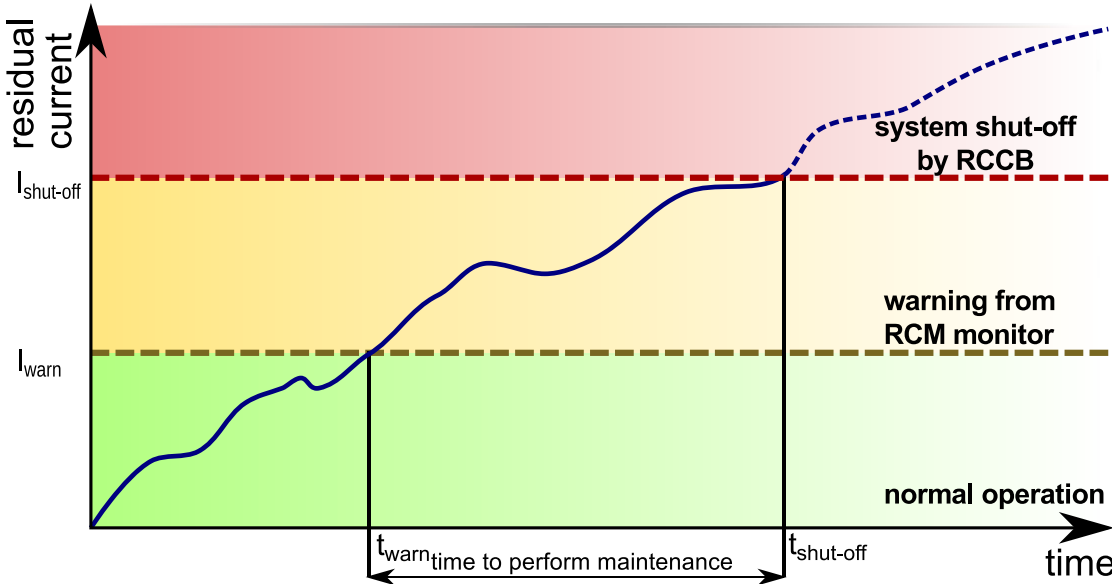


Residual Current Monitoring



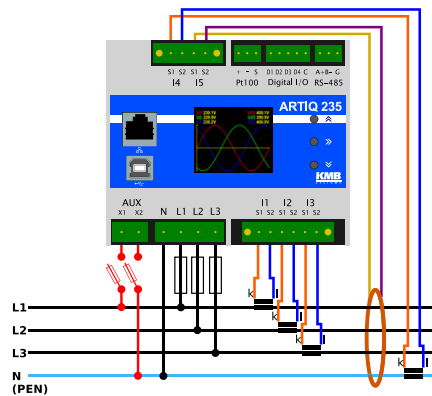
Residual current monitoring stands for calculation and monitoring of residual currents in grounded power supply systems. Calculation is made as sum of currents in all conductors except PE wire. Residual currents typically appears because of leakage currents or insulation faults which are usually results of mechanical failures, faulty components etc.

By monitoring residual currents it's possible to provide warning about its level way before RCCB (residual current circuit breaker) triggers and performs complete unwanted system shut-off. Using this method, maintenance staff can perform service and repair tasks on time and prevent unplanned shut-down of facility which can be very costly.



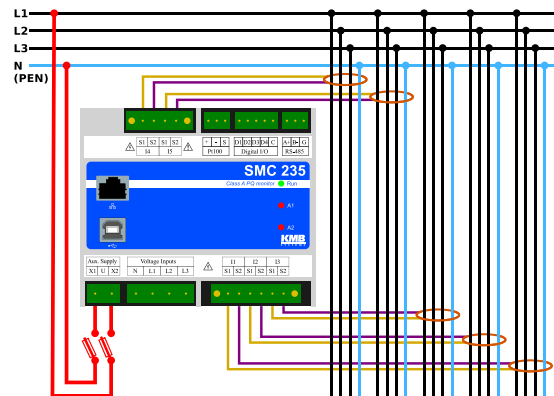
SMC 235 a ARTIQ 235 - Analyser with RCM

Class S and A power quality analysers according IEC 61000 - 4 -30 ed3 features not only 4 standard X/5A current inputs but also one RCM input for residual current monitoring using specially designed CT.



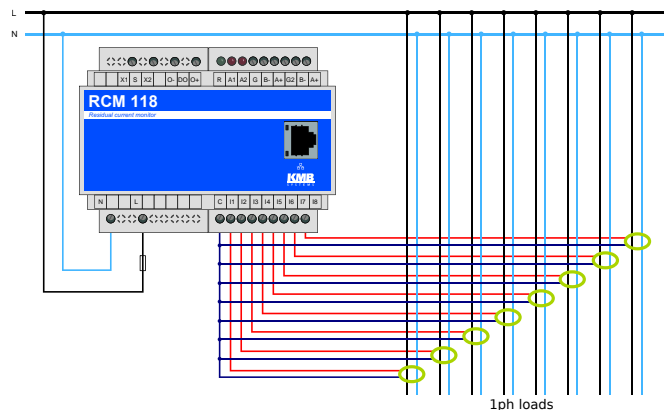
SMC 235 RCM - Class S power quality analysers with 5 RCM inputs

Special version of SMC 235 analyser equipped with RCM inputs for measuring up to five residual currents using special current transformers. Digital outputs of the instrument can be configured to provide warning when situation with residual current gets worse.



RCM 118 - analyser with up to 8 RCM inputs

Based on modified instrument SMC 118 with modified current inputs to accept special ZCT for residual current monitoring. It measures up to 8 residual currents of 1- or 3- phase systems. Situation about each current can be monitored over Modbus protocol.



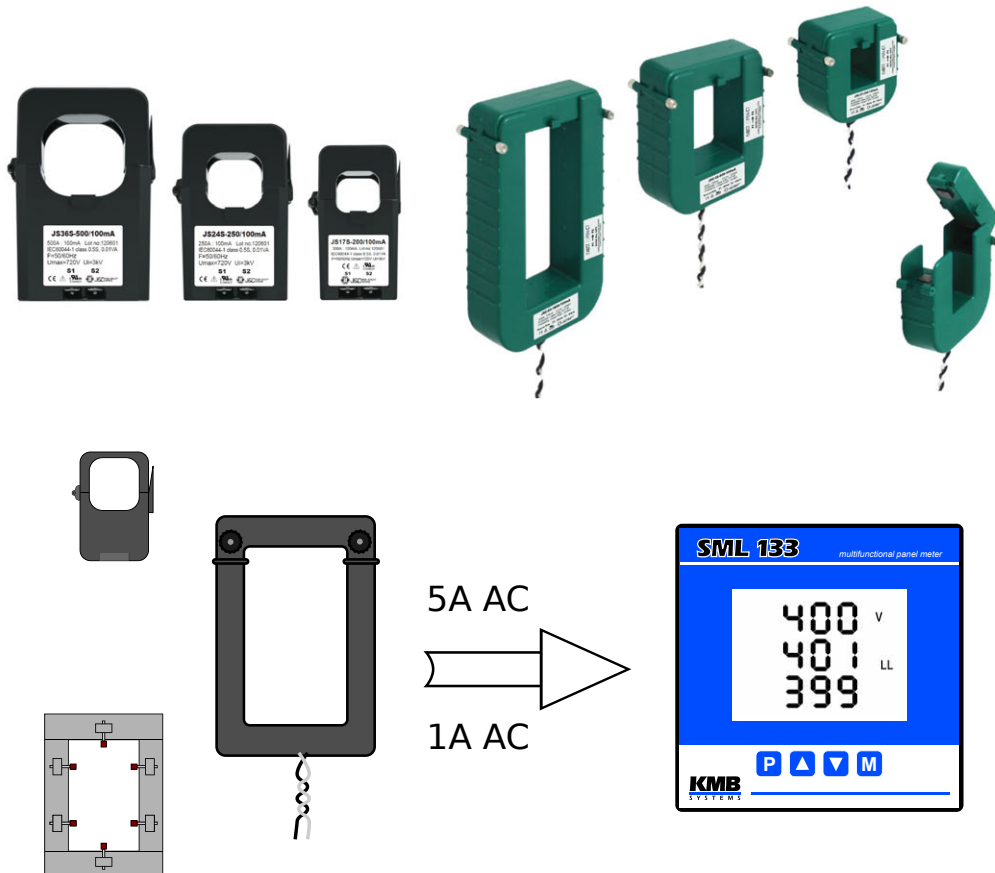
Built-in instruments accessories

Option X/5A

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

Supported instruments: SMC 133, SMY 133, SML 133, SMZ 133, ARTIQ 235, SMC 235

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

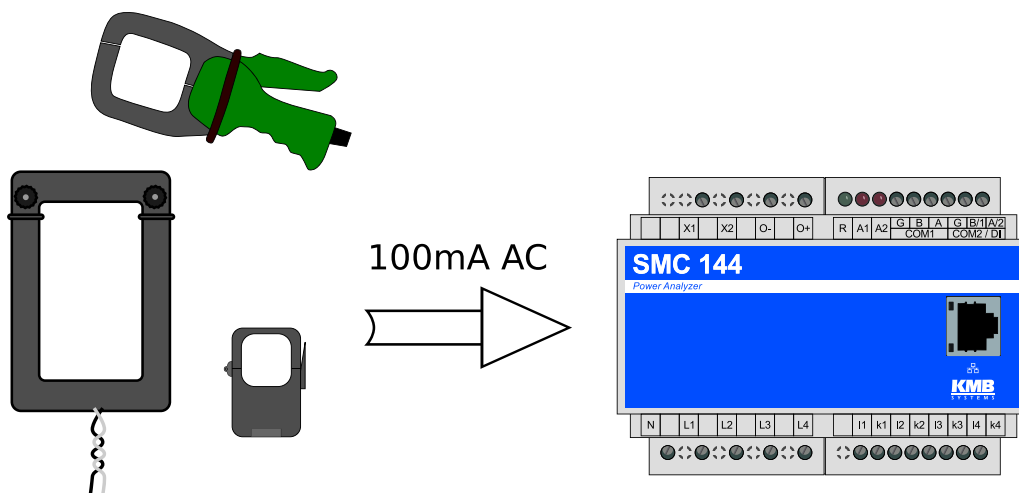


Option X/100mA

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

Split-Core Model	Inom [A]	d [mm]	Connection	Dimension [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



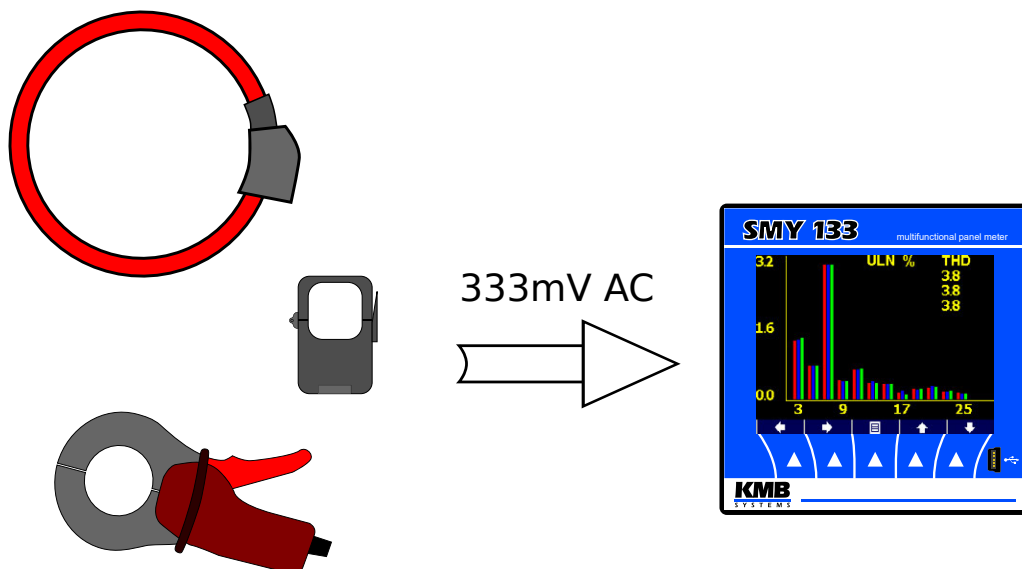
Option X/333mV

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-80 Inom	100, 150, 200, 250, 300	80	Wire	5VDC 15mA max	600V CAT IV
JRF MOI 333M-115 Inom	400, 500, 600, 800, 1000 1200, 1500, 2000, 2400, 2500	115	Wire		600V CAT IV
JRF MOI 333M-200 Inom	3000, 4000, 5000, 6000	200	Wire		600V CAT IV

Split-Core Model	Inom [A]	d [mm]	Connection	Dimension [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

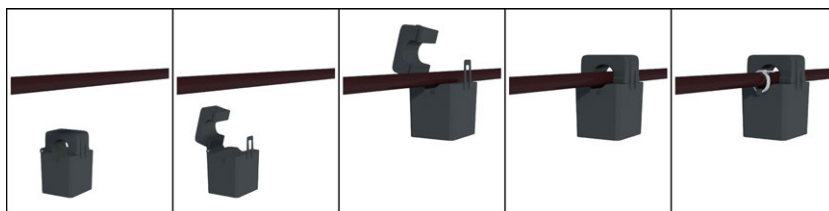


Option Sxxx

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

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

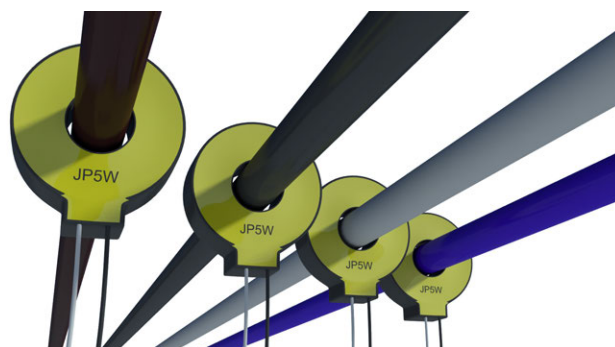


Option Pxxx

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

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



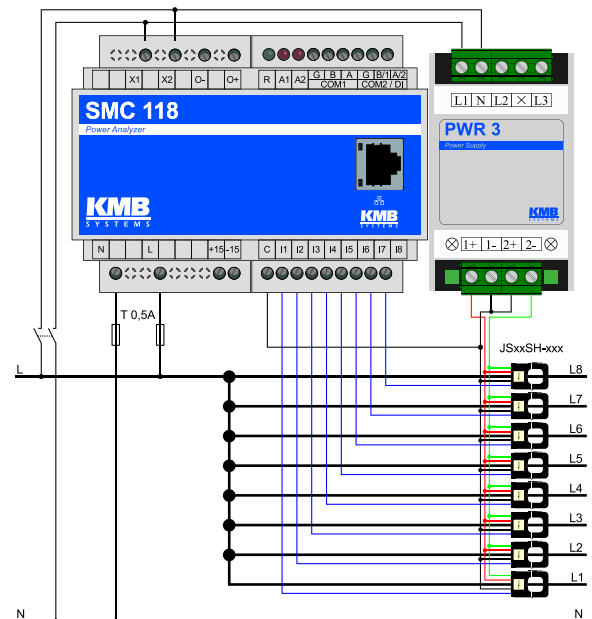
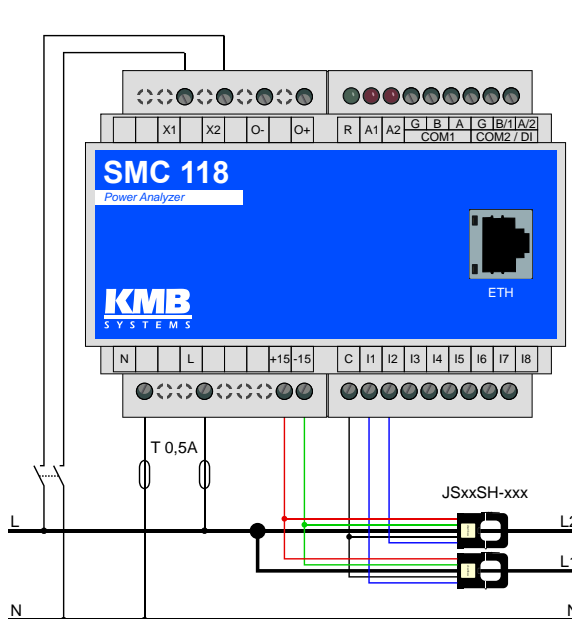
Option X/4V

Instruments with this option features $\pm 4V$ 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, BC 235

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

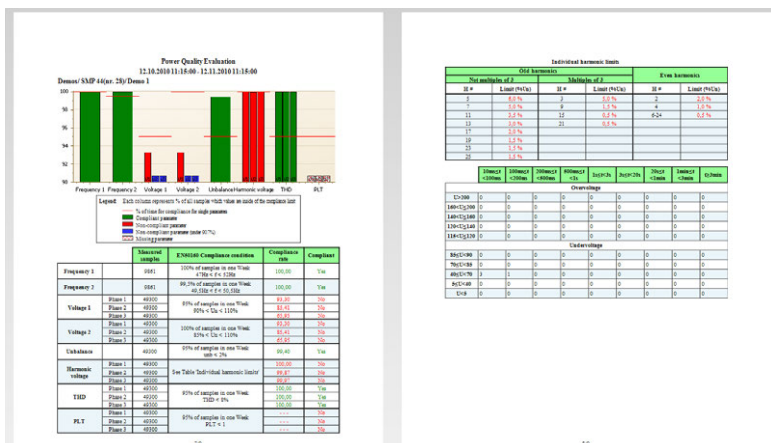


Optional Firmware Modules



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 become class S, respectively class A power quality analysers according to IEC 61000-40-30.



