

# How to do ... with PowerView3.0

## Instruction tips

Version 1.6.7 Code No. 20 753 092



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# 1 Introduction

**PowerView3.0** is a common application for management of the new generation of Metrel's PQ instruments.

With this application the wide palette of Metrel's Power Quality Instruments can be managed. Metrel PowerView3 is a powerful tool for downloading, analysing and printing recorded data for Metrel Power Quality instruments. Through a simple but powerful interface, PowerView3 helps you find your data quickly, while allowing you to easily make complex analysis and data comparisons.

## 1.1 Supported instruments:

This application is fully compatible with the new generation of Metrel's PQ instruments, starting with:

- Power Master XT – MI 2893,
- Power Master - MI 2892,
- Master Q4 – MI 2885,
- Energy Master XA – MI 2884,
- Energy Master – MI 2883.

Also, some other older PQ instruments are supported:

- PowerQ – MI 2492 (HW5)
- PowerQ Plus – MI 2392 (HW5)
- Power Q4 - MI 2592
- PowerQ4 Plus – MI 2792
- PowerQ4 Plus - MI 2792A

## 1.2 Supported Operating Systems:

Microsoft Windows 7 SP1

Microsoft Windows 8.1

Microsoft Windows 10 Anniversary update

Microsoft Windows 11

## 1.3 Supported Languages:

Since PowerView supports different languages, the list of supported languages could vary from different type of release:

ENGLISH, GERMAN, CHINESE, FRENCH, SPANISH, KOREAN, POLISH, RUSSIAN, SLOVAK, ITALIAN, UKRAINIAN, LITHUANIAN, SLOVENE



# 2 PowerView 3.0 installation

**PowerView3.0** supports 32-bit and 64-bit operation system. Installation file for each operation system is different:

- 32-bit → PowerView.v3.0.0.45xx.x86
- 64-bit → PowerView.v3.0.0.45xx.x64;

where "45xx" presents the PowerView3.0 version release.

Two “setup” files are available:

-  Windows Installer Package setup file
-  Application setup file

## 2.1 Installation procedure

Double click on  **PowerViewSetup** :

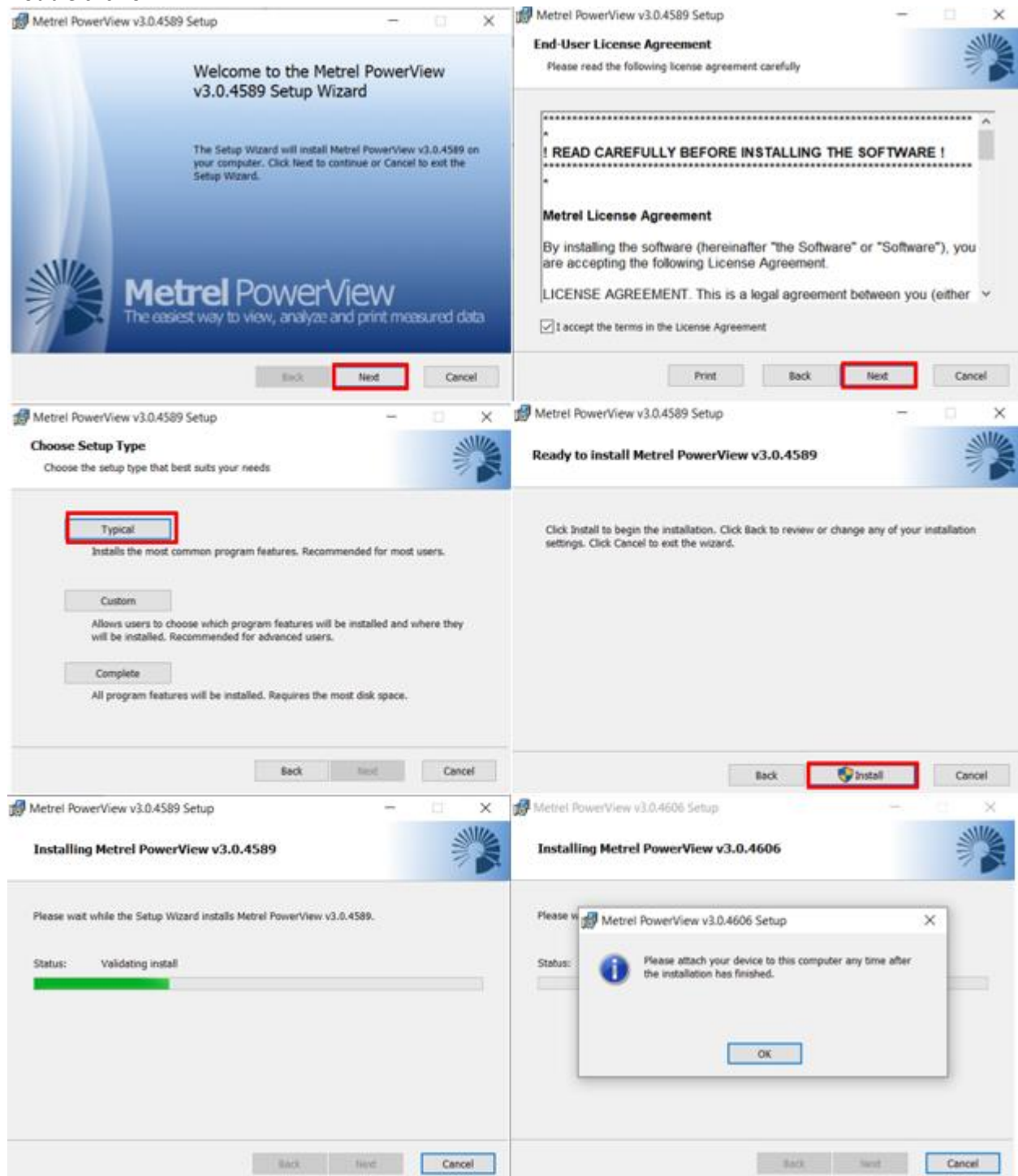


Figure 1 Successful PowerView installation

In case, that PowerView, normally due to administrator restrictions are not installed successfully following screen will appear:



Figure 2 Unsuccessful PowerView installation

In such case, try to start the installation through the "setup.exe" installation file, use option "Run as administrator".

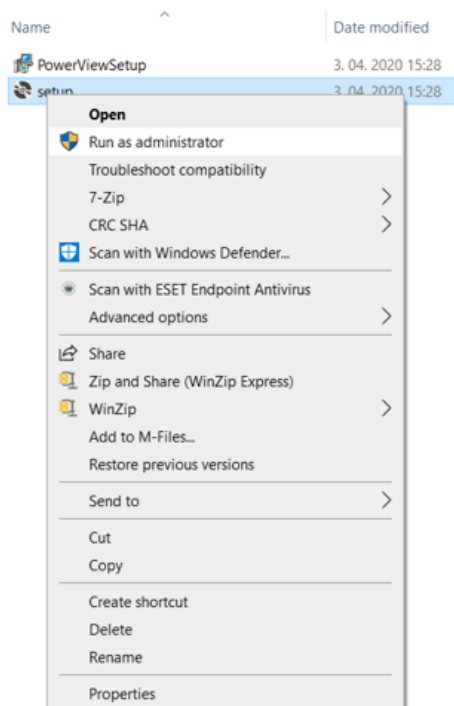


Figure 3 PowerView installation via "setup.exe" file

### 3 Starting with PowerView



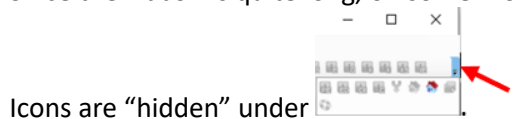
During the installation procedure short cut icon is created the PC desktop. Double click will start the application and PowerView Quick Start window appears:



Figure 4 PowerView initial windows screen

#### 3.1 Icon's explanation ad how to “make visible the whole ribbon”?

Since the ribbon is quite long, on some monitors (or PC's) whole ribbon is not visible.



Icons are “hidden” under

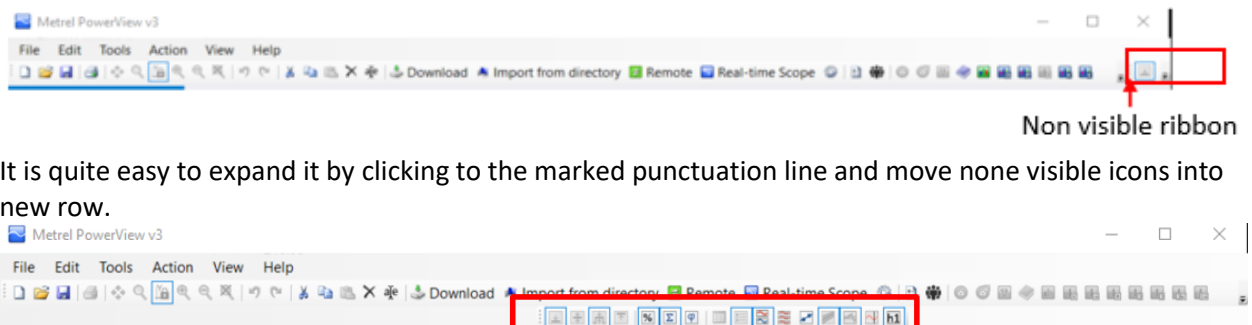
































Figure 5 Extended the ribbon in two rows



Table 1 PowerView ribbon's description

	Open New Folder.
	Open New Document.
	Save Document
	Print selected documents
	Chart panning (active, when Trend Chart is zoomed)
	Manual Zoom <ul style="list-style-type: none"> <li>- "Ctrl + Mouse Wheel" for X-axis zoom</li> <li>- "Shift + Mouse Wheel" for Y-axis zoom</li> </ul>
	Lock Y axis (Manual Zoom Only)
	Zoom In X-Axis ("Ctrl + Mouse Wheel Up")
	Zoom Out X-Axis ("Ctrl + Mouse Wheel Down")
	Reset Zoom
	Undo (last operation)
	Redo (last Undo operation)
	Cut
	Copy
	Paste
	Delete
	Rename
	Download data from the Instrument
	Import data from Folder
	Remote connection to the Instrument
	Real-time Scope (on line) data monitor
	Configure instrument
	Options settings
	Contacts management
	Create Snapshot
	Update Snapshot
	Change TDD calculation settings (related to AVR phase current/Nominal transformer current)
	Create Generic report from current view
	Define Power Quality Criteria (EN 50160, GOST 32144/33073, CHINESE)
	Create GOST 32144/33073 compliant report
	Create EN 50160 compliant report
	Create OSINERGMIN report

	Create Korean report
	Create Korean report ver. 2
	Create KESS report
	Create IEEE 519 compliant report
	Create Energy report
	Create Energy Demand report
	Create Código de Red report
	Create Chinese report
	Average measured data
	Add new site
	Add new location within site
	Merge records
	Repair Record Data
	Toggle Min interval display
	Toggle Avg (Average) interval display
	Toggle AvgOn (Average while active) interval display
	Toggle Max interval display
	Show harmonic values in percent
	Show Energy as Cumulative values
	Show displacement factor in degrees
	Show Table in Chart View
	Show chart legend
	Split data to multiple panes
	Split data by phase number
	Show data markers
	Show Min-Max range as filled area
	Show EN 50160 criteria as chart regions
	Show Flag Markers
	Show First Harmonic

**Note 1:** some icons became active after opening the PowerView file or selecting specific Quantity.

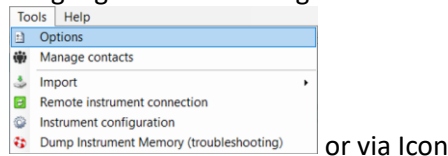
**Note 2:** access to the specific functions is available by selecting appropriate quantity and the clicking the right mouse button.

## 3.2 Language settings

There are many different languages supported (Check **Item 1.3**). Since PowerView is under daily development and implementation of new strings/functions, some of strings could not be presented in local language. No translated terms will be presented in default English language till the next updated localisation file.

PowerView selects the “language”, based on the Windows settings. If appropriate language is not supported in PowerView, the English localisation will be taken.

Language could be changed via: OPTIONS → ENVIRONMENT



or via Icon

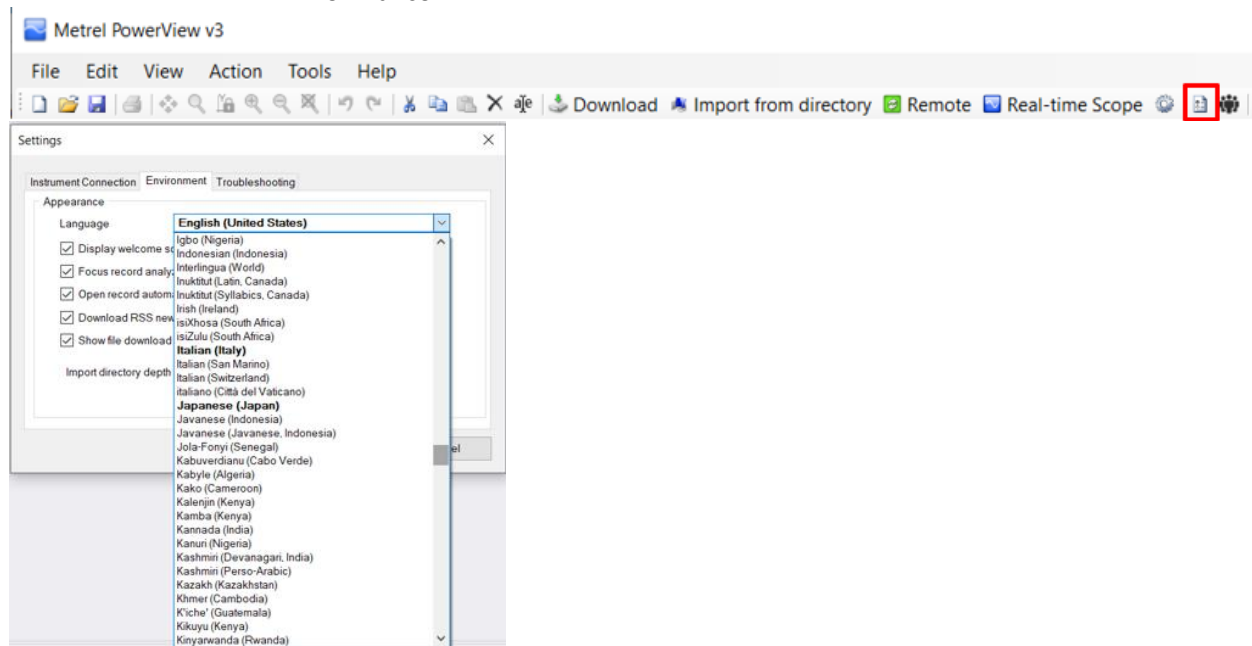


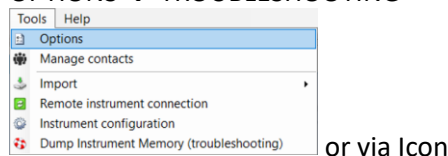
Figure 6 Language selection

Supported languages are bolded.

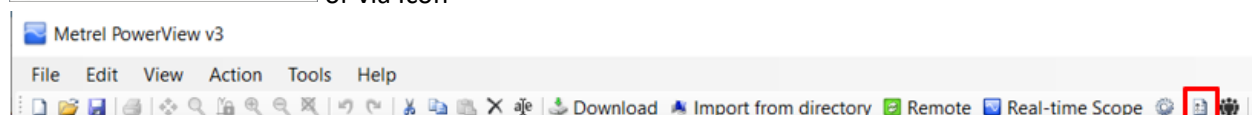
## 3.3 Troubleshooting

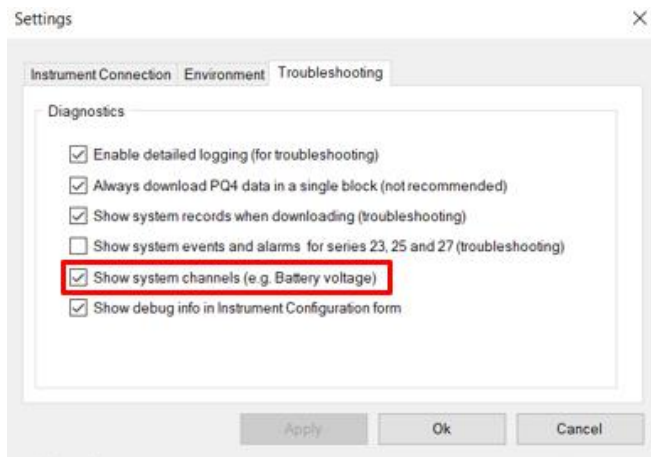
During the data download (import) different specific information data could be imported. Different options could be selected from:

OPTIONS → TROUBLESHOOTING



or via Icon





Example for presentation of Battery voltage (and temperature):

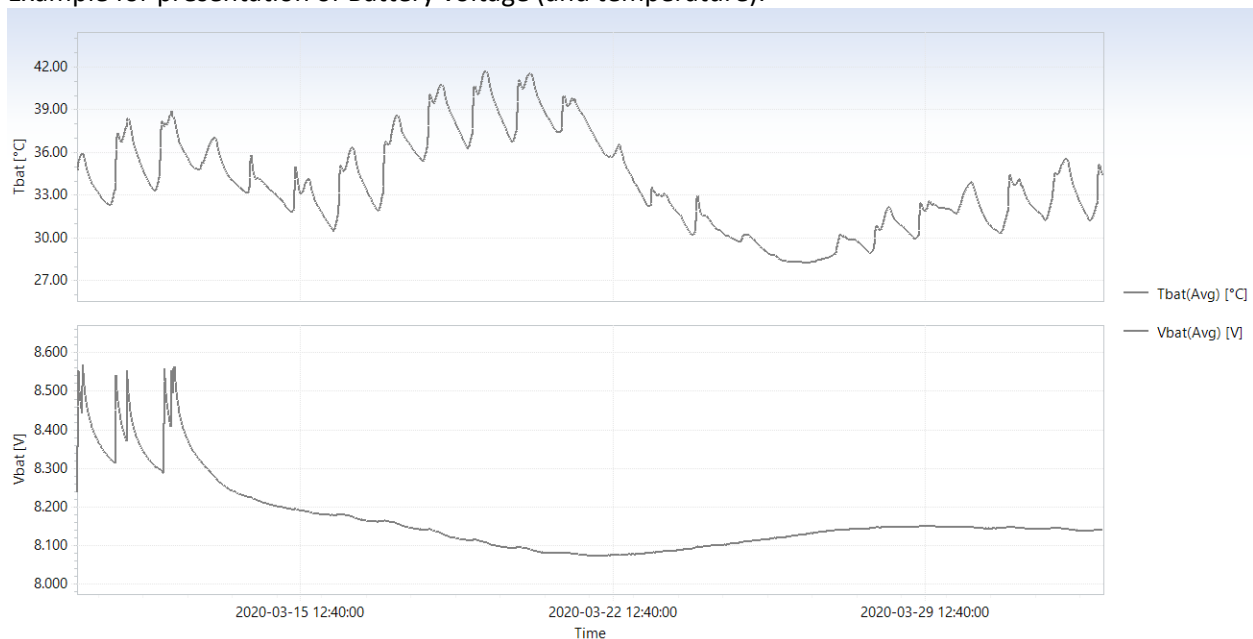
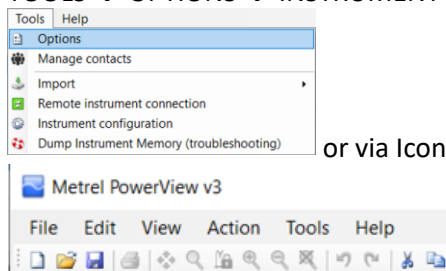


Figure 7 Battery voltage and temperature graphical presentation

### 3.4 Data download

Data could be directly downloaded from the Power Quality Instrument. Communication channel could be selected from

TOOLS → OPTIONS → INSTRUMENT CONNECTION



Few options available:

- Serial – direct connection between PC and PQI via serial (RS232) port on the PC.

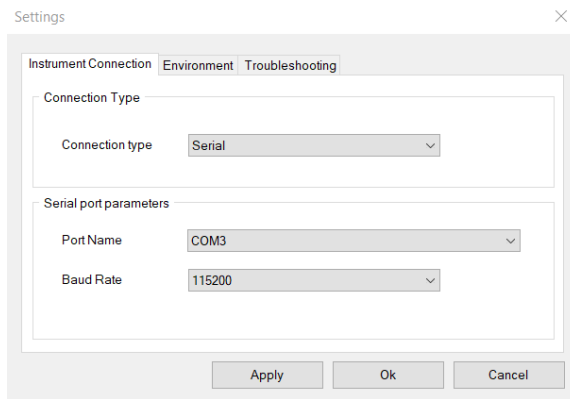


Figure 8 Serial port selection

- USB – direct connection between PC and PQI via USB port on the PC.

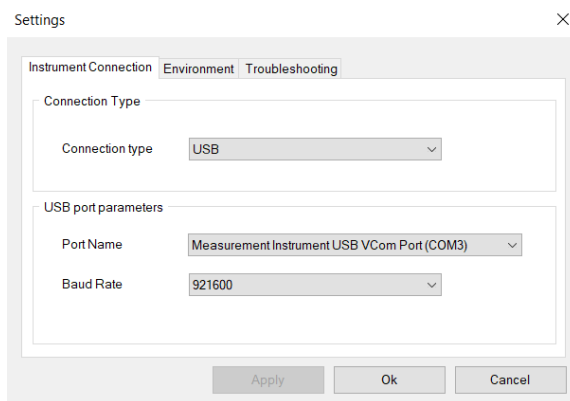


Figure 9 USB port selection

- TCP/IP – remote connection via TCP/IP between PC and PQI via Ethernet port on the PC.

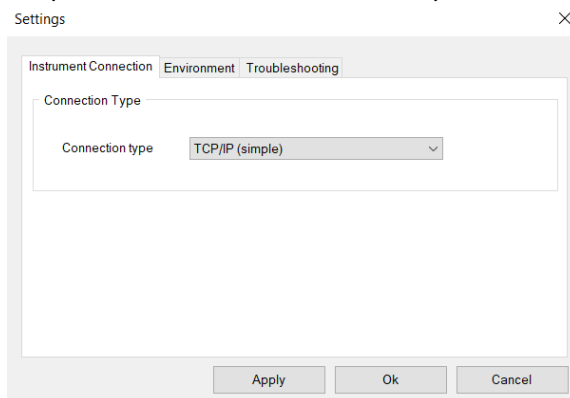


Figure 10 TCP/IP connection selection

**Note:** to connect to PQI via TCP/IP, only PQI S/N and “Secret key” should be entered to PowerView. Connection is performed via Metrel server.

- Internet – remote connection via TCP/IP between PC and PQI via Ethernet port on the PC.

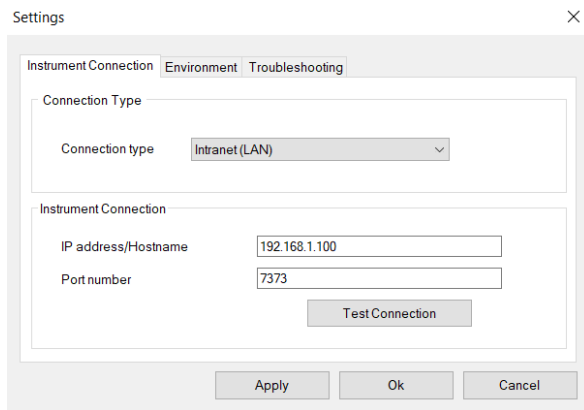


Figure 11 Intranet (LAN) connection selection

**Note:** this type of connection is directly between PC and PQI. In this case; IP address and specific port should be entered.

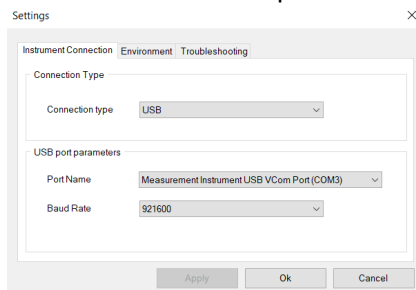
**Note:** Each connection should be properly setup on the PQ Analyser. For specific connection, please check connection setup in the Power Quality Installation manual.

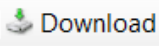
For downloading huge files, we suggest to remove SD card from the PQ analyser and import data directly from the card.

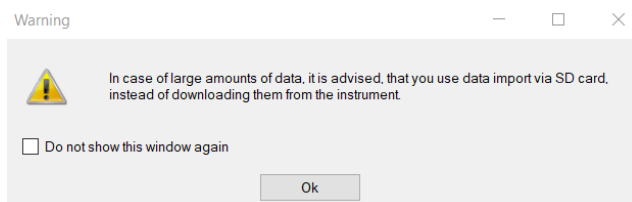
### 3.4.1 Data download (local) via USB

Procedure:

1. Connect PC and PQI with USB cable
2. Setup the “PC connection” on the PQI to “USB”
3. In the PowerView setup the USB connection type



4. Select “DOWNLOAD” function  and download selected files.



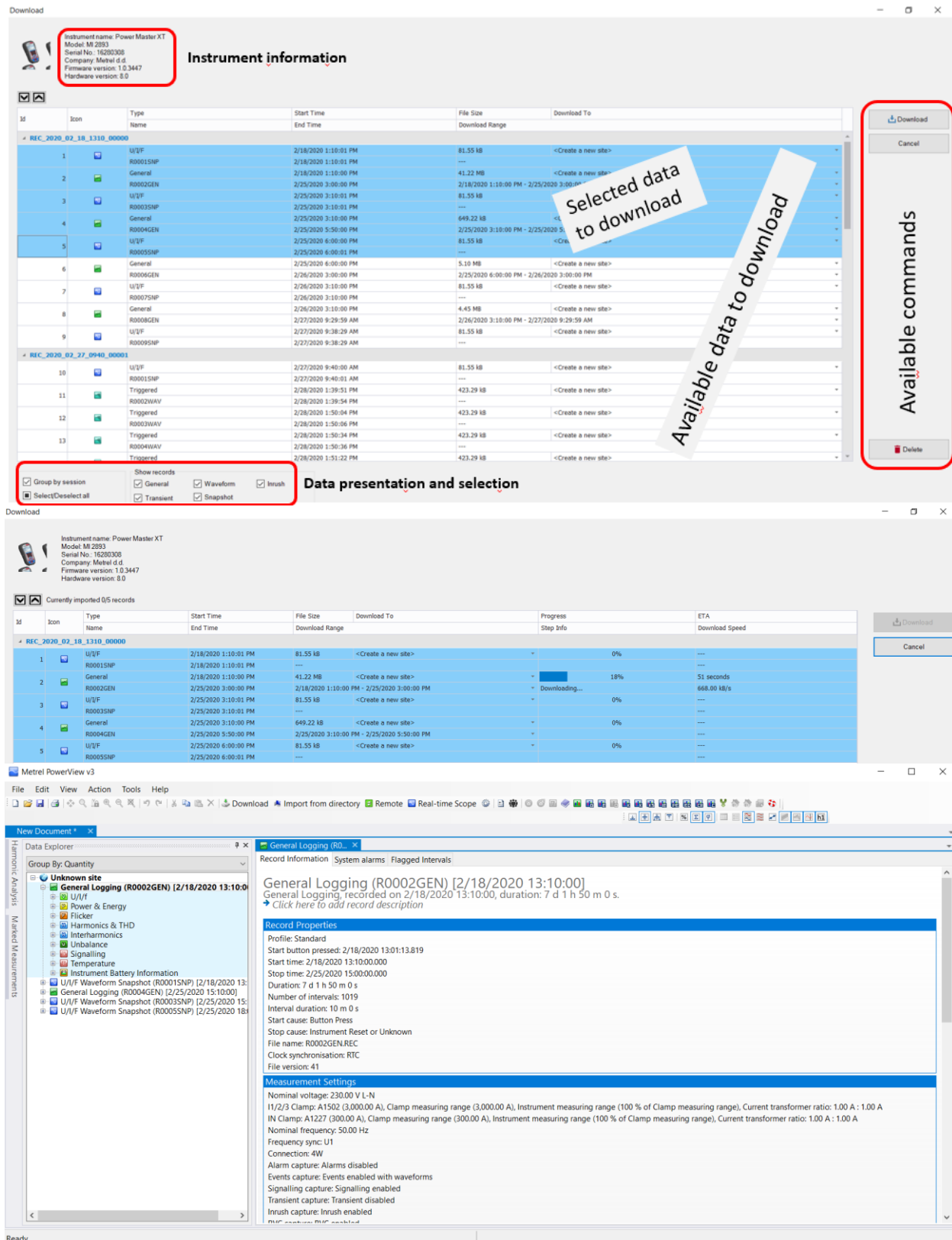


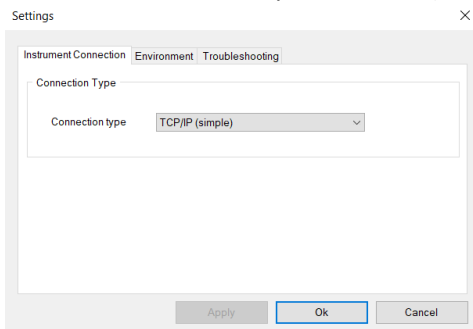
Figure 12 Data download procedure

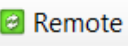
### 3.4.2 Data download (remote) via TCP/IP (INTERNET / INTERNET(3G/GPRS))

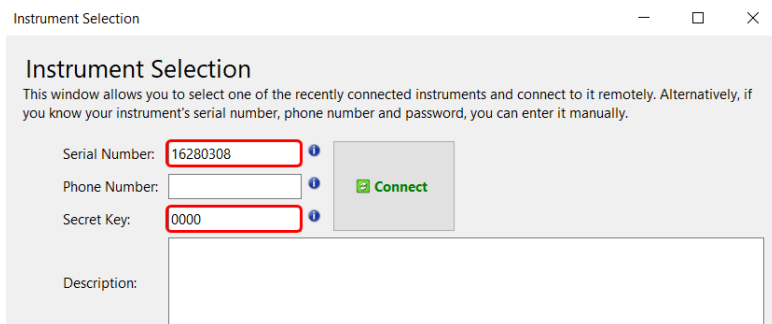
Procedure:

1. PC should be connected to LAN

2. Connect the PQI to LAN (or via GPRS modem) and setup the communication parameters on PQI properly.
3. In the PowerView setup the TCP/IP (simple) connection type



4. Select "REMOTE" function  and enter PQI serial number and "Secret key"



5. Press "Connect" and wait, that connection is established

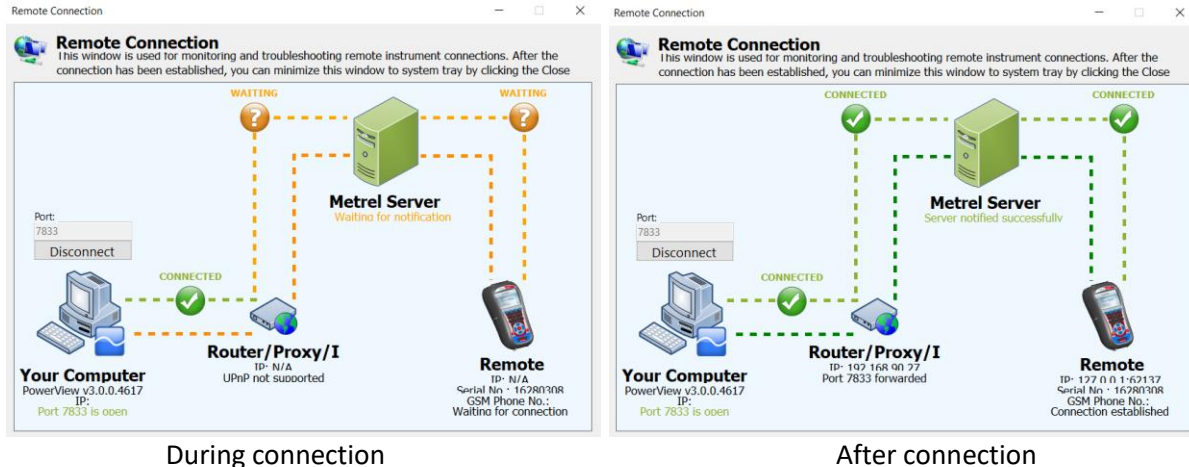
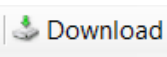


Figure 13 Remote data download procedure

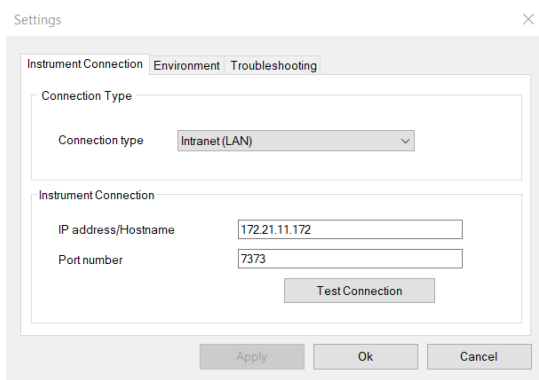
6. Select "DOWNLOAD" function  and download selected files.