PQ Events

Time	Start time[ms]	End time[ms]	Duration[ms]	Extreme[V]	Min/Max[%]	Phase[]	type[]
02.08.2010 13:57:29.50	02.08.2010 14:02:47.46	00:05:17.9600000	0	0	3P		Power Fail
02.08.2010 14:02:58.41	02.08.2010 14:08:48.36	00:05:49.9500000	443.2	192.7	2		Voltage Swell
02.08.2010 14:08:48.36	02.08.2010 14:08:48.37	00:00:00.0100000	52.22	22.70	2		Voltage Dip

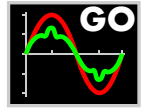
Undervolt...	10msst<...	100msst<...	200msst<...	500msst<...	1sst<3s	3sst<20s	20sst<1...	1minst<...	t≥3min
85<d<90	2	0	0	0	0	0	0	0	0
70<d<85	0	0	0	0	0	0	0	0	0
40<d<70	1	0	0	0	0	0	0	0	0
5<d<40	2	0	0	0	0	0	0	0	0
0<d<5	0	0	1	0	0	2	19	10	8

Overvoltage...	10msst<1...	100msst<1...	500msst<1s	1sst<3s	3sst<20s	20sst<1min	1minst<3...	t≥3min
115<d<120	0	1	0	0	0	0	3	3
120<d<140	5	2	0	0	1	0	0	4
140<d<160	0	0	0	0	0	0	3	0

Supported Instruments

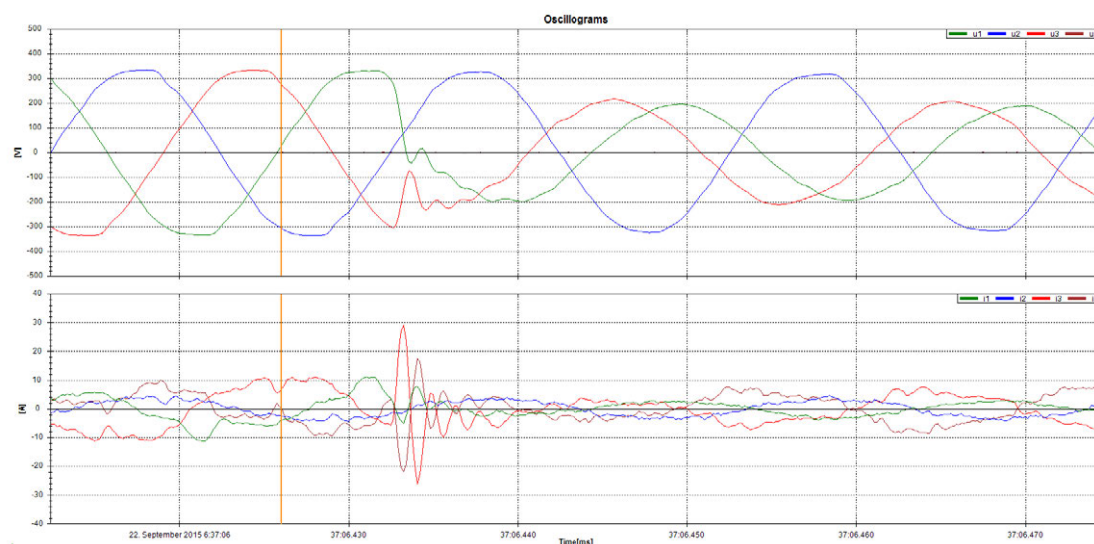
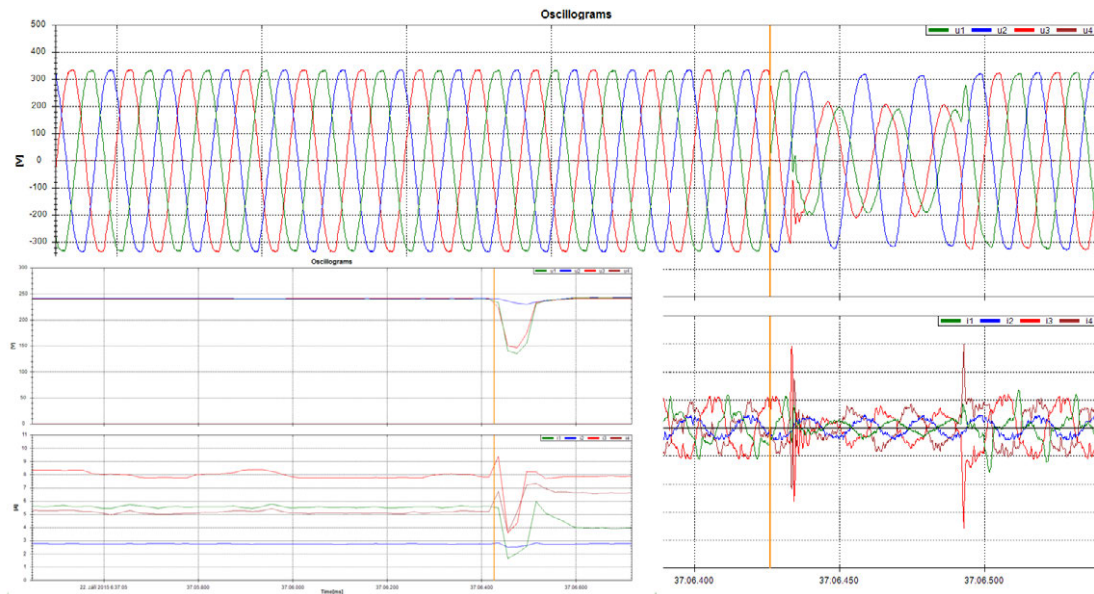
PQ S: SMC 233, SMC 235, BCPM 233, SMC 133, SMC 144, SMY 133, SMY 134, SMP 133, SMZ 133, SIMON S, SMY-CA

PQ A: SMZ 244, ARTIQ 233, ARTIQ 235



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.



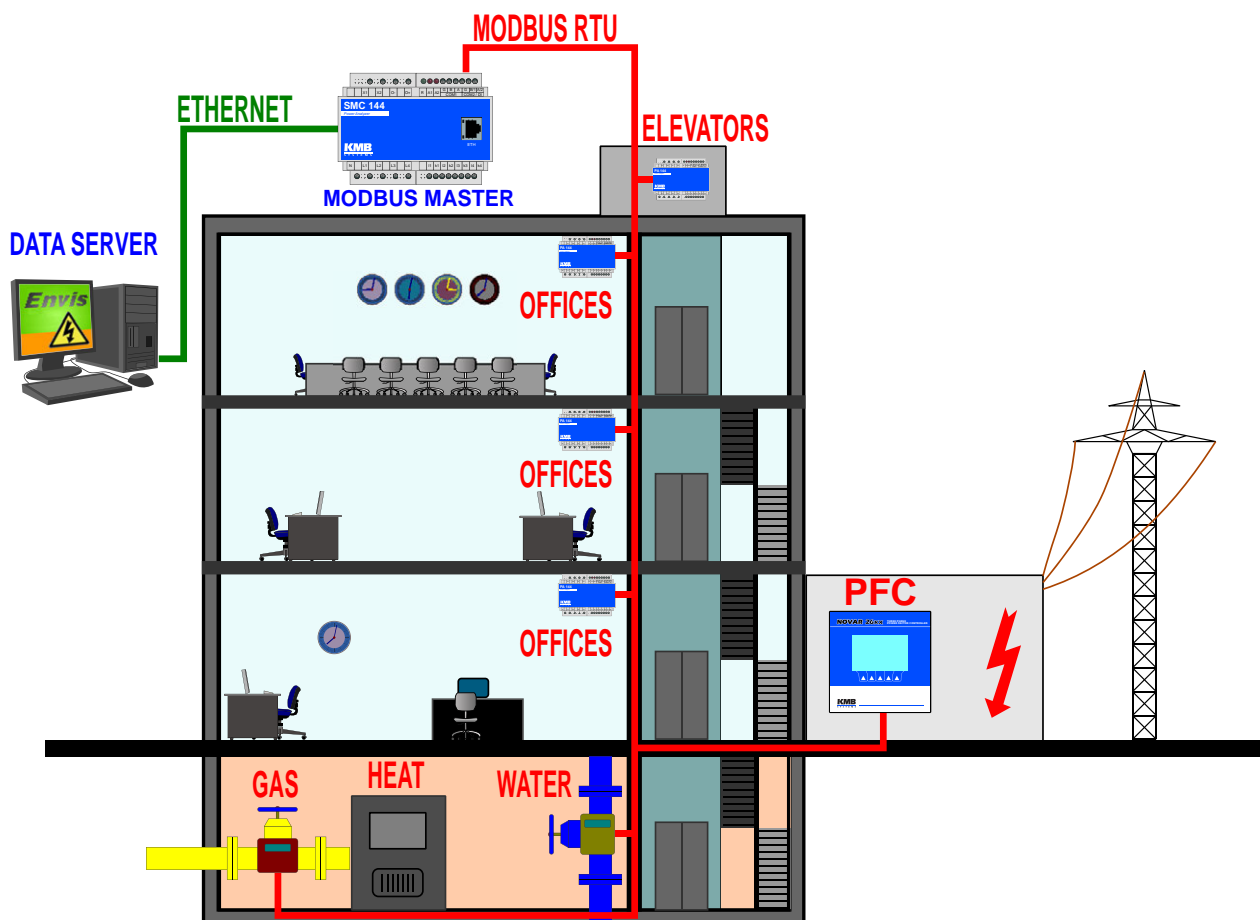
Supported Instruments

any ARTIQ, SMC, SMY, SMZ, SIMON, SMY-CA



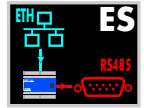
MM Module (ModBus Master)

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 its RS-485 line. Downloaded values are stored into its 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.



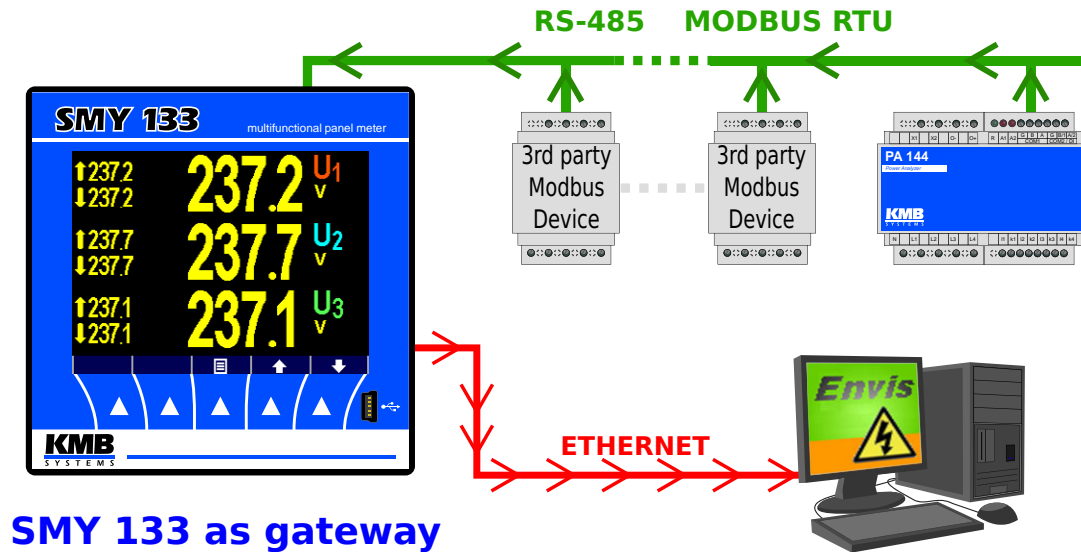
Supported Instruments

ARTIQ, SMC, SMY, SMZ, BCPM



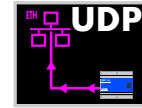
ES Module (Ethernet to Serial)

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.



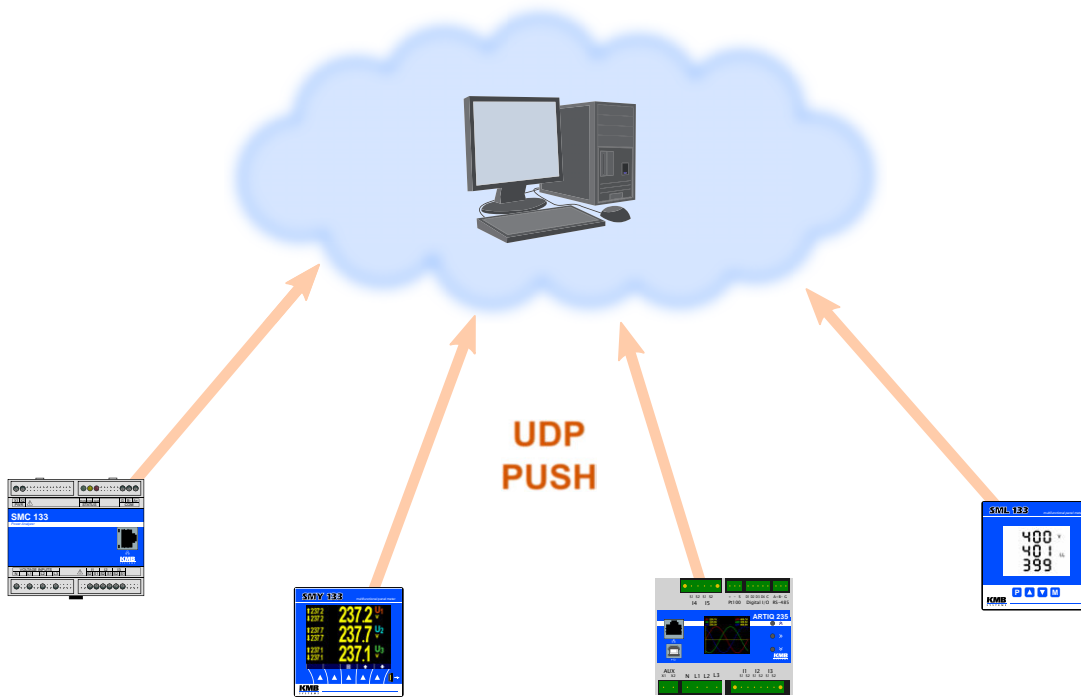
Supported Instruments

ARTIQ, SMC, SMY, SMZ, BCPM



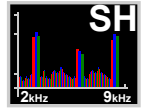
UDP Push Module

The UDP Push module allows instrument to send data over Ethernet using UDP protocol to dedicated server. Transmitted data can be freely configured and mapped. Instrument sends data autonomously in periodical manner and control of the communication from server side is not necessary. Acquisition of the archived data from instruments memory over Modbus is also possible with this module.



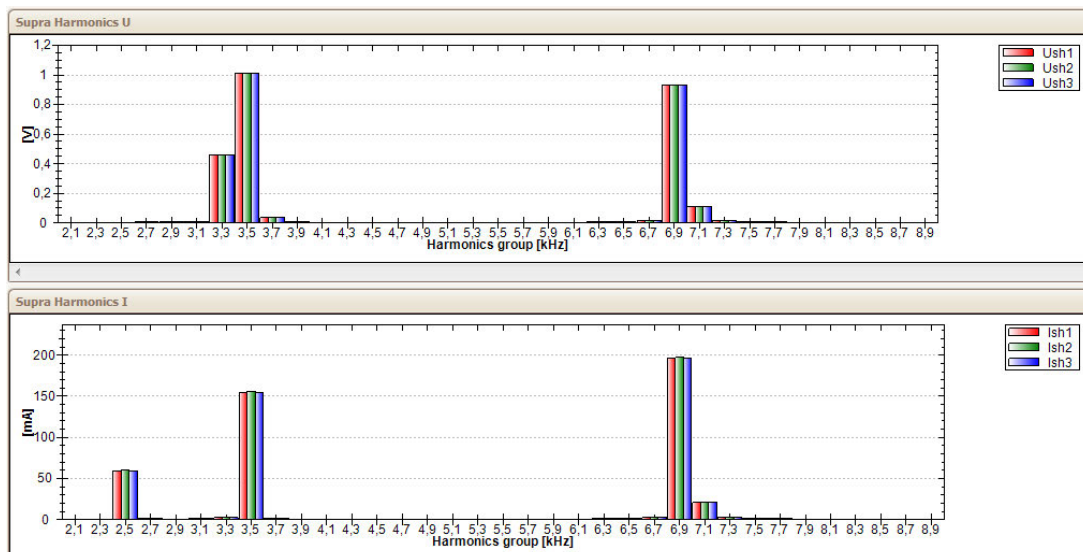
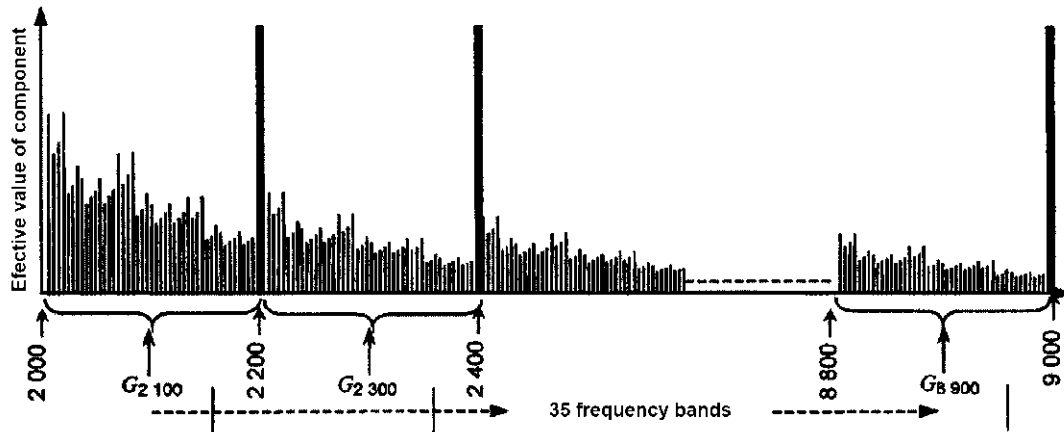
Supported Instruments

ARTIQ, SMC, SMY, SMZ, BCPM, SML



SH Module (Supra Harmonics)

The SH module allows instrument to measure harmonics in the range of 2 kHz to 9 kHz. So called Supra Harmonics of voltage and current are measured in accordance to the standard EN 61000-4-7 ed.2. Spectrum is divided into 35 frequency bands each 200Hz wide from which DFT is calculated as standard requires. With activation of this module, 2-9kHz harmonics are automatically enabled and available in Actual Data and are also part of the Main Archive recorded to internal memory.



Supported Instruments

ARTIQ 235, SMC 235, SMC 233, ARTIQ 233

Certificates

Our hard work was rewarded in 2017 and 2018 by receiving of class A and class S (IEC 61000-4-30:2015) certificates for some of our analysers. Devices and algorithms have been tested by Czech Metrological Institute (ČMI), one of few in the world accredited for such a testing.

Český metrologický institut
Okružní 31, 638 00 Brno
tel. +420 545 555 111
www.cmi.cz

Pracoviště: Oblastní inspektorát / Regional Inspectorate Brno, Okružní 31, 638 00 Brno
Oddělení primární etalonáže ss a nf el. veličin, tel.: +420 545 555 208, fax +420 545 555 183
Laboratory: Department of primary metrology of DC and LF electrical quantities

PROTOKOL O ZKOUŠCE TEST REPORT

6011-PT-L0004-17

Datum vystavení: 27.09.2017 List 1 z(e) 6 listů
Date of issue: 27th September, 2017 Page 1 of 6

Zákazník: K M B systems, s.r.o.
Customer: Dr. Milady Horákové 559
460 07 Liberec

Měřidlo: PQ monitor
Measuring instrument:

Výrobce: K M B systems, s.r.o.
Manufacturer:

Typ: ARTIQ 233
Type:

Výrobní číslo: 2
Serial number:

Výsledky zkoušek byly získány za podmínek a s použitím postupů uvedených v tomto protokolu o zkoušce a vztahují se pouze k době a místu provedení zkoušky.
The results of the tests have been obtained following the procedures reported in this Report and are related only to the date, place and conditions of the test.

Datum provedení zkoušky: 10.8. – 26.9.2017
Date of test: 10th August - 26th September, 2017

Protokol vystavil:
Report issued:

Vedoucí oddělení:
Head of the Department:

Ing. Věra Nováková Zachovalová, Ph.D. Ing. Jiří Švec

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Laboratory: Department of primary metrology of DC and LF electrical quantities

PROTOKOL O ZKOUŠCE TEST REPORT

6011-PT-L0014-18

Datum vystavení: 29.5.2018 List 1 z(e) 6 listů
Date of issue: 29th May, 2018 Page 1 of 6

Zákazník: K M B systems, s.r.o.
Customer: Dr. Milady Horákové 559
460 07 Liberec

Měřidlo: PQ monitor
Measuring instrument:

Výrobce: K M B systems, s.r.o.
Manufacturer:

Typ: SMY 133
Type:

Výrobní číslo: 878
Serial number:

Výsledky zkoušek byly získány za podmínek a s použitím postupů uvedených v tomto protokolu o zkoušce a vztahují se pouze k době a místu provedení zkoušky.
The results of the tests have been obtained following the procedures reported in this Report and are related only to the date, place and conditions of the test.

Datum provedení zkoušky: 10.8.2017 – 29.5.2018
Date of test: 10th August, 2017 - 29th May, 2018

Protokol vystavil:
Report issued:

Vedoucí oddělení:
Head of the Department:

Ing. Michal Hedvíček Ing. Jiří Švec

Tento dokument nesmí být bez písemného souhlasu provádějící laboratoře rozmnožován jinak než v celkovém počtu listů.
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PROTOKOL O ZKOUŠCE 6011-PT-L0004-17 List 1 z(e) 6 listů

6011-PT-L0004-17

Průběh	Číslo	Typ	Metoda	Ukázka
Výsledky zkoušek	1	1	1	1
	2	1	1	1
	3	1	1	1
	4	1	1	1
	5	1	1	1
	6	1	1	1
	7	1	1	1
	8	1	1	1
	9	1	1	1
	10	1	1	1

PROTOKOL O ZKOUŠCE 6011-PT-L0004-17 List 1 z(e) 6 listů

6011-PT-L0004-17

Průběh	Číslo	Typ	Metoda	Ukázka
Výsledky zkoušek	1	1	1	1
	2	1	1	1
	3	1	1	1
	4	1	1	1
	5	1	1	1
	6	1	1	1
	7	1	1	1
	8	1	1	1
	9	1	1	1
	10	1	1	1

PROTOKOL O ZKOUŠCE 6011-PT-L0004-17 List 1 z(e) 6 listů

6011-PT-L0004-17

Průběh	Číslo	Typ	Metoda	Ukázka
Výsledky zkoušek	1	1	1	1
	2	1	1	1
	3	1	1	1
	4	1	1	1
	5	1	1	1
	6	1	1	1
	7	1	1	1
	8	1	1	1
	9	1	1	1
	10	1	1	1

PROTOKOL O ZKOUŠCE 6011-PT-L0014-18 List 1 z(e) 6 listů

6011-PT-L0014-18

Průběh	Číslo	Typ	Metoda	Ukázka
Výsledky zkoušek	1	1	1	1
	2	1	1	1
	3	1	1	1
	4	1	1	1
	5	1	1	1
	6	1	1	1
	7	1	1	1
	8	1	1	1
	9	1	1	1
	10	1	1	1

PROTOKOL O ZKOUŠCE 6011-PT-L0014-18 List 1 z(e) 6 listů

6011-PT-L0014-18

Průběh	Číslo	Typ	Metoda	Ukázka
Výsledky zkoušek	1	1	1	1
	2	1	1	1
	3	1	1	1
	4	1	1	1
	5	1	1	1
	6	1	1	1
	7	1	1	1
	8	1	1	1
	9	1	1	1
	10	1	1	1

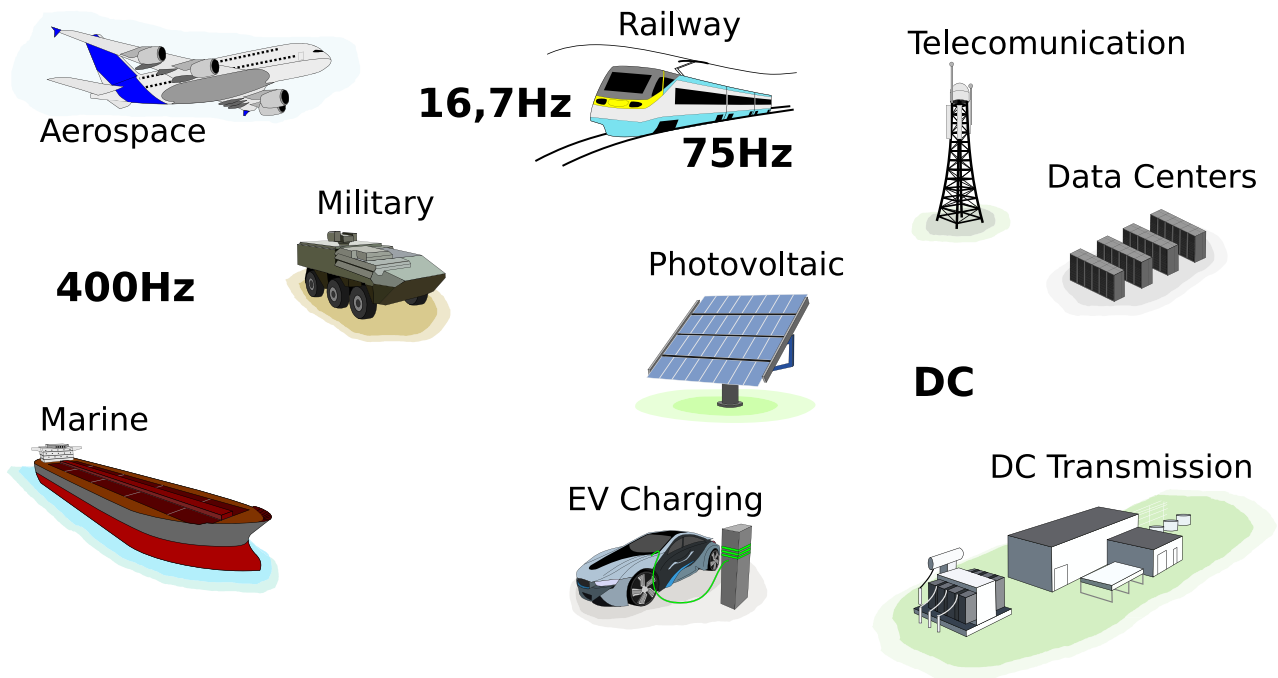
PROTOKOL O ZKOUŠCE 6011-PT-L0014-18 List 1 z(e) 6 listů

6011-PT-L0014-18

Průběh	Číslo	Typ	Metoda	Ukázka
Výsledky zkoušek	1	1	1	1
	2	1	1	1
	3	1	1	1
	4	1	1	1
	5	1	1	1
	6	1	1	1
	7	1	1	1
	8	1	1	1
	9	1	1	1
	10	1	1	1

Measuring DC networks

Analysers for DC to 500Hz networks



These instruments are suitable for wide range of different applications such as power generation (photovoltaics), data centers, transportation (EV charging), telecommunication, aerospace, marine, military (typically 400Hz), railway in form of trains and trams (DC, 16,7Hz) and many others. Above mentioned systems are very important and all of them needs to monitor energy and its quality, therefore many of our instruments are suitable not only for use in common 50/60Hz systems but also for special networks such as DC, or AC networks with 16.7Hz, 75Hz, 400Hz and others up to 500Hz.

Measuring in DC networks can be divided to measuring of only voltage and quantities related to it. For this we can use any of our devices allowing DC-500 setting, generally all of series 1xx and above (such as SMY 133). Same devices can be used also in networks up to 500Hz. For projects where also DC currents have to be measured we present instruments like BC 235 or SMC 118 X/4V. These instruments support connection of special Hall effect current sensors and allow measurement of DC and also AC currents.

DC-500 - solution for measuring in networks with non-standard frequency

Supported by instruments which allow DC-500 setting (SML, SMY, SMZ, PA, SMC, ARTIQ). This setting allows to regular instruments not only to measurement and evaluation of DC voltage, but also for measurement in networks up to 500Hz.. Those special systems can be 16,7Hz, 75Hz and 275Hz used in railways, 400Hz frequencies used in small "isolated" systems such as planes, ships and military equipment.

T A
Č R

BC 235 - Power quality analyser for AC/DC



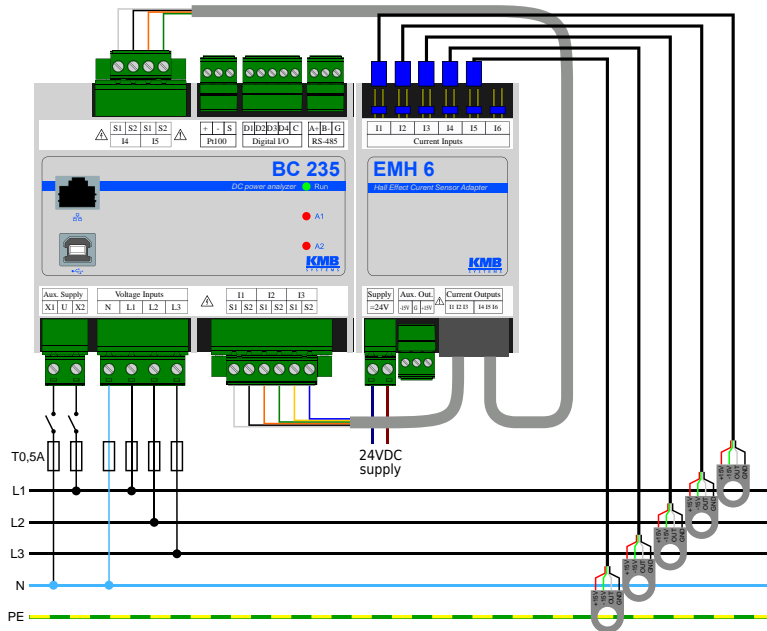
Class S power quality analyser according IEC 61000 - 4 -30 ed3 suitable for measuring in AC and DC networks. Features three voltage inputs and 5 current inputs which supports connection of external hall sensors with X/4V output. Instrument measures voltages, currents, powers, energies (0.5S), voltage unbalance, harmonics, THD and many others. Instrument is mounted on DIN-rail and features RS-485, USB and Ethernet communication interface, four universal input/outputs and input for Pt100 temperature sensors. Optionally it can be equipped also with color LCD.

Standard

INPUTS 3U, 5I	MEASUREMENT U, I, P, Q	PF, cos, THD	+/- Wh, varh	HARMONICS 128	SAMPLING 28kHz	MEASUREMENT AC/DC	CURRENT INPUT ±4V	FLASH 512MB	SUPPLY 230V	USB
STANDARDS class 0.5S IEC 62053-22	STANDARDS IEC 61557-12	STANDARDS EN 50160	RS485	MODBUS	ETH	WEBSERVER	NTP	INPUTS-OUTPUTS 4xDIGI	INPUTS Pt100	

Optional

STANDARDS
class S
IEC 61000-4-30



EMI DC - Multi-channel DC current monitoring

EMI DC is multi-channel DC current monitoring setup suitable used in LocalBus system in combination with EMU voltage measurement module. Its 5 current inputs are designed to accept standardized 4VDC output from Hall sensors. Special +/- 15VDC voltage, which is usually needed to supply hall sensors, is provided from EMI DC module.