### 3.4.3 Data download (remote) via TCP/IP (INTRANET (LAN))

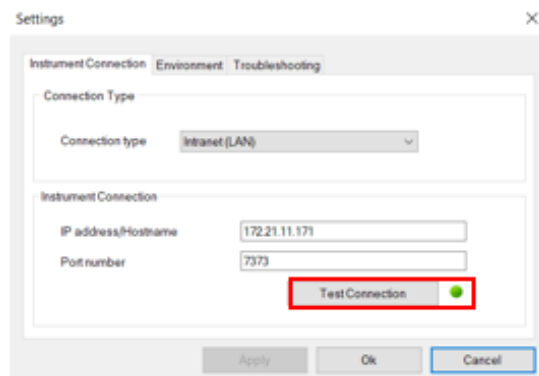
Procedure:

1. PC should be connected to LAN
2. Connect the PQI to LAN (setup the communication parameters on PQI properly)
3. In the PowerView setup the Internet (LAN) connection type






#### 4. Test the connection



#### 5. Select “DOWNLOAD” function and download selected files.

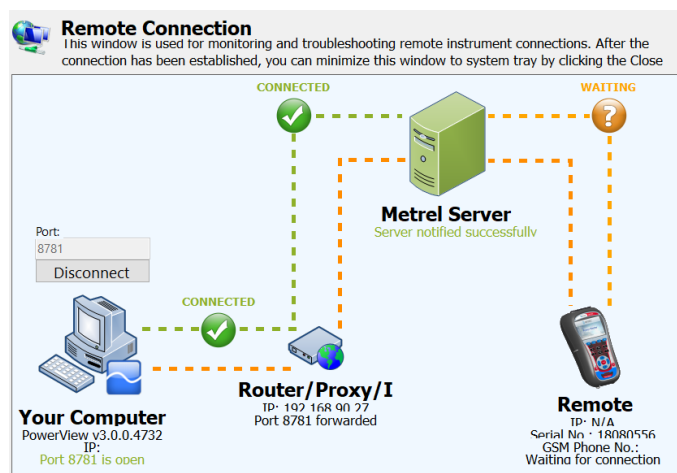
### 3.4.4 Typical errors during data download via TCP/IP

Be sure, that:

1. Communication setup on the PQI is set accordingly. Please check the manual for the PQI and be sure, that status bar icon  appears on the LCD (could take few minutes).
2. Check that entered instrument serial number and “secret key” are set accordingly.
3. Outgoing ports 80, 443, 7781 ÷ 8888 to the gprs.metrel.si server are opened on remote firewall where instrument is placed.

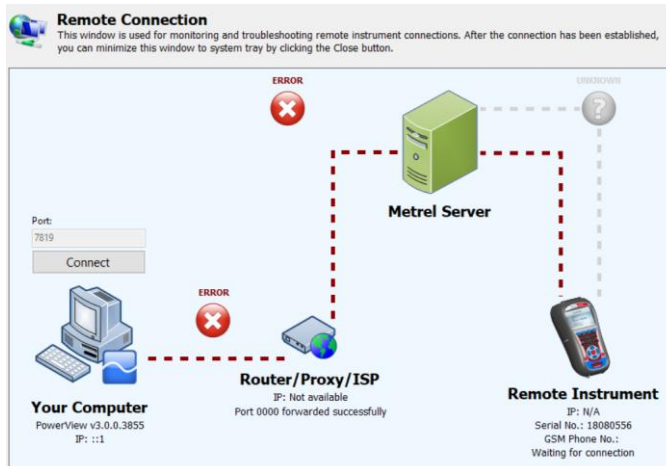
#### Typical error #1:

Connection to Metrel server is OK, PQI not connected to the system.

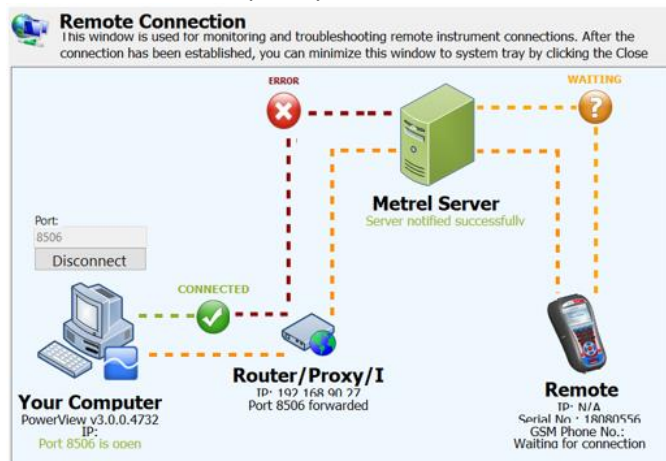


**Typical error #2:**

PC is not connected to internet:

**Typical error #3:**

Metrel server is temporary down:



Note: Server state is regularly checked and updated, so “temporary down” state should be only exceptional.

## 3.5 Type of logged files

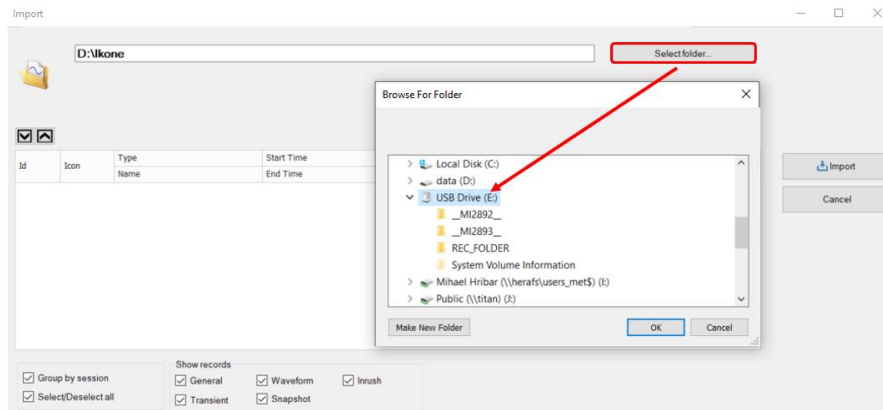
During the recording session, different type of files are created:

- WAW – waveform record (samples values)
- INR – inrush record (RMS values)
- SNP – waveform snapshot
- TRA – transient record
- EME – E-Meter recorder
- GEN – general record. General record generates also AVG, EVT, PAR, ALM, SEL files, which can be found on SD Card and are automatically imported into PowerView.

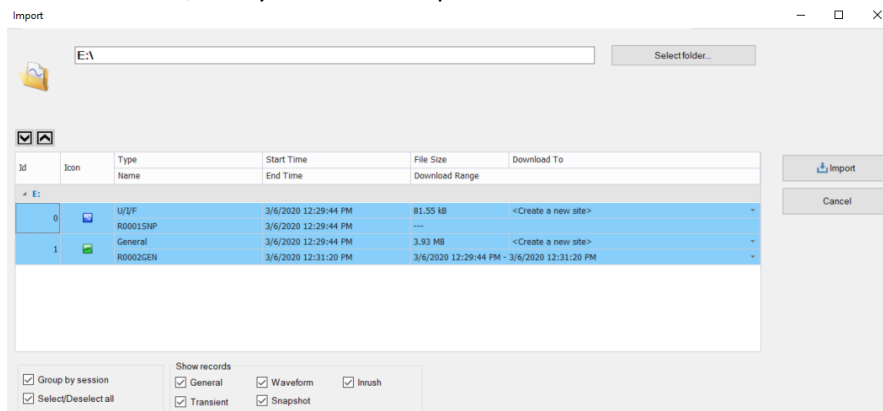
## 3.6 Opening PowerView files

Data import direct from the SD card (or PC is the fastest way to import data into PowerView (specially, if import huge files – in the range of GB)).

1. Select folder, from where you want to import data -  .






## 2. Select data, that you want to import.



Imported data are saved under specific PowerView “PWV” format.

## 3.7 PWV data import

Previously downloaded files are saved as “PWV” file. It is possible to open/share these files.

Use the function  **Open** **Ctrl+O** /  /  to open PWV file:

IA Program > VFD

Name	Date modified	Type	Size
Fotke	27. 03. 2018 08:54	File folder	
MI 2893 VFD #1	24. 04. 2020 09:56	Metrel PowerView ...	16.950 KB
MI 2893 VFD	24. 04. 2020 09:53	Metrel PowerView ...	16.421 KB
primerjava	11. 09. 2017 17:05	Metrel PowerView ...	33.900 KB
VFD test HV Lab osnovni	22. 05. 2018 08:24	Metrel PowerView ...	14.958 KB
VFD test HV Lab	21. 05. 2018 14:35	Metrel PowerView ...	15.010 KB

Recently saved files could be directly accessed via “Welcome screen”:



## 4 Data processing with PowerView

PowerView enables different functionality on the downloaded data:

- Data analysing,
- Data export,
- Snapshot creation for custom report creation,
- Data correction,
- Data averaging,
- Creation of different types of reports.

### 4.1 U/I/F Waveform snapshot

200ms U/I/F waveform snapshot is automatically done at recorder start and end; MI 2893/2892/2885 could also take snapshot each recording hour automatically. Different type of information is presented:

- Record information,
- Meter information,
- Waveform scope,
- Table data,
- Phase diagram,
- Harmonics bar chart,
- Interharmonics bar chart.

#### 4.1.1 U/I/F Record information

200ms U/I/F waveform snapshot is automatically done at recorder start and end.

Snapshot gives the basic info about:

- Recorder properties

```
Profile: Standard
Start time: 10/4/2019 12:30:01.199
Stop time: Unspecified
Snapshot length: 199.99 ms (1395 samples)
Stop cause: Finished Successfully
File name: R0003SNP.REC
Clock synchronisation: RTC
File version: 27
```

- Measurement settings and nominal voltage

```
Nominal voltage: 400.00 V L-L
I1/2/3 Clamp: A1502 (3,000.00 A), Clamp measuring range (3,000.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A
IN Clamp: A1227 (300.00 A), Clamp measuring range (300.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A
Nominal frequency: 50.00 Hz
Frequency sync: U12
Connection: Open delta
```

- Connection check status

```
Voltage: L1 ✓ L2 ✓ L3 ✓
Current: L1 ✓ L2 ✓ L3 ✓
Phase: L1 ✓ L2 ✓ L3 ✓
Frequency: ✓
Voltage sequence: ( 1 2 3 ) ✓
Current sequence: ( 1 2 3 ) ✓
Result: ✓
```

- Instrument information

```
Model: MI 2892
Instrument name: Power Master
Hardware version: 8
Firmware version: 2.0.3370
S/n: 19331027
Calibration date: 8/28/2019 11:49:23
```

### 4.1.2 U/I/F Meter information

The complete set of information captured in a 200ms measurement interval presented in tabular form.

U/I/F Waveform Sna...

Record Information Meter Phase Diagram Interharmonics Bar Chart

Phase values

Symbol	Name	L1	L2	L3	LN	Total	Unit
U	Voltage	227.57	227.88	227.13	42.675	---	V
I	Current	671.22	639.52	633.51	38.899	---	A
f	Frequency	49.936	---	---	---	---	Hz
THD U	Voltage THD	2.9419	2.7752	2.7592	11.481	---	%
THD I	Voltage THD	6.6836	6.3139	6.2578	4.8577	---	V
THD I	Current THD	12.307	12.289	12.269	127.72	---	%
THD I	Current THD	81.857	77.895	77.038	30.400	---	A
CFu	Voltage Crest Factor	1.4498	1.4462	1.4454	---	---	---
CFI	Current Crest Factor	1.5265	1.5083	1.5081	2.3489	---	---
PLt	Flicker PLT	---	---	---	---	---	---
Pst	Flicker PST	---	---	---	---	---	---
Pst(1min)	Flicker PST 1min	0.3229	0.3057	0.3402	---	---	---
T	Temperature	---	---	---	---	---	°C

Line values

Peak Values (since last user reset)

IEEE 1459 Power Measurement

Symbol	Name	L1	L2	L3	LN	Total	Unit
Combined							
P	Active Power	145.62	139.13	136.31	---	421.06	kW
Q	Reactive Power	46.120	43.372	46.083	---	135.57	kvar
S / Se	Phase Apparent Power / Total Effective	152.75	145.73	143.89	---	442.78	kVA
PF	Phase Power Factor / Total Effective	0.9533	0.9547	0.9473	---	0.9510	---
Qfund / Q+	Phase Fundamental Reactive Power	40.607	38.030	41.381	---	-0.0208	kvar
Sfund / S+	Phase Fundamental Apparent Power	151.12	144.21	142.41	---	0.0213	kVA
Sfund	Unbalanced Fundamental Apparent Power	---	---	---	---	437.97	kVA
DFF / DFF+	Phase Displacement Factor / Total Displacement	0.9632	0.9646	0.9569	---	0.2069	---
LU	Load Unbalance	---	---	---	---	2,056,110.0	%

Fundamental

Non fundamental

Arithmetic Power Measurement

Symbol	Name	L1	L2	L3	LN	Total	Unit
Combined							
Qa	Reactive Power Arithmetic	---	---	---	---	135.65	kvar
Sa	Apparent Power Arithmetic	---	---	---	---	442.37	kVA
Pfa	Power Factor Arithmetic	---	---	---	---	0.9518	---

Fundamental

Vector Power Measurement

Energy Measurement

Unbalance Measurement

Figure 14 Complete meter information captured in 200ms snapshot

### 4.1.3 U/I/F Phase/Unbalance diagram

Phase and unbalance diagram are used for checking the proper selection (rotation field and proper U/I phase connection). Also, inductive/capacitive load character is easily identifiable.

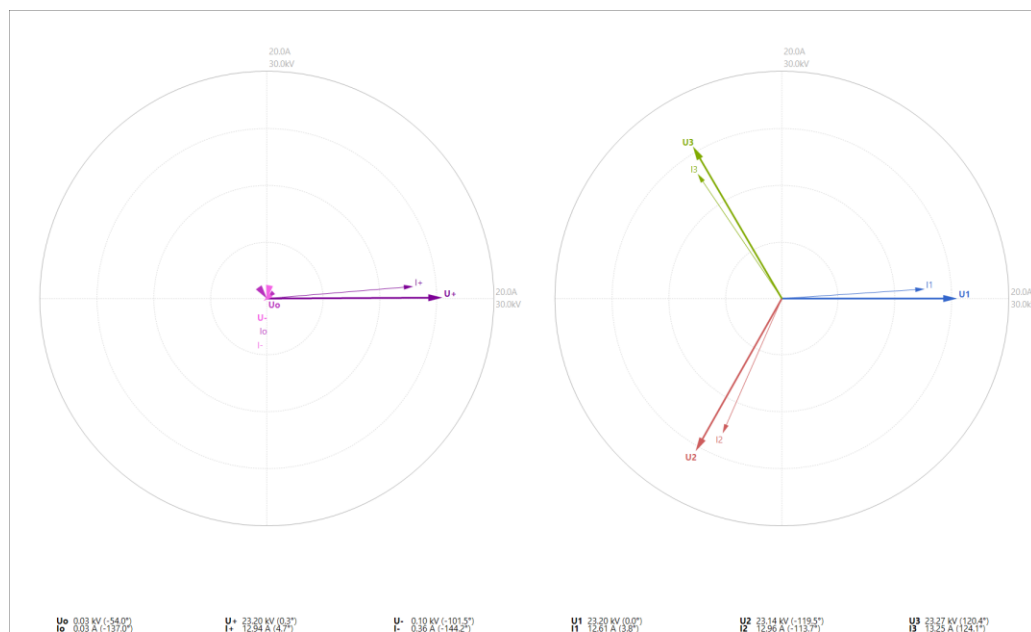
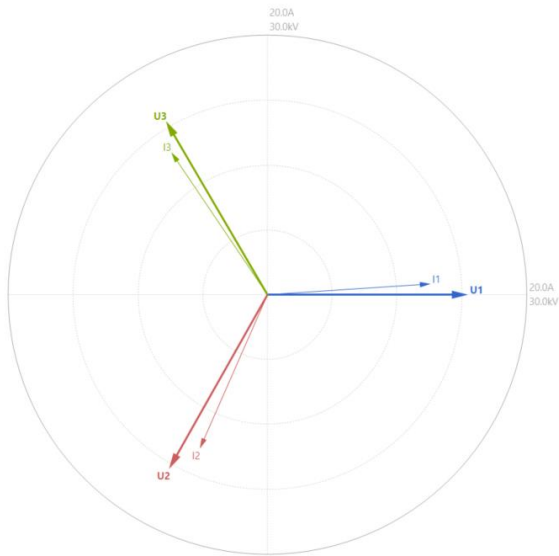
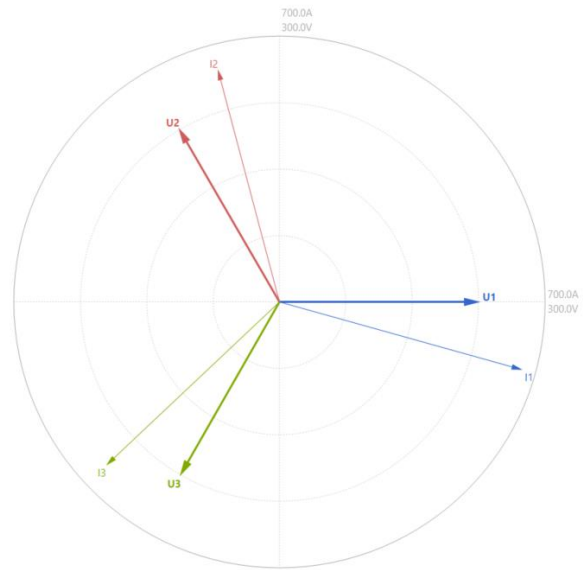


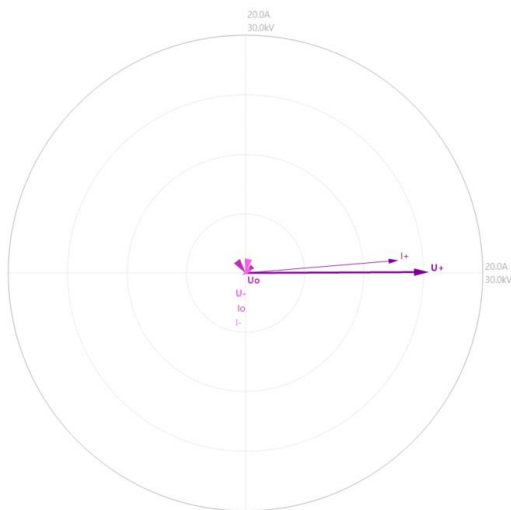
Figure 15 Unbalance and Phase diagram



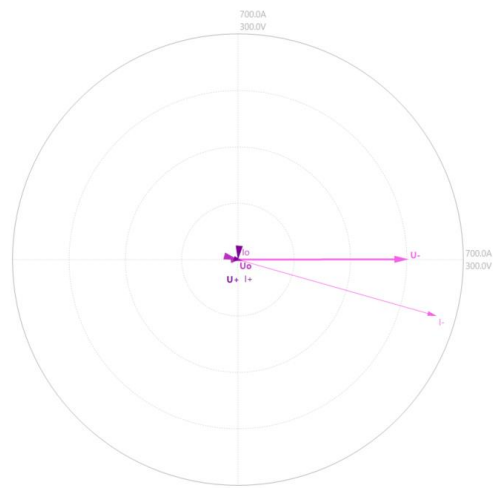
U1 23.20 kV (0.0°) U2 23.14 kV (-119.5°) U3 23.27 kV (120.4°)  
I1 12.61 A (3.8°) I2 12.96 A (-113.7°) I3 13.25 A (124.1°)



U1 227.19 V (0.0°) U2 227.51 V (120.1°) U3 226.80 V (-119.8°)  
I1 665.15 A (-15.6°) I2 633.86 A (104.9°) I3 627.90 A (-136.7°)



U0 0.03 kV (-54.0°) U+ 23.20 kV (0.3°) U- 0.10 kV (-101.5°)  
I0 0.03 A (-137.0°) I+ 12.94 A (4.7°) I- 0.36 A (-144.2°)



U0 0.07 V (-15.0°) U+ 0.43 V (-95.5°) U- 227.17 V (0.1°)  
I0 7.15 A (8.9°) I+ 16.39 A (-17.5°) I- 642.26 A (-15.8°)

Capacitive type – current lead related to voltage vector  
Positive voltage sequence (123, 231, 312)

Inductive type – current lag related to voltage vector  
Negative voltage sequence (132, 213, 321)

#### 4.1.4 U/I waveform presentation

Different type of waveforms could be easily selectable, by selecting voltage and current. Waveforms are presented in “**Waveform scope**”. Data are taken from the 200ms Snapshot.

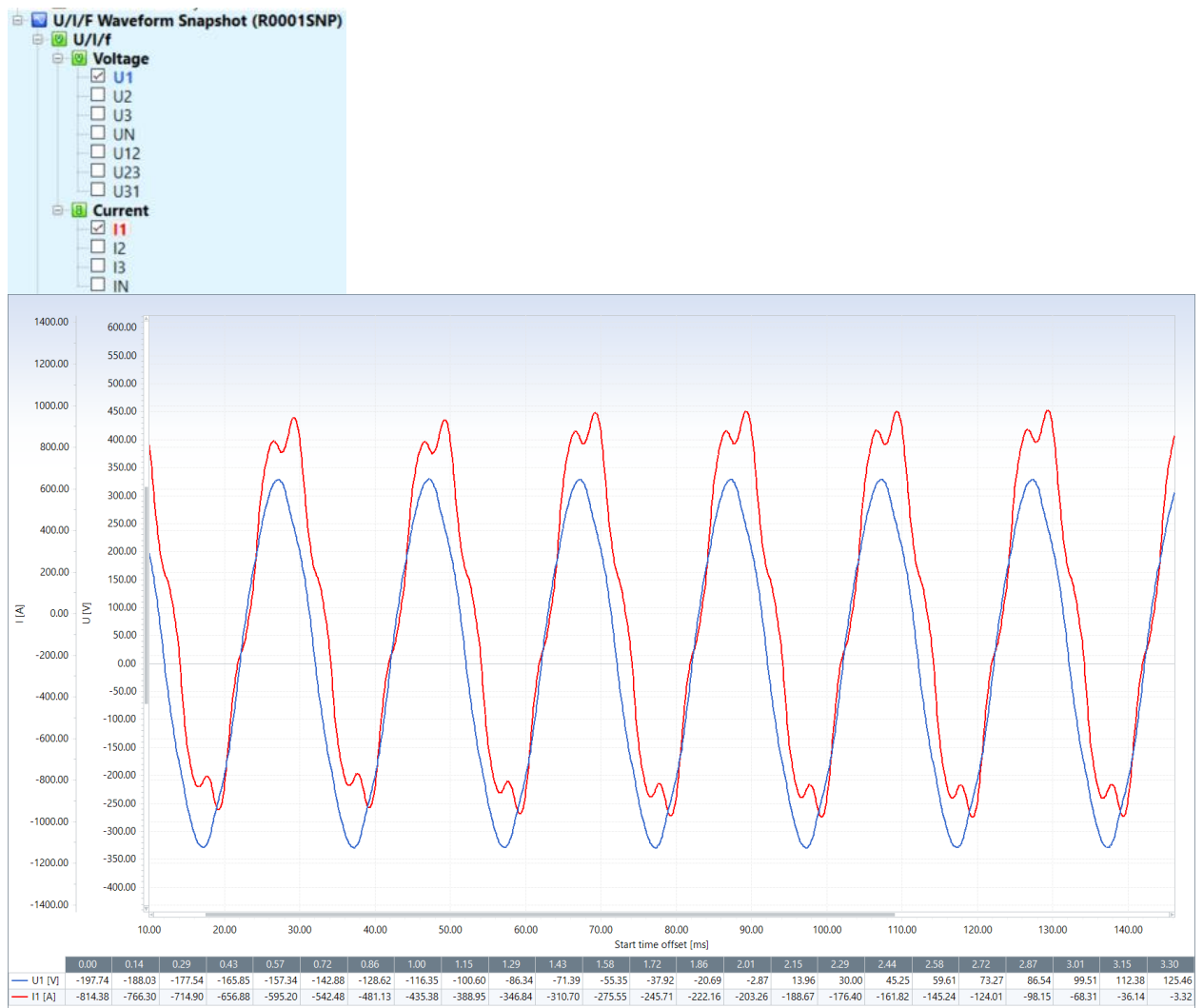


Figure 16 Voltage & Current waveform presentation

### 4.1.5 Harmonics/Interharmonics bar chart presentation

Harmonics/Interharmonics bar charts are presented by selecting voltage/current harmonics/interharmonics value.

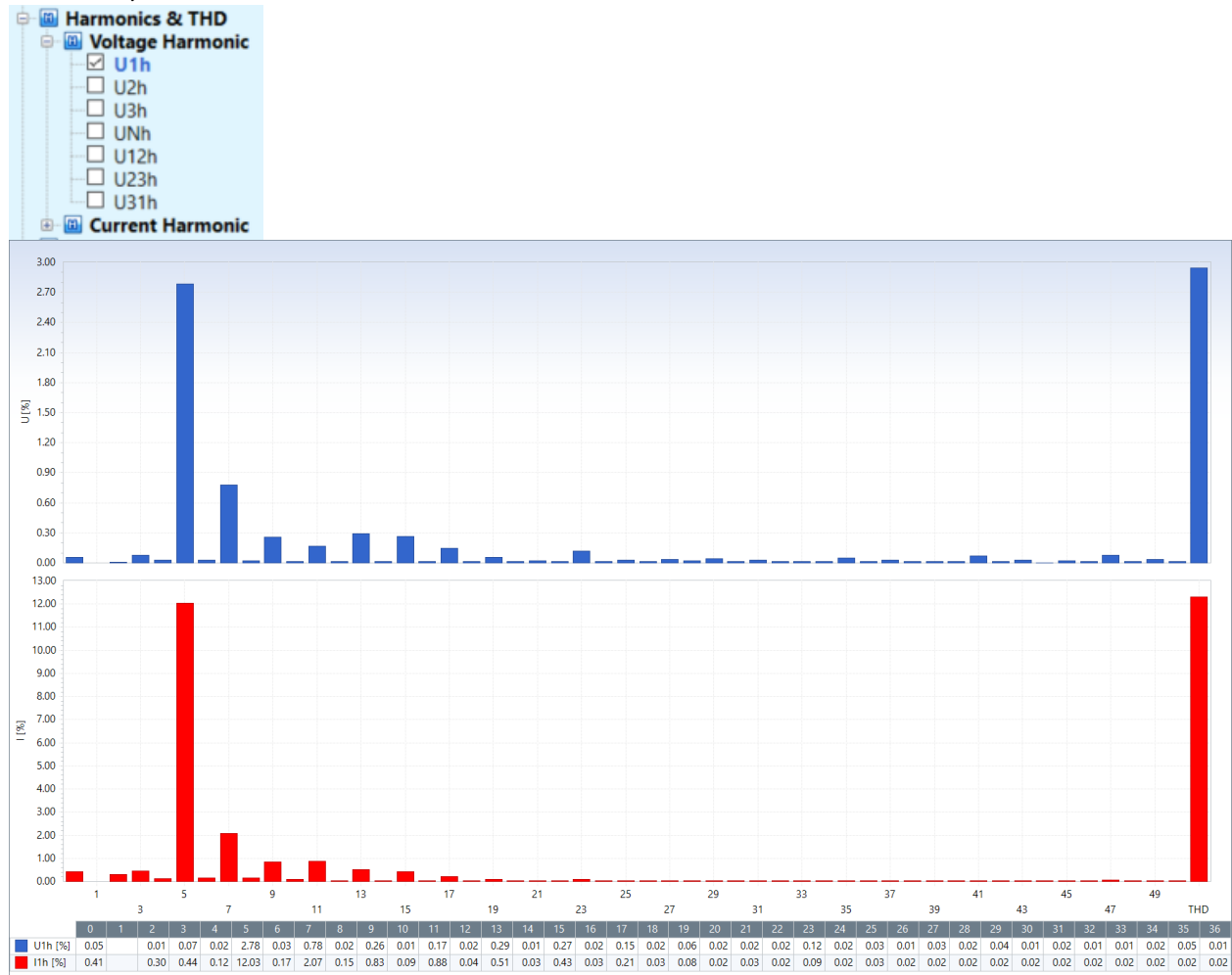


Figure 17 Voltage, Current and THD presentation



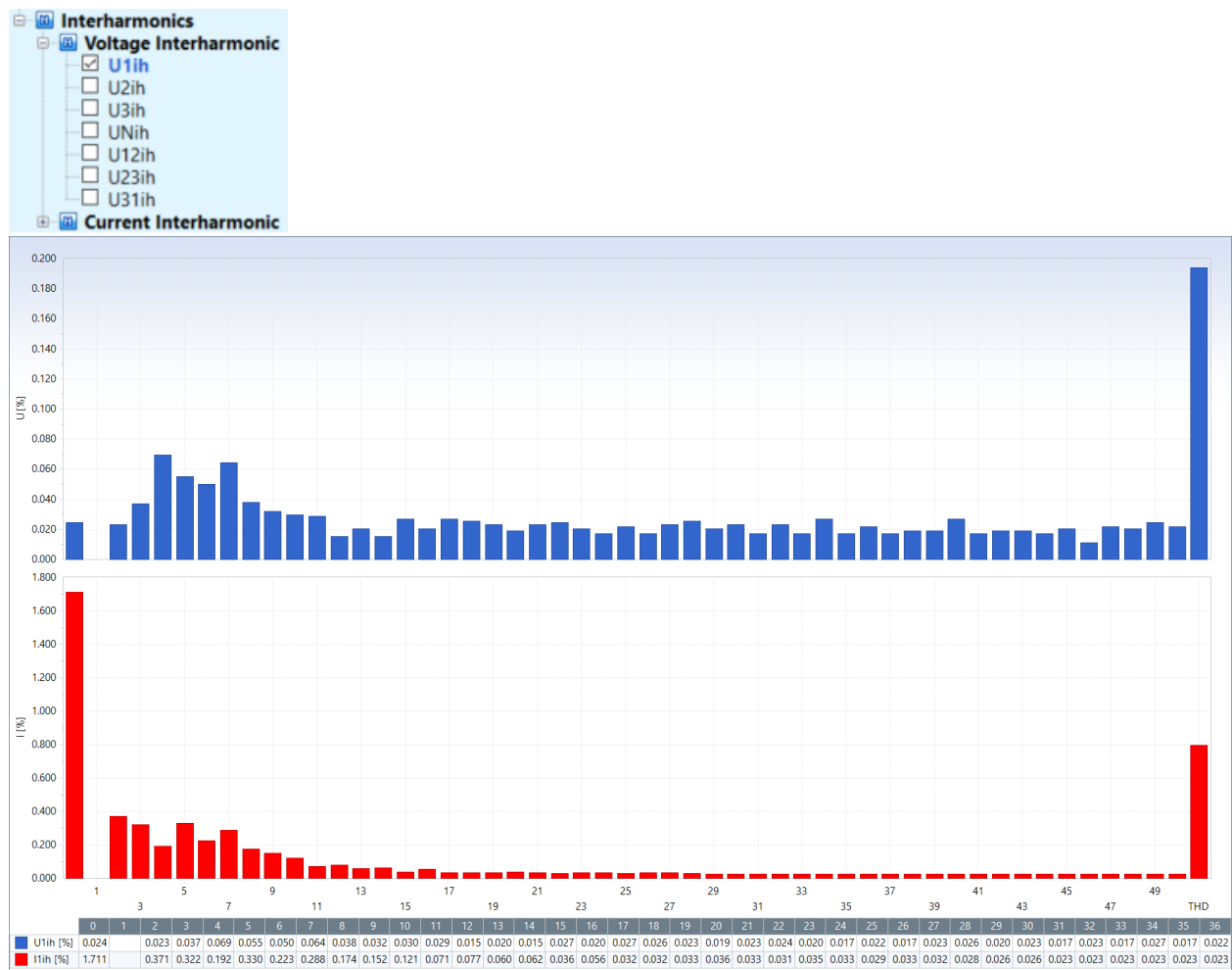



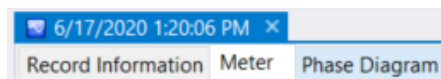


Figure 18 Voltage and Current interharmonics presentation

## 4.2 Real-time Scope

During the recording session it is possible to monitor actual measurement values remotely (Ethernet) or via USB. Real-time scope performs 200 ms Snapshot, same as U/I/F Waveform snapshot, which automatically done at recorder start.