Coming soon






Portable Analysers



Comparison table of portable instruments							
	Memory [MB]	Meter	Communication	IEC 61000-4-30	EN 50160	Measurement	Dimensions
SIMON S04	512	✓	USB, WiFi	S	✓	4×U, 4×I	138 x 53 x 78 mm
SMY-CA	512	✓	USB, Ethernet	S	✓	3×U, 3×I	210 x 166 x 90 mm
SMY-CA	512	✓	USB, Ethernet, local bus	S	✓	3×U, 4×I, 2×RCM	210 x 166 x 90 mm

SMY-CA and SIMON 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 SIMON 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	SMY - CA PRO	SIMON S
Measuring Range	170 ÷ 860V _{LL} 100 ÷ 500V _{LN}	170 – 860V _{LL} / 20 – 1060V _{LL} 100 – 500V _{LN} / 10 – 625V _{LN}	5 ÷ 1380V _{LL} 3 ÷ 800V _{LN}
Auxiliary voltage	same as measuring	from measuring / separate 24V	85 ÷ 480V _{AC} 100 ÷ 600V _{DC}
Measurement cat.	CAT III/ 300V	CAT III/ 300V	CAT IV/ 600V
Measurement	3U, 3I	3U, 4I, 2RCM	4U, 4I
Current Inputs	X/333mV	X/333mV	SPQ-I
Quadrants	4	4	4
Sampling rate	25,6kHz	25,6kHz	25,6kHz
Aggregation	200ms	200ms	200ms
Continuous meas.	●	●	●
Harmonics V/A	1 - 50	1 - 50	1 - 50
Interharmonics	●	●	●
THD-U [%]	●	●	●
THD-I [%]	●	●	●
Unbalance	●	●	●
Flicker (Pst, Plt)	●	●	●
Waveforms	●	●	●
Voltage Events	●	●	●
Accuracy V	0.2	0.2	0.2
Accuracy A	0.2	0.2	0.2
Active energy	0.5S	0.5S	0.5S
Reactive energy	2	2	2
Digital I/O	-	-	-
Relay outputs	-	-	-
Analogue I/O	-	-	-
Temp. input	-	-	-
Internal temp.	●	●	●
Min/max memory	●	●	●
Memory size	512 MB	512 MB	512 MB
Clock	●	●	●
Software	ENVIS	ENVIS	ENVIS
EN 50160	●	●	●
IEC 61000-4-30	class S	class S	class S
Interfaces			
RS 232	-	-	-
RS 485	-	-	-
Ethernet	●	●	-
USB	●	●	●
Web server	●	●	-
Wifi	-	-	○
Protocols			
Modbus RTU	-	-	-
KMB	●	●	●
ModBus TCP	●	●	-
Construction			
Display	color LCD	color LCD	-
Dimension	220×190×110	220×190×110	138×73×58

●, 2 - Standard
○, 2 - Optional

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

INPUTS 3U, 3I	MEASUREMENT U,I,P,Q	PF,cos,THD	+/- Wh,varh	HARMONICS 50	SAMPLING 25,6kHz	CURRENT INPUT 333mV
FLASH 512MB	STANDARDS IEC 61557-12	USB	ETH	WEBSERVER	NTP	

Optional

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, 1 st harmonic) [act, avg, avg _{max} , avg _{min}]
	Reactive Power (Q)	Q1, Q2, Q3, 3Q (import, export, total, 1 st 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	unbl, unbU, φnsl
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDU12, THDU23, THDU31
	Current THD (THDI)	THDI1, THDI2, THDI3
	Individual Harmonics	Harmonics 1 st to 50 th of Voltage and Current and their angles
	Fundament. Harmonic (Ufh, lfh)	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, lfh, 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	100 ÷ 500 V _{AC}
	power	8 VA / 3 W
	overvoltage cat.	CAT III / 300 V
INPUT VOLTAGE	measuring range	170 ÷ 860 V _{LL} / 100 ÷ 500 V _{LN}
	measurement category	CAT III / 300V
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	

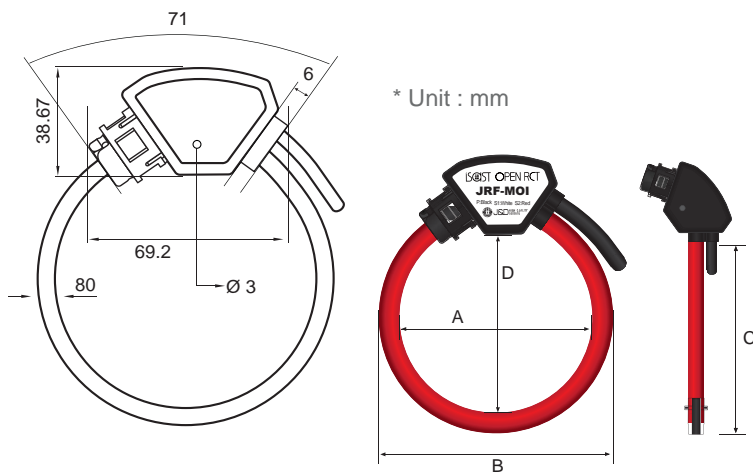
COMMUNICATION	Local USB 2.0 KMBlong, MODBUS RTU protocols Connector type Mini-B
	Ethernet KMBlong, MODBUS TCP protocols

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	

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.

Sensor Model	Inom [A]	d [mm]	Overvoltage Category
CA-JRF MOI 333M-80 100	100 A	80 mm	600V CAT IV
CA-JRF MOI 333M-80 300	300 A	80 mm	600V CAT IV
CA-JRF MOI 333M-115 100	100 A	115 mm	600V CAT IV
CA-JRF MOI 333M-115 300	300 A	115 mm	600V CAT IV
CA-JRF MOI 333M-115 1000	1000 A	115 mm	600V CAT IV
CA-JRF MOI 333M-115 2500	2500 A	115 mm	600V CAT IV
CA-JRF MOI 333M-200 3000	3000 A	200 mm	600V CAT IV



Model		B	C	D
CA-JRF MOI 333M-80	80	96	285	80
CA-JRF MOI 333M-115	115	131	385	115
CA-JRF MOI 333M-200	200	216	628	200

Optional firmware modules

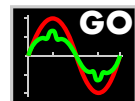
PQ S module

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.



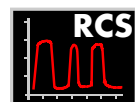
GO module

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.

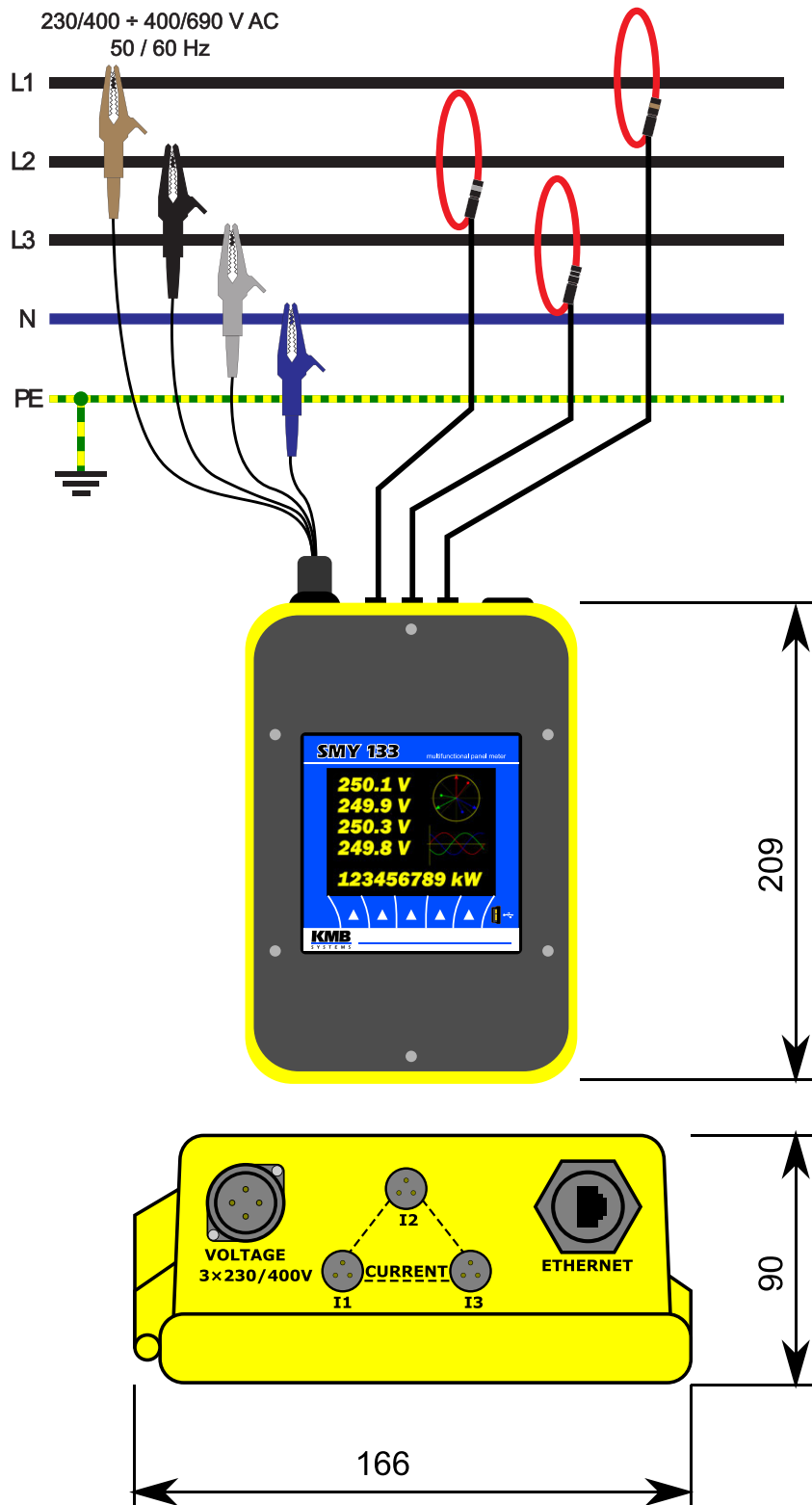


RCS module

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



SIMON S

Compact Power Quality Analyser



SIMON S 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 predecessor NEMO 104.

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 SIMON S is evaluated according to EN 50160 while PQ S module is used. It also records voltage events and other predefined phenomena. Its ultra compact robust 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
- optional class S power monitoring according to the international standard IEC 61000-4-30, ed. 2.
- power quality evaluation according to EN 50160 (PQ S)
- 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 4U, 4I	MEASUREMENT U, I, P, Q	PF, cos, THD	+/- Wh, varh	HARMONICS 50
BATTERY 	SAMPLING 25, 6kHz	FLASH 512MB	USB 	

Optional

WIFI 	STANDARDS class S IEC 61000-4-30
STANDARDS EN 50160	

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, 1 st harmonic) [act, avg, avg _{max} , avg _{min}]
	Reactive Power (Q)	Q1, Q2, Q3, QN, 3Q (import, export, total, 1 st 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	unbl, unbU, φnsI
	Voltage THD (THDU)	THDU1, THDU2, THDU3, THDUN
	Current THD (THDI)	THDI1, THDI2, THDI3, THDIN
	Individual Harmonics	Harmonics 1 st to 63 rd of Voltage and Current and their angles
	Fundament. Harmonic (U _{fh} , I _{fh})	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)
DATA LOG.	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, U _{fh} , I _{fh} , 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	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, WiFi

POWER	aux. voltage	85 ÷ 440 V _{AC}
	power	8 VA / 8 W
	meas. cat.	CAT IV / 300 V
INPUT VOLTAGE	meas. range	5 ÷ 1030 V _{LL} / 3 ÷ 600 V _{LN}
	connection	wye, delta, aron
	overload	800 V _{RMS} , 1200 V _{RMS} for 1s
CURRENT	measuring range	up to 10kA, depends on probe
	overload	-

OTHER TEMP	operating	-25 ÷ 50°C, <95% non-condens. environ.
	storage	-40 ÷ 85°C, <95% non-condens. environ.
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) KMBlong protocol IEEE 802.11 b,g

ACCURACY (IEC 61557-12)	voltage	0.5
	current	0.5
	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	

Ordering options

SIMON S 1 W	
Instrument Type	SIMON S = Portable Network Monitor
Current Inputs	0 = Without input for current probe 1 = 1 input for SI current probe (up to 4 currents)
Wireless Communication Interface	N = Without communication interface W = WiFi interface with internal antenna

Voltage sets

SU basic	Voltage measurement set – 8× croco-clip XKK-1001 (20mm span), 8× voltage cable XSMF-419 with fuses, 3× jumper cable SPQ-Ux, 2× spare fuse GT632210
SU plus	Voltage measurement set – 8× croco-clip XDK-1033 (30mm span, dolphin-clip), 8× voltage cable XSMF-419 with fuses, 3× jumper cable SPQ-Ux, 2× spare fuse GT632210
SU pro	Voltage measurement set – 8× croco-clip XDK-1033 (30mm span, dolphin-clip), 8× voltage cable XSMF-419 with fuses, 4× magnetic adapter for screw head XMA-7, 3× jumper cable SPQ-Ux, 2× spare fuse GT632210

Current probe options

SI 3000 4 JRF1	
Current Probe Type	SI = Probe for SIMON class instruments
Current Ranges	10000 = Inom 10000A/3000A/1000A/300A 3000 = Inom 3000A/1000A/300A/100A 1000 = Inom 1000A/300A/100A/30A 300 = Inom 300A/100A/30A/10A
Number of Current Sensors	3 = Three sensors 4 = Four sensors
Current Sensor Type	JRF55= Rogowski coil (Ø7mm), latch lock, length 20cm (Ø5,5cm), only I300 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)

SI 250 4 JCLA	
Current Probe Type	SI = Probe for SIMON class instruments
Current Ranges	250 = 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

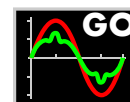
PQ S module

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.

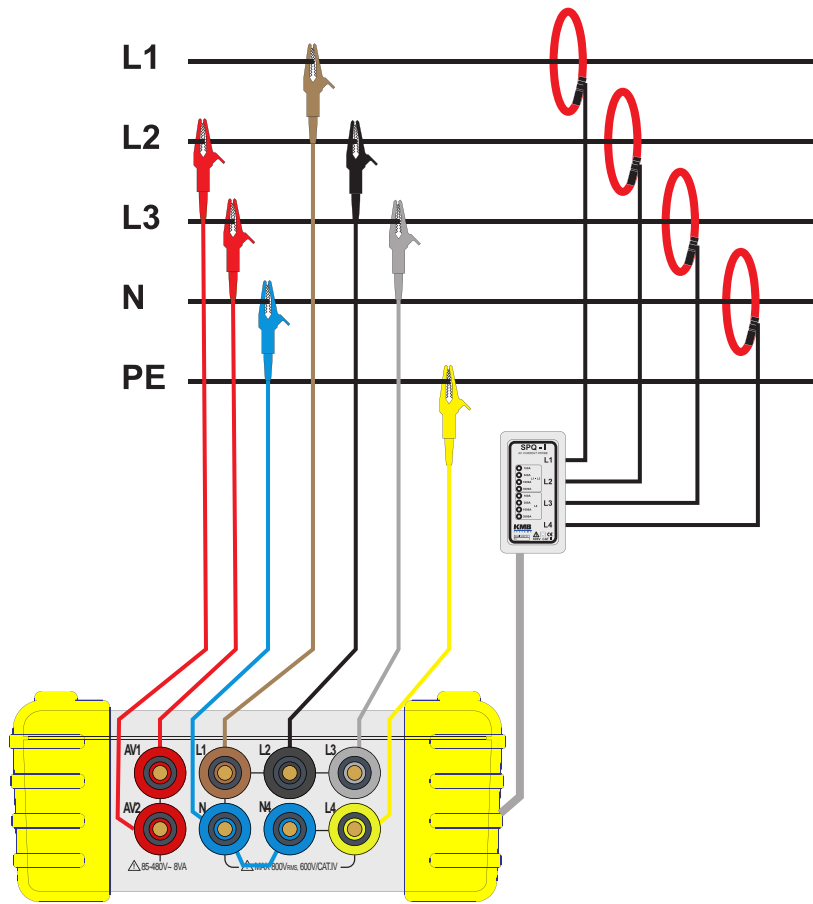


GO module

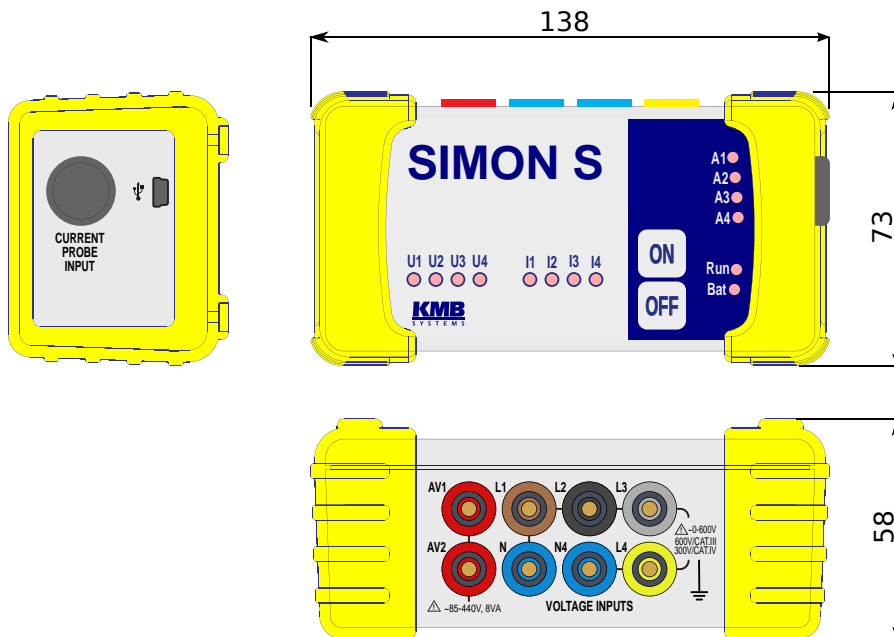
Module for detection and precise recording of various waveform distortions. This module records the so called oscillograms of voltages and currents in extended detail, capacity and trigger options into the flash memory.



Typical connection schema



Mechanical dimensions



Power Factor Controllers

Comparison table of power factor controllers															
NOVAR Model	Outputs R=relay T=thyristor	Sensitivity [mA]	2 nd tarif Input	Supply volt. up to 500V	Relay comm. pole Separated	Temp. meas. & fan control	Fast Compensation	Optional Rem. Comm.	Panel 144x144	Panel 96x96	DIN-rail	3-phase Controller	3-phase Analyser	Energy counter	Datalogger (512MB)
1005	5+1 R	20	x	x	x	✓	x	x	x	✓	x	x	x	x	x
1007	7+1 R	20	x	x	x	✓	x	x	x	✓	x	x	x	x	x
1005D	5+1 R	20	x	x	x	✓	x	x	x	x	✓	x	x	x	x
1007D	7+1 R	20	x	x	x	✓	x	x	x	x	✓	x	x	x	x
1106	6 R	2	x	x	x	✓	x	✓	✓	x	x	x	x	x	x
1114	14 R	2	x	x	x	✓	x	✓	✓	x	x	x	x	x	x
1206	6 R	2	✓	x	x	✓	x	✓	✓	x	x	x	x	x	x
1214	14 R	2	✓	x	x	✓	x	✓	✓	x	x	x	x	x	x
1106/S400	6 R	2	x	✓	✓	✓	x	✓	✓	x	x	x	x	x	x
1114/S400	14 R	2	x	✓	✓	✓	x	✓	✓	x	x	x	x	x	x
1206/S400	6 R	2	✓	✓	✓	✓	x	✓	✓	x	x	x	x	x	x
1214/S400	14 R	2	✓	✓	✓	✓	x	✓	✓	x	x	x	x	x	x
1312	12 T+2 R	2	✓	x	x	✓	✓	✓	✓	x	x	x	x	x	x
1312-3	12 T+2 R	2	✓	x	x	✓	✓	✓	✓	x	x	✓	x	x	x
2100	24 R/T	5	✓	✓	✓	✓	x	✓	✓	x	x	x	x	✓	x
2200	24 R/T	5	✓	✓	✓	✓	x	✓	✓	x	x	x	x	✓	x
2400	18 R/T	5	✓	✓	✓	✓	x	✓	✓	x	x	✓	✓	✓	x
2600	18 R/T	5	✓	✓	✓	✓	x	✓	✓	x	x	✓	✓	✓	✓

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 line¹ 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 and NOVAR 2200, 2400, 2600 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.

¹Please 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

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 18x 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

NOVAR 2600 R18 N L U 4T

Instrument class
NOVAR 2600 = 3-ph automatic PF controller, 144x144mm, LCD

Outputs
R09 = 9 relay outputs
R16 = 16 relay outputs + 1 digital input
R18 = 18 relay outputs
T18 = 18 transistor outputs

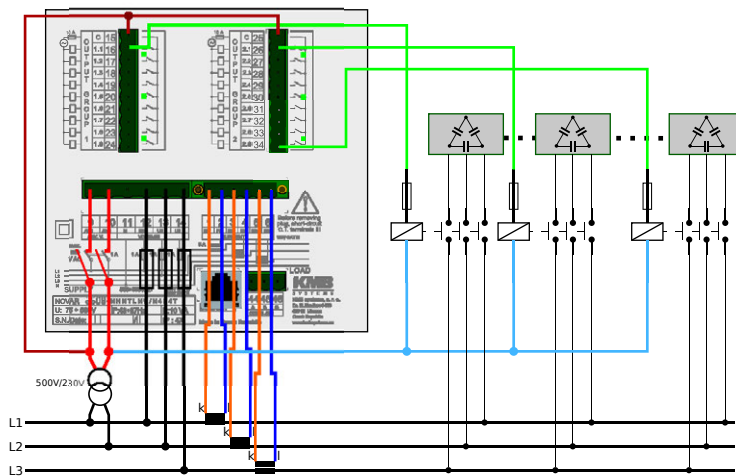
Relay Voltage Rating
N = max. 250 VAC
H = max. 400 VAC / 220 VDC

Data logging
N = max. & min. values registering, electricity meter readout
L = programmable datalogging, 512MB of internal memory

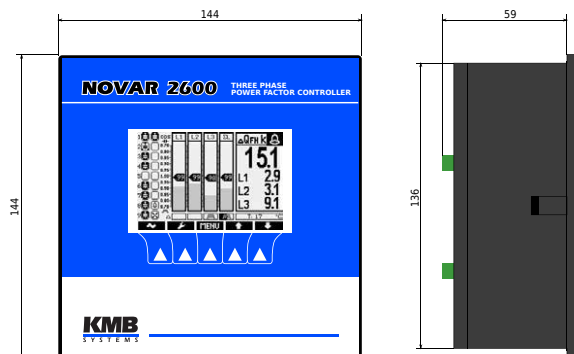
Local communication interface
U = USB communication interface

Remote communication interface and ext. thermometer input
N = USB
4 = USB, RS-485
4T = USB, RS-485, Pt100 external thermometer input
E = USB, Ethernet
E4 = USB, Ethernet, RS-485
ET = USB, Ethernet, Pt100 external thermometer input

Typical connection schema



Mechanical dimensions



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 both 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.

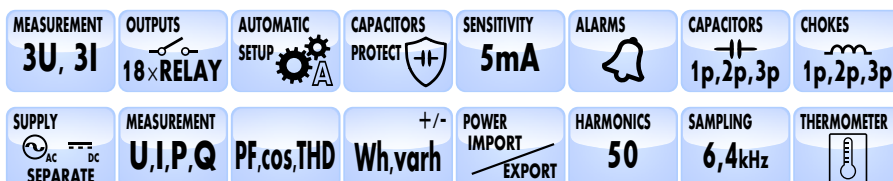
Typical applications: power factor correction in three phase unbalanced networks, to compensate frequent load changes (18 steps) also in single phase applications



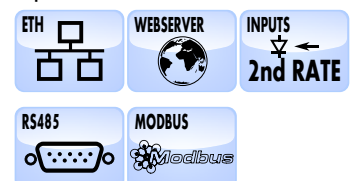
Key features:

- 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 both capacitors and reactors)
- RS-485 and Ethernet communication options
- embedded four quadrant electricity meter with TOU and power meter (class 0.5)

Standard



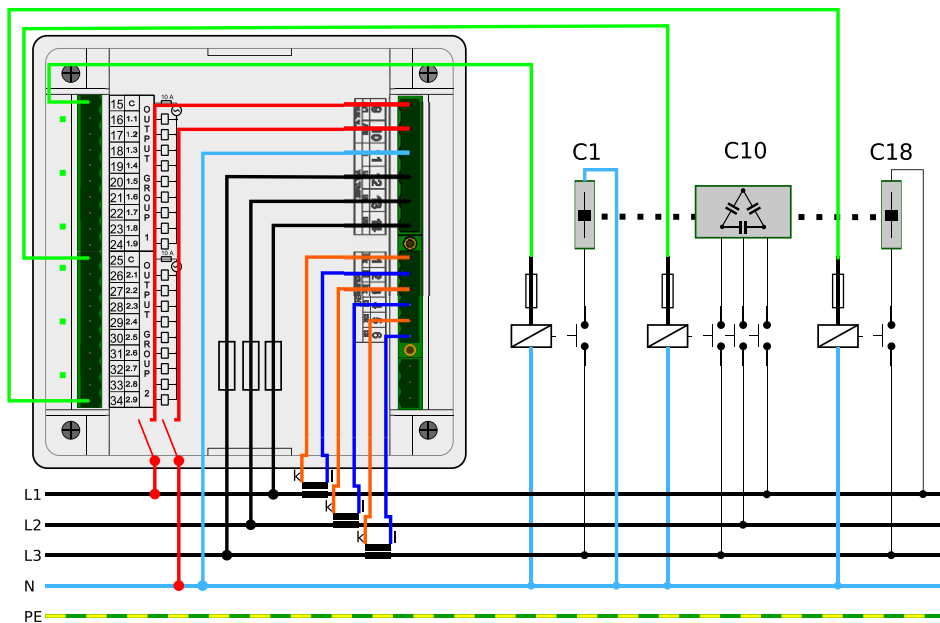
Optional



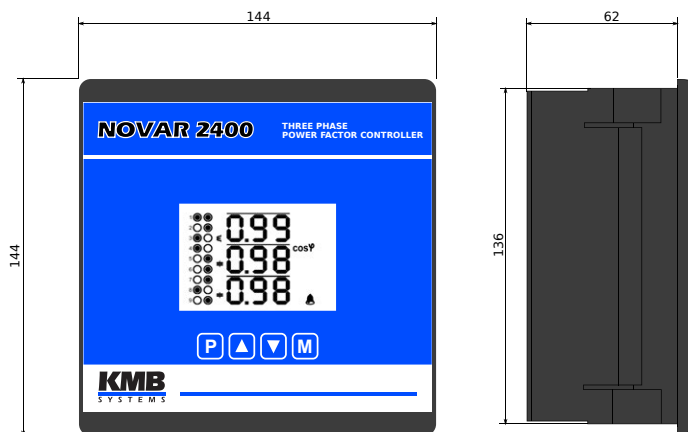
Ordering Options

		NOVAR 2400 R18 E
Instrument class		
NOVAR 2400 = Automatic power factor controller, 3U, 3I, 144x144		
Outputs		
R09	=	9 relay outputs
R16	=	16 relay outputs + 1 digital input
R18	=	18 relay outputs
T18	=	18 transistor outputs
Remote communication interface		
N	=	service USB
4	=	service USB, RS-485
E	=	service USB, Ethernet

Typical connection schema



Mechanical dimensions



NOVAR 2100 and 2200

Advanced Power Factor Controller

NOVAR 2100 and 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. USB is standard for all variants and makes configuration and commissioning quick and easy.

This controller builds on success of its predecessor 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 both capacitors and reactors)
- USB for configuration as standard
- RS-485 and Ethernet communication options
- embedded electricity meter

Standard

MEASUREMENT 1U, 1I	AUTOMATIC SETUP	CAPACITORS PROTECT	SENSITIVITY 5mA	ALARMS
CAPACITORS 3p	CHOKES 3p	MEASUREMENT U, I, P, Q	PF, cos, THD	Wh, varh
USB	POWER IMPORT EXPORT	HARMONICS 50	SAMPLING 6,4kHz	THERMOMETER

(NOVAR 2200)

SUPPLY AC DC SEPARATE

Optional

ETH	WEBSERVER
RS485	MODBUS
OUTPUTS 18x RELAY	INPUTS 2nd RATE

Ordering Options

NOVAR 2100 R18 E

Instrument class

NOVAR 2100 = Automatic PFC, 1U, 1I, USB, 144x144

NOVAR 2200 = Automatic PFC, 1U, 1I, separate power supply, USB, 144x144

Outputs

R09 = 9 relay outputs

R15 = 15 relay outputs

R18 = 18 relay outputs, 1 digital input

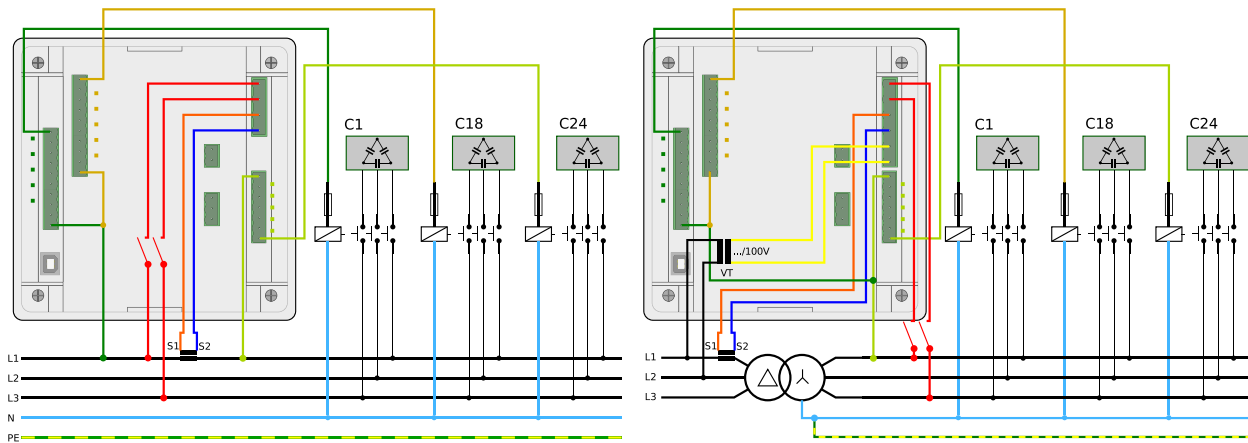
Remote communication interface

N = service USB, without remote communication

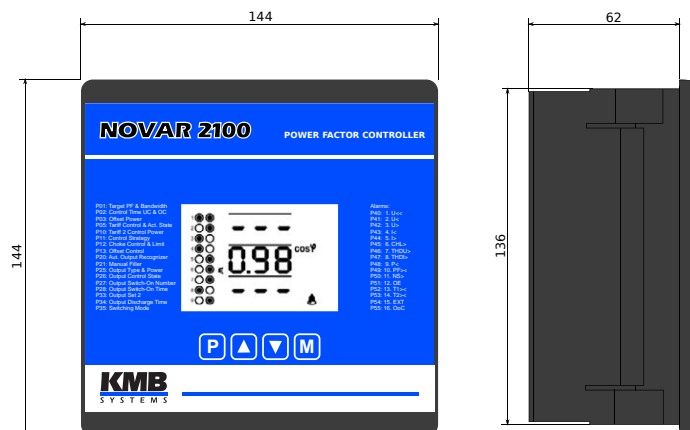
4 = service USB, RS-485

E = service USB, Ethernet

Typical connection schema



Mechanical dimensions



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 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 14x 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

MODBUS Modbus
RS485

Ordering Options

NOVAR 1214 4

Instrument Class
NOVAR = Automatic power factor controller

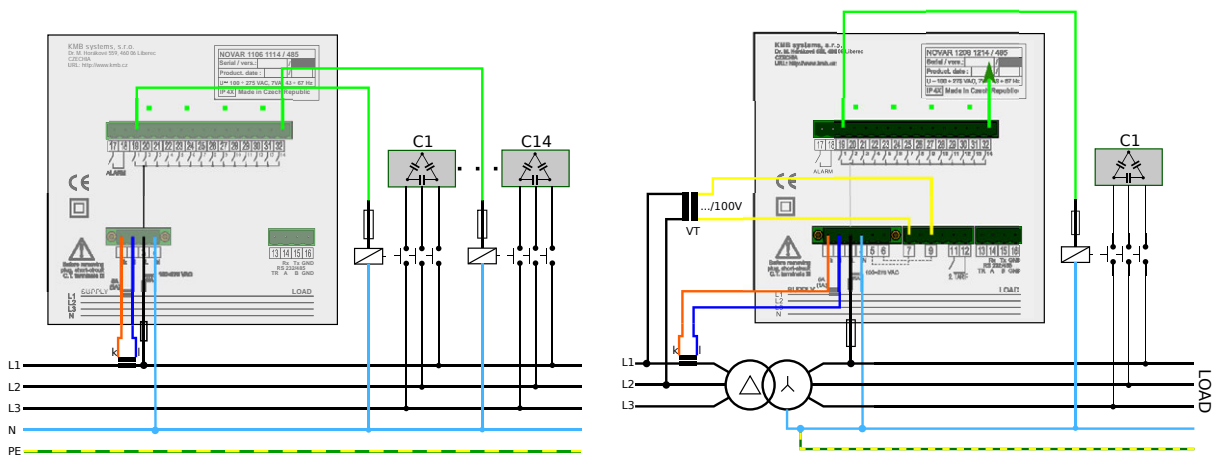
NOVAR model
11 = common terminal for measuring and supply voltage
12 = separated terminals for measuring and supply voltage

Outputs
06 = 6 relay outputs + 1 alarm relay
14 = 14 relay outputs + 1 alarm relay

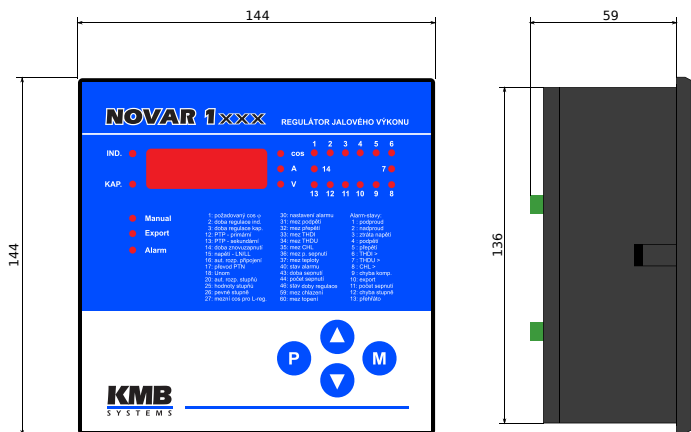
Supply voltage
_____ = Supply voltage up to 275V
/S400 = Supply voltage up to 500V, relays common pole separated

Remote Communication Interface
_ = Without remote communication interface
4 = RS-485

Typical connection schema



Mechanical dimensions



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 is fully backward compatible with the NOVAR 5 model (terminal, wiring). Furthermore, the NOVAR 1007 has 8 output relays.

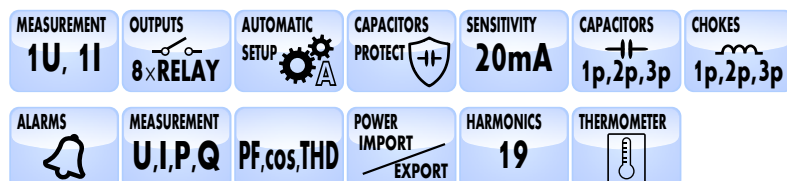
Both models are produced in two different housings. Standard model is determined for panel mounting. Models marked with D, such as NOVAR 1005D or NOVAR 1007D features different housing which is determined for DIN-rail installation.