1. Select appropriate communication port (USB/ Intranet/ TCP/IP) -  or **Tools → Options**
2. Press icon Real-time Scope  **Real-time Scope**
3. Real-Time Scope is updated cca every 2 seconds -
4. For the results interpretation, please check **Item 4.1**
5. Stop the updating of Real-time scope, by pressing  **Real-time Scope** again.



## 4.3 Recorded data analysing

Downloaded/opened files are presented as "Folder" structure:

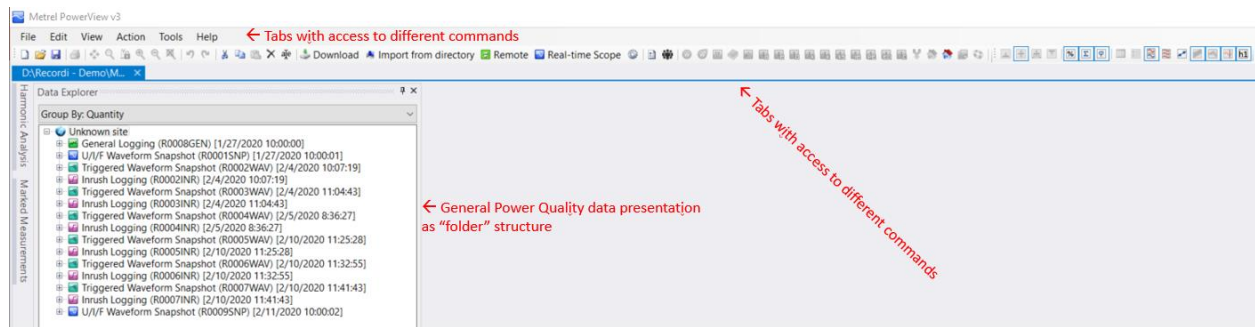


Figure 19 Downloaded PowerView data presentation

### 4.3.1 Data presentation “By Quantity” or “By Phase”

Data could be grouped “By Quantity” or “By Phase”

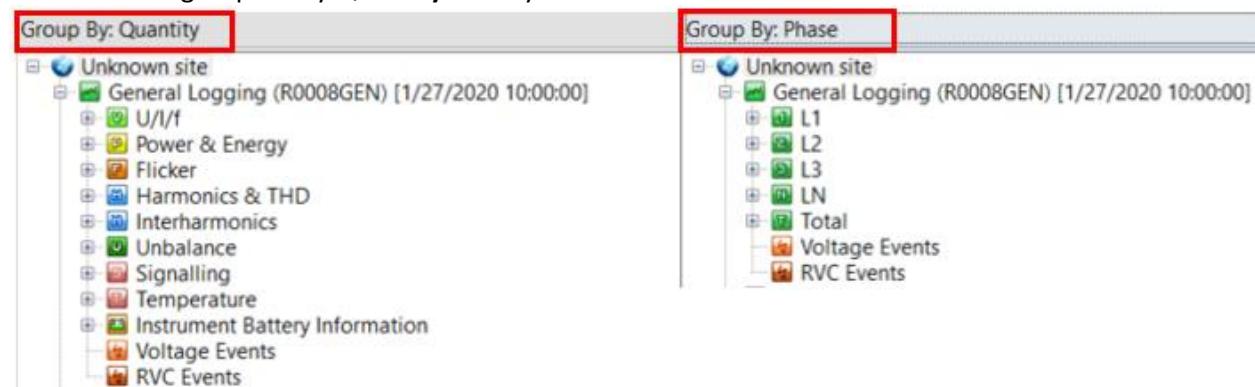


Figure 20 Quantity/Phase data presentation

### 4.3.2 Recorder Data presentation

With double click on recorded data, recorded items are open. It includes basic data related to the specific recorded data.

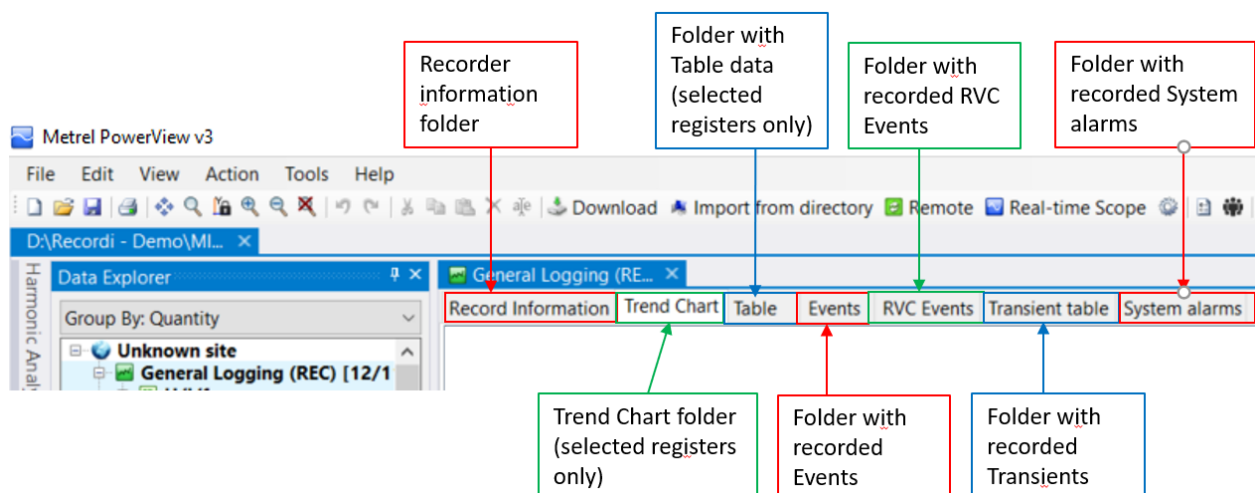


Figure 21 PowerView data explanation

Also, other Folders could be presented – depends on the actual PowerView selection; for example, Inrush table, ITIC, CBME curve etc.

### 4.3.3 Recorder information

General Recorder information are available under “Recorder Information” folder.

General recorder data information:

General Logging (R0008GEN) [1/27/2020 10:00:00]  
General Logging, recorded on 1/27/2020 10:00:00, duration: 15 d 0 h 0 m 0 s  
User comments

R0008GEN - source recorder file

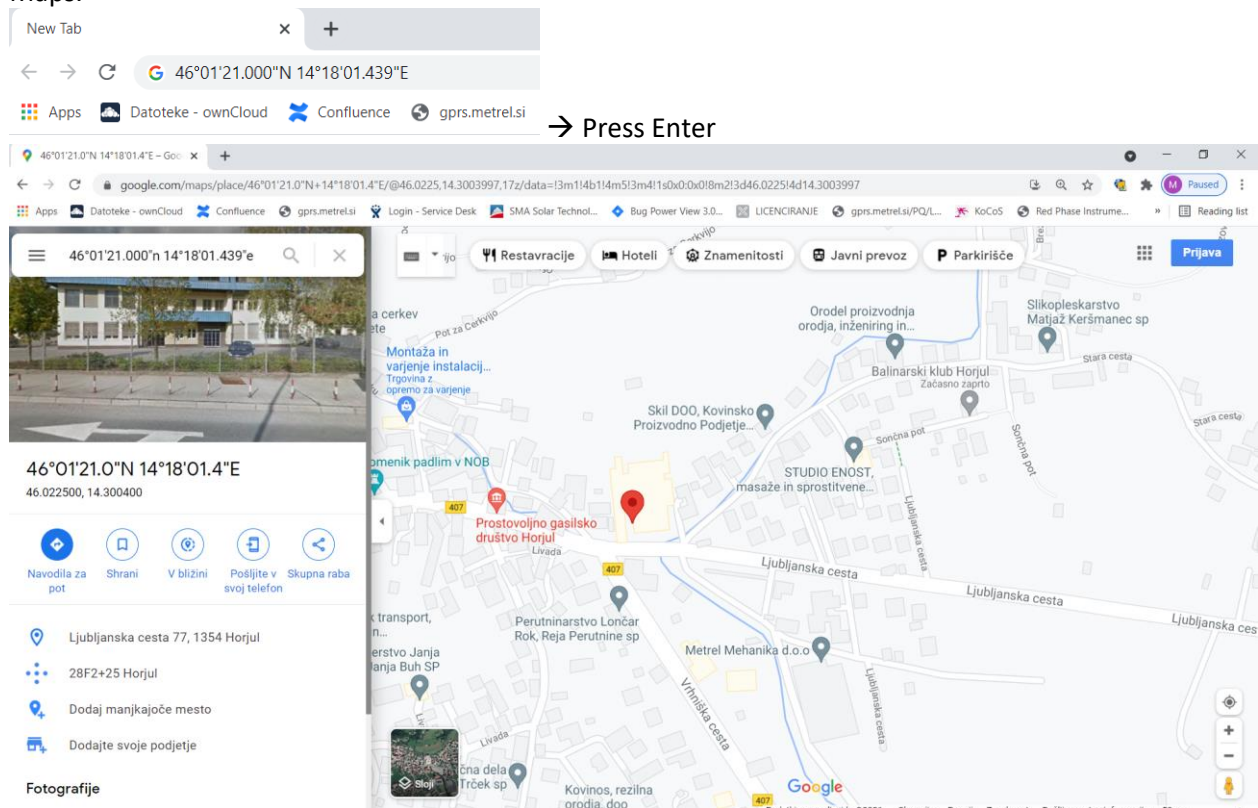
Recorder Start time and duration

User comments (remarks)

Basic recorder information:

Record Properties	Type of profile: Standard/Limited
Profile: Standard	
Start button pressed: 1. 07. 2021 07:51:57,428	
Start time: 1. 07. 2021 08:00:00,000	Recorder Start & Stop time
Stop time: 1. 07. 2021 14:00:00,000	
Duration: 6 h 0 m 0 s	Recorder duration
Number of intervals: 36	Number of intervals
Interval duration: 10 m 0 s	Interval duration / Recorder period
Start cause: Button Press	
Stop cause: Instrument Reset or Unknown	
File name: REC.REC	Source file name
Clock synchronisation: GPS	Synchronisation type
File version: 43	File version (related to internal PowerView structure)
GPS position: 46°01'21,000"N 14°18'01,439"E <a href="#">Copy</a>	GPS coordinates (location)

GPS coordinates could be easily copied by pressing [Copy](#) → Paste and present location under Google Maps.



Location could be saved as picture and later imported into different type of predefined reports.

Measurement settings information:

Measurement Settings	
Nominal voltage: 5,000.00 V L-N	Nominal Voltage & VT ratio
Potential transformer ratio: 100 : 1	
I1/2/3 Clamp: A1502 (3,000.00 A), Clamp measuring range (3,000.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A	Phase and Neutral current clamps selection & CT ratio
IN Clamp: A1502 (300.00 A), Clamp measuring range (300.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A	
Nominal frequency: 50.00 Hz	Selected nominal frequency
Frequency sync: U1	Selected synchronisation channel
Connection: 4W	
Alarm capture: Alarms disabled	
Events capture: Events enabled with waveforms	
Signalling capture: Signalling disabled	
Transient capture: Transient disabled	
Inrush capture: Inrush enabled	
RVC capture: RVC enabled	Selected Recorder additional options

### Additional Recorder options setup:

Transient Trigger Settings	Additional Recorder Options settings
Level UL-N: 5,000.00 V	
Level UN-GND: 50.00 V	
Level IL: Off	
Level IGD: Off	
Envelope UL-N: 50.00 V	
Envelope IL: Off	
Envelope IGD: Off	
Inrush Trigger Settings	
Level: 0.00 A (90.00 %)	
Slope: Rise	
Duration: 2.00 s	
Pretrigger: 1.00 s	
Event Settings	
Nominal voltage: 5,000.00 V L-N	
L-N Dip threshold: 90.00 % (4,500.00 V)	
L-N Dip hysteresis: 2.00 %	
L-N Swell threshold: 110.00 % (5,500.00 V)	
L-N Swell hysteresis: 2.00 %	
L-N Interruption threshold: 5.00 % (250.00 V)	
L-N Interruption hysteresis: 2.00 %	
RVC Settings	
Nominal voltage: 5,000.00 V L-N	
L-N RVC threshold: 3.00 % (150.00 V)	
L-N RVC hysteresis: 50.00 % (75.00 V)	
Alarm Settings	
Quantity: f, Phase: T, Level: > 50.00 Hz, Duration: > 200 ms	
Quantity: U1, Phase: L1, Level: > 5,000.00 V, Duration: > 200 ms	
Signalling Settings	
Nominal voltage: 5,000.00 V L-N	
Sig. 1 frequency: 316.00 Hz	
Sig. 2 frequency: 1,060.00 Hz	
Duration: 10.00 s	
Threshold: 5.00 % (250.00 V)	

Instrument and Miscellaneous information:

Instrument Properties	
Model: MI 2893	Instrument type
Instrument name: Power Master XT	
Hardware version: 8	Hardware and Firmware version
Firmware version: 1.0.3459	Instrument serial number
S/n: 16280308	Instrument calibration date
Calibration date: 4/17/2019 8:08:23	
Miscellaneous Information	
Instrument name: TEST97	User defined instrument name
Downloaded on: 4/28/2020 12:06:23.109	Time stamp of downloaded files
Downloaded by: Mihael Hribar	Downloaded by...
Downloaded using: Metrel PowerView v3.0.0.4635 (64-bit), en-US	PowerView version used for download
Windows version: Windows 10 64-bit (Microsoft Windows NT 10.0.18362.0)	Windows version

#### 4.3.4 Presentation of Power & Energy data according different measurement method IEEE 1459/ Vector/Arithmetic

Metrel PQI support different measurement methods for Power & Energy:

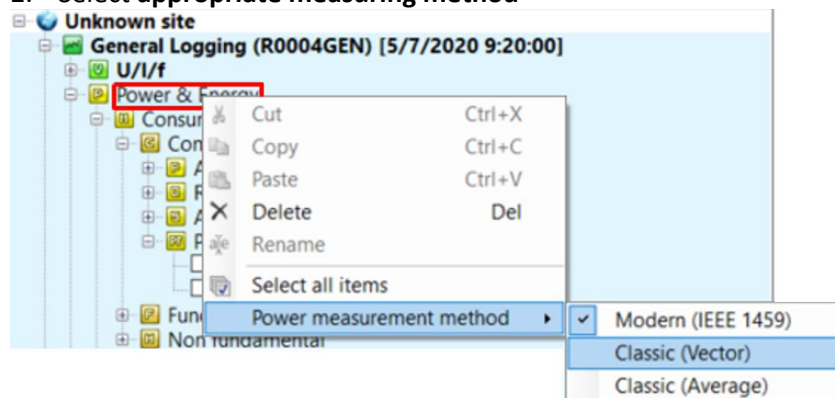
- According IEEE 1459 standard
- Vector type
- Arithmetic type

PQI always register power & energy according IEEE 1459 standard; presentation method on the LCD or in PowerView could be selectable.

More details, about measuring algorithms for specific measurement method is available in the PQI manual.

Measurement method could be changed via:

1. Select **Power & Energy** folder
2. Select **appropriate measuring method**



Phase Apparent Power / Total Effective Apparent Power			Vector Phase Apparent Power / Total Effective Vector Apparent Power			Apparent Power Arithmetic		
Setot+			Svtot+			Satot+		
Avg [kVA]			Avg [kVA]			Avg [kVA]		
2/27/2020 9:50:00.000	156.86		2/27/2020 9:50:00.000	152.95		2/27/2020 9:50:00.000	153.91	
2/27/2020 10:00:00.000	154.38		2/27/2020 10:00:00.000	150.50		2/27/2020 10:00:00.000	151.74	
2/27/2020 10:10:00.000	156.19		2/27/2020 10:10:00.000	153.24		2/27/2020 10:10:00.000	153.93	
2/27/2020 10:20:00.000	151.54		2/27/2020 10:20:00.000	149.43		2/27/2020 10:20:00.000	149.90	
2/27/2020 10:30:00.000	151.29		2/27/2020 10:30:00.000	149.49		2/27/2020 10:30:00.000	149.83	
2/27/2020 10:40:00.000	162.95		2/27/2020 10:40:00.000	160.27		2/27/2020 10:40:00.000	160.95	
2/27/2020 10:50:00.000	172.88		2/27/2020 10:50:00.000	169.15		2/27/2020 10:50:00.000	170.58	
2/27/2020 11:00:00.000	181.99		2/27/2020 11:00:00.000	178.71		2/27/2020 11:00:00.000	179.22	
2/27/2020 11:10:00.000	180.63		2/27/2020 11:10:00.000	177.18		2/27/2020 11:10:00.000	177.62	
2/27/2020 11:20:00.000	175.84		2/27/2020 11:20:00.000	172.30		2/27/2020 11:20:00.000	173.70	
2/27/2020 11:30:00.000	176.48		2/27/2020 11:30:00.000	173.49		2/27/2020 11:30:00.000	174.40	
2/27/2020 11:40:00.000	180.28		2/27/2020 11:40:00.000	176.29		2/27/2020 11:40:00.000	177.80	
2/27/2020 11:50:00.000	167.55		2/27/2020 11:50:00.000	163.13		2/27/2020 11:50:00.000	165.06	
2/27/2020 12:00:00.000	168.52		2/27/2020 12:00:00.000	165.14		2/27/2020 12:00:00.000	166.43	

Figure 22 Apparent Power presentation under IEEE 1459 / Vector / Arithmetic measurement method

### 4.3.5 Averaging the measurement result

Sometimes, there is a need to present recorded data with different measurement period, for example: data are recorded with period 5 minutes, but we need to present data with the recorded period of 15 minutes.


In the table bellow, there is presented relation between registration period and averaging period.

Table 2 Relation between Registration vs Averaging measurement period

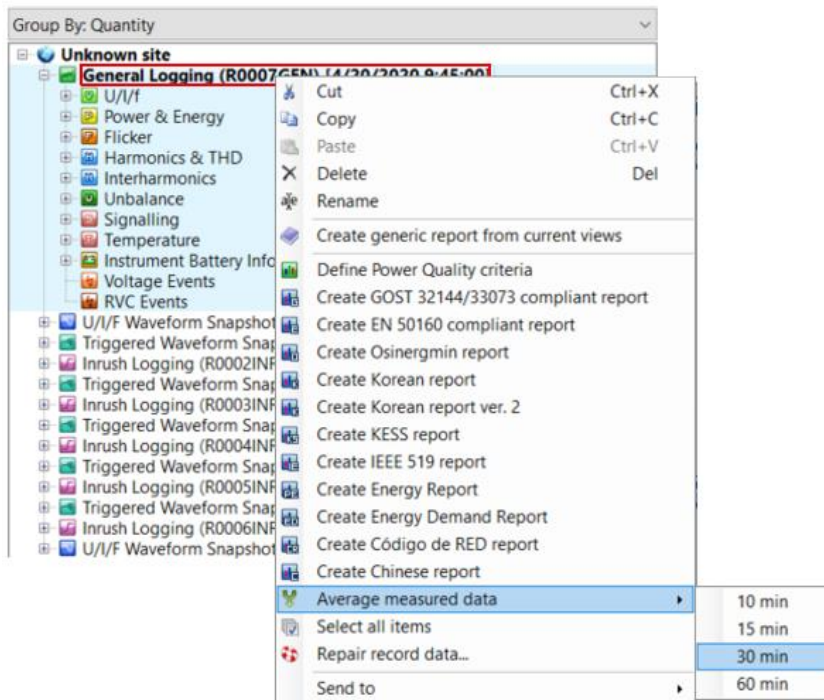
Registration period Averag. to	1 sec	3 sec	5 sec	10 sec	1 min	2 min	5 min	10 min	15 min	30 min
3 s	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
5 s	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
10 s	✓	✗	✓	✗	✗	✗	✗	✗	✗	✗
1 min	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗
2 min	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗
5 min	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗
10 min	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗
15 min	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗
30 min	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
60 min	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

To perform averaging of measurement results:

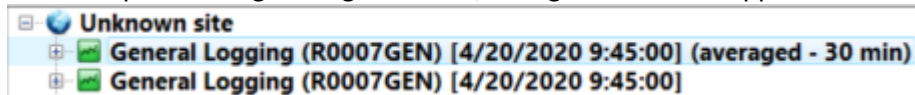
1. Select General Logging
2. Double click on right mouse button → Average measured data → select requested averaged

period or via icon 





3. After performing Average function, new general record appears under Folder structure



Final result:

- Two recorders – original one and created one with averaged measurement period

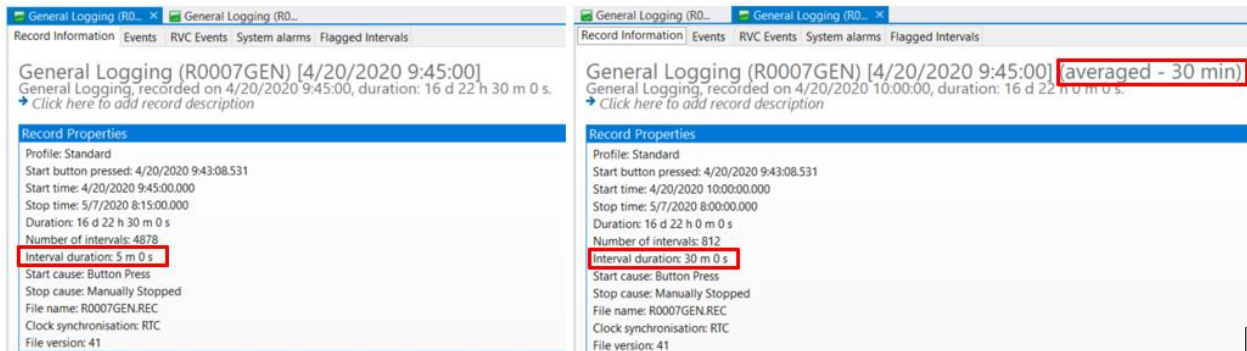
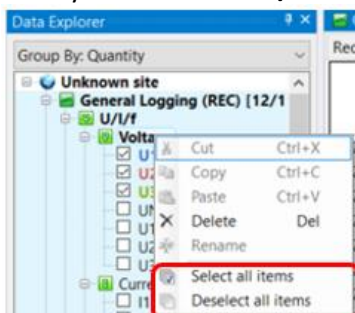


Figure 23 Original recorder data (5 min) and averaged recorder data(30 min)

### 4.3.6 Table and Trend Chart data presentation

Selected registers are presented in Table as well as Trend chart. Registers are selected simple by clicking one by one or to **Select/Deselect all items** (registers) under specific group of parameters:



	Voltage			Current		
	U1	U2	U3	I1	I2	I3
	± Avg [V]	± Avg [V]	± Avg [V]	± Avg [A]	± Avg [A]	± Avg [A]
12/11/2019 11:20:00.000	227.38	227.95	227.59	303.61	289.08	284.20
12/11/2019 11:30:00.000	227.55	228.07	227.70	305.84	285.05	284.80
12/11/2019 11:40:00.000	227.89	228.47	228.08	304.83	282.66	280.69
12/11/2019 11:50:00.000	227.67	228.21	227.82	304.90	282.70	287.77
12/11/2019 12:00:00.000	228.03	228.56	228.33	300.52	280.41	275.90
12/11/2019 12:10:00.000	228.16	228.73	228.44	290.18	267.23	270.63
12/11/2019 12:20:00.000	227.35	227.91	227.55	295.85	272.66	281.12
12/11/2019 12:30:00.000	227.54	228.16	227.81	297.24	266.63	273.72
12/11/2019 12:40:00.000	227.67	228.29	227.95	299.62	270.72	276.61

Figure 24 Table PowerView data presentation

For selected registers, also appropriate Trend Chart is presented.

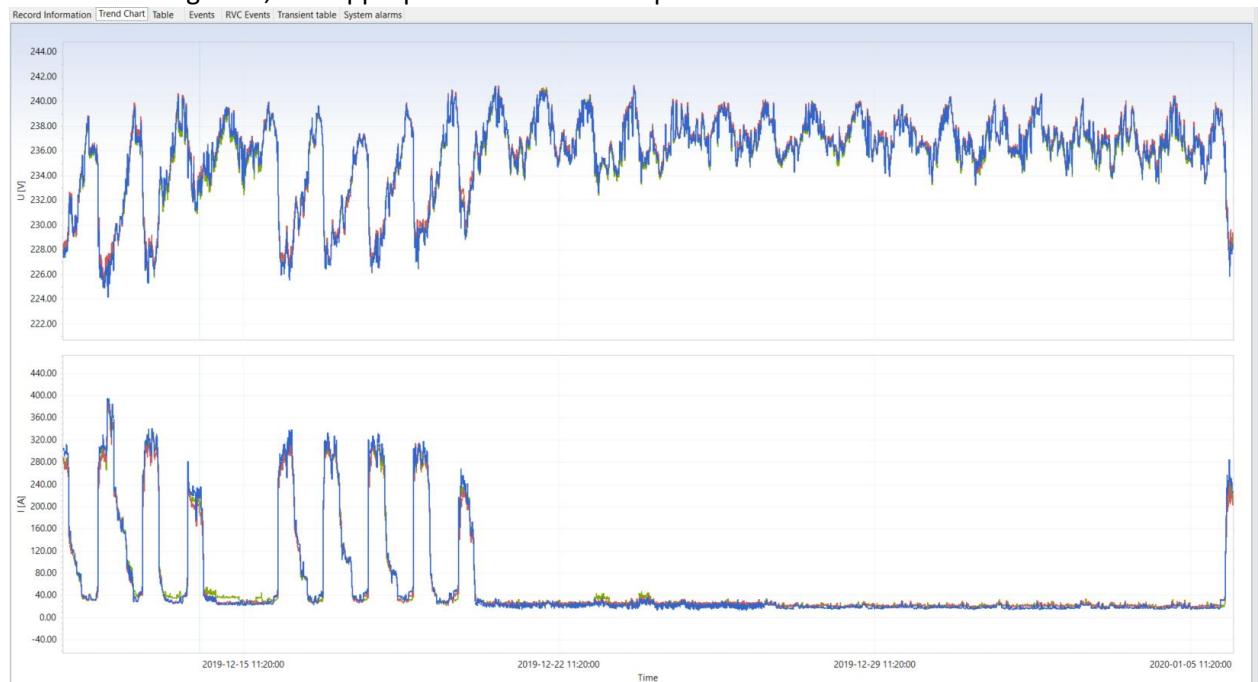
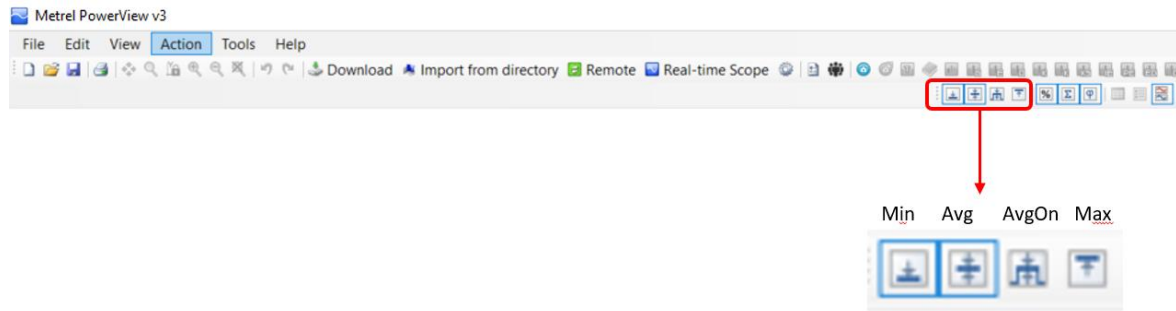


Figure 25 Chart PowerView data presentation

#### 4.3.7 Min, Avg, AvgOn, Max table value presentation

Power Quality Analyser registers Min, Avg, AvgOn and Max value. You can simply add/remove selected value by clicking on:





**Note:** Min, Avg, AvgOn and Max value are not available for all registers!

**Example:**

Avg value for Frequency is NOT presented:

	Voltage				Frequency		
	Min [V]	Avg [V]	AvgOn [V]	Max [V]	Min [Hz]	AvgOn [Hz]	Max [Hz]
12/11/2019 11:20:00.000	225.32	227.38	227.38	228.51	49.958	49.977	49.998
12/11/2019 11:30:00.000	225.25	227.55	227.55	228.88	49.970	49.985	50.009
12/11/2019 11:40:00.000	225.59	227.89	227.89	229.31	49.966	49.983	50.010
12/11/2019 11:50:00.000	225.00	227.67	227.67	229.04	49.963	49.986	50.007
12/11/2019 12:00:00.000	226.09	228.03	228.03	229.20	49.965	49.997	50.027
12/11/2019 12:10:00.000	225.98	228.16	228.16	229.51	49.969	49.992	50.013
12/11/2019 12:20:00.000	225.09	227.35	227.35	228.94	49.979	49.998	50.011
12/11/2019 12:30:00.000	225.28	227.54	227.54	228.81	49.975	49.995	50.016

Figure 26 Min/Max/Avg/AvgOn PowerView Table data presentation

### 4.3.8 Recorder data export

Registered data could be exported into XLS, CSV or TXT format. There are few options:

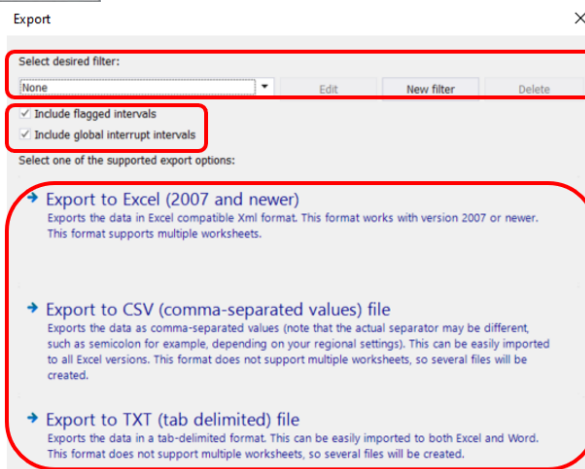
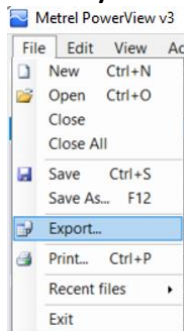
- Direct selection (Copy/Paste) from the Table:

	Voltage				Frequency		
	Min [V]	Avg [V]	AvgOn [V]	Max [V]	Min [Hz]	AvgOn [Hz]	Max [Hz]
12/11/2019 11:20:00.000	225.32	227.38	227.38	228.51	49.958	49.977	49.998
12/11/2019 11:30:00.000	225.25	227.55	227.55	228.88	49.970	49.985	50.009
12/11/2019 11:40:00.000	225.59	227.89	227.89	229.31	49.966	49.983	50.010
12/11/2019 11:50:00.000	225.00	227.67	227.67	229.04	49.963	49.986	50.007
12/11/2019 12:00:00.000	226.09	228.03	228.03	229.20	49.965	49.997	50.027
12/11/2019 12:10:00.000	225.98	228.16	228.16	229.51	49.969	49.992	50.013
12/11/2019 12:20:00.000	225.09	227.35	227.35	228.94	49.979	49.998	50.011
12/11/2019 12:30:00.000	225.28	227.54	227.54	228.81	49.975	49.995	50.016
12/11/2019 12:40:00.000	225.71	227.67	227.67	229.04	49.963	49.986	50.007
12/11/2019 12:50:00.000	225.14	227.71	227.71	229.04	49.963	49.986	50.007
12/11/2019 13:00:00.000	226.43	228.13	228.13	229.46	49.961	49.989	50.011
12/11/2019 13:10:00.000	226.25	228.25	228.25	229.54	49.955	49.974	49.996
12/11/2019 13:20:00.000	225.91	227.83	227.83	229.27	49.980	49.999	50.023
12/11/2019 13:30:00.000	225.69	227.83	227.83	229.12	49.965	49.989	50.012
12/11/2019 13:40:00.000	225.85	228.18	228.18	229.47	49.944	49.971	49.995
12/11/2019 13:50:00.000	225.06	227.94	227.94	229.19	49.969	49.983	50.001
12/11/2019 14:00:00.000	226.58	228.64	228.64	230.19	49.977	49.997	50.023
12/11/2019 14:10:00.000	226.75	229.03	229.03	230.33	49.964	49.982	50.021

Figure 27 Copying data from PowerView Table

- Only selected cells could be copied
- Entire table could be copied

- All data/filtered data export → select **File** → **Export**



Option selection

Filter selection

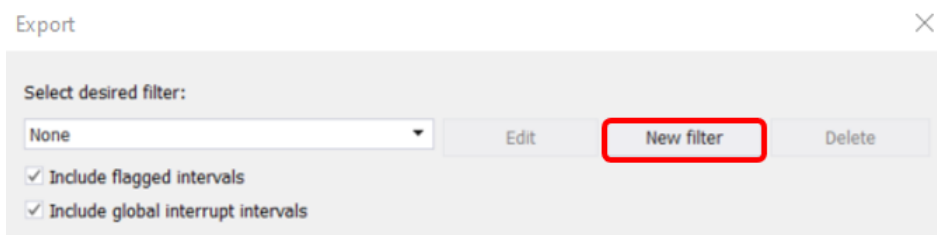
Export format selection

Select “Export format” and follow the procedure...