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



Ordering Options

NOVAR 1007

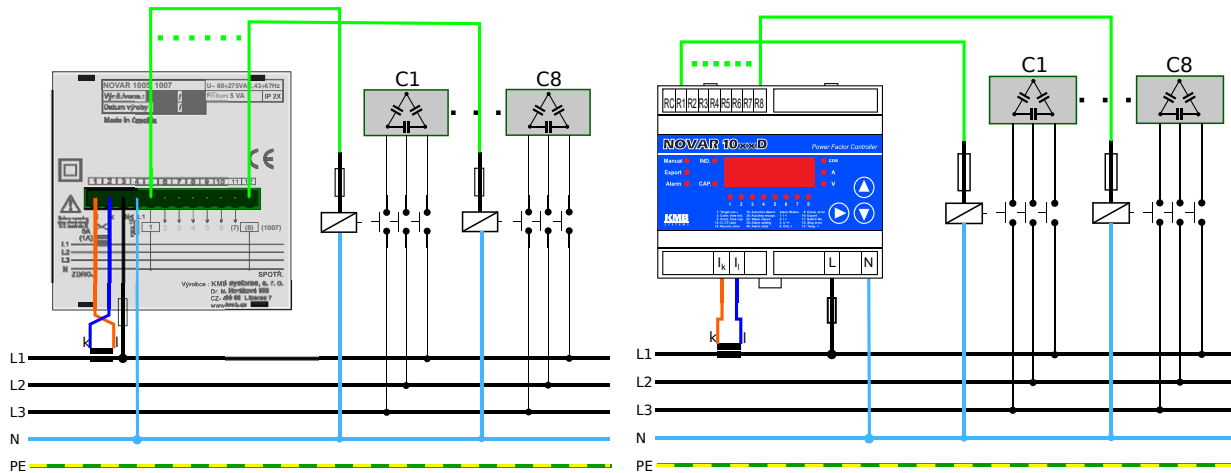
Instrument Class

NOVAR = Automatic power factor controller

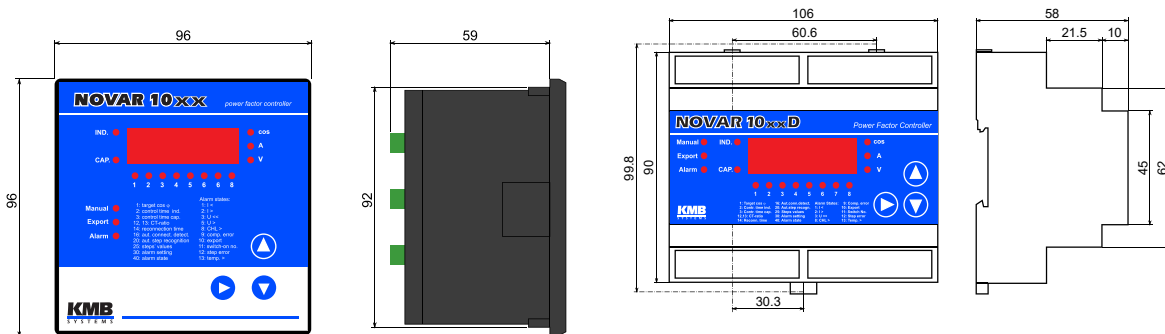
NOVAR model

- 1005 = panel mounted, dimensions 96x96mm, 6 relay outputs
- 1007 = panel mounted, dimensions 96x96mm, 8 relay outputs
- 1005D = DIN-railmounted, dimensions 6 modul, 6 relay outputs
- 1007D = DIN-railmounted, dimensions 6 modul, 8 relay outputs

Typical connection schema



Mechanical dimensions



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.

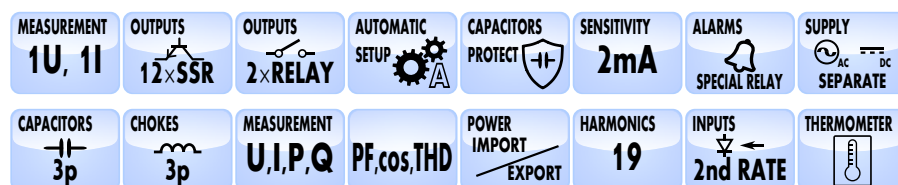
Typical applications: real time compensation, thyristor switched capacitors (TSC), combined compensation systems with fast thyristor modules and classic mechanical relays.

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 communication interface



Standard



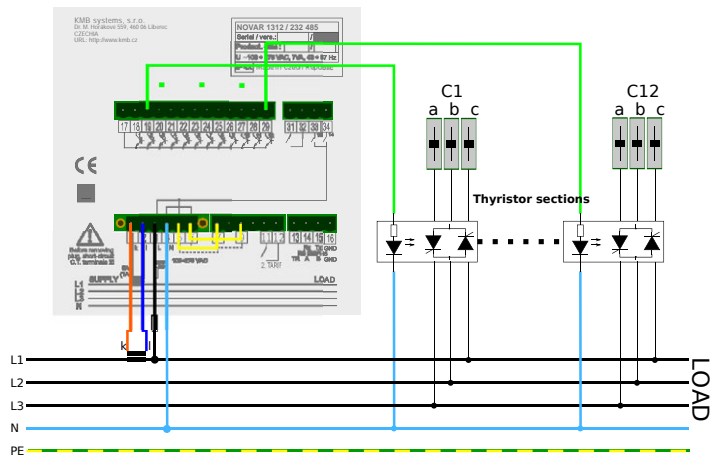
Optional



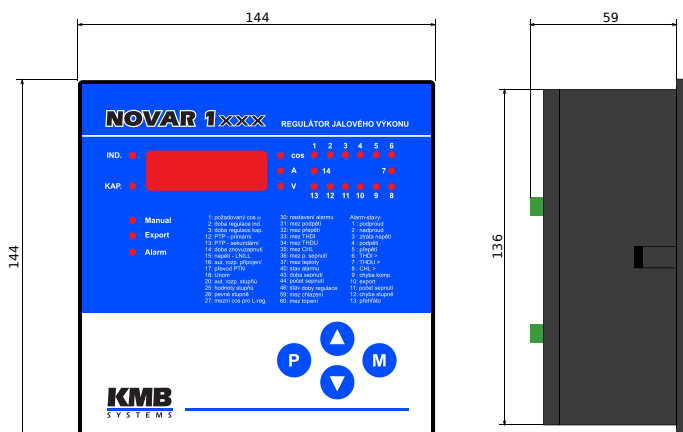
Ordering Options

		NOVAR 1312 4
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)		

Typical connection schema



Mechanical dimensions



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

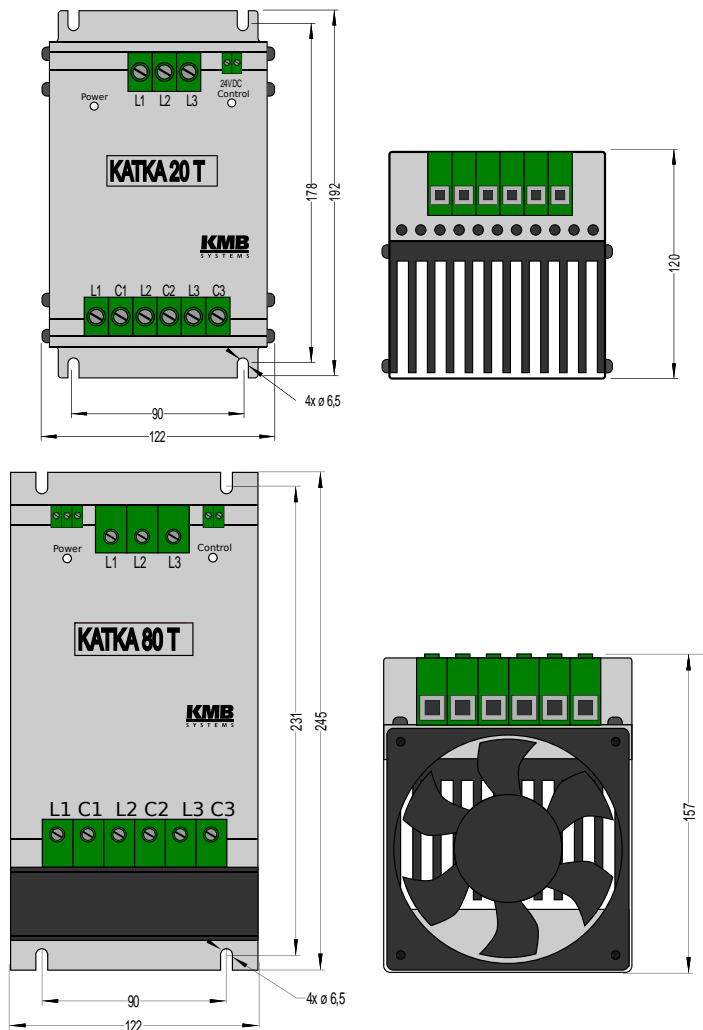
Ordering options

	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)

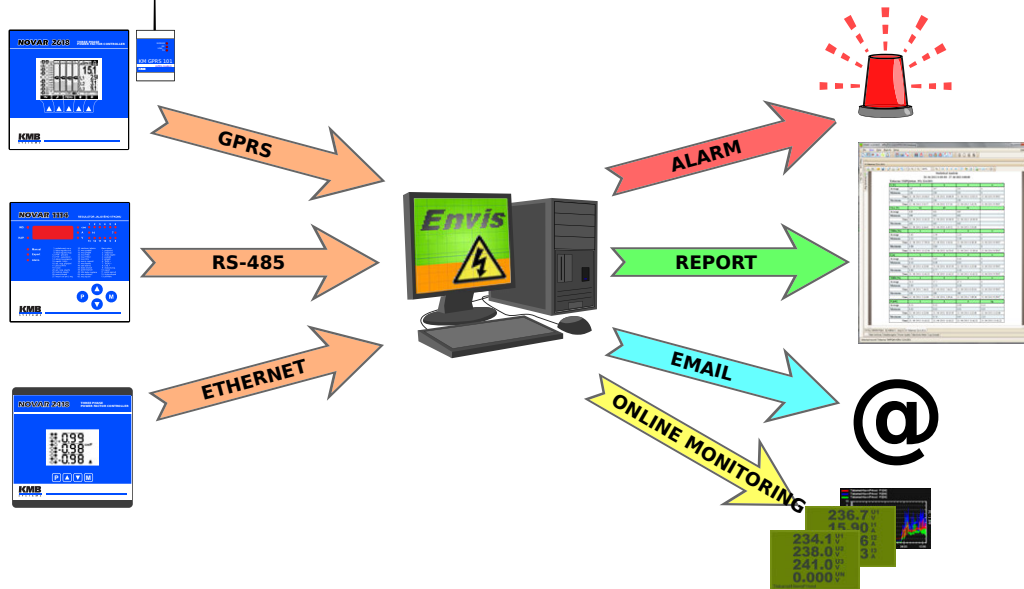
Technical specification

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

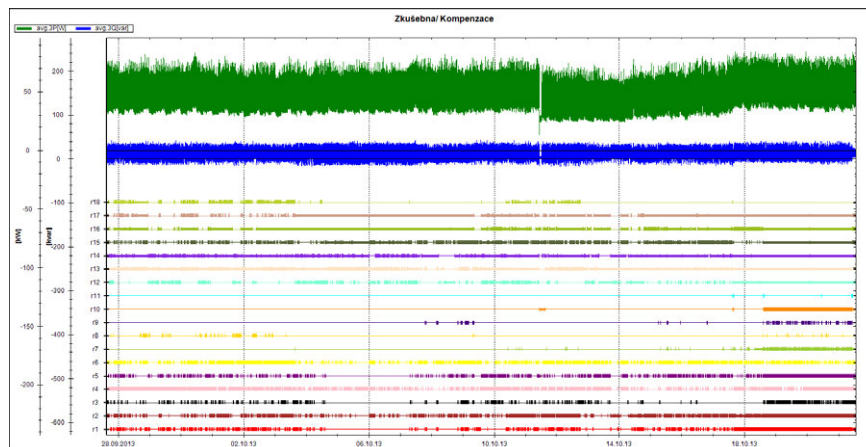


Figure 1: Record of power factor correction trend of NOVAR 2618 in ENVIS software

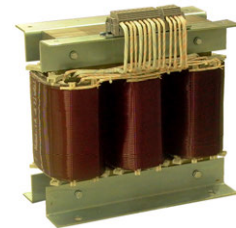
Distribution of Power Factor Correction components

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 to 900 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

LV and MV Capacitors

Power Factor Correction capacitors are used for individual or central power factor correction systems to compensate inductive reactive power of inductive loads such as electrical motors. This inductive power is undesirable for the grid operator who commonly penalize it therefore we should reduce it by implementing PFC. Additionally we can improve local power quality conditions by reduction of inductive reactive power.

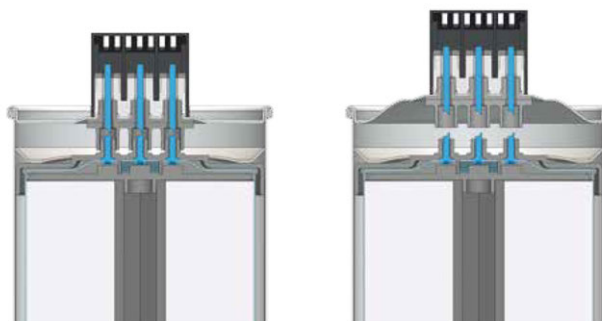
Capacitors are built from metallized polypropylene film with self-healing effect and extremely low dielectric losses. They are filled either by inert gas or non-toxic environmentally friendly semi-solid resin. All capacitors are equipped with automatic overpressure disconnecter, which ensures safe disconnection from the network in case of overload.



If THD-U in the network is over 3-5% it's good to consider Detuned Filter Reactors to protect the capacitors and extend lifetime of the system.

Key features:

- very low losses
- automatic overpressure disconnecter
- very long lifetime (over 150000h)
- built-in discharge resistors
- **1ph and 3ph** models from **230V up to 15kV** available



Overpressure disconnecter

3-phase, 400V, 50Hz, PFC capacitors, delta connection, MKP						
Type	Power [kvar]	Capacitance [μ F]	I_{nom} [A]	Filling	$\varnothing d \times H/H_{Total}$	Weight [kg]
CSADG 1-0,4/0,5	0,50	3×3,32	3×0,7	Gas	Ø85×175/226	0,50
CSADG 1-0,4/1	1,00	3×6,63	3×1,4	Gas	Ø85×175/226	0,60
CSADG 1-0,4/1,5	1,50	3×9,95	3×2,2	Gas	Ø85×175/226	0,60
CSADG 1-0,4/2	2,00	3×13,26	3×2,9	Gas	Ø85×175/226	0,70
CSADG 1-0,4/2,5	2,50	3×16,58	3×3,6	Gas	Ø85×175/226	0,70
CSADG 1-0,4/3,15	3,15	3×20,89	3×4,6	Gas	Ø85×175/226	0,70
CSADG 1-0,4/4	4,00	3×26,53	3×5,8	Gas	Ø85×175/226	0,80
CSADG 1-0,4/5	5,00	3×33,16	3×7,2	Gas	Ø85×175/226	0,90
CSADG 1-0,4/6,25	6,25	3×41,45	3×9,0	Gas	Ø85×175/226	1,00
CSADG 1-0,4/8	8,00	3×53,05	3×11,6	Gas	Ø85×245/296	1,00
CSADG 1-0,4/10	10,00	3×66,31	3×14,5	Gas	Ø85×245/296	1,10
CSADG 1-0,4/12,5	12,50	3×82,89	3×18,1	Gas	Ø85×245/296	1,20
CSADG 1-0,4/15	15,00	3×99,47	3×21,7	Gas	Ø110×245/296	1,60
CSADG 1-0,4/20	20,00	3×132,63	3×28,9	Gas	Ø110×245/296	1,90
CSADG 1-0,4/25	25,00	3×165,79	3×36,1	Gas	Ø110×245/296	2,10
CSADG 3-0,4/30	30,00	3×198,94	3×43,4	Gas	Ø136×220/271	2,90
CSADG 3-0,4/40	40,00	3×265,26	3×57,8	Gas	Ø136×261/324	3,40
CSADP 3-0,4/50	50,00	3×331,57	3×72,3	Gel	Ø136×355/418	5,20

3-phase, 440V, 50Hz, PFC capacitors, delta connection, MKP						
Type	Power [kvar]	Capacitance [μ F]	I_{nom} [A]	Filling	$\varnothing d \times H/H_{Total}$	Weight [kg]
CSADG 1-0,44/0,5	0,50	3×2,74	3×0,7	Gas	Ø85×175/226	0,60
CSADG 1-0,44/0,75	0,75	3×4,11	3×1,0	Gas	Ø85×175/226	0,60
CSADG 1-0,44/1	1,00	3×5,48	3×1,3	Gas	Ø85×175/226	0,60
CSADG 1-0,44/1,5	1,50	3×8,22	3×2,0	Gas	Ø85×175/226	0,60
CSADG 1-0,44/2	2,00	3×10,96	3×2,6	Gas	Ø85×175/226	0,60
CSADG 1-0,44/2,5	2,50	3×13,70	3×3,3	Gas	Ø85×175/226	0,60
CSADG 1-0,44/3,15	3,15	3×17,26	3×4,1	Gas	Ø85×175/226	0,70
CSADG 1-0,44/4	4,00	3×21,92	3×5,3	Gas	Ø85×175/226	0,70
CSADG 1-0,44/5	5,00	3×27,40	3×6,6	Gas	Ø85×175/226	0,80
CSADG 1-0,44/6,25	6,25	3×34,25	3×8,2	Gas	Ø85×175/226	0,90
CSADG 1-0,44/10	10,00	3×54,81	3×13,1	Gas	Ø85×245/296	1,00
CSADG 1-0,44/12,5	12,50	3×68,51	3×16,4	Gas	Ø85×245/296	1,20
CSADG 1-0,44/15	15,00	3×82,21	3×19,7	Gas	Ø85×245/296	1,30
CSADG 1-0,44/18,2	18,20	3×99,75	3×23,9	Gas	Ø110×245/296	1,90
CSADG 1-0,44/20	20,00	3×109,61	3×26,3	Gas	Ø110×245/296	1,90
CSADG 1-0,44/25	25,00	3×137,01	3×32,8	Gas	Ø110×245/296	2,10
CSADG 1-0,44/28	28,10	3×154,00	3×36,9	Gas	Ø110×245/296	2,20
CSADG 3-0,44/30	30,00	3×164,42	3×39,4	Gas	Ø136×220/271	2,90
CSADG 3-0,44/40	40,00	3×219,22	3×52,5	Gas	Ø136×261/324	3,30
CSADP 3-0,44/50	50,00	3×274,03	3×65,7	Gel	Ø136×355/418	5,20

Other types available on request.