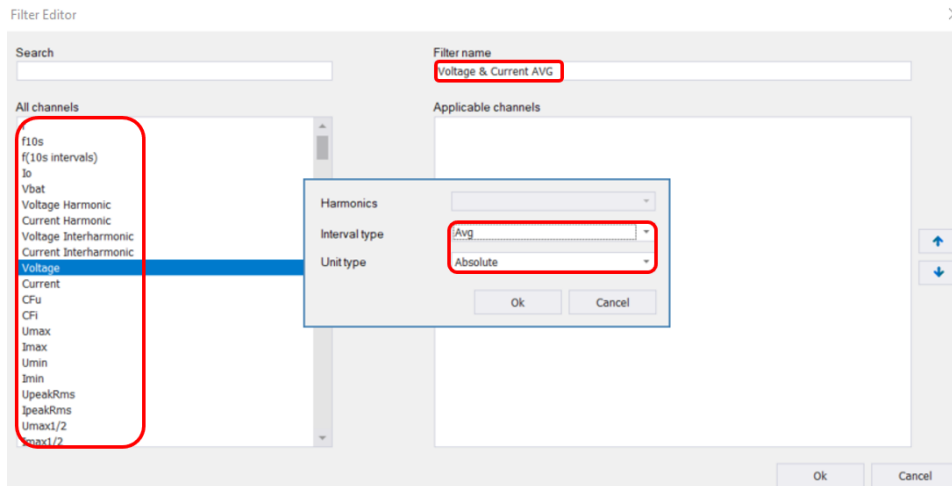
### 4.3.9 Creating custom designed filter

PowerView enables creation of user defined filter, where only needed data are exported.

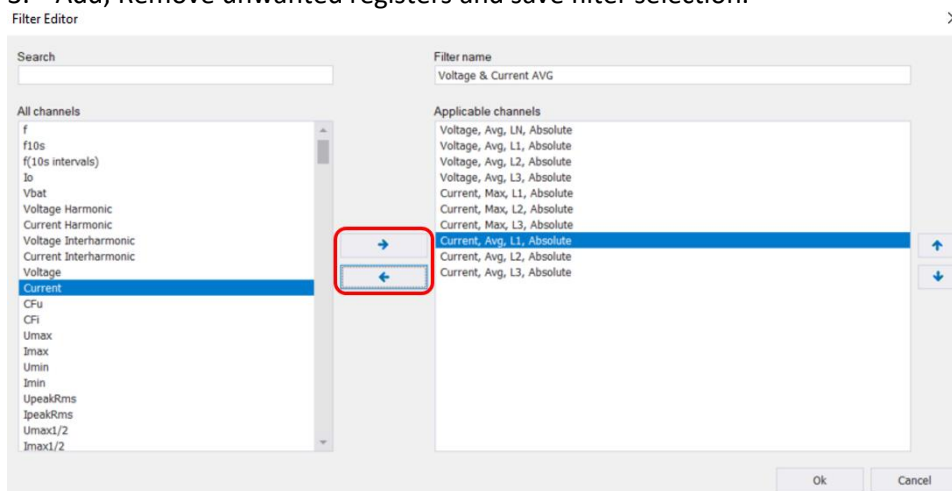
1. Select “New filter”



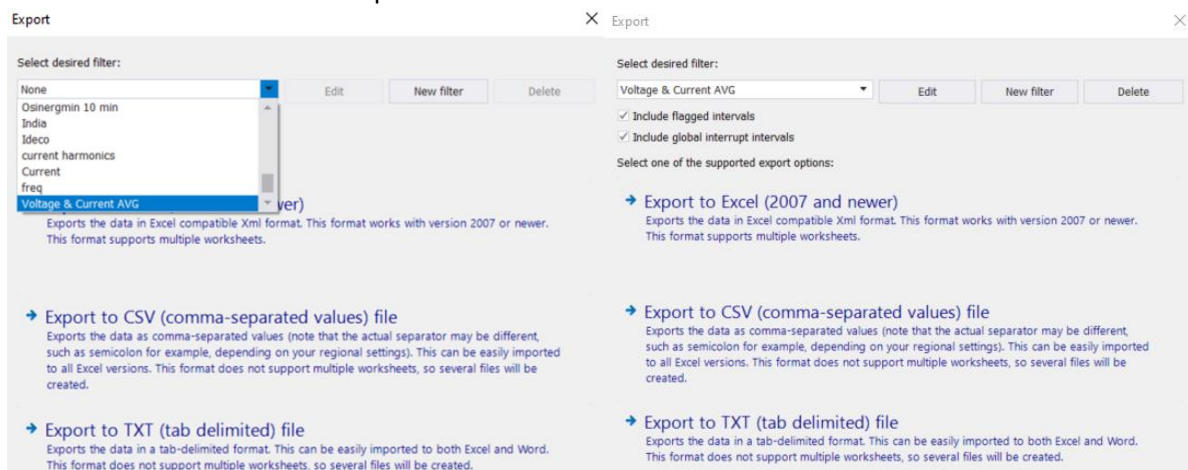
2. Set “Filter name”; Channels – values; interval type ....



### 3. Add; Remove unwanted registers and save filter selection.

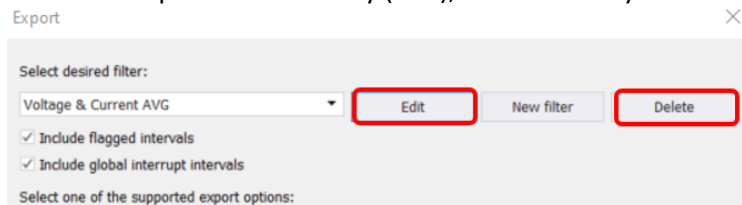


### 4. Select created filter and export data



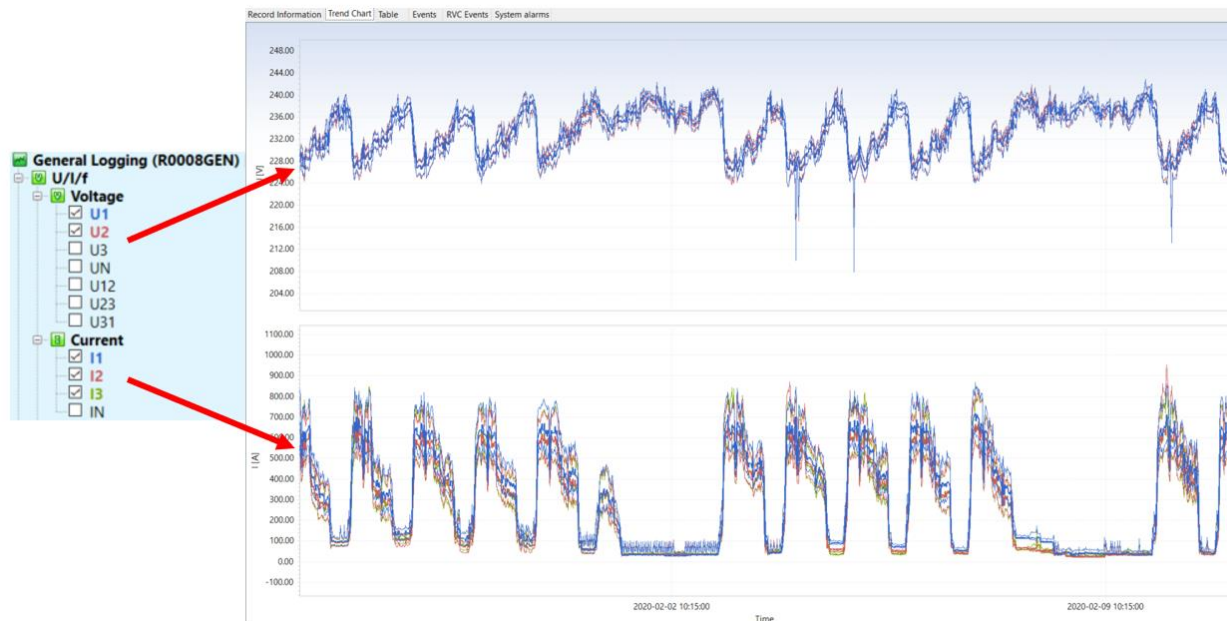
Time [UTC]	U1(Avg) [V]	U2(Avg) [V]	U3(Avg) [V]	I1(Max) [A]	I2(Max) [A]	I3(Max) [A]	I1(Avg) [A]	I2(Avg) [A]	I3(Avg) [A]
27.1.2020 10:15:00,000	227,84	228,26	227,55	832,32	794,63	792,84	675,69	639,72	643,55
27.1.2020 10:30:00,000	228,06	228,44	227,82	801,75	773,04	770,82	660,18	622,66	629,14
27.1.2020 10:45:00,000	229,41	229,57	229,10	665,69	646,94	638,89	518,85	479,34	488,70
27.1.2020 11:00:00,000	229,23	229,63	228,92	576,80	555,98	574,39	500,14	454,03	465,20
27.1.2020 11:15:00,000	227,93	228,23	227,48	749,93	735,67	739,14	597,67	567,01	574,31
27.1.2020 11:30:00,000	226,94	227,23	226,42	750,88	711,56	718,10	632,37	597,71	598,05
27.1.2020 11:45:00,000	227,00	227,28	226,60	717,61	685,39	734,90	584,10	542,88	547,44
27.1.2020 12:00:00,000	226,65	226,90	226,31	766,60	733,38	782,30	631,78	595,03	596,08
27.1.2020 12:15:00,000	228,10	228,48	227,88	740,10	696,92	745,87	619,70	582,44	582,13
27.1.2020 12:30:00,000	228,84	229,31	228,60	697,40	655,11	699,58	577,90	539,77	539,66
27.1.2020 12:45:00,000	228,42	228,87	228,27	708,02	671,81	676,64	623,99	584,95	589,55
27.1.2020 13:00:00,000	228,44	228,81	228,22	736,03	693,39	695,75	632,54	590,51	594,09
27.1.2020 13:15:00,000	228,17	228,57	227,94	739,55	695,72	688,93	635,28	591,43	592,46
27.1.2020 13:30:00,000	228,15	228,52	227,82	750,53	692,04	688,85	647,95	595,50	591,82
27.1.2020 13:45:00,000	228,24	228,50	227,83	788,79	742,67	742,67	660,68	621,22	614,41

5. It is also possible to modify (Edit), Delete already created filters.



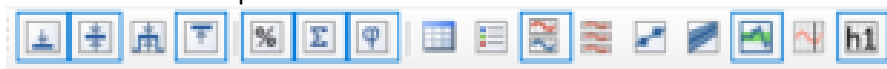
### 4.3.10 Creating Trend Charts (Graphs)

Trend Chart – Graph automatically appears by clicking on selected register. All selected values (Min, Max, Avg, AvgOn) are presented. Values presented under same folder are presented in same chart.



#### 4.3.10.1 Trend Charts manipulation

Most of Chart manipulation functions are available via icons:



## 4.3.10.1.1 Zoom In – Zoom out

X - Chart could be zoomed IN by using keys “Ctrl + Mouse wheel Up”




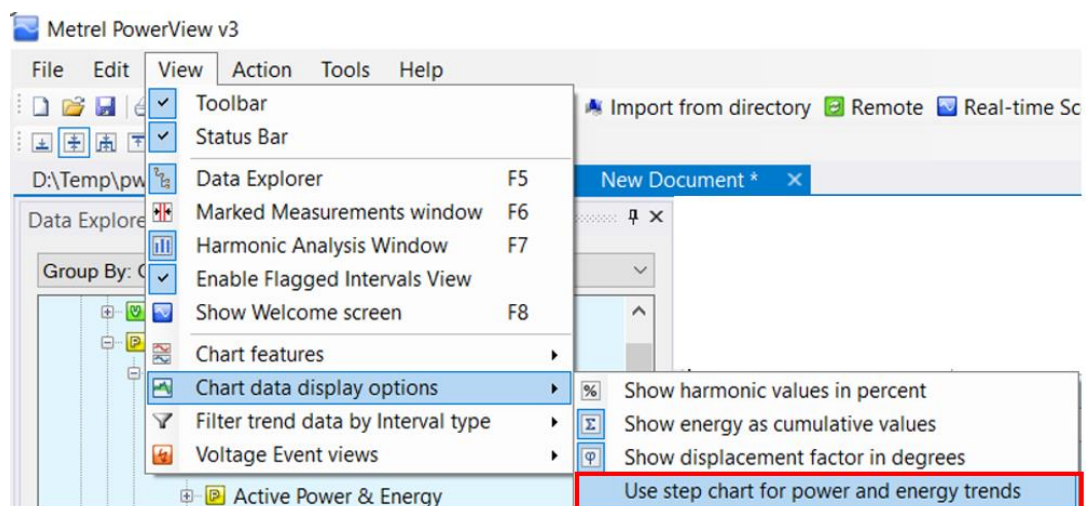
	X-Axis (for all Charts)	Y-Axis (for selected Chart only)
<b>Zoom IN</b>	Ctrl + Mouse wheel Up 	Shift + Mouse wheel Up
<b>Zoom OUT</b>	Ctrl + Mouse wheel Down 	Shift + Mouse wheel Down
<b>Zoom Reset</b>		



Figure 28 Zoom-in/ Zoom-out data chart data

Hint:

Do not use graph presentation “Use step chart for power and energy trends” as when zooming x-axis. Otherwise, there is vertical line at the end of graph.





## 4.3.10.1.2 Trend Chart Legend presentation




Legend could be added to Trend Chart by clicking on the “Show chart Legend” icon →  or via **View** → **Chart features** → **Show chart legend**


Chart info Legend as well as Flag info are presented  (“Show Flag markers” icon).



Figure 29 Chart Legend

## 4.3.10.1.3 Interval Chart presentation – by Week, by Day, by Hour, by Minute

Sometimes is useful to present recorded data by week/day/hour to get better view to the specifics, specially in case of longer registration periods.

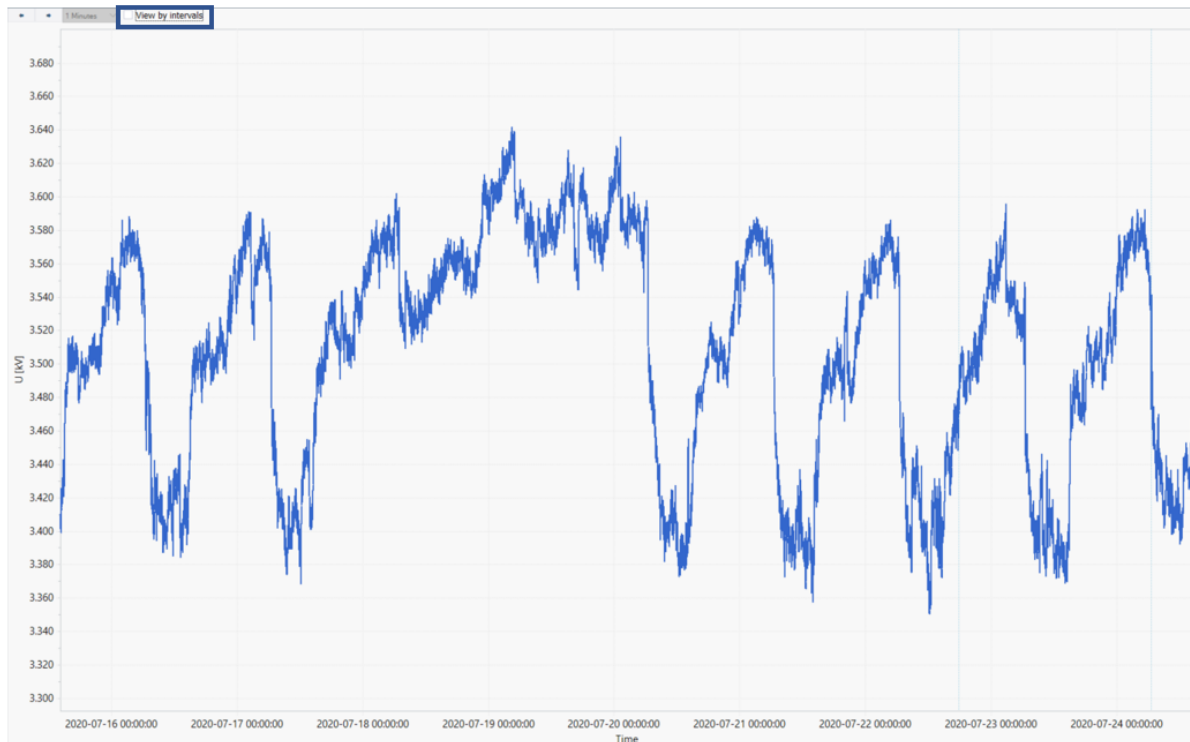


Figure 30 Complete recorded Chart data presentation

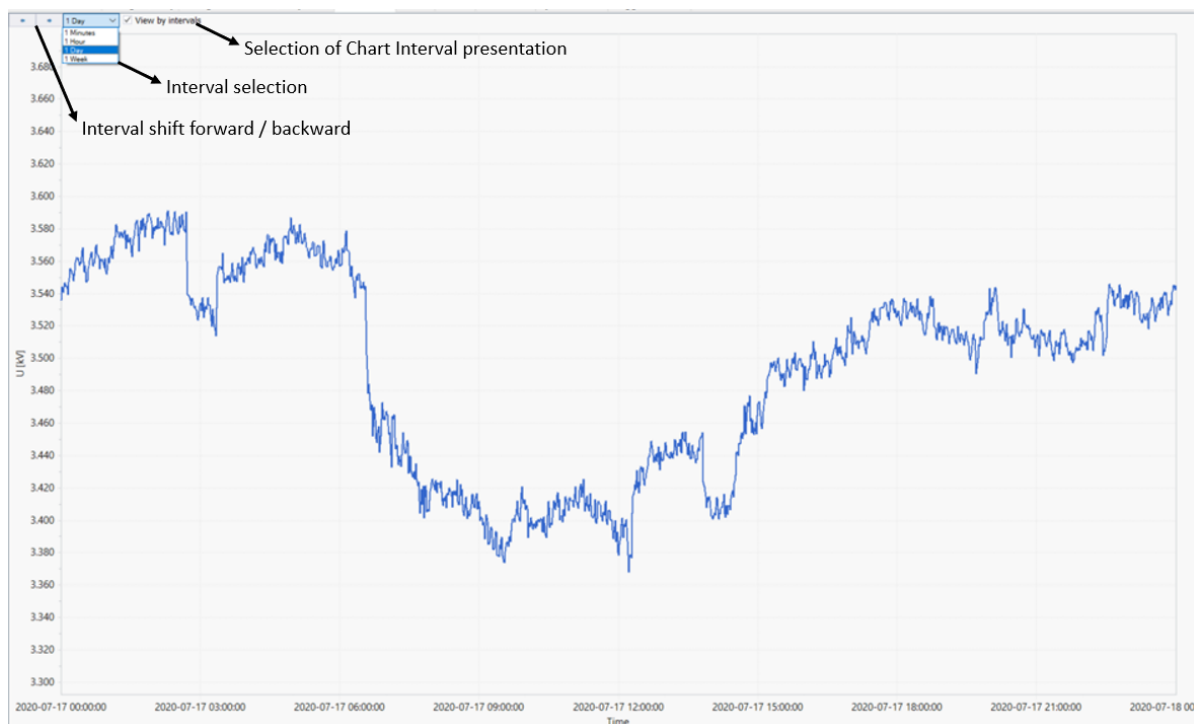
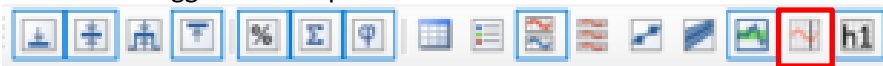



Figure 31 Interval Chart data presentation (Day by Day)

#### 4.3.10.1.4 Flagged marker presentation



Flagged intervals are presented in Trend Chart by clicking on “Show Flag markers” icon .

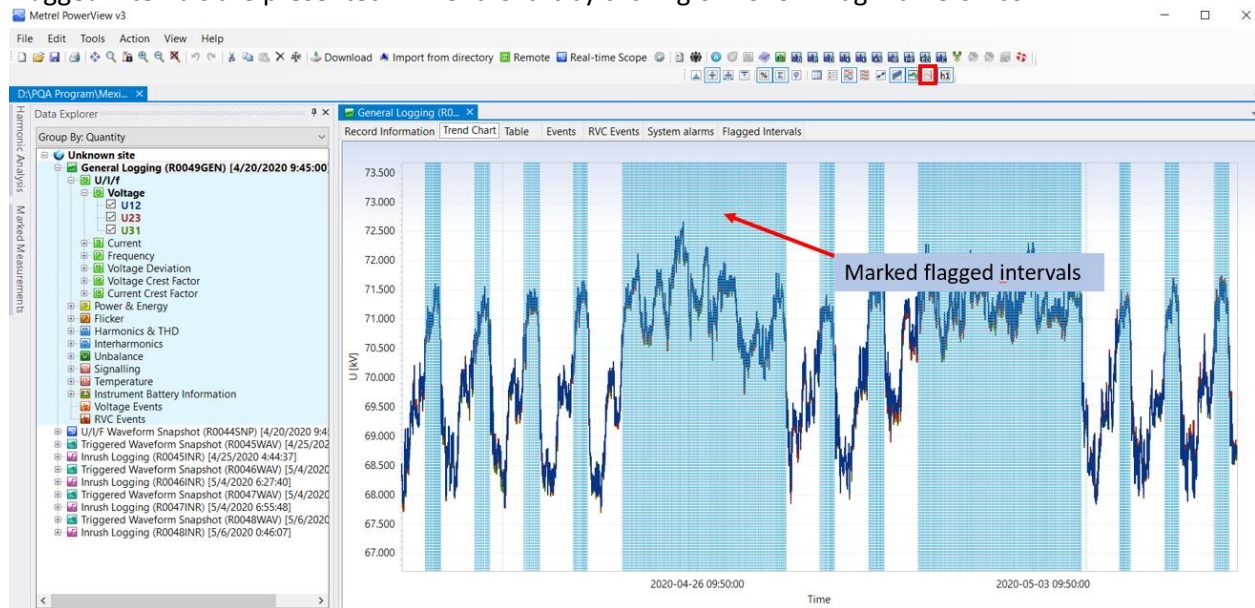


Figure 32 Flagged intervals - Chart

Table Flagged interval presentation:

Select **View** → **Enable Flagged Intervals View**

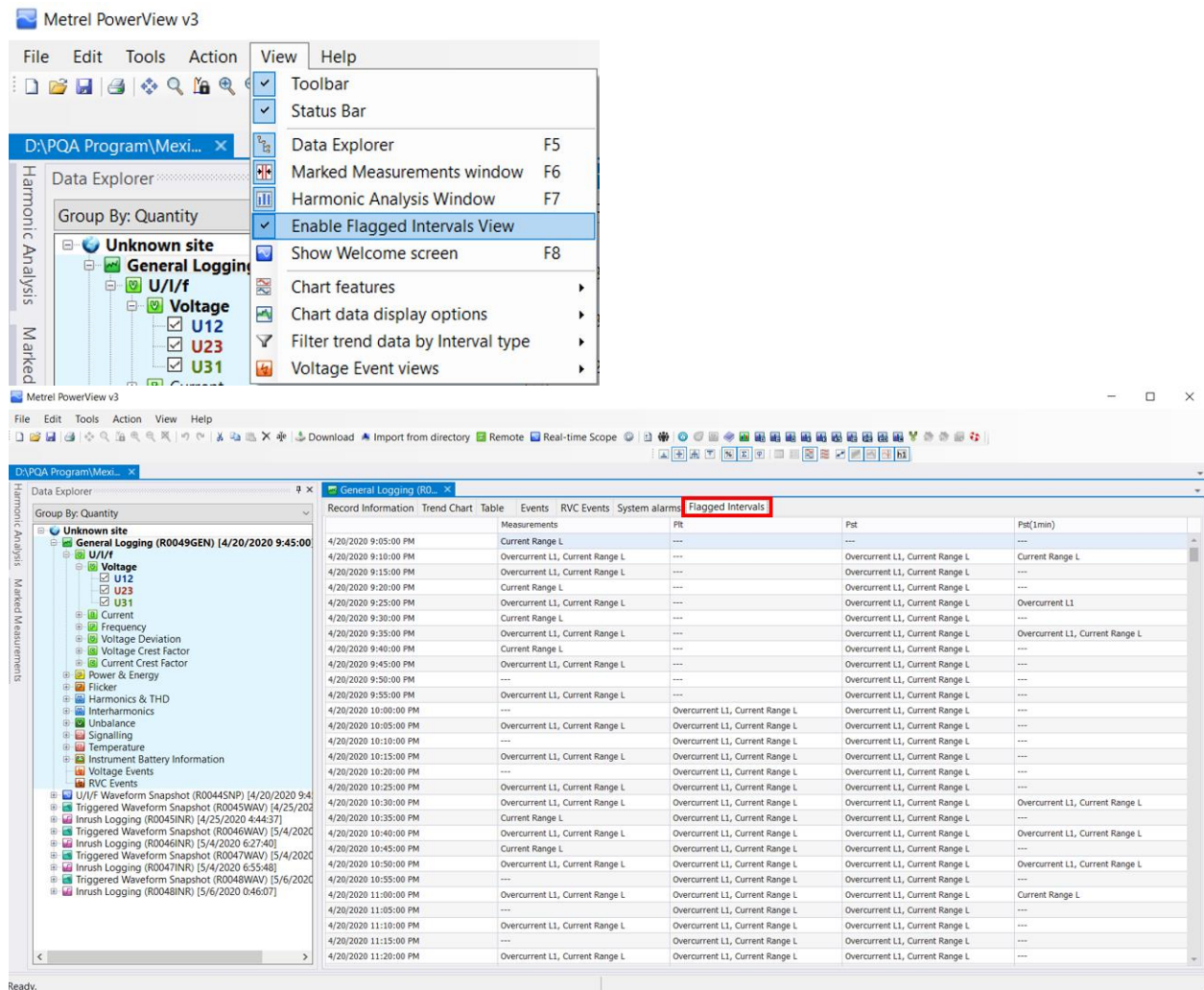




Figure 33 Flagged intervals - Table

## 4.3.10.1.5 Min/Avg/AvgOn/Max value presentation



To perform different values presentation, just click between Min/Avg/AvgOn/Max selection.

For some registers, all four selections are not available.


General Logging (R0...							
Record Information				Trend Chart			
Table				Events			
RVC Events				Subinterval Table			
System alarms				Flagged Intervals			
Voltage				Frequency			
U12				f			
	Min [kV]	Avg [kV]	AvgOn [kV]	Max [kV]	Min [Hz]	AvgOn [Hz]	Max [Hz]
4/20/2020 9:50:00.000	68.097	68.504	68.504	68.826	49.967	49.987	50.015
4/20/2020 9:55:00.000	67.964	68.361	68.361	68.645	49.998	50.011	50.022
4/20/2020 10:00:00.000	67.906	68.291	68.291	68.606	50.001	50.018	50.031
4/20/2020 10:05:00.000	67.865	68.185	68.185	68.464	49.987	50.011	50.029
4/20/2020 10:10:00.000	67.610	67.986	67.986	68.378	49.991	50.016	50.031
4/20/2020 10:15:00.000	67.533	67.949	67.949	68.293	49.985	50.003	50.024

For specific registers; like Power Factor, we suggest to monitor AvgOn value or Universal (Unsigned) Power Factor (includes cap & ind part)

Record Information					
Trend Chart					
Table					
Events					
Alarms					
System alarms					
Power Factor			Power Factor Universal		
PFtotcap+		PFtotind+		UPFtot+	
Avg []	AvgOn []	Avg []	AvgOn []	Avg []	
5/21/2018 14:55:00.000	---	---	0.986	0.986	0.986
5/21/2018 15:00:00.000	0.011	0.988	0.974	0.984	0.984
5/21/2018 15:05:00.000	---	---	0.985	0.985	0.985
5/21/2018 15:10:00.000	---	---	0.986	0.986	0.986
5/21/2018 15:15:00.000	---	---	0.987	0.987	0.987
5/21/2018 15:20:00.000	0.022	0.985	0.966	0.988	0.988
5/21/2018 15:25:00.000	---	---	0.983	0.983	0.983
5/21/2018 15:30:00.000	0.007	0.993	0.980	0.987	0.987
5/21/2018 15:35:00.000	0.073	0.990	0.910	0.983	0.983
5/21/2018 15:40:00.000	---	---	0.984	0.984	0.984
5/21/2018 15:45:00.000	---	---	0.987	0.987	0.987
5/21/2018 15:50:00.000	---	---	0.989	0.989	0.989
5/21/2018 15:55:00.000	---	---	0.987	0.987	0.987
5/21/2018 16:00:00.000	---	---	0.985	0.985	0.985
5/21/2018 16:05:00.000	---	---	0.987	0.987	0.987
5/21/2018 16:10:00.000	---	---	0.986	0.986	0.986
5/21/2018 16:15:00.000	---	---	0.985	0.985	0.985
5/21/2018 16:20:00.000	---	---	0.986	0.986	0.986
5/21/2018 16:25:00.000	0.070	0.986	0.916	0.985	0.985

## 4.3.10.1.6 Toggle between harmonics presentation in % or in basic unit [V/A]



Harmonic components and THD could be presented in % (related to the first harmonic component) or as absolute value (presented in V or A). Click on icon  or via **View → Chart data display options → Show harmonic values in percent**


	Voltage THD		Current THD		Voltage Harmonic		Current Harmonic			
	THD U12	THD U23	THD I1		U12 h3	I1 h1		I1 h3		
	AvgOn [%]	AvgOn [%]	Avg [%]	AvgOn [%]	Avg [%]	AvgOn [%]	Avg [%]	AvgOn [%]	Avg [%]	
4/20/2020 9:50:00.000	4.511	4.496	19.01	19.01	0.181	100.0	100.0	6.12	6.12	
4/20/2020 9:55:00.000	4.557	4.507	18.38	18.38	0.176	100.0	100.0	5.97	5.97	
4/20/2020 10:00:00.000	4.312	4.270	17.10	17.10	0.163	100.0	100.0	5.93	5.93	
4/20/2020 10:05:00.000	4.293	4.277	16.80	16.80	0.134	100.0	100.0	5.82	5.82	

	Voltage THD		Current THD		Voltage Harmonic	Current Harmonic			
	THD U12	THD U23	THD I1		U12 h3	I1 h1		I1 h3	
	AvgOn [kV]	AvgOn [kV]	Avg [A]	AvgOn [A]	Avg [kV]	Avg [A]	AvgOn [A]	Avg [A]	AvgOn [A]
4/20/2020 9:50:00.000	3.088	3.078	50.23	50.23	0.124	267.35	267.35	16.21	16.21
4/20/2020 9:55:00.000	3.112	3.078	48.63	48.63	0.120	267.61	267.61	15.80	15.80
4/20/2020 10:00:00.000	2.942	2.915	45.19	45.19	0.111	268.41	268.41	15.72	15.72
4/20/2020 10:05:00.000	2.924	2.917	44.01	44.01	0.092	264.66	264.66	15.27	15.27

Figure 34 Harmonics presentation - % / [V/A]

## 4.3.10.1.7 Energy presentation as “Cumulative” od “Delta” values



Consumed/ Generated Energy could be presented as Cumulative or Delta values. Selection could be performed by clicking on  icon or via **View → Chart data display options → Show energy as cumulative values**



Energy presented as “Delta” values

Energy presented as “Cumulative” values

Figure 35 Delta/Cumulative Energy Chart presentation

Also, under Table data presentation, there is Summ of Total energy presented:

Active Energy		Active Energy	
Eptot+		Eptot+	
Avg [MWh]		Avg [kWh]	
2/3/2020 8:30:00.000	30.06	2/3/2020 8:30:00.000	100.94
2/3/2020 8:45:00.000	30.16	2/3/2020 8:45:00.000	98.54
2/3/2020 9:00:00.000	30.26	2/3/2020 9:00:00.000	96.49
2/3/2020 9:15:00.000	30.36	2/3/2020 9:15:00.000	97.79
2/3/2020 9:30:00.000	30.46	2/3/2020 9:30:00.000	103.73
2/3/2020 9:45:00.000	30.56	2/3/2020 9:45:00.000	103.18
2/3/2020 10:00:00.000	30.67	2/3/2020 10:00:00.000	102.06
Total energy:	30.67	Total energy:	30665.98

## 4.3.10.1.8 Displacement Power factor presentation in degrees



Displacement power factor could be presented in degrees or as an absolute value (0.00 – 1.00).

Selection could be performed by clicking on the icon  or via **View → Chart data display options → Show displacement factor in degrees**

	Displacement Factor				Displacement Factor		
	DPF1ind+	DPF2ind+	DPF3ind+		DPF1ind+	DPF2ind+	DPF3ind+
	± Avg [°]	± Avg [°]	± Avg [°]		± Avg []	± Avg []	± Avg []
1/27/2020 10:15:00.000	15.20	15.06	16.35	1/27/2020 10:15:00.000	0.965	0.966	0.960
1/27/2020 10:30:00.000	13.18	13.66	14.30	1/27/2020 10:30:00.000	0.974	0.972	0.969
1/27/2020 10:45:00.000	6.12	6.35	7.51	1/27/2020 10:45:00.000	0.994	0.994	0.991
1/27/2020 11:00:00.000	5.32	4.47	6.77	1/27/2020 11:00:00.000	0.996	0.997	0.993
1/27/2020 11:15:00.000	11.86	11.29	12.75	1/27/2020 11:15:00.000	0.979	0.981	0.975
1/27/2020 11:30:00.000	14.13	13.54	14.96	1/27/2020 11:30:00.000	0.970	0.972	0.966
1/27/2020 11:45:00.000	12.35	12.05	13.83	1/27/2020 11:45:00.000	0.977	0.978	0.971
1/27/2020 12:00:00.000	14.19	14.25	15.73	1/27/2020 12:00:00.000	0.969	0.969	0.963
1/27/2020 12:15:00.000	14.52	14.59	16.01	1/27/2020 12:15:00.000	0.968	0.968	0.961

#### 4.3.10.1.9 Universal Power factor presentation

In case of compensated load, power factor varies between capacitive and inductive part. Power factor is split into two values according standard definition → PF inductive and PF capacitive. Users have problem, how to interpret these values as a unique one; like Unsigned/Universal Power Factor. PowerView makes a summation between PF ind and PF cap and present it like Universal Power Factor.

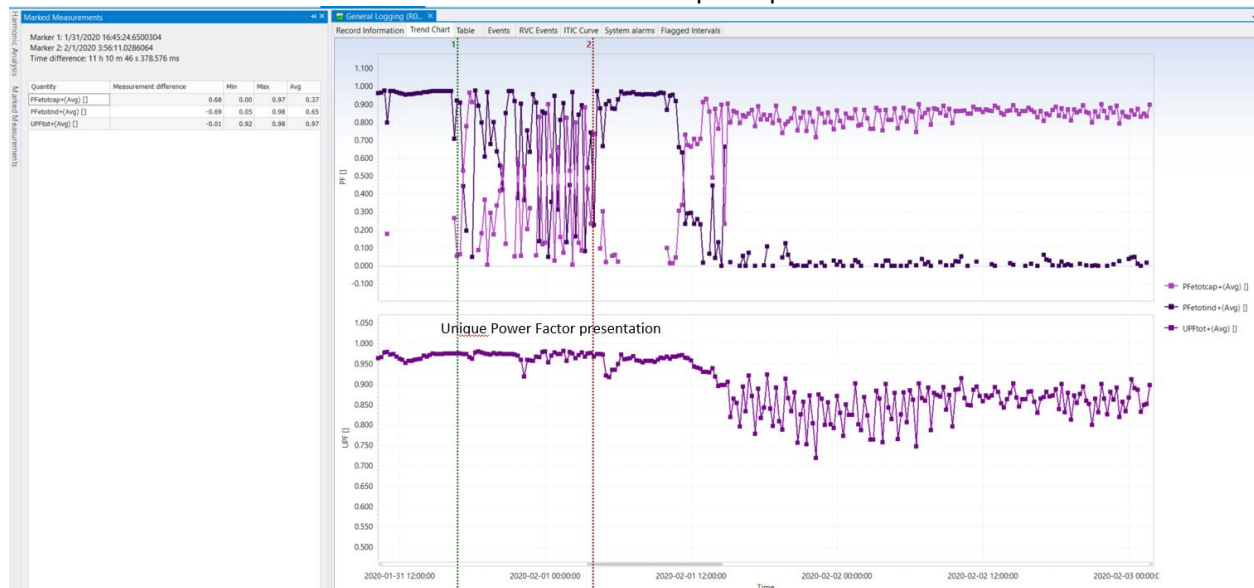


Figure 36 PFind & PFcap vs PFUni

#### 4.3.10.1.10 Data markers chart presentation and attaching custom annotations



On the chart presentation it is possible to select data markers, which mark the individual points in the graph. This is useful for specific points labelling under the chart presentation.

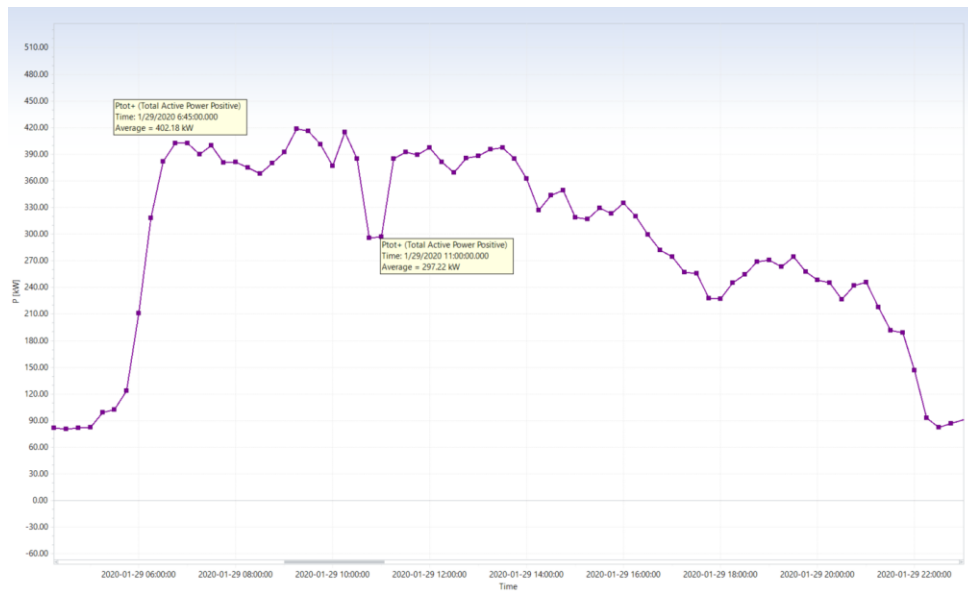
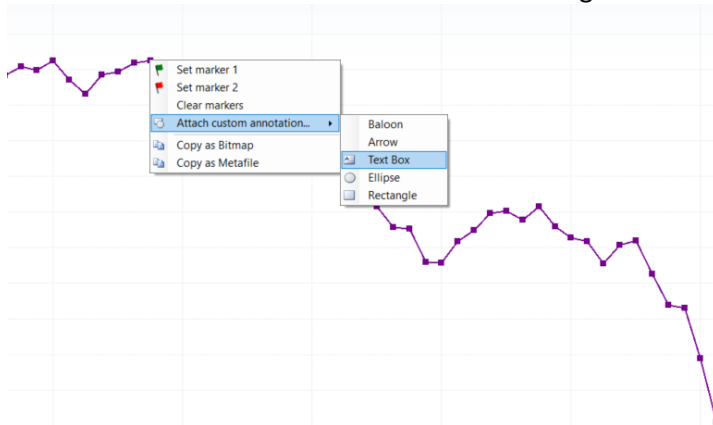
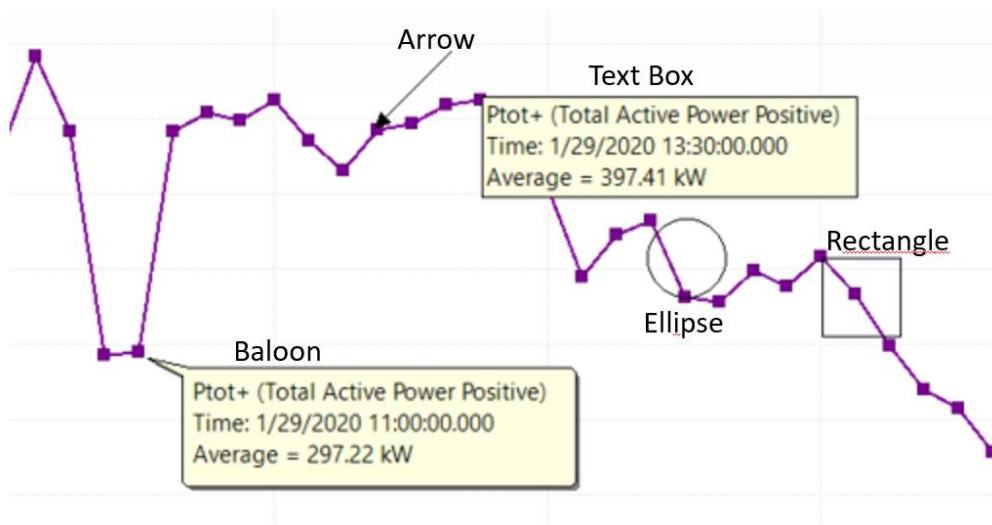


Figure 37 – Chart Annotation

Custom annotation marks could be added through:



Different options of Custom annotations:



## 4.3.10.1.11 MIN-MAX range presentation as filled area



When Min/Max data on the chart are presented, then area between min/max could be presented as filled area.

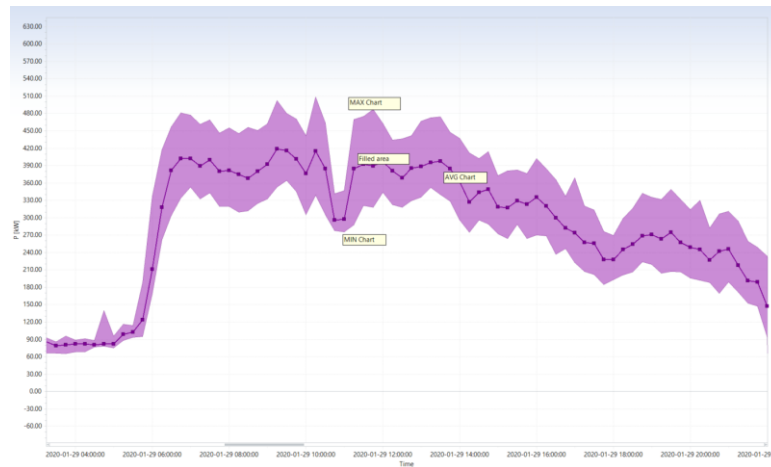


Figure 38 MIN-MAX Chart presentation

## 4.3.10.1.12 Marked measurements - MIN/MAX/AVG data presentation from the chart selection

For the detailed analyse, it is possible to get Min/Max/Avg values from the selected time frame on the chart. These values are presented for all selected charts. Time frame is defined with marker 1 & 2 selection. Values are presented under folder “Marked Measurements”.



Selection of marker 1 & marker 2



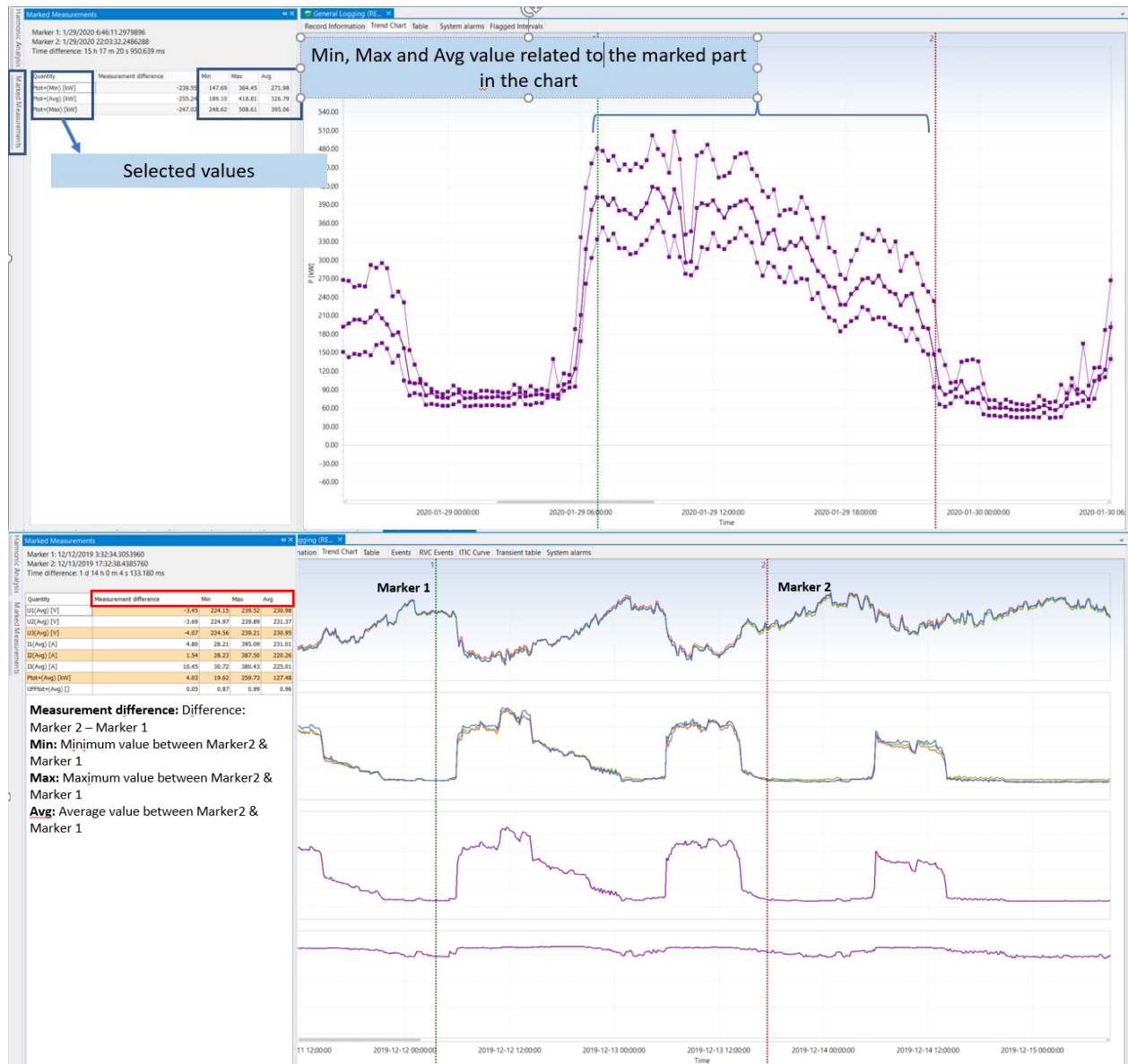
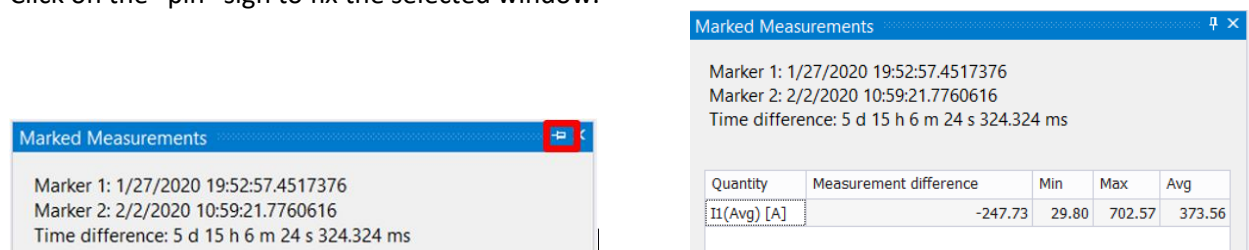


Figure 39 - Min/Max/Avg data presentation from the chart values on the selected time frame

## How to fix the “Marked measurements” window?

Click on the “pin” sign to fix the selected window.




Same procedure for “Harmonic Analysis” and “Data Explorer” window.

#### 4.3.10.1.13EN 50160 limits presented in Charts

Some data, like Voltage, Long-term Flicker Plt and unbalance could be presented in Trend Chart with EN 50160 limits for specific quantity.

Procedure:

1. Select Power Quality Criteria limits. Selection can be between:
  - EN 50160
  - GOST 32144/33073
  - CHINESE
  - Customer specific (based on EN 50160/GOST 32144/33073/CHINESE)

To open Power Quality Criteria limits, click on  icon or via → **Action** → **Define Power Quality Criteria**.

Power Quality Criteria limits are updated on regular base to follow mentioned standards.

2. Click on  icon or via → **View** → **Chart features** → **Show EN 50160 criteria as chart regions** to insert selected limits on the Chart.

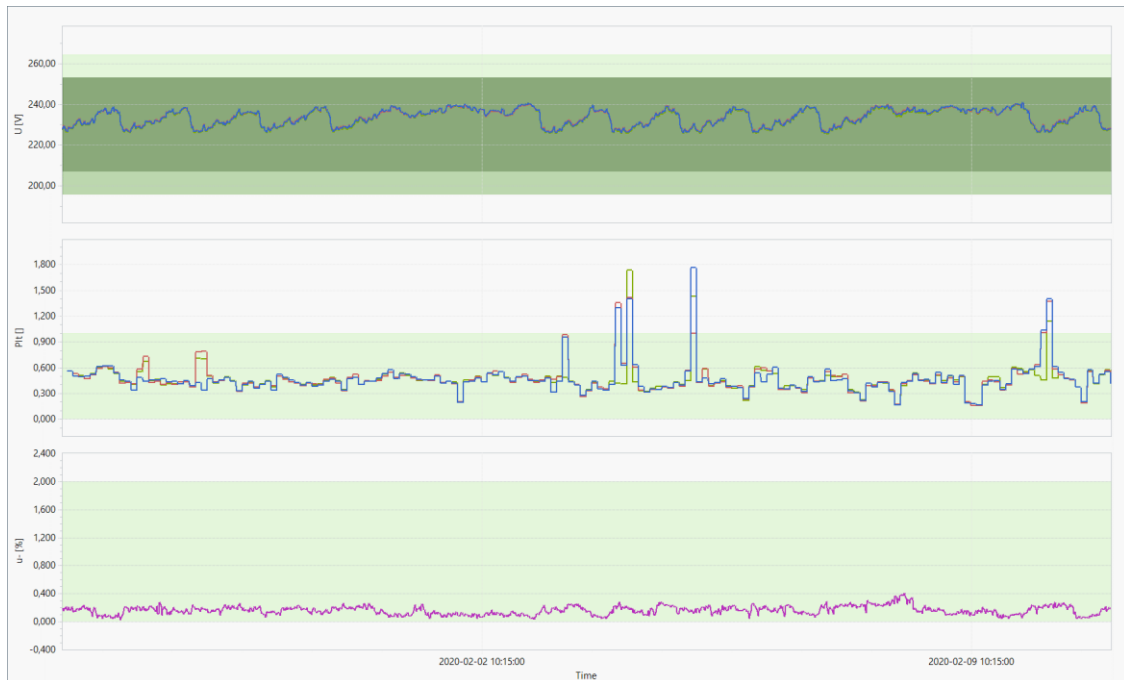



Figure 40 – EN 50160 criteria as Chart limits

#### 4.3.10.1.14 Show Table data with Chart view

For easiest data analysing is useful to monitor the Chart and Table data in same window. To create such

view, click on  icon or via → **View** → **Chart features** → **Show tabular data**

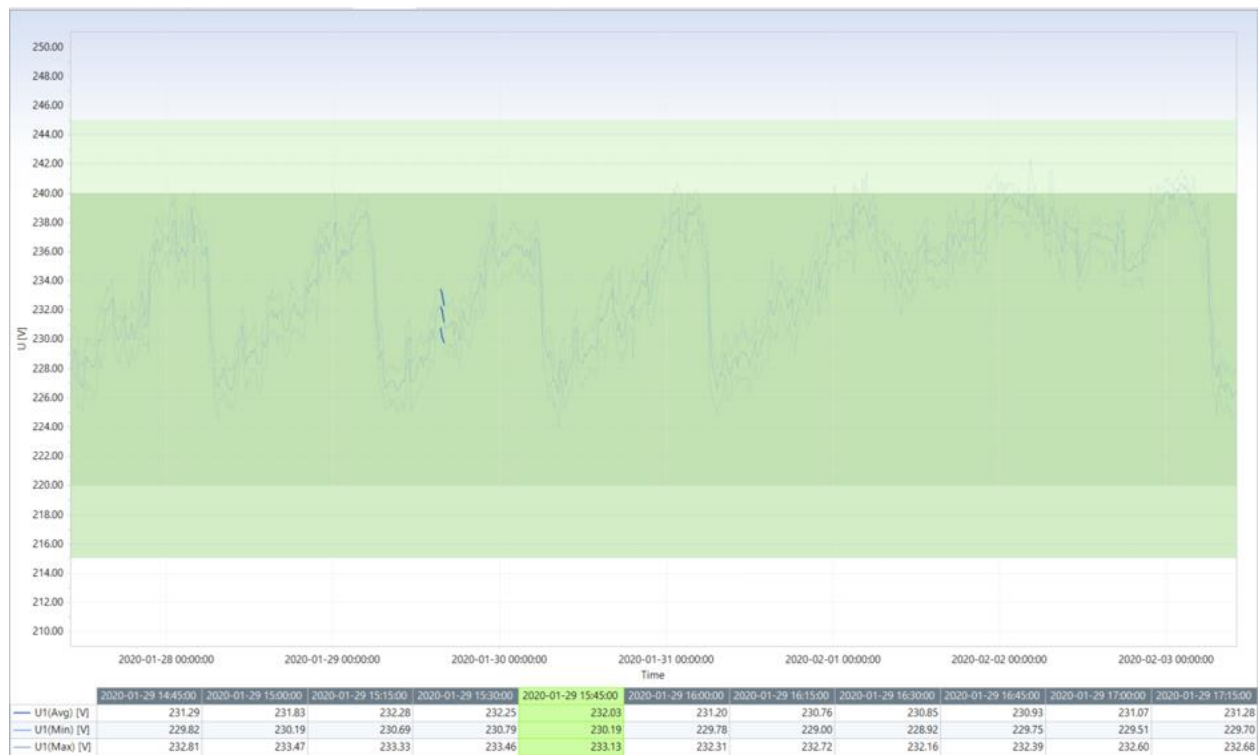


Figure 41 – Chart and Tabular data presentation



### 4.3.11 Creating Snapshots

Snapshot is useful tool for creating and saving particular Charts/Tables used for the customized report creation.

To create Snapshots:

1. Create specific Chart, with specific annotations etc..

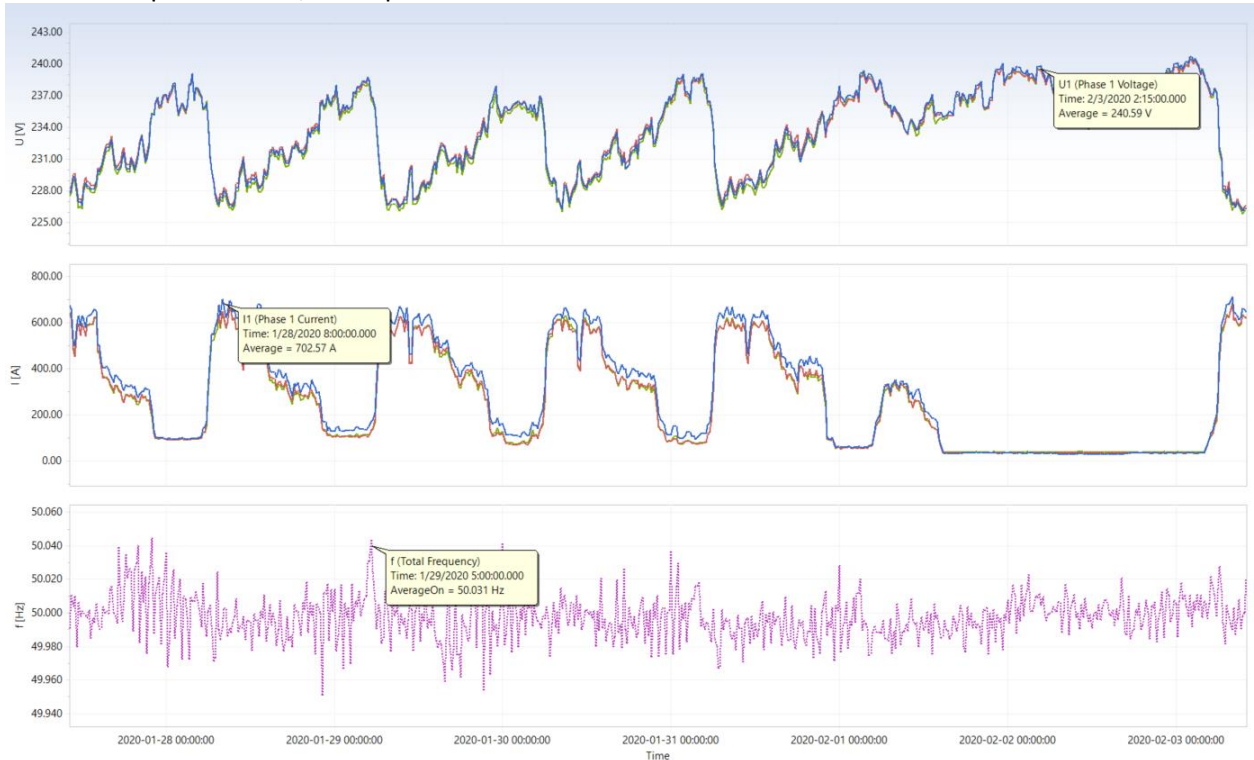


Figure 42 – Chart creating under PowerView

2. Create Snapshot → select **General Logging** folder and right mouse button → **Create snapshot**

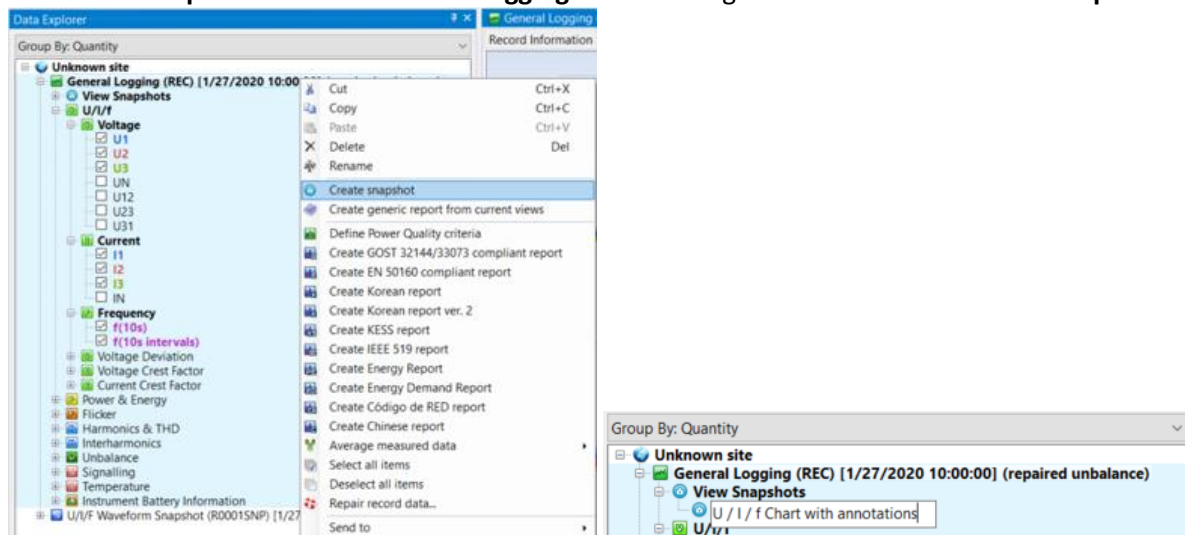
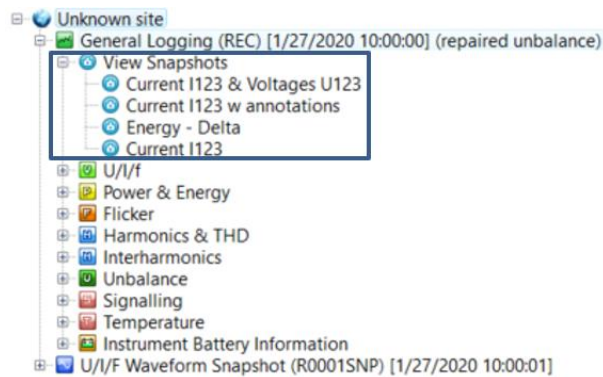


Figure 43 – Creating Snapshot

3. You can add additional register to exit Chart under Snapshot, you can rename it, update it etc
4. Snapshots are saved under generic folder structure.
5. Different type of Snapshots could be crated.