Detuned Filter Reactors

Detuned Harmonic Filter Reactors are used in series with capacitor banks in power factor correction units. Main purpose of these reactors is protection of power factor correction capacitors against negative effects of the harmonics in the system.

Reactors are designed in compliance with EN 61558-2-20. Vacuum impregnated varnish ensures moisture-immune and silent operation. All models are equipped with thermal switch for overload protection.

While designing the system, correct resonance frequency must be chosen according to harmonic analysis of the system, where total THDV as well as individual harmonics level is concern. Most typical resonance frequencies are 189Hz ($p=7\%$) and 134Hz ($p=14\%$) but others are also available on request.



Key features:

- protects PFC capacitors against harmonics
- thermal switch for overload protection
- vacuum impregnated varnish for silent operation

Designing the protected PFC system

First is to determine total reactive power of the PFC system and steps which is done similarly to standard unprotected system. Then it's good to make harmonic analysis of the system which gives us levels of individual harmonics and total THDU. Based on the results we have to select proper detuning factor (p)/resonance frequency of the reactor. Most typically reactors with $p = 7\%$ are used, it resonates at 189Hz which is below most common 5th harmonics (250Hz) and possible resonance between capacitor and network inductance is therefore prevented. In case of high content of 3rd harmonics (150Hz) in the system it might be necessary to use reactor with $p = 14\%$ which resonates at 134Hz (below 3rd harmonic). 7% type reactor might have negative effect on stability of the system because it will greatly raise levels of 3rd harmonic. When proper reactor type is selected we need to choose appropriate capacitor based on its capacitance, when it's paired wrongly it can resonate on different frequency and cause serious problems. Furthermore voltage of fundamental harmonic (50Hz) is raised by resonance behind the reactor, therefore higher voltage rated capacitors have to be selected. Typically in 400V systems with 7% reactors we use 440V rated capacitor, because voltage is raised up to 430V. When 14% reactor is used voltage raise over 460V and most typically 480V or 525V rated capacitors are used.

50-ERH 7/400/440/44,4-a1

Nominal power of the capacitor

Reactor type

Detuning factor (p)

Nominal power of the block

Nominal voltage of the capacitor

Nominal voltage of the network

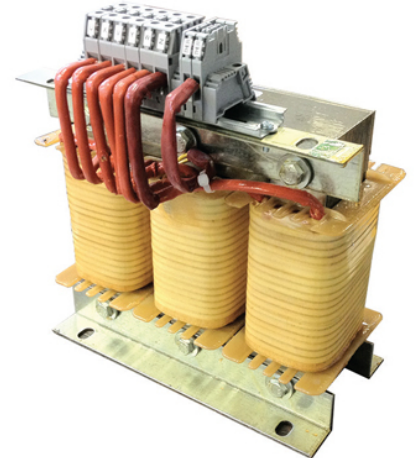
7% Harmonic filter reactors, 189Hz							
Type	Inductance [mH]	Power of step at 400V [kvar]	Suitable capacitor		I _{nom} [A]	I _{lin} [A]	Weight [kg]
			Power at 440V [kvar]	Capacitance [uF]			
1,5 – ERH 7/400/440/1,3-al	28,82	1,3	1,5	3 × 8,2	2,14	4,47	2,5
2,5 – ERH 7/400/440/2,22-al	17,42	2,2	2,5	3 × 13,7	3,60	7,40	3,0
3,15 – ERH 7/400/440/2,8-al	12,17	2,8	3,15	3×17,3	4,62	10,08	3,5
5 – ERH 7/400/440/4,44-al	8,70	4,4	5,0	3 × 27,4	7,13	14,7	4,0
6,25 – ERH 7/400/440/5,6-al	6,85	5,6	6,25	3 × 34,3	8,93	18,78	5,0
10 – ERH 7/400/440/8,89-al	4,31	8,9	10,0	3 × 54,8	14,28	29,82	8,0
12,5 – ERH 7/400/440/11,1-al	3,45	11,1	12,5	3 × 68,5	17,85	37,26	8,0
15 – ERH 7/400/440/13,3-al	2,87	13,3	15,0	3 × 82,2	21,42	44,73	10,0
20 – ERH 7/400/440/17,77-al	2,16	17,7	20,0	3 × 109,6	28,55	59,63	11,5
25 – ERH 7/400/440/22,2-al	1,72	22,2	25,0	3 × 137,0	35,69	74,54	16,5
28,2 – ERH 7/400/440/25-al	1,53	25,0	28,2	3 × 154,5	40,25	84,00	18,0
30 – ERH 7/400/440/26,7-al	1,43	26,7	30,0	3 × 164,4	42,83	89,45	14,0
40 – ERH 7/400/440/35,5	1,08	35,5	40,0	3 × 219,2	57,12	100,00	15,3
45 – ERH 7/400/440/40-al	0,96	40,0	45,0	3 × 246,6	64,25	134,18	18,1
50 – ERH 7/400/440/44,3-al	0,86	44,4	50,0	3 × 274,0	71,39	149,08	20,0
56,4 – ERH7/400/440/50-al	0,77	50,0	56,4	3 × 309,0	80,50	168,00	26,0
60 – ERH 7/400/440/53,5-al	0,72	53,6	60,0	3 × 328,0	85,67	178,90	22,0
75 – ERH 7/400/440/66,6-al	0,58	66,6	75,0	3 × 411,0	107,08	223,63	34,0
100 – ERH 7/400/440/88,8-al	0,43	88,8	100	3 × 548,0	142,78	298,17	38,0

14% Harmonic filter reactors, 134Hz							
Type	Inductance [mH]	Power of step at 400V [kvar]	Suitable capacitor		I _{nom} [A]	I _{lin} [A]	Weight [kg]
			Power at 440V [kvar]	Capacitance [uF]			
2.5 – ERH 14/400/480/2-al	41,45	2,0	2,5	3 x 11,5	3,20	5,60	2,2
5 – ERH 14/400/480/4-al	20,73	4,0	5,0	3 × 23,0	6,30	11,10	3,5
7,5 – ERH 14/400/480/6,25-al	13,82	6,25	7,0	3 × 34,5	9,60	16,90	4,5
10 – ERH 14/400/480/8,1-al	10,36	8,1	10,0	3 x 46,1	12,44	22,67	5,5
12,5 – ERH 14/400/480/10,1-al	8,21	10,1	12,5	3 x 57,6	15,55	28,34	10,0
15 – ERH 14/400/480/12,1-al	6,84	12,1	15,0	3 x 69,1	18,64	34,00	12,0
20 – ERH 14/400/480/16,2-al	5,13	16,2	20,0	3 x 92,1	24,85	45,30	16,0
25 – ERH 14/400/480/20,2-al	4,11	20,2	25,0	3 x 115,1	31,05	56,60	18,0
31,05 – ERH 14/400/480/25-al	3,32	25,00	31,05	3 x 143,0	38,60	70,38	25,0
50 – ERH 14/400/480/40,38-al	2,05	40,38	50,0	3 x 230,3	62,10	113,30	33,0
60 – ERH 14/400/480/48,4-al	1,71	48,4	60,0	3 x 276,0	74,50	136,00	37,0
62.1 – ERH 14/400/480/50-al	1,65	50,0	62,1	3 x 286,0	77,15	140,70	38,0
75 – ERH 14/400/480/60,6-al	1,37	60,6	75,0	3 x 345,4	93,17	170,00	48,0
100 – ERH 14/400/480/80,7-al	1,03	80,7	100,0	3 x 460,5	124,20	227,00	60,0
123.8 – ERH 14/400/480/100-al	0,83	100,0	123,8	3x570,3	153,90	280,70	71,0

Other types available on request.

Shunt Reactors

Shunt reactors are mainly used in places where overcompensation is the problem. Typically they are used to compensate capacitive power of long power transmission and distribution lines, on solar farms, wind parks and any other site where is too high capacitive load. This capacitive characteristics causes system to become overcompensated which usually results in penalties from utility because of high capacitive demand. Furthermore this capacitive characteristic causes the line voltage to increase and may damage sensitive equipment connected to it. This problem can be seen in industrial zones, large commercial buildings, data centers and other large objects.



Key features:

- One or three phase, highly permeable iron core
- Thermal fuse protection against overheating in all phases
- Vacuum impregnated varnish to ensure silent and moisture-immune operation
- Low losses, high efficiency

Designing the PFC system with de-compensation ability

Shunt reactor can be permanently connected to system to compensate static capacitive load, such as long cable. This method is simplest but definitely not optimal and efficient because of the heat and losses. Better solution is to include shunt reactor to PFC system, where it will be used only when it is necessary (during nights when inductive load of facility reduces etc.). When implemented in PFC system it's very important to use controller which allows shunt reactors switching and de-compensation such as NOVAR controller. Similarly to capacitors, shunt reactors are sized in kvar which indicates its reactive power and works in exact opposite to capacitors. That means effect of 50kvar capacitors can be negated with 50kvar shunt reactor. Usually PFC cabinet uses multiple capacitor banks with one larger shunt reactor and power factor controller can combine simultaneously capacitive and inductive steps to reach maximal number of possible inductive and capacitive powers. This is not only possible way of usage, various other systems where multiple shunt reactors or exclusively shunt reactors are used in PFC system in combination with advanced NOVAR power factor controllers.

ERS3 – 400/5

Type

ERS3 = 3-phase shunt reactor
ERS1 = 1-phase shunt reactor

Nominal Voltage

Nominal Reactive Power

3-phase, 400V, Shunt Reactor					
Type	Power [kvar]	Inductance [mH]	I _{nom} [A]	Max Losses [W]	Weight [kg]
ERS3 – 400/0,25	0,25	2043	0,36	17	2,4
ERS3 – 400/0,5	0,5	1000	0,7	33	3
ERS3 – 400/1	1	505	1,45	40	5
ERS3 – 400/1,5	1,5	336	2,2	75	7,5
ERS3 – 400/2	2	252	2,9	90	9
ERS3 – 400/2,5	2,5	203	3,6	98	10
ERS3 – 400/3	3	170	4,3	107	12
ERS3 – 400/3,5	3,5	146	6,5	130	17
ERS3 – 400/4	4	128	7,5	150	21
ERS3 – 400/4,5	4,5	113	8,33	170	22
ERS3 – 400/5	5	100	7,2	195	20
ERS3 – 400/6,25	6,25	81	9	207	25
ERS3 – 400/8	8	64	11,5	220	30
ERS3 – 400/10	10	51	14,5	280	34
ERS3 – 400/12,5	12,5	41	18,1	308	45
ERS3 – 400/15	15	34	21,6	320	60
ERS3 – 400/20	20	25,5	29	385	90
ERS3 – 400/25	25	20,4	36,3	420	115
ERS3 – 400/30	30	17	43,5	447	125
ERS3 – 400/40	40	12,75	58	542	140
ERS3 – 400/50	50	10,2	72,5	698	160
ERS3 – 400/80	80	6,3	116	1158	260
ERS3 – 400/100	100	5	145	1050	273

1-phase, 230V, Shunt Reactor					
Type	Power [kvar]	Inductance [mH]	I _{nom} [A]	Max Losses [W]	Weight [kg]
ERS1 – 230/0,125	0,125	1523	0,55	10	2,4
ERS1 – 230/0,25	0,25	672	1,10	17	3,0
ERS1 – 230/0,5	0,50	338	2,20	33	5,0
ERS1 – 230/0,8	0,80	220	3,35	38	7,5
ERS1 – 230/1	1,00	168	4,35	40	9,0
ERS1 – 230/1,25	1,25	135	5,50	70	10,0
ERS1 – 230/1,5	1,50	103	6,60	75	12,0
ERS1 – 230/2	2,00	77	8,80	90	17,0
ERS1 – 230/2,5	2,50	67	11,00	98	21,0
ERS1 – 230/3	3,00	56	13,10	107	22,0
ERS1 – 230/5	5,00	34	21,80	195	20,0
ERS1 – 230/7,5	7,50	22	32,70	215	25,0
ERS1 – 230/10	10,00	17	43,50	280	30,0

Other types available on request.

Split-Core CT

Split-core current transformers are compact and lightweight transformers for accurate monitoring of the current in LV networks. Its Split-core construction allows quick and easy installation on cables or bus bars without interruption of the power. Transformers are available in various outputs where X/5A are most common one. Smaller sized JS24S and JS36S designed mainly for measuring on cables are additionally equipped with overvoltage protection which prevent CT destruction when secondary side is disconnected.



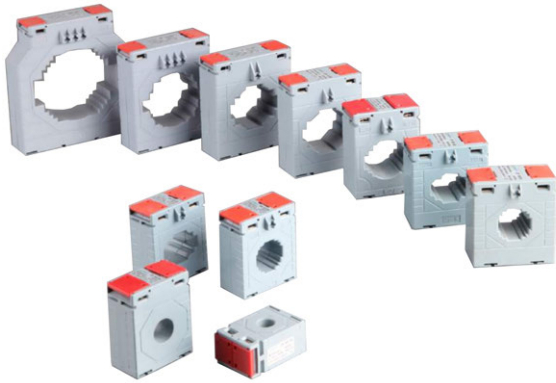
Key features:

- compact and lightweight
- quick and easy installation
- protection against overvoltage for extra security and safety (JS models)

Type	Inom [A]	Window size [mm]	Burden [VA]	Accuracy class	Dimmension [mm]	Construction
JS24S - 100/5A	100	24	1.5	3	75×45×34	
JS24S - 150/5A	150	24	1.5	3	75×45×34	
JS24S - 200/5A	200	24	1.5	3	75×45×34	
JS24S - 250/5A	250	24	1.5	3	75×45×34	
JS36S - 300/5A	300	36	0.5	1	92×57×40	
JS36S - 400/5A	400	36	0.5 / 2.5	0.5S/1	92×57×40	
JS36S - 600/5A	600	36	0.5 / 5	0.5S/1	92×57×40	
KMS-58 - 300/5A	300	53×83	2.5 / 5	0.5 / 1	158×127×52	
KMS-58 - 600/5A	600	53×83	5 / 10	0.5 / 1	158×127×52	
KMS-58 - 1200/5A	1200	53×83	10	0.5	158×127×52	
KMS-812 - 600/5A	600	83×123	2.5 / 5	0.5 / 1	198×157×52	
KMS-812 - 1600/5A	1600	83×123	10	0.5	198×157×52	
KMS-812 - 2500/5A	2500	83×123	15	0.5	198×157×52	
KMS-816 - 5000/5A	5000	83×163	15 / 30	0.5 / 1	245×197×73	

Other types available on request.

Solid-Core CT



Solid-core current transformers are compact precise transformers for accurate monitoring of the current in LV networks. Its solid-core construction allows secure installation on cables or bus bars of various sizes and shapes. Transformers are available in various outputs where X/5A are most common one. It can be mounted on panel, attached to the cable or bus-bar or fixed on DIN35 rail via supplied adapter.