6. For opening already saved Snapshot, double click on the optional Snapshot, where predefined Chart is saved and presented.

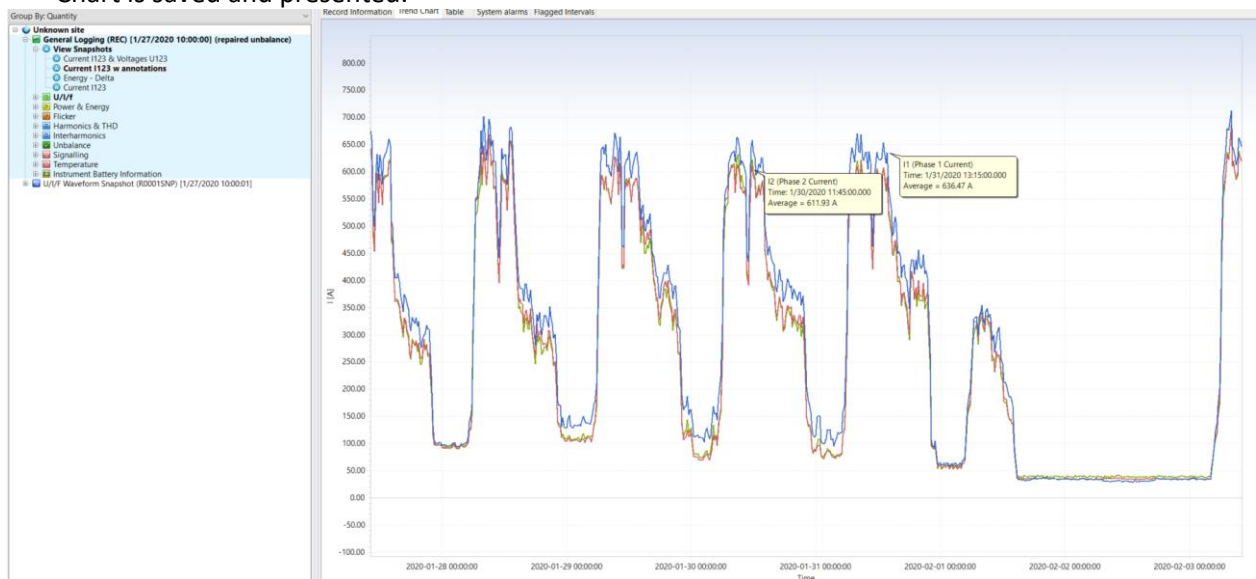


Figure 44 – Opening existing Snapshot

#### 4.3.12 Copying Charts as Bitmap/Metafile

Charts could be easily Copy/Paste as Bitmap or Metafile. Select appropriate function by click on the right mouse button.

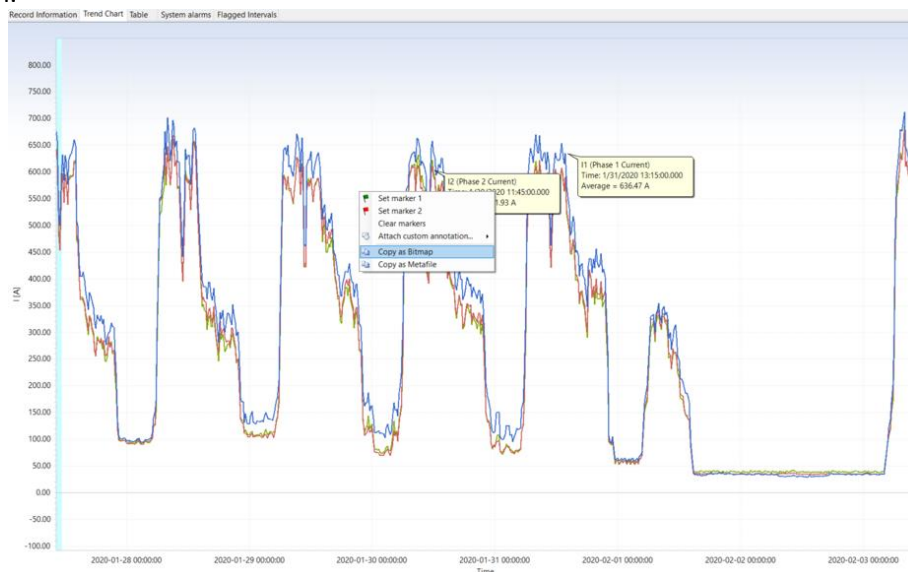


Figure 45 – Bitmap/Metafile copy

Files could be easily copied to other programs, like Word, Excel etc, just by selecting Paste option or “Ctrl V / Shift Ins”.

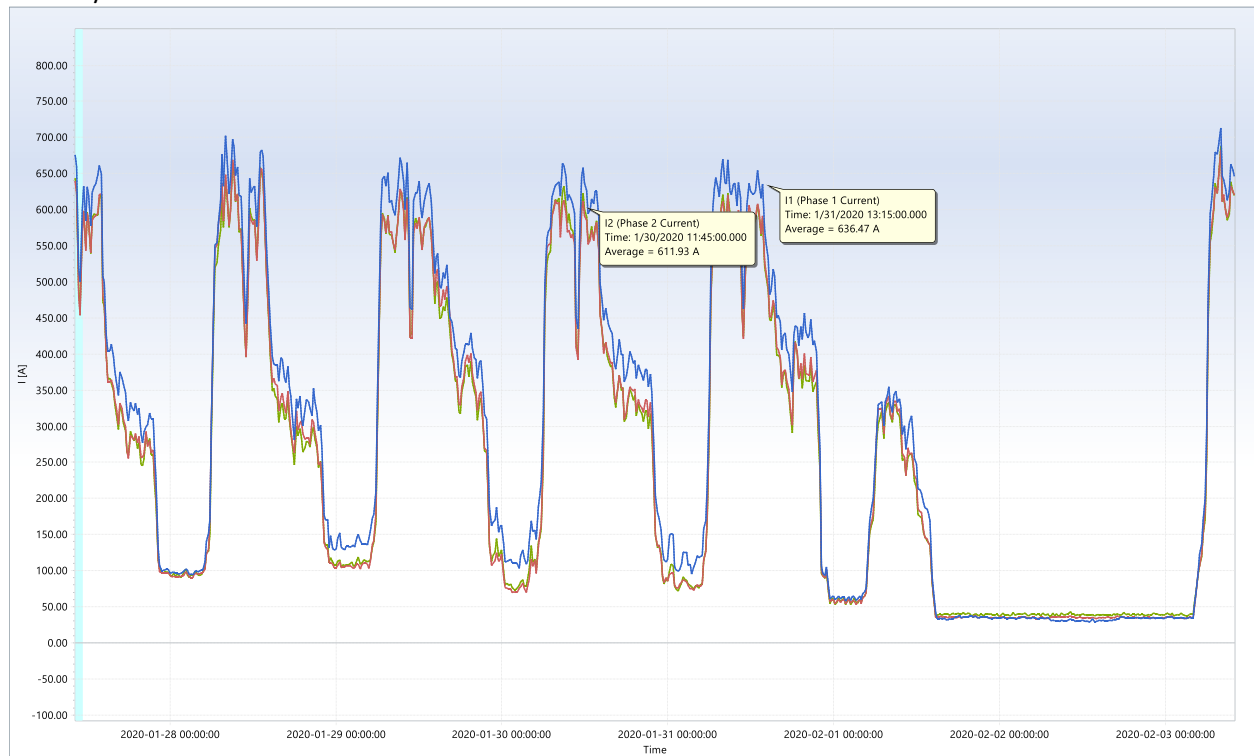
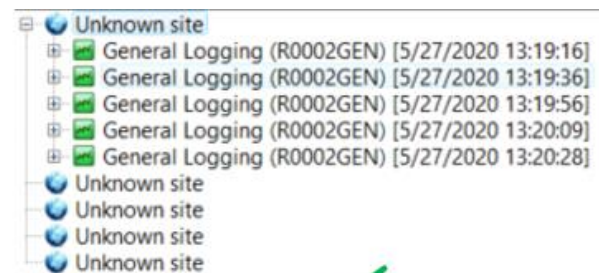


Figure 46 – Bitmap/Metafile copy

### 4.3.13 Merge records

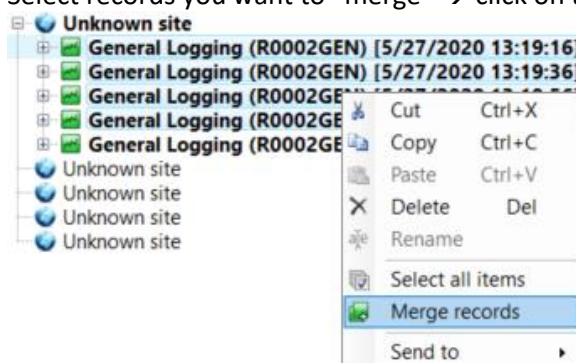
Sometimes it could happen, that due some different reasons we need to merge more records to a single one. Limitations:

- Records should be under same “Site”

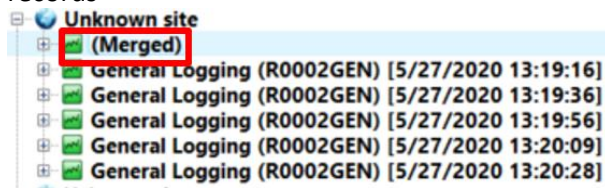


- Records should have same settings

1. Select records you want to “merge” → click on the right mouse button



2. Default “merged” record is named as “**(Merged)**” and includes info about all, together merged records

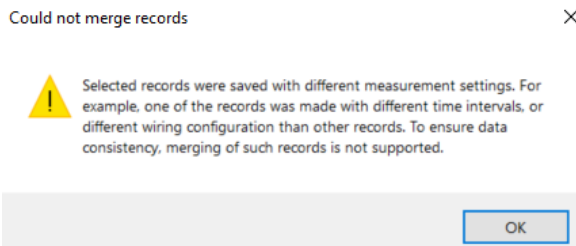


(Merged)

General Logging, recorded on 5/27/2020 13:19:17, duration: 45 s.

Merged from several records: General Logging (R0002GEN) [5/27/2020 13:19:16]; General Logging (R0002GEN) [5/27/2020 13:19:36]; General Logging (R0002GEN) [5/27/2020 13:19:56]; General Logging (R0002GEN) [5/27/2020 13:20:09]. Merged by: Mihael Hribar, on 5/27/2020 1:37:23

3. In case, that records parameters do not match each other, merging is not possible. In such case, alert information appears on display:




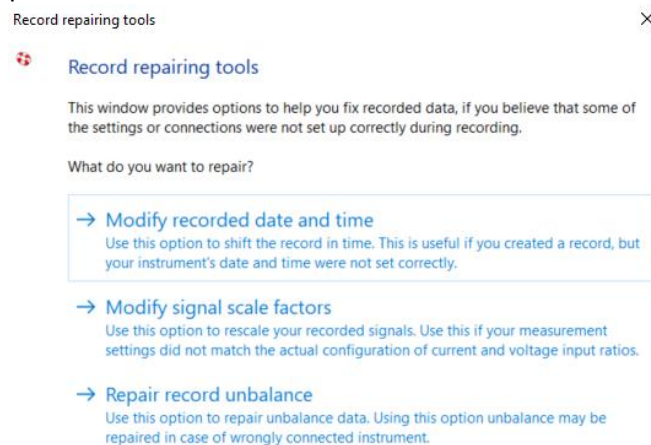
#### 4.3.14 Record repairing tools

It could happen, that during recording some parameters or connection were not properly set. PowerView enables correction of recorded data in case of wrong settings or connection. It is not possible to correct all possible mistakes; for example – wrong current sequence, related to the voltage one could not be corrected with PowerView.

PowerView enables correction of:

- Modify recorded date and time
- Modify signal scale factors
- Repair record unbalance

Select **General Logging** and click on icon  or press **Action → Repair record data** and select repairing option, that you want to perform on the recorded data.



### 4.3.15 Modify recorded date and time

In case, that actual time was not properly set or GPS receiver was not used during recorder session, PowerView enables correction the recorded time.

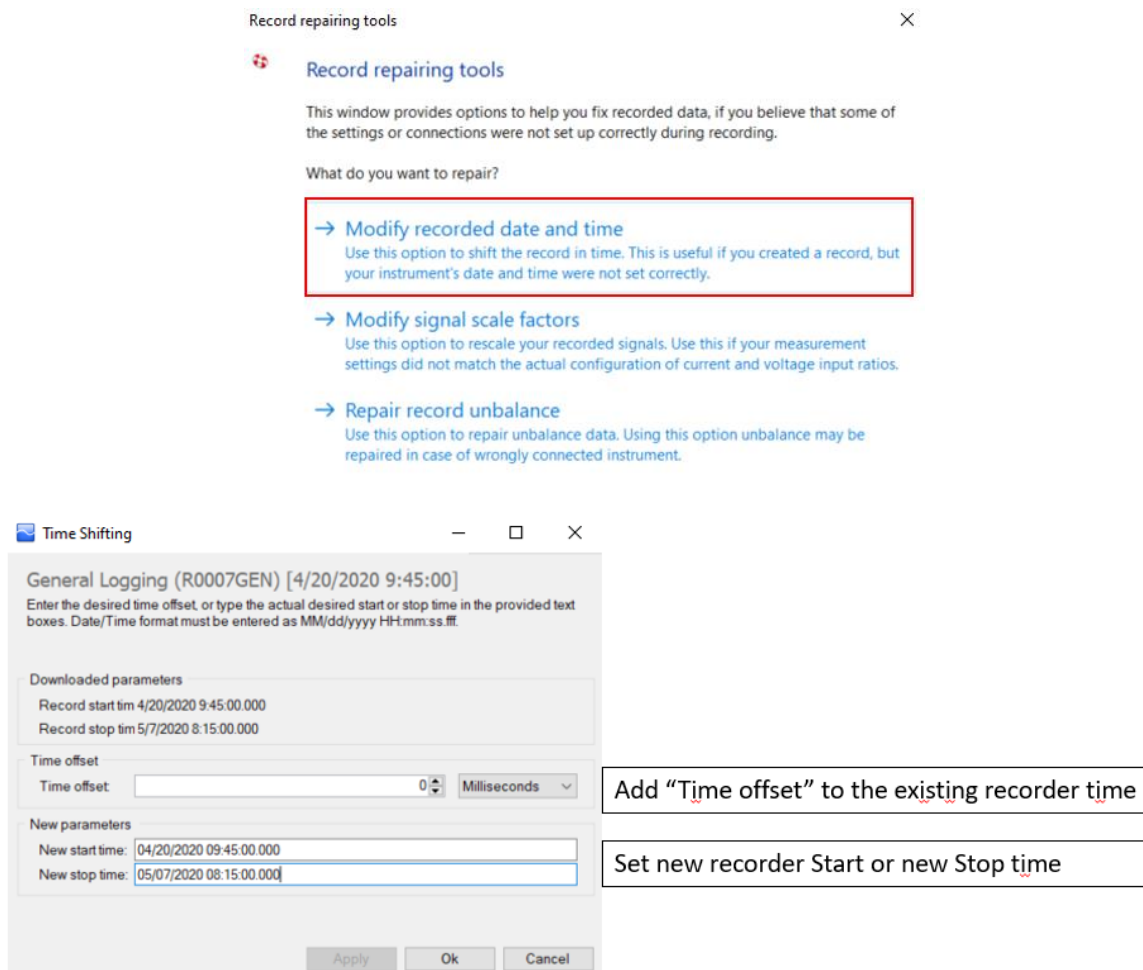


Figure 47 – Correction of recorder Start/Stop time

PowerView corrects recorder time stamps accordingly.

#### 4.3.15.1 Modify signal scale factors (CT/VT ratio)

In case, that actual registration was done on secondary data or with wrong CT/VT ratio, it is possible to multiply/divide all necessary data with proper CT/VT correction factor.



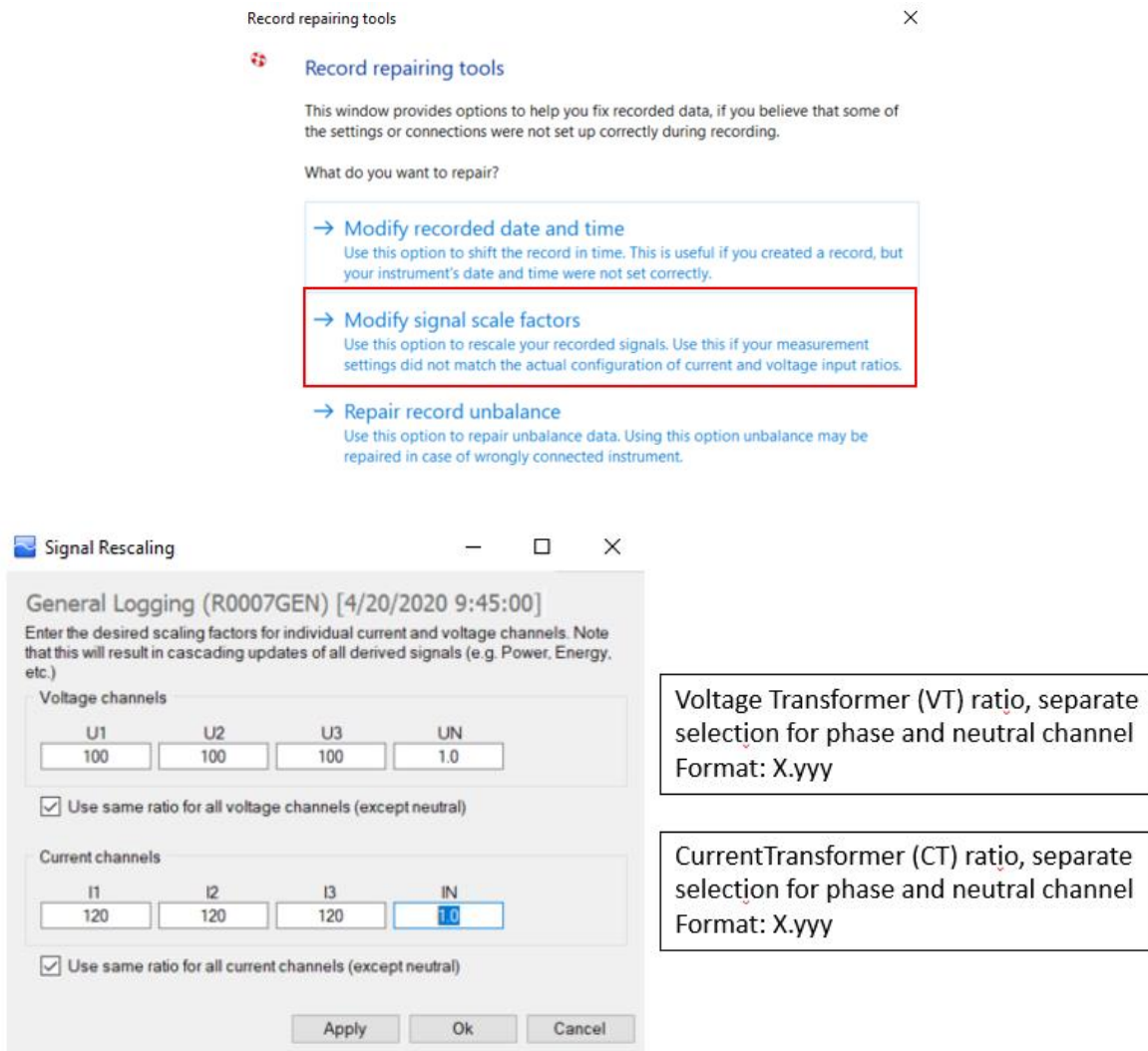


Figure 48 – Correction of VT/CT ratio

PowerView corrects all registers, which are influenced to the CT/VT ratio.

**Note:**

At INV-1W and INV-3W connection, UN and IN refer to DC voltage and current.

#### 4.3.15.2 Repair record unbalance

Some measurement installations don't have proper voltage rotation field, which caused FAIL result on EN 50160 report – Negative sequence voltage ratio.

Negative sequence voltage ratio could be detected through Unbalance diagram (significant  $U^-$  and  $I^-$  components).

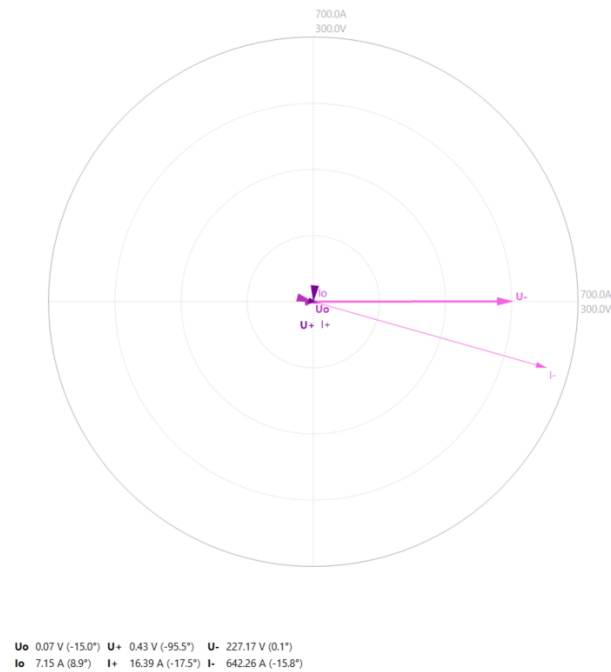


Figure 49 – Unbalance diagram – Negative voltage sequence

PowerView enables correction of Negative voltage sequence via “**Repair record unbalance**”.

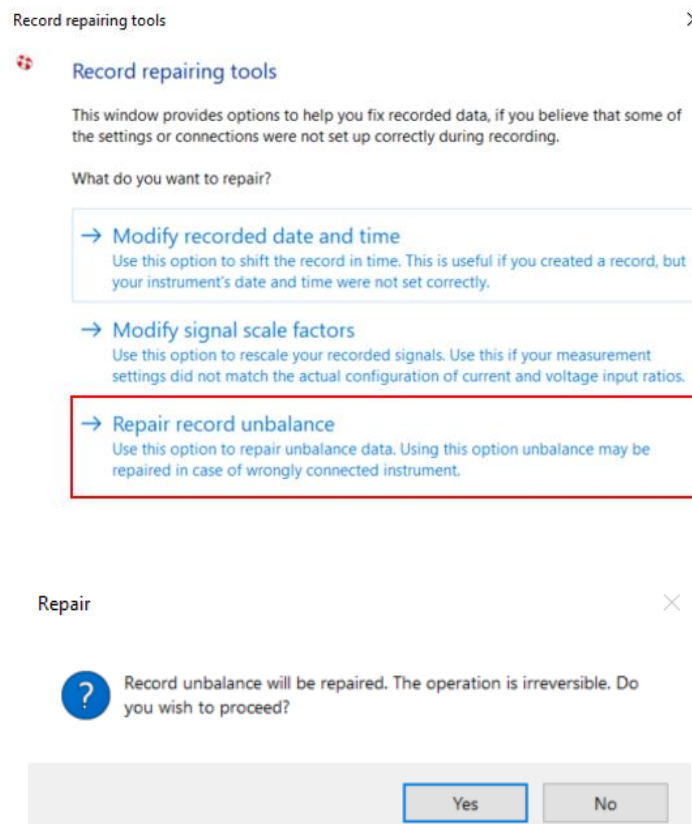


Figure 50 – Correction of Record Unbalance

PowerView corrects Record unbalance.

Correction is visible through additional comment, attached to the end of the General recorder naming  
 → General Logging (R0007GEN) [4/20/2020 9:45:00] (**repaired unbalance**)

All changes are noted under “Record Information”, for time change and Signal scale factors, there are also correction added.

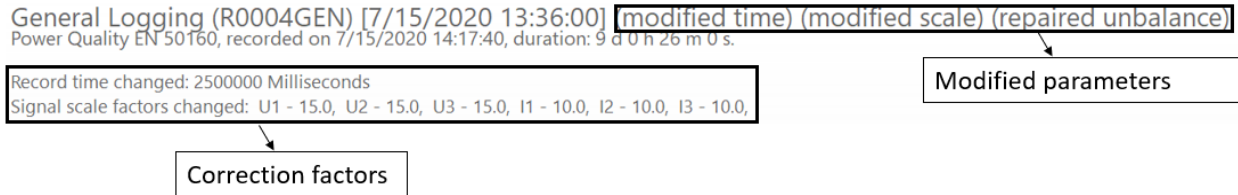


Figure 51 – List of changed parameters under PowerView

### 4.3.16 Current and voltage harmonics/interharmonics presentation

Voltage and current harmonics could be presented on the chart. Useful icon/buttons:

**h1**

Show First Harmonic

**F7**

Show Harmonic Analysis

**Harmonics presentation** for Voltage and Current:

- Harmonic components from DC to 50<sup>th</sup> could be presented
- Harmonics for voltage includes Avg, Max values
- Harmonics for current includes Avg, AvgOn and Max values
- Some current harmonic components are not presented in bar graph. Reason: measured current is under the minimum limit measurement for the used current clamps (bar graph example bellow)
- For the specific point in the harmonic chart, **bar chart** could be presented (present separate harmonic components for the selected point in the harmonic chart)

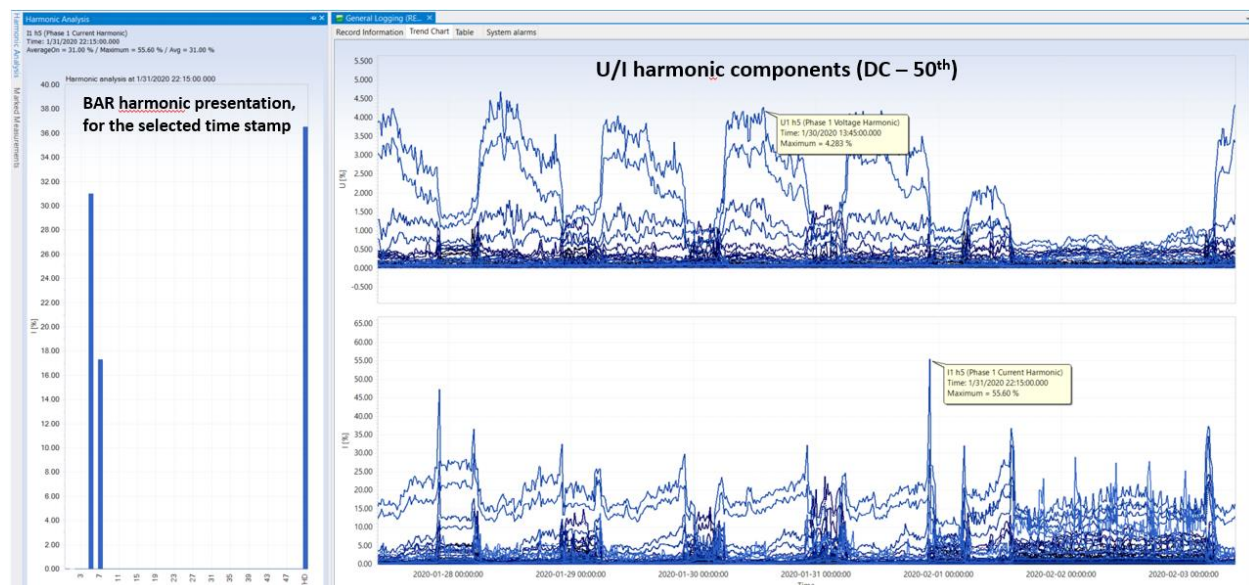


Figure 52 – Current and Voltage harmonics with harmonics bar chart presentation



**THD presentation for Voltage and Current:**

- THD for voltage includes AvgOn, Max values
- THD for current includes Avg, AvgOn and Max values

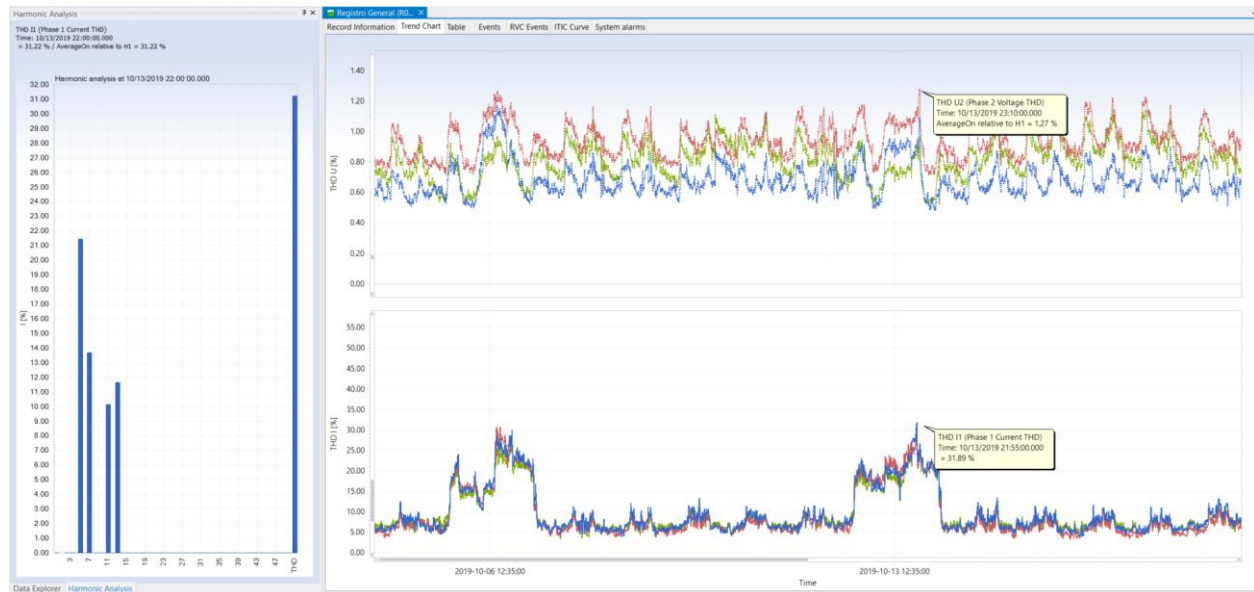


Figure 53 – Current and Voltage THD chart with harmonics bar chart presentation

Same approach is valid also for the interharmonics presentation.

#### 4.3.17 TDD calculation – related to measured RMS current or nominal transformer current

Total Demand Distortion (TDD) is calculated harmonic current distortion against the full load level of the electrical system. At the full load  $TDD(I) = THD(I)$ . TDD gives better insight about how big is impact of harmonic distortion in the system. For example we could have very high THD but the load of the system is low. In this case the impact on the system is also low. TDD calculation formula:

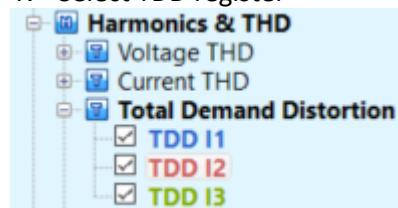
$$I_{TDD} = \frac{\sqrt{I_2^2 + I_3^2 + I_4^2 + I_5^2 + \dots}}{I_L}$$

Where “ $I_L$ ” is to the maximum demand load current. PowerView enables selection of  $I_L$  from:

- RMS current for each phase separately
- Nominal transformer current

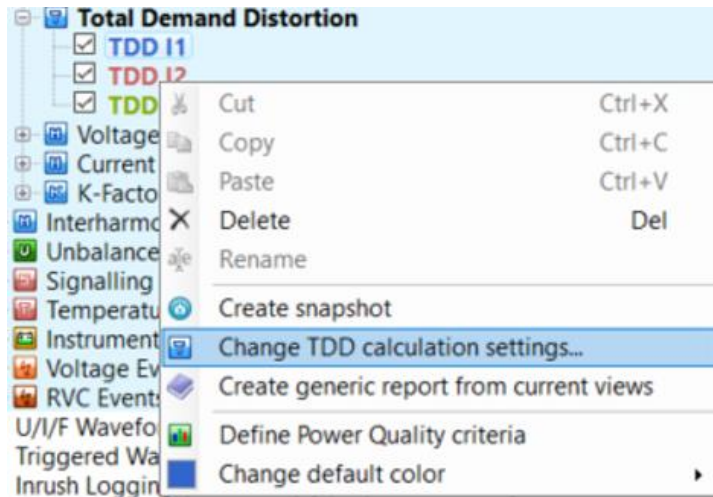
To select which current is taken into account in the calculation:

1. Select TDD register



2. Press mouse right button or icon





### 3. Select demand current for TDD calculation

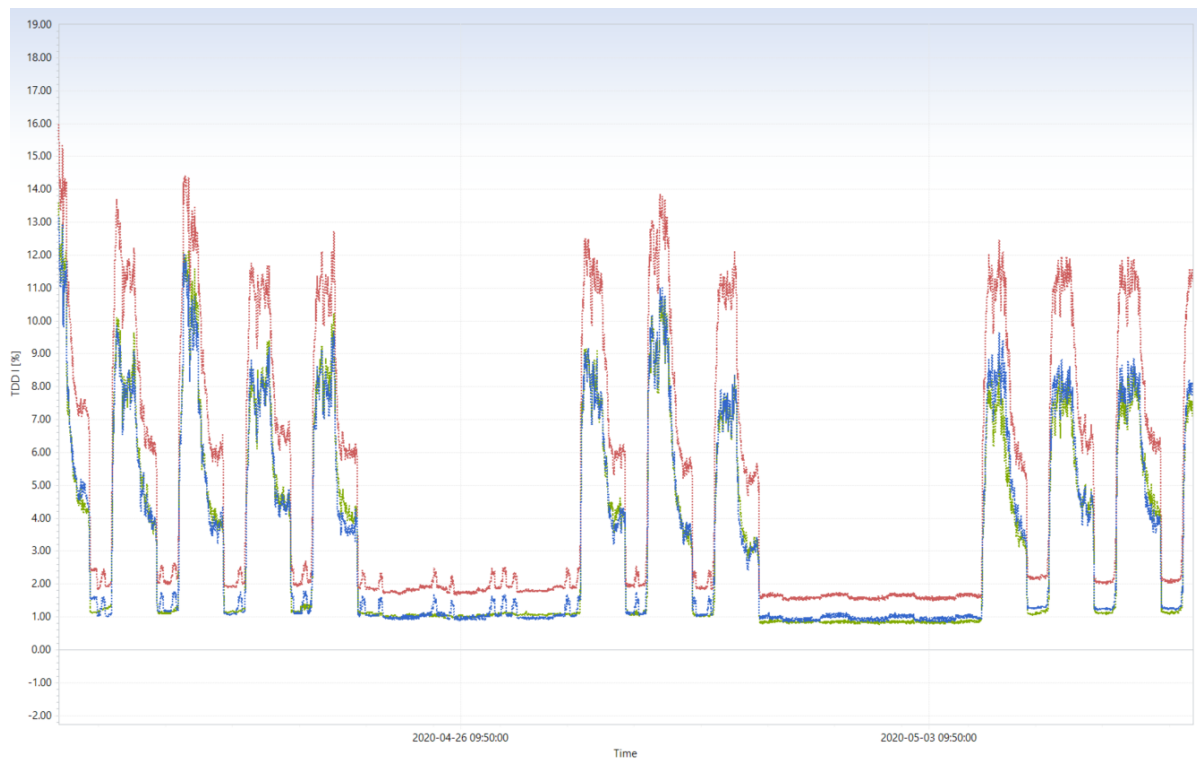
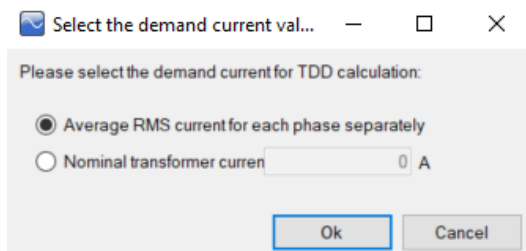


Figure 54 TDD calculated from the RMS current for each phase separately

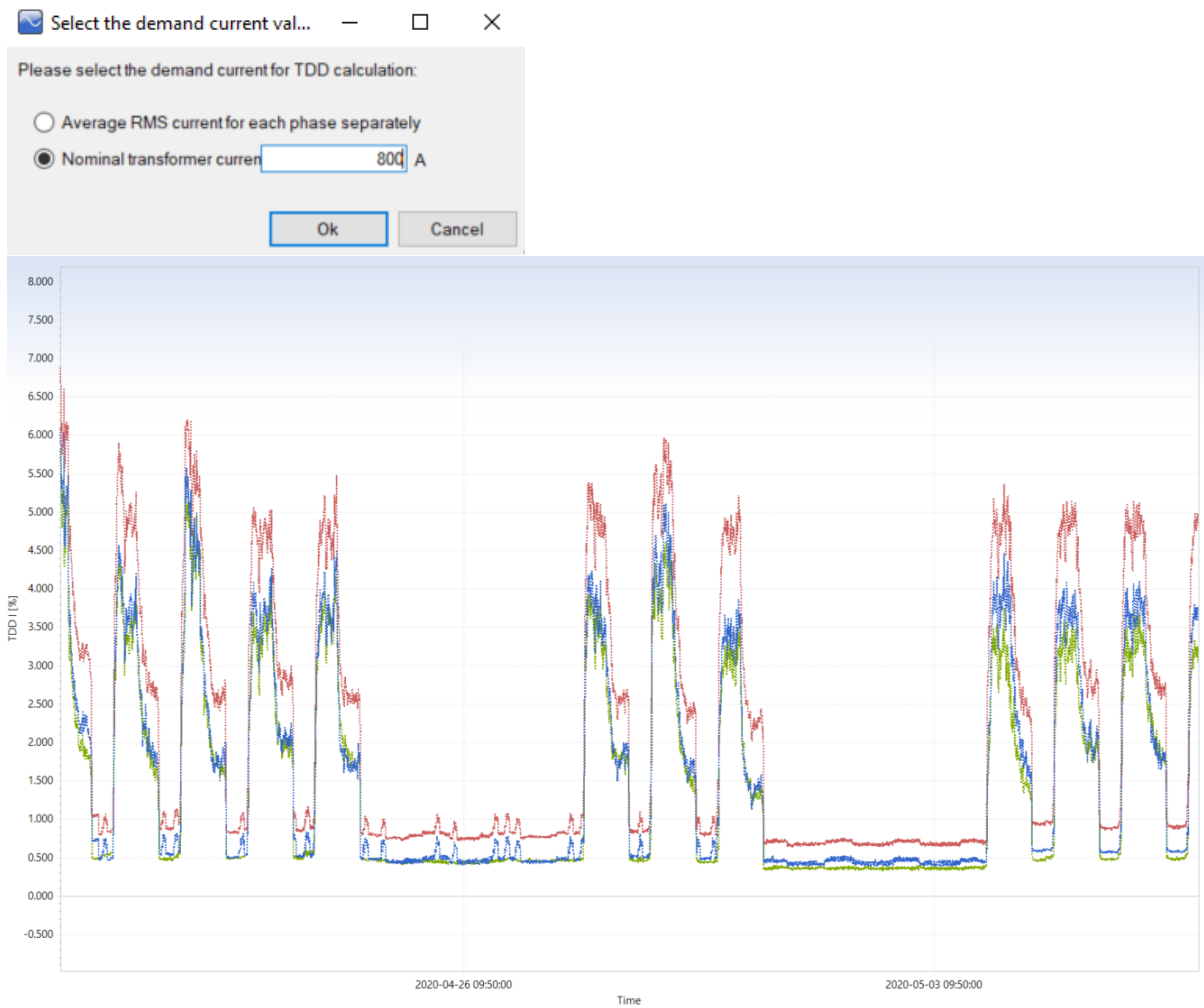


Figure 55 TDD calculated from the nominal transformer current

### 4.3.18 Partial Weighted Harmonic Distortion – PWHD

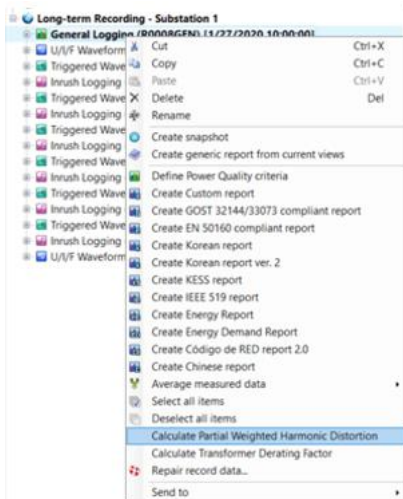
Partial Weighted Harmonic Distortion (PWHD) is the ratio of the rms value of a selected group of higher order harmonics (default setup in PowerView beginning from the 14<sup>th</sup> harmonic order up to 40<sup>th</sup> harmonic order, to the rms value of the fundamental).

PWHD is calculated according to the formula:

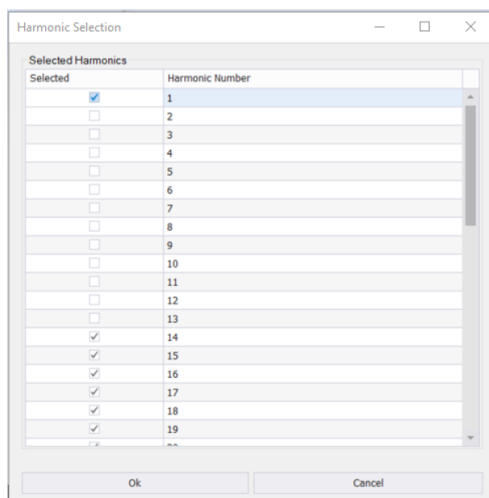
$$PWHD, i = \frac{\sqrt{\sum_{n=14}^{n=40} I_n^2}}{I_1} \cdot 100\% = \frac{\sqrt{I_{h14}^2 + I_{h15}^2 + I_{h16}^2 + I_{h17}^2 + \dots + I_{h40}^2}}{I_1} \cdot 100\%$$

$$PWHD, v = \frac{\sqrt{\sum_{n=14}^{n=40} U_n^2}}{U_1} \cdot 100\% = \frac{\sqrt{U_{h14}^2 + U_{h15}^2 + U_{h16}^2 + U_{h17}^2 + \dots + U_{h40}^2}}{U_1} \cdot 100\%$$

1. Select General Logging and press the right mouse button and select Partial Weighted Harmonic Distortion



2. Select “Partial Weighted Harmonic Distortion” and select harmonics component, that you to be included in the PWHD calculation:



and press OK button.

3. Partial Weighted Harmonic Distortion data are presented under “Harmonics & THD” results

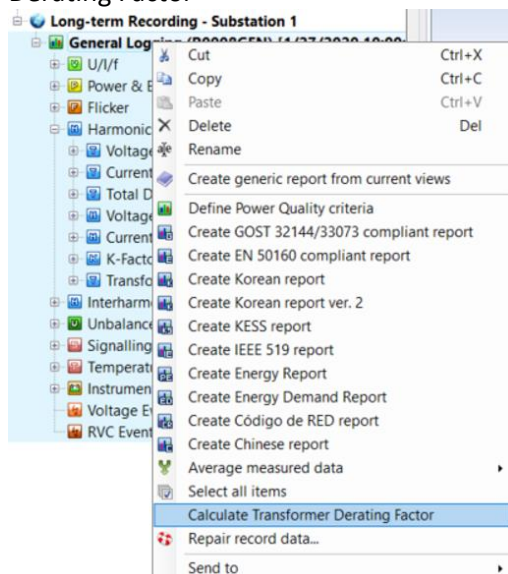


### 4.3.19 Transformer Derating Factor – TDF

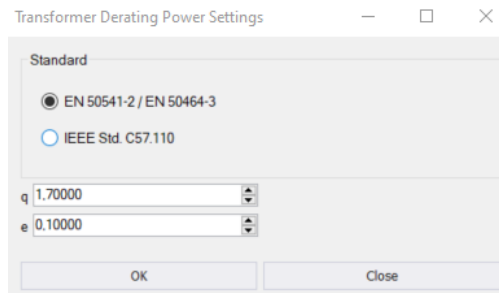
Most of devices that have invertors or rectifiers are designated as non-linear loads (a load with harmonic contents with frequencies different than the fundamental). They generate disturbances and unbalance into the grid in a way that may compromise the lifecycle of distribution transformers.

When a non-linear load is applied to a transformer, this could increase transformer vibrations and temperature. This reaction may lead to a reduction of the power of the transformer (derating of the transformer). This increase in losses is defined and calculated both in the European (EN 50541-2/EN 50464-3 and in the Americans (IEEE Std. C57.110) standards.

4. Select General Logging and press the right mouse button and select Calculate Transformer Derating Factor



5. Select "Calculate Transformer Derating Factor" and select appropriate standard according to which TDF should be calculated:



where:

e ... eddy current loss at the fundamental frequency divided by the loss due to a DC current equal to the RMS value of the sinusoidal current, both at reference temperature. Typical value is 10% i.e.  $e=0.1$

q .... constant, dependent on the type of winding and frequency. Typical values are 1.7 for transformers with round or rectangular cross section conductors in both windings and 1.5 for those with foil low voltage windings

and press OK button.

#### 6. Transformer Derating Factor data are presented under “Harmonics & THD” results



Figure 56 TDF data presentation

### 4.3.20 Net Power presented demand (Consumed – Generated)

For some applications, like wind turbines, photovoltaics installations or measurement places, where consumed and generated energy is expected; it is sometimes desired to present demand as “unique” value in the same chart, where consumed demand is presented with the positive (+) sign and generated demand with the negative sign (-). Both demands are Net presented; active and reactive.

Calculation algorithms:

$$P_{sumtot} = P_{tot+} - P_{tot-}$$

$$N_{sumtot} = (N_{totind+} + N_{totcap+}) - (N_{totind-} + N_{totcap-})$$

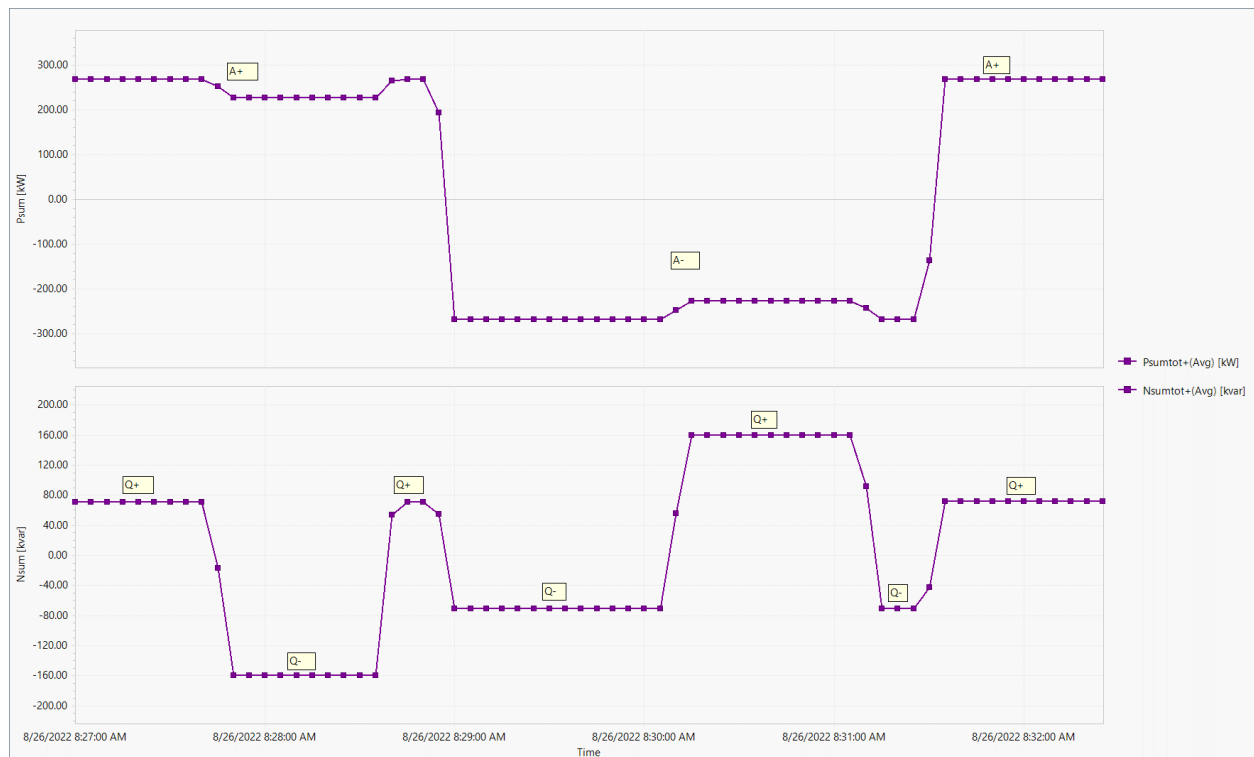


Figure 57 Active and reactive demand as Net presented values

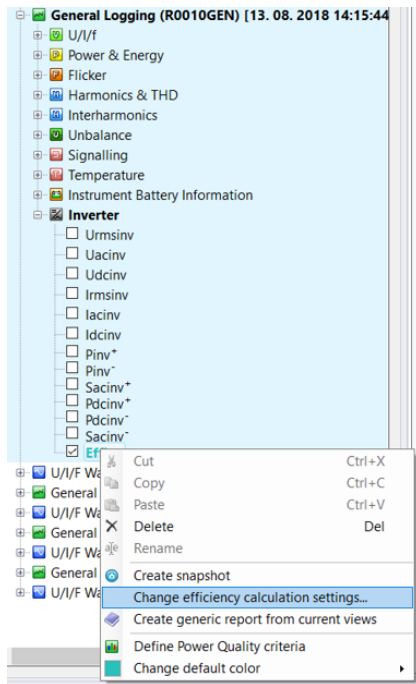
#### 4.3.21 Efficiency presentation for AC/DC measurements

Power Quality Analysers (MI 2893/ MI 2892 / MI 2885) could measure different types of (single or three phase) Photo-voltaic inverters, UPS power supplies or EVSE chargers and calculate the system efficiency. Efficiency is saved on the instrument as  $P_{ac}/P_{dc}$ , which is regular for Photo voltaic inverters or UPS power supply.

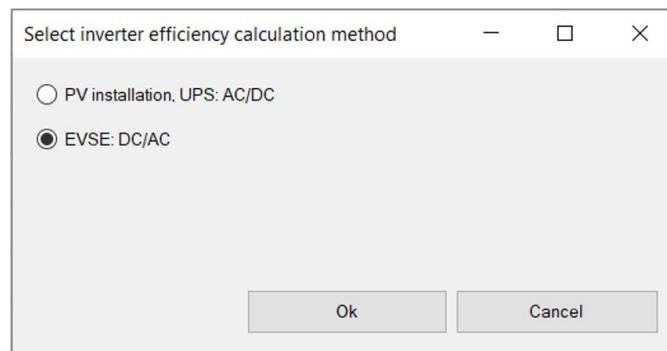
PowerView enables Efficiency data conversion from  $P_{ac}/P_{dc}$  to  $P_{dc}/P_{ac}$  which corresponds to EVSE chargers.

1. Select Effinv data under **General Logging data** → **Inverter** → **Effinv** and press the right mouse button and select “**Change efficiency calculation settings ...**”





2. Select Efficiency calculation as  $P_{ac}/P_{dc}$  (Photo-voltaic inverters, UPS systems) or  $P_{dc}/P_{ac}$  (EVSE chargers) ...



... and PowerView will automatically recalculate Efficiency data. When Powerview file is saved, last presented Efficiency data are saved (either as  $P_{ac}/P_{dc}$  or  $P_{dc}/P_{ac}$ ).

3. Example of Efficiency presentation:



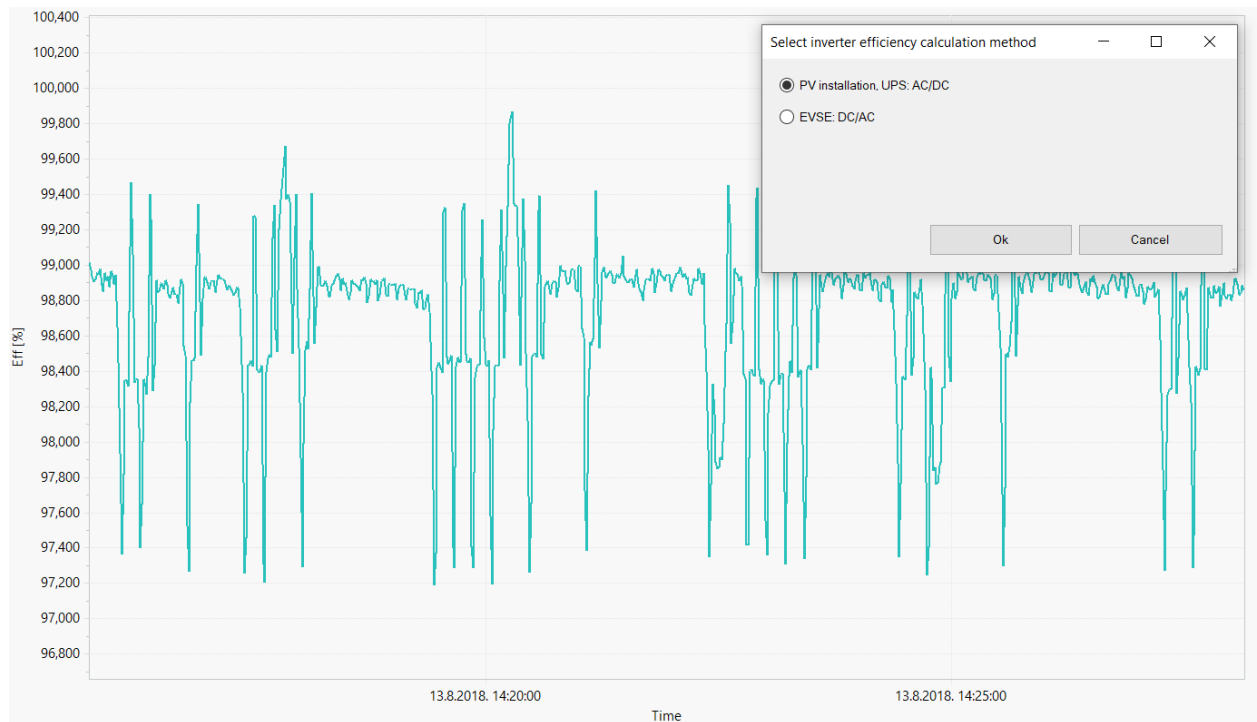


Figure 58 Efficiency presented as  $P_{ac}/P_{dc}$

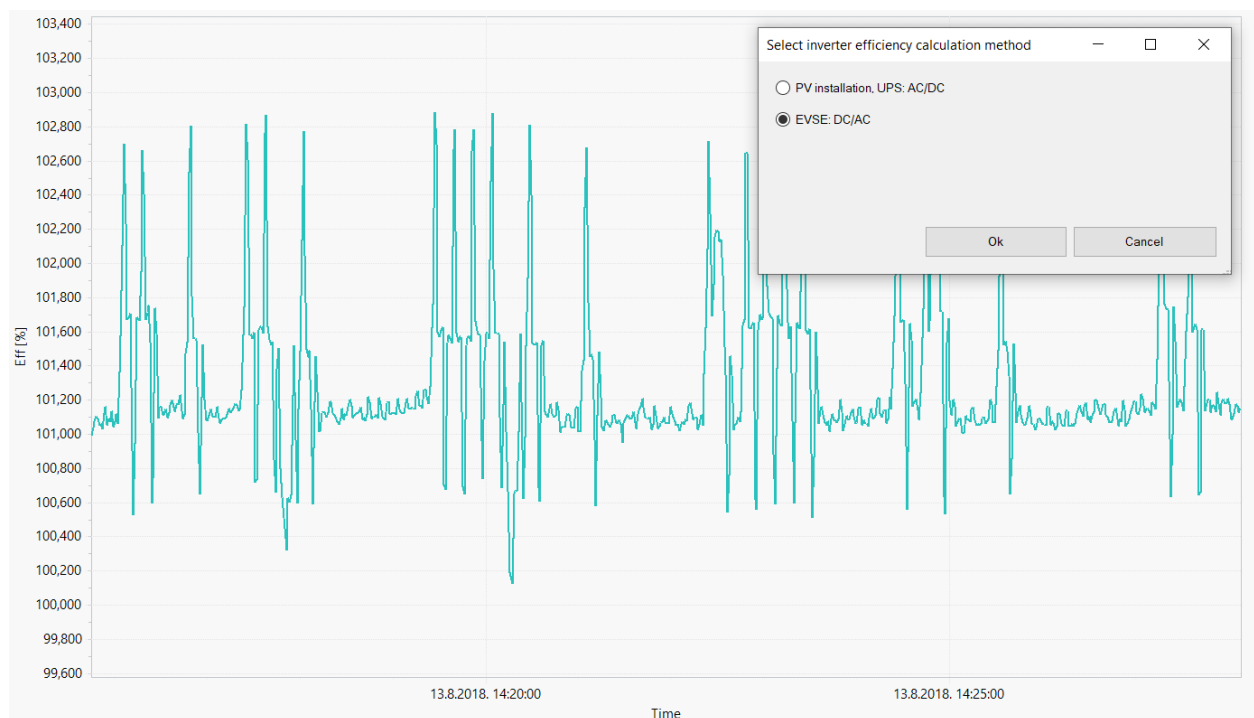


Figure 59 Efficiency presented as  $P_{dc}/P_{ac}$

#### 4.3.22 Power harmonics

Harmonic pollution presents an increasing problem which can cause different problems on the installed equipment. They could have destructive impact on the equipment, including classical components like capacitors and also distribution transformers. Harmonics are mainly caused by non-linear loads.

Origins of harmonics disturbances:

- single phase rectifiers – high 3rd harmonic

- three phase loads – 5th, 7th, 11th, 13th, 17th harmonic
- non-symmetrically controlled supply – even harmonics and DC
- higher pulse number – lower THDI
- serial inductance decreases THDI
- LV power supply network – THDU 1.5 ÷ 4.5%, mainly 5th harmonic

#### Impact on customers' equipment

- overall energy efficiency is decreased
- premature ageing of system components
- triple harmonics can produce high currents in a neutral line causing overheating and losses
- increased heating, noise and vibrations in transformers and motors
- current into capacitor bank increases with harmonic order causing failures
- presence of harmonic increase possibility of resonance
- problems with signalling frequencies
- tripping of protection devices
- electronic drives and switchers failure rate increase if THDU rises above 8%

Most of customers are interested in direction of power harmonics, coming from source to load or load to source. Different measured practice a used, the most common looks harmonics watt (voltage, current and phase angle of specific harmonics). In most cases, the value of harmonics power is meaningless (few mW's) and information is used for determining the harmonic's direction.