Key features:

- compact and accurate
- fits most sizes of the cables and bus-bars
- adapter for DIN35 or panel mounting

Type	Inom [A]	Burden [VA]	Accuracy class	Construction
KM – 62B	10/5A	1.5 / 2,5	0.5/1	
KM – 45/14	30/5A, 50/5A, 75/5A	2,5	1	
KM – 62/30	100/5A, 150/5A, 200/5A, 250/5A, 300/5A	3 / 5	0.5/1	
KM – 62/40	400/5A, 500/5A, 600/5A	3 / 5	0.5/1	
KM – 74/50	400/5A, 600/5A, 800/5A, 1000/5A	3 / 5	0.5/1	
KM – 140/100	1200/5A, 1600/5A, 2000/5A, 2500/5A, 3200/5A	15/20	0.5/1	

Other types available on request.

AFR 31

Smart Load to Reduce VT Ferroresonance

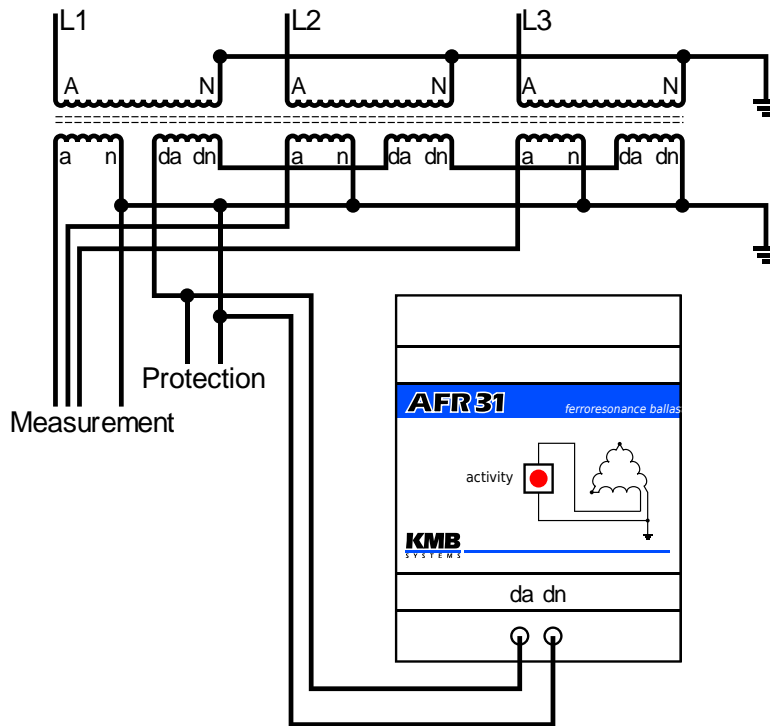
The AFR 31 Smart Load is an instrument designed to protect metering voltage transformers against adverse effects of ferroresonance in medium voltage power distribution systems with ungrounded or indirectly grounded neutral wire. Ferroresonance comes up between transformer inductance and conductors' or 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.).



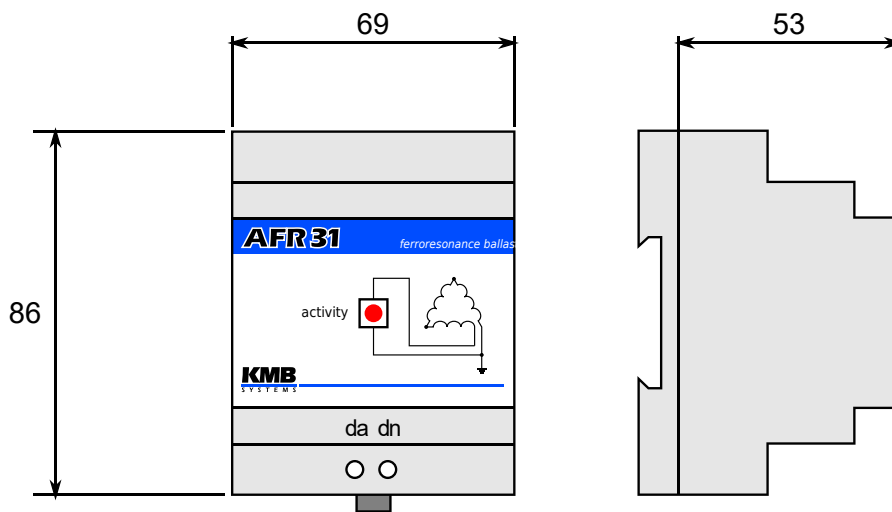
Key features:

- 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



Mechanical dimensions



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 50

Instrument Class

AFR = Smart load to reduce ferroresonance

Connection of protected VT

111 = 1 pole VT
131 = 3 phase measuring with open delta secondary

Extending modules

N = no extension
V = memory for events, RS-485 communication interface

Power supply

N = supply from protected VT
L = separate 10 ÷ 265 VAC, 10 ÷ 265 VDC

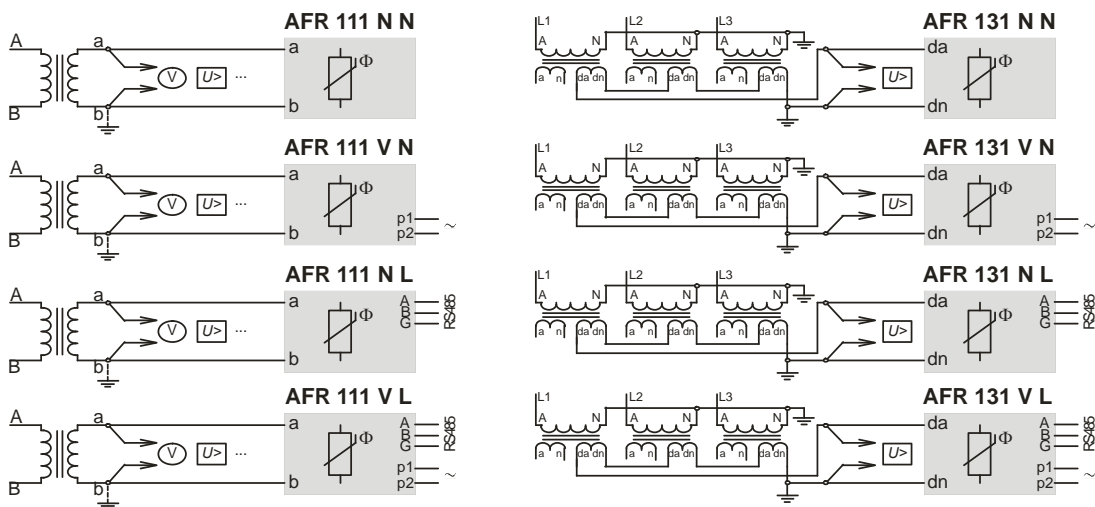
Nominal voltage

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 = 57,7 VAC
110/V3 = Nominal secondary voltage of VT Un = 63,5 VAC
120/V3 = Nominal secondary voltage of VT Un = 69,3 VAC
220 = Nominal secondary voltage of VT Un = 220VAC, only AFR 111 N N 220-__
230 = Nominal secondary voltage of VT Un = 220VAC, only AFR 111 N N 230-__
Other voltages on request.

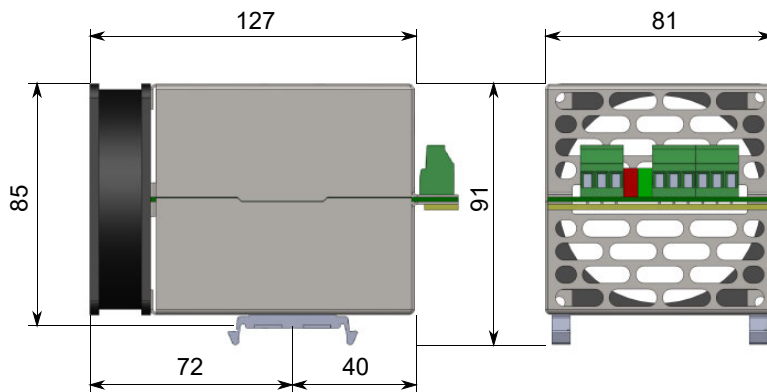
Nominal frequency

50 = for 50Hz networks
60 = for 60HZ networks

Typical connection schema



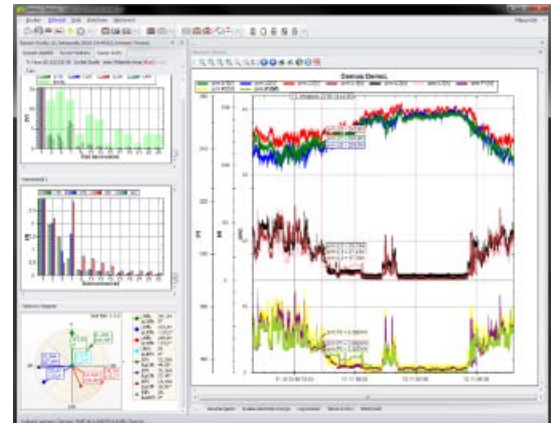
Mechanical dimensions



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.

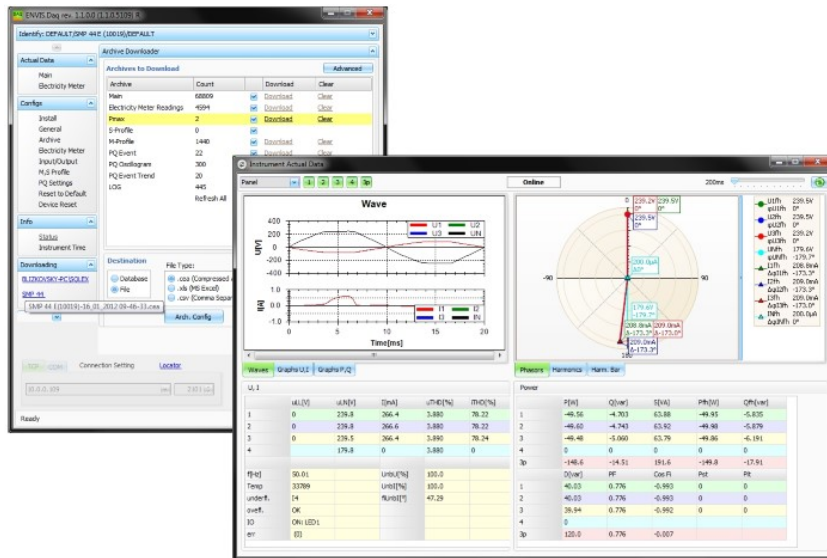


Key audience:

- 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.



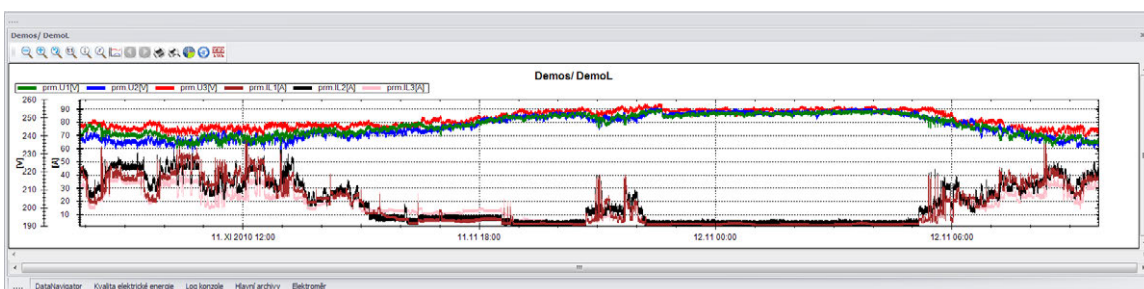
Content of ENVIS Application Suite

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.

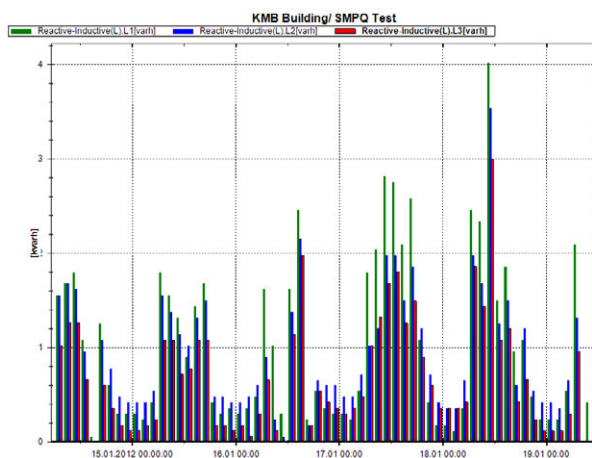
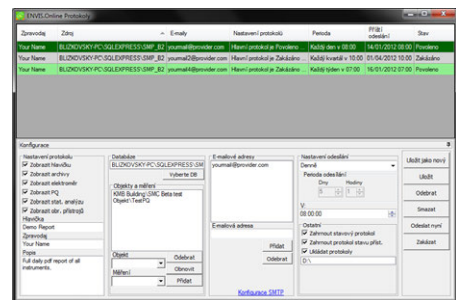
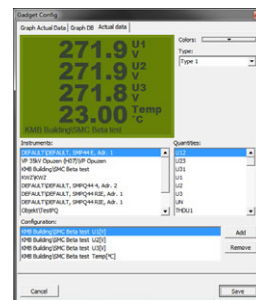
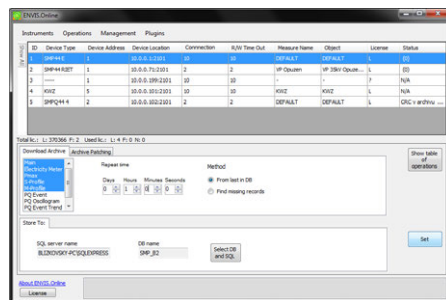
ENVIS.Daq (Data Acquisition) for instrument handling. Daq provides features for remote device configuration/programming, archive acquisition (download records) and saves it to various formats. This tool can be run as a standalone Windows application or initiated directly from ENVIS application. Meters 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 via e-mail, SNMP, SMS or directly to desktop.



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.

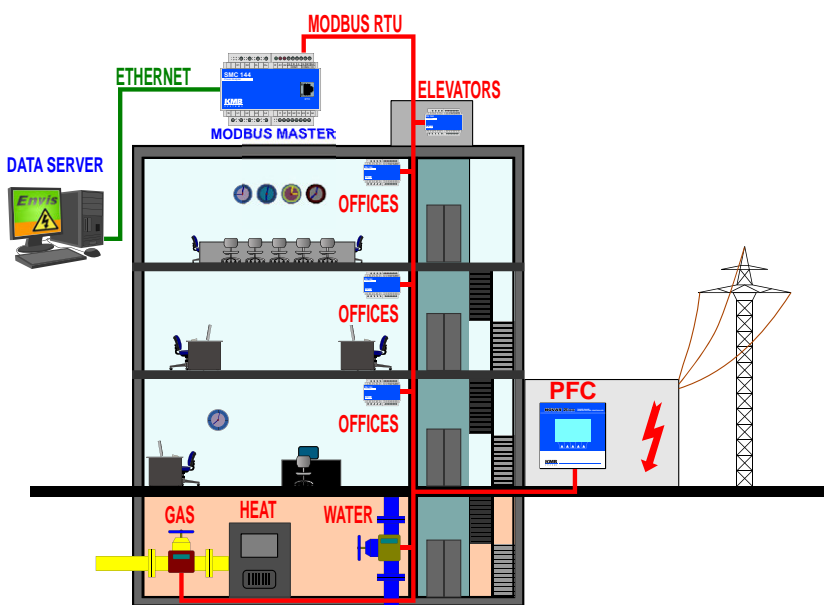
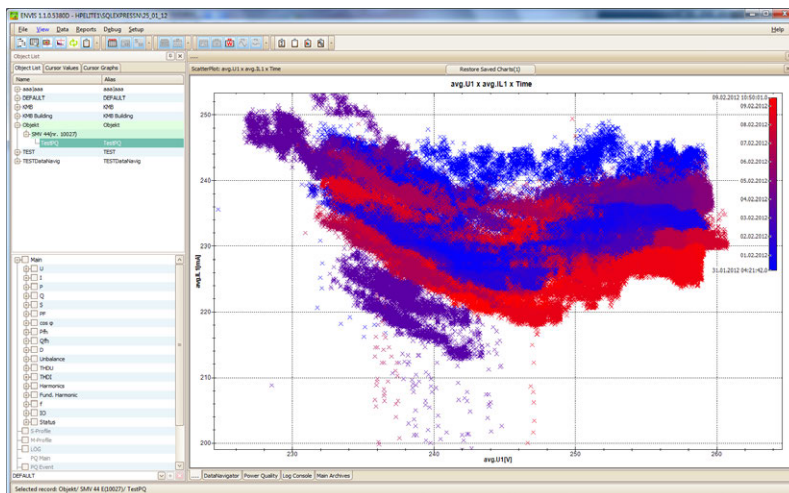


ENVIS is also a SCADA application for specific instruments - the **ENVIS.Online system service is a reliable and transparent tool to handle instruments** connected to your PC. It manages periodical downloads of the instrument. Also it monitors actual values of selected quantities or inputs and generate events/alerts 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 ENVIS 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 selfdonly required. For specific projects we can also add special functions.

In the past we have helped the ENVIS 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 timestamp. 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

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