Power harmonics are available from General Recorder data:

Data Explorer		Record Information Trend Chart Table System alarms										
Group By: Quantity												
Unknown site												
Total (R0002GEN) [29.5.2020 9:52:00]												
U/I/f												
Power & Energy												
Consumed (+)												
Combined												
Fundamental												
Non fundamental												
Active Power & Energy												
Reactive Power & Energy												
Apparent Power & Energy												
Harmonic Pollution												
Power Harmonics												
P1												
P2												
P3												
PN												
Generated (-)												
Combined												
Fundamental												
Non fundamental												
Active Power & Energy												
Reactive Power & Energy												
Apparent Power & Energy												
Harmonic Pollution												
Power Harmonics												
P1												
P2												
P3												
PN												
Flicker												
Harmonics & THD												
Interharmonics												
Unbalance												
Signalling												
Temperature												
Instrument Battery Information												
		P1+ h0	P1+ h2	P1+ h3	P1+ h4	P1+ h5	P1+ h6	P1+ h7	P1+ h8	P1+ h9	P1+ h10	
		AvgOn [kW]	AvgOn [kW]	AvgOn [kW]	AvgOn [kW]	AvgOn [kW]	AvgOn [kW]	AvgOn [kW]	AvgOn [kW]	AvgOn [kW]	AvgOn [kW]	
5/29/2020 9:53:00.000		0.0000	0.000004	0.000	0.000001	0.015	0.000001	0.001	0.0000	0.0000	0.000003	
5/29/2020 9:54:00.000		0.0000	0.000001	0.000	0.000001	0.015	0.000003	0.004	0.0000	0.0000	0.000005	
5/29/2020 9:55:00.000		0.0000	0.000008	0.000	0.000001	0.020	0.000004	0.002	0.0000	0.0000	0.000001	
5/29/2020 9:56:00.000		0.0000	0.000010	0.000	0.000001	0.017	0.000002	0.004	0.0000	0.0000	0.000003	
5/29/2020 9:57:00.000		0.0000	0.000001	0.000	0.000003	0.022	0.000001	0.003	0.0000	0.0000	0.000002	
5/29/2020 9:58:00.000		0.0000	0.000005	0.000	0.000003	0.018	0.000001	0.003	0.0000	0.0000	0.000001	
5/29/2020 9:59:00.000		0.0000	0.000001	0.000	0.000001	0.018	0.000003	0.003	0.0000	0.0000	0.000001	
5/29/2020 10:00:00.000		0.0000	0.000001	0.000	0.000002	0.019	0.000001	0.003	0.0000	0.0000	0.000002	
5/29/2020 10:01:00.000		0.0000	0.000006	0.000	0.000006	0.019	0.000007	0.002	0.0000	0.0000	0.000004	
5/29/2020 10:02:00.000		0.0001	0.000004	0.000	0.000004	0.019	0.000003	0.003	0.0000	0.0000	0.000006	
5/29/2020 10:03:00.000		0.0000	0.000009	0.000	0.000002	0.016	0.000005	0.003	0.0000	0.0000	0.000008	
5/29/2020 10:04:00.000		0.0000	0.000019	0.000	0.000011	0.017	0.000005	0.002	0.0000	0.0000	0.000002	
5/29/2020 10:05:00.000		0.0000	0.000001	0.000	0.000002	0.019	0.000002	0.002	0.0000	0.0000	0.000002	
5/29/2020 10:06:00.000		0.0000	0.000005	0.000	0.000001	0.017	0.000002	0.003	0.0000	0.0000	0.000002	
5/29/2020 10:07:00.000		0.0000	0.000003	0.000	0.000003	0.017	0.000003	0.003	0.0000	0.0000	0.000002	
5/29/2020 10:08:00.000		0.0000	0.000001	0.000	0.000001	0.019	0.000005	0.001	0.0000	0.0000	0.000002	
5/29/2020 10:09:00.000		0.0000	0.000001	0.000	0.000003	0.024	0.000003	0.002	0.0000	0.0000	0.000002	
5/29/2020 10:10:00.000		0.0000	0.000001	0.000	0.000003	0.019	0.000008	0.001	0.0000	0.0000	0.000001	
5/29/2020 10:11:00.000		0.0000	0.000003	0.000	0.000001	0.020	0.000001	0.002	0.0000	0.0000	0.000002	
5/29/2020 10:12:00.000		0.0000	0.000009	0.000	0.000002	0.016	0.000001	0.002	0.0000	0.0000	0.000003	
5/29/2020 10:13:00.000		0.0000	0.000004	0.000	0.000001	0.018	0.000002	0.000	0.0000	0.0000	0.000004	
5/29/2020 10:14:00.000		0.0000	0.000003	0.000	0.000002	0.020	0.000001	0.002	0.0000	0.0000	0.000002	
5/29/2020 10:15:00.000		0.0000	0.000002	0.000	0.000001	0.018	0.000003	0.001	0.0000	0.0000	0.000001	
5/29/2020 10:16:00.000		0.0000	0.000001	0.000	0.000001	0.021	0.000001	0.002	0.0000	0.0000	0.000001	
5/29/2020 10:17:00.000		0.0000	0.000002	0.000	0.000003	0.013	0.000004	0.002	0.0000	0.0000	0.000001	
5/29/2020 10:18:00.000		0.0000	0.000006	0.000	0.000002	0.017	0.000004	0.001	0.0000	0.0000	0.000006	
5/29/2020 10:19:00.000		0.0000	0.000004	0.000	0.000002	0.014	0.000001	0.003	0.0000	0.0000	0.000003	
5/29/2020 10:20:00.000		0.0000	0.000001	0.000	0.000003	0.014	0.000004	0.002	0.0000	0.0000	0.000001	
5/29/2020 10:21:00.000		0.0000	0.000009	0.000	0.000003	0.020	0.000003	0.001	0.0000	0.0000	0.000003	
5/29/2020 10:22:00.000		0.0000	0.000001	0.000	0.000006	0.015	0.000001	0.001	0.0000	0.0000	0.000001	
5/29/2020 10:23:00.000		0.0000	0.000001	0.000	0.000003	0.021	0.000004	0.001	0.0000	0.0000	0.000001	
5/29/2020 10:24:00.000		0.0000	0.000001	0.000	0.000001	0.022	0.000001	0.001	0.0000	0.0000	0.000001	
5/29/2020 10:25:00.000		0.0000	0.000003	0.000	0.000001	0.019	0.000001	0.002	0.0000	0.0000	0.000001	
5/29/2020 10:26:00.000		0.0000	0.000003	0.000	0.000004	0.019	0.000002	0.001	0.0000	0.0000	0.000003	
5/29/2020 10:27:00.000		0.0000	0.000012	0.000	0.000003	0.019	0.000003	0.002	0.0000	0.0000	0.000001	
5/29/2020 10:28:00.000		0.0000	0.000009	0.000	0.000001	0.020	0.000001	0.002	0.0000	0.0000	0.000001	
5/29/2020 10:29:00.000		0.0000	0.000008	0.000	0.000001	0.019	0.000002	0.002	0.0000	0.0000	0.000005	
5/29/2020 10:30:00.000		0.0000	0.000018	0.000	0.000002	0.019	0.000001	0.002	0.0000	0.0000	0.000001	
5/29/2020 10:31:00.000		0.0000	0.000008	0.000	0.000004	0.019	0.000001	0.001	0.0000	0.0000	0.000005	
5/29/2020 10:32:00.000		0.0000	0.000001	0.000	0.000004	0.018	0.000002	0.002	0.0000	0.0000	0.000008	
5/29/2020 10:33:00.000		0.0000	0.000008	0.000	0.000001	0.017	0.000002	0.001	0.0000	0.0000	0.000001	

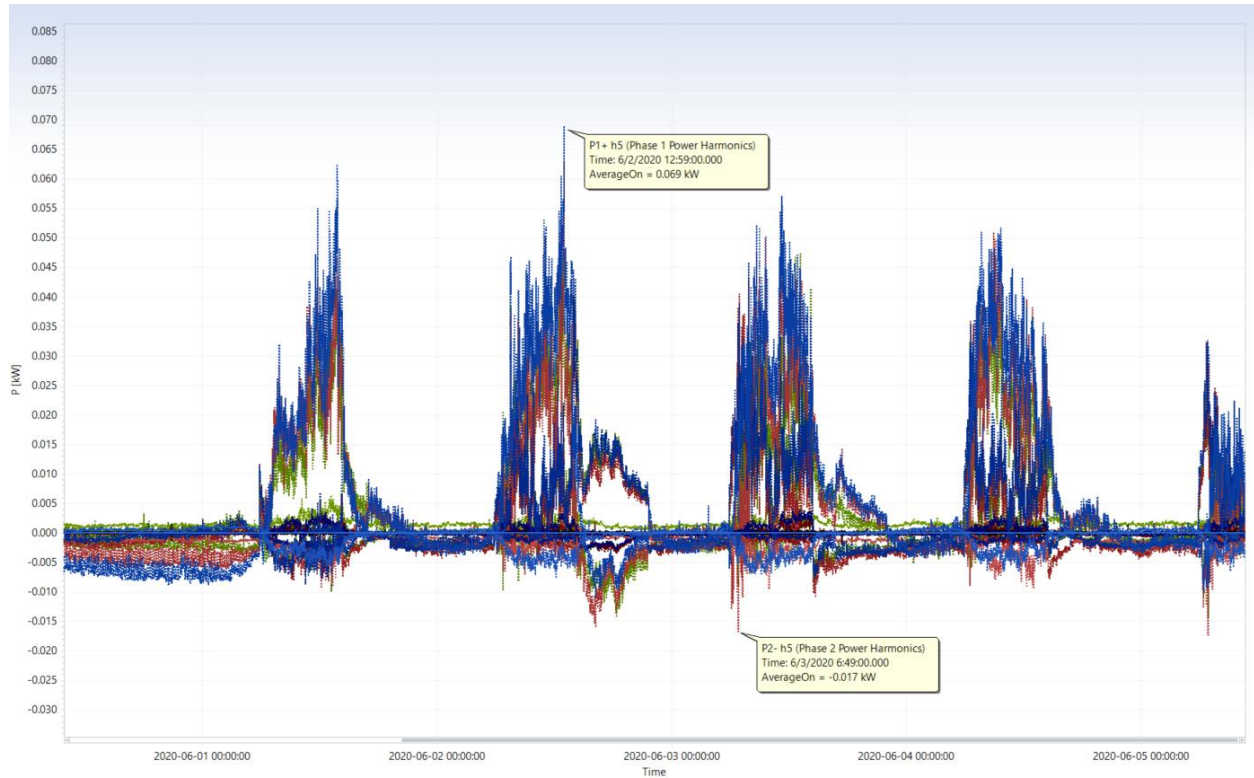


Figure 60 Harmonic power Consumed/Generated

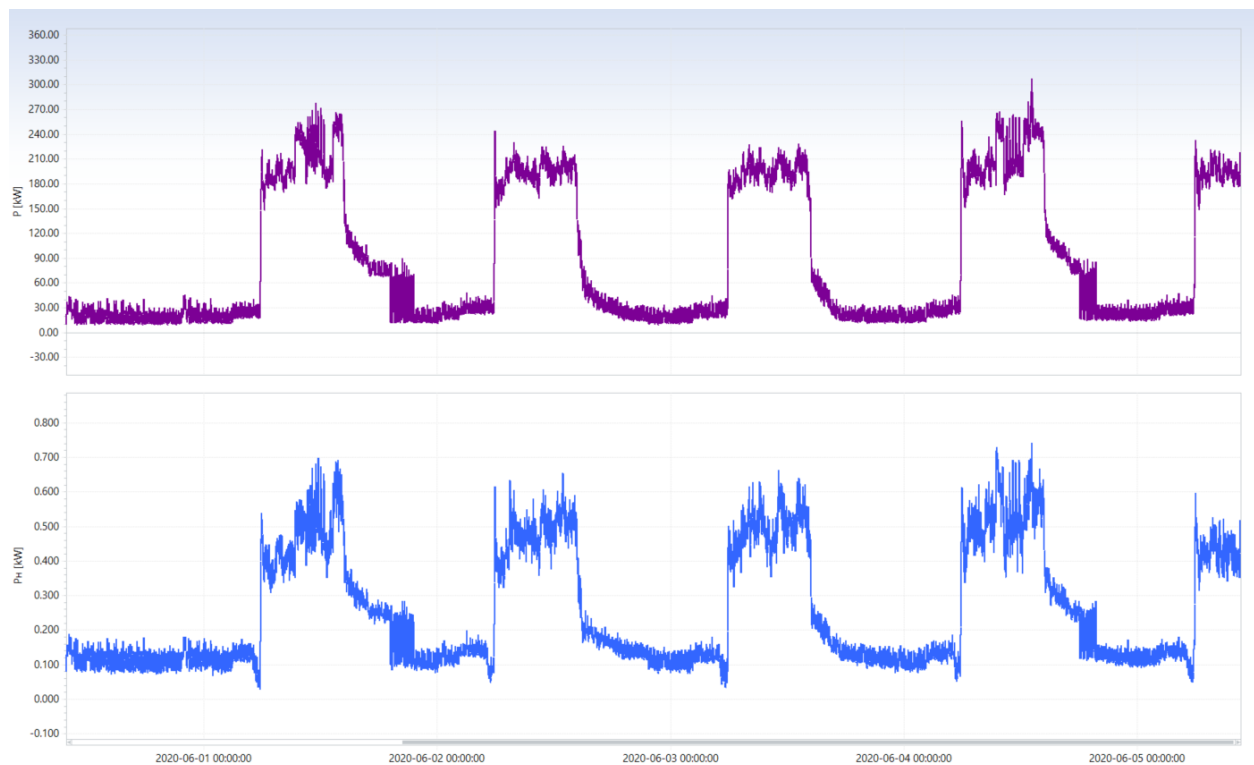


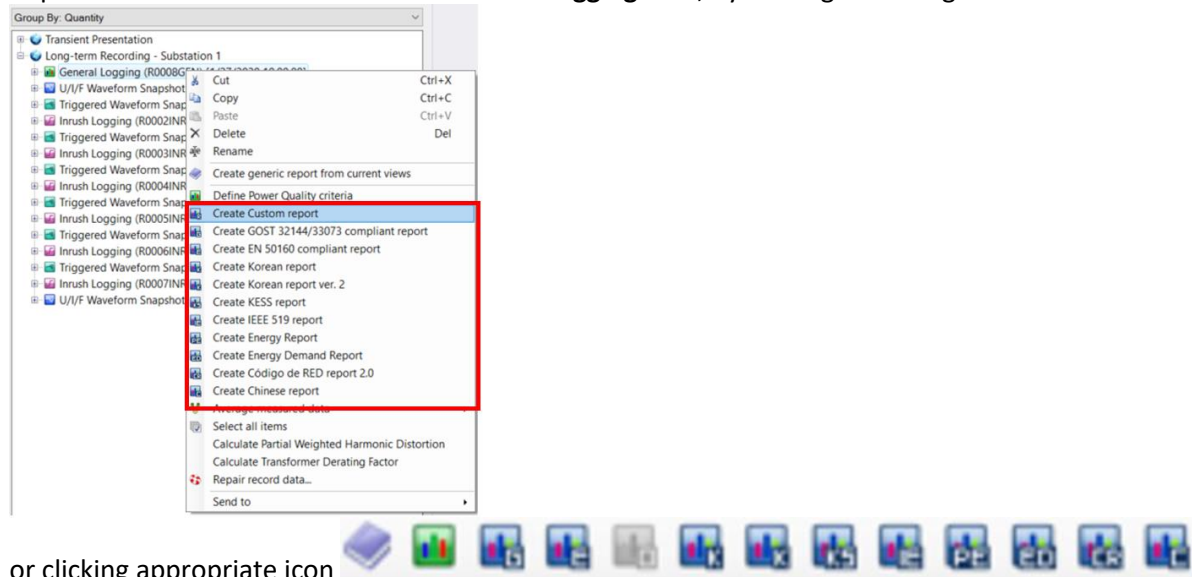
Figure 61 Active power vs Harmonic Active power

## 4.4 Reports creation

PowerView enables creation of different types of standard/custom specific reports. Each report has specific requirements related to the measurement period and recording time duration. Report based on











the General Logging data. Related to the specific for specific report, PowerView could averaged some data to get the requested values according the standard/customer request.

Reports could be accessed from the **General Logging** data, by clicking on the right mouse button



or clicking appropriate icon

PowerView supports:

- Generic Report from current View – custom; accessed by  icon
- Voltage Quality report – normalized overview/standard; accessed by  icon
- Custom report – report, automatically created from the selected values; access by  icon
- GOST 32144/33073 report - standard – “Quality standards for electric energy in general power supply systems”; mostly used in Russia; accessed by  icon
- EN 50160 report - standard – “Voltage characteristics of electricity supplied by public distribution networks”; mostly used in Europe; accessed by  icon
- Korean reports, KESS – custom specific; accessed by  icons
- IEEE 519 report – standard; “IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems”; accessed by  icon
- Energy/Energy Demand report – custom specific: accessed by  icon
- Codigo de RED report – custom specific; accessed by  icon
- Chinese report – custom specific; accessed by  icon

#### 4.4.1 Generic report from current View

Simply tool for creating Generic report, which includes currently opened Items:

- Recorder information data
- Voltage Quality \*
- Voltage Harmonics Quality \*
- Trend Charts

With powerful editor, it is possible editing document inserting charts, tables comments... Report could be saved in different formats, like: DOC, PDF, RTF, TXT, XML....

General Logging (REC) [1/27/2020 10:00:00] (repaired unbalance)  
Power Quality EN 50160, recorded on 1/27/2020 10:00:00, duration: 7 d 0 h 0 m 0 s.

This report was generated by **OpenView** v3.0.0.4750 (64-bit), en-US on 6/2/2020 12:53:57 PM.

#### Record Properties

Profile: Standard  
Start button pressed: 1/27/2020 9:52:08.477  
Start time: 1/27/2020 10:00:00.000  
Stop time: 2/3/2020 10:00:00.000  
Duration: 7 d 0 h 0 m 0 s  
Number of intervals: 672  
Interval duration: 15 m 0 s  
Start cause: Button Press  
Stop cause: Instrument Reset or Unknown  
File name: REC\_REC  
Check synchronization: RTC  
File version: 41

#### Measurement Settings

Normal voltage: 230.00 V L-N  
1/2/3 Clamp: A1302 (3,000.00 A), Clamp measuring range (3,000.00 A), Instrument measuring range (300 % of Clamp measuring range), Current transformer ratio: 1.00 A/A, 1.00 A  
3W Clamp: A1302 (3,000.00 A), Clamp measuring range (3,000.00 A), Instrument measuring range (300 % of Clamp measuring range), Current transformer ratio: 1.00 A/A, 1.00 A  
Normal frequency: 50.00 Hz  
Frequency sync: UI  
Connection: 4W  
Harmonics capture:  
Alarm capture: Alarm disabled  
Event capture: Events enabled with waveforms  
Signaling capture: Signaling disabled  
Transient capture: Transient disabled  
Breach capture: Breach enabled  
RVC capture: RVC enabled

#### Instrument Properties

Model: ME 2003  
Instrument name: Power Master XT  
Hardware version: 8.0.3437  
Firmware version: 1.0.3437  
S/N: 12345678  
Calibration date: 1/1/2000 0:12:59

#### Event Settings

Normal voltage: 230.00 V L-N  
L-N Dip threshold: 90.00 % (207.00 V)  
L-N Dip threshold: 3.00 %  
L-N SAG threshold: 110.00 % (253.00 V)  
L-N SAG threshold: 2.00 %  
L-N Interruption threshold: 5.00 % (11.50 V)  
L-N Interruption threshold: 2.00 %

#### RVC Settings

Normal voltage: 230.00 V L-N

L-N RVC threshold: 3.00 % (6.90 V)  
L-N RVC threshold: 50.00 % (114.5 V)

#### Signaling Settings

Normal voltage: 230.00 V L-N  
Sig. 1 frequency: 316.00 Hz  
Sig. 2 frequency: 1,000.00 Hz  
Duration: 10.00 s  
Threshold: 5.00 % (11.50 V)

#### Miscellaneous Information

Instrument name: M2020  
Downloaded on: 2/3/2020 10:23:04.270  
Downloaded by: Mikael Inger  
Downloaded using: **OpenView** v3.0.0.4750 (64-bit), en-US  
Windows version: Windows 10 (64-bit) (Microsoft Windows NT 10.0.18362.0)

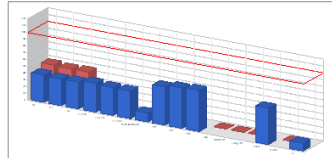


Figure 1: Voltage Quality

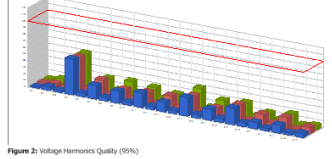


Figure 2: Voltage Harmonics Quality (95%)

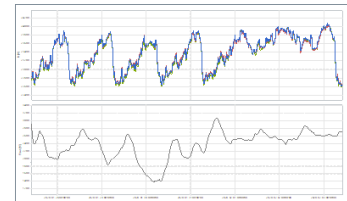


Figure 3: Trend Chart

Figure 62 Generic report from current views

## 4.4.2 Voltage Quality report

Simply tool for creating Generic Voltage Quality and Voltage Harmonics Quality general overview. All data are “normalized”, so it easy to determine whether the monitoring values are within or outside the prescribed limits.



Recorded data could be analysed according:

- EN 50160
- GOST 32144/33073
- CHINESE
- Customer specific limits (based on EN 50160/GOST 32144/3307/ CHINESE)

standard.

In the PowerView base, there are always default limits (values change according to standards) which are regularly updated. End user could also change default values to the customized ones, according the current requirements.

Voltage Quality general overview is created also during generation of above-mentioned reports.

Click icon  or via  **Define Power Quality criteria** :

➔ Select appropriate Power Quality Criteria or Load defaults one

## Edit Power Quality Criteria

Specified percent of intervals 100% of intervals Voltage harmonics Current harmonics Events **Monitoring values**

Quantity	Percent of intervals	Max. neg. difference (-)	Max. pos. difference (+)	Reference value
Voltage	95.00 %	-10.00 %	10.00 %	230.00 V
Voltage	99.00 %	-10.00 %	10.00 %	230.00 V
Voltage THD	95.00 %	0.00 %	8.00 %	0.00 %
Frequency	99.50 %	-1.00 %	1.00 %	50.00 Hz
Frequency	95.00 %	-2.00 %	2.00 %	50.00 Hz
Negative sequence voltage ratio	95.00 %	0.00 %	2.00 %	0.00 %
Flicker PLT	95.00 %	0.00	1.00	0.00
Signalling (3s)	99.00 %	0.00 %	10.00 %	0.00

**Limits for specific values**

Load defaults for ENS0160

Monitoring standard

EN50160  
GOST 32144/33073  
CHINESE

→ Press OK

All specified values are analysed. Analyse is presented in two "tab's":

- All data are normalized, so limit 100% present PASS/FAIL condition for specific parameter.

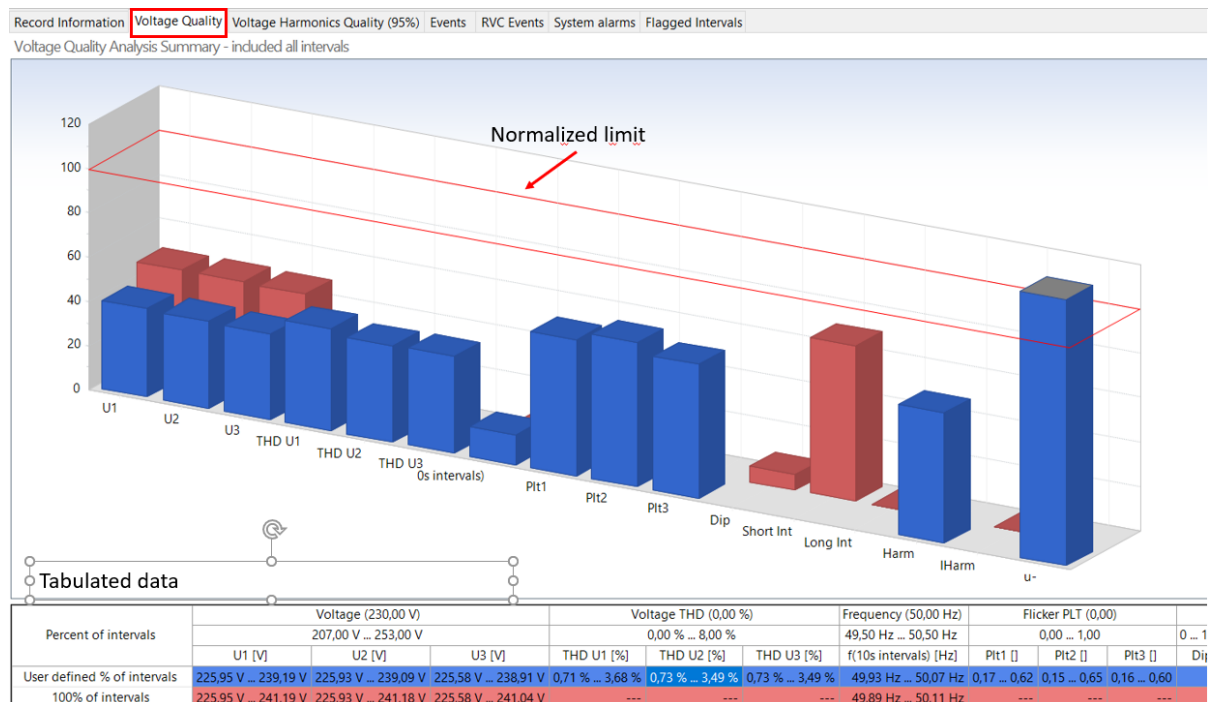




Figure 63 Voltage Quality tab

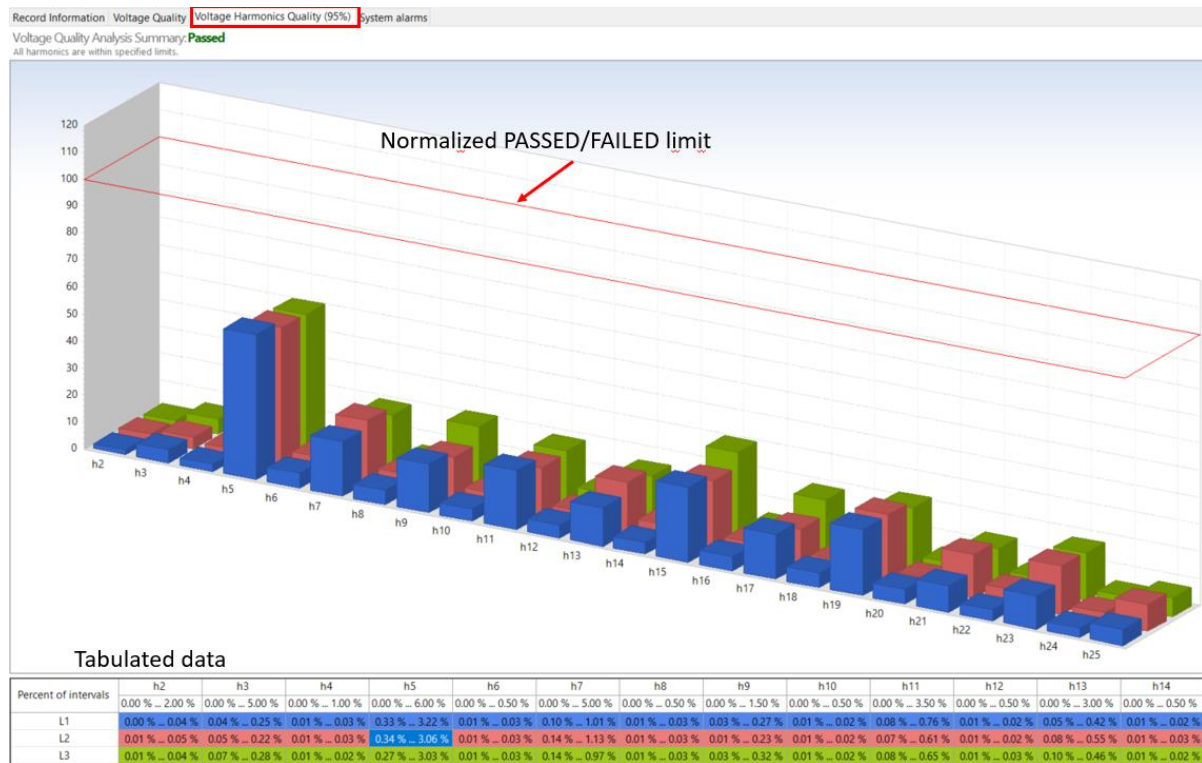


Figure 64 Voltage Harmonics Quality tab

**Note:** all recorder intervals are included under this presentation, including flagged ones (also interruptions).

Charts from the Voltage Quality report could be reported under “Generic report”, table or charts could not be direct copied as bitmap/metafile to other application.

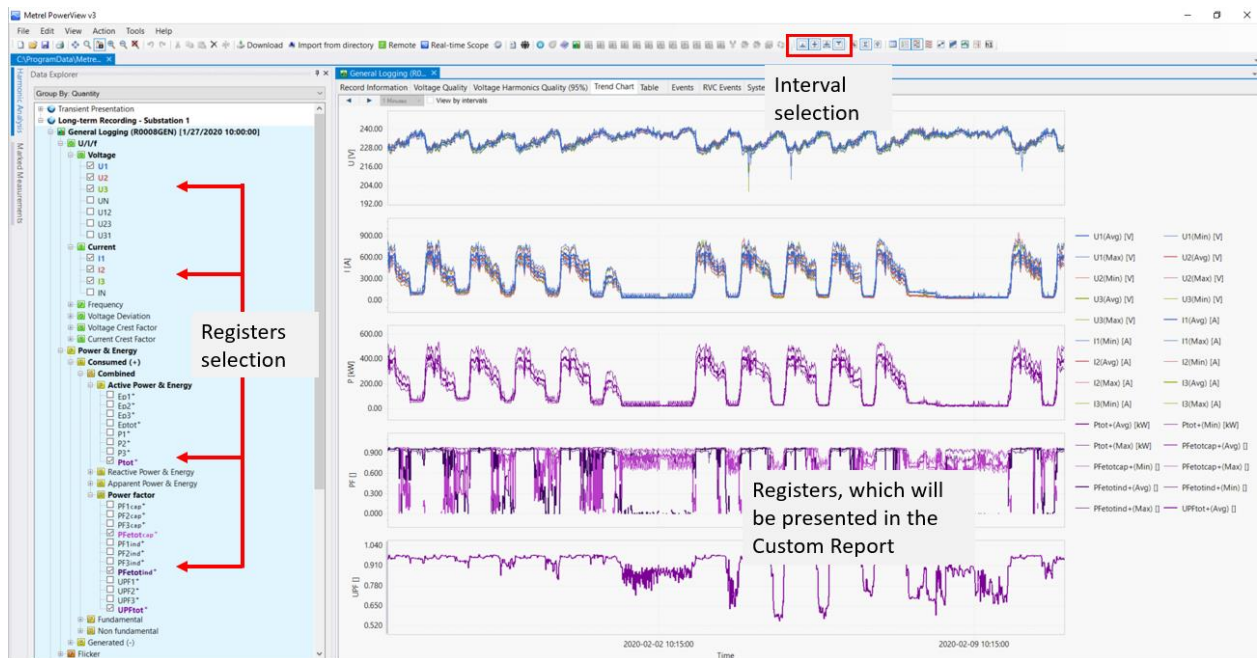
#### 4.4.3 Custom report

Custom report is automatically created from the selected registers, which are presented in Trend Chart. Group of values related to the same quantity is presented in one chart. Interval values (Avg, AvgOn, Max, Min), which are selected in the chart, are also presented in the report. For each value MIN – AVG – MAX value for the selected interval is presented. Additionally, number of Dip/Swell/Interruption and Transients are presented in the specific table. Report could be equipped with Client and Company information.

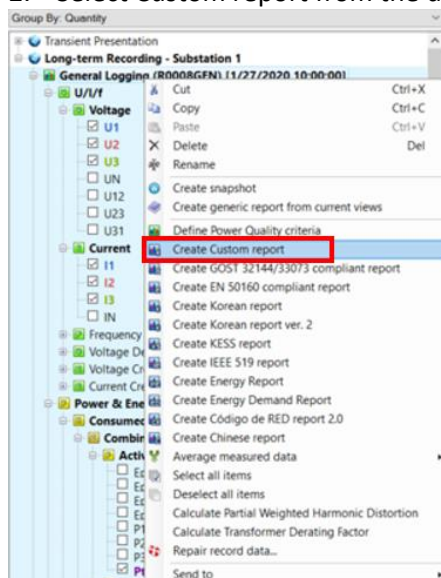
How to create Custom report:

1. Select registers and intervals that you want to present in the report





## 2. Select Custom report from the drop-down list



## 3. Select Company and Client information if needed


The screenshot shows the 'Select contacts to use in report' dialog box. It contains two sections: 'Company information' and 'Client information'. In the 'Company information' section, the 'Name' field is filled with 'Janez Novak' and the 'Company' field is filled with 'Metrel Mehanika d.d.'. In the 'Client information' section, the 'Name' field is filled with 'Jana Novak' and the 'Company' field is filled with 'Metrel d.d.'. The 'Select...' button is highlighted in blue. The 'Ok' and 'Cancel' buttons are at the bottom.


## 4. Select Time interval, which should be included in the report and press Generate Report

Custom Report

Report parameters

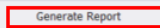
**General**

Company Logo 

Client Logo 

Start **1** 1/27/2020 10:00 AM

Stop 2/11/2020 10:00 AM

**2** 

### Custom Report

#### Company

Name	Janez Novak
Company	Metrel Mehanika d.d.
Address	Vrhniska c. 99b
Phone	0199856247
Email	janez.novak@metrel.si



#### Client

Name	Jana Novak
Company	Metrel d.d.
Address	Ljubljanska c. 77a
Phone	0125478956
Email	jana.novak@metrel.si



#### Measurement

Objective	
Site description	
Start time	1/27/2020 10:00:00 AM
Stop time	2/11/2020 10:00:00 AM
Duration	15 d 0 h 0 min 0 s
Interval	15 minutes
Connection	Three phase four wire
Nominal voltage	230.00 V
Nominal frequency	50.00 Hz

#### Instrument

Instrument name	Power Master XT
Instrument model	MI 2893
Manufacturer	Metrel d.d.
Serial number	12345678
Firmware version	1.0.3437
Operator name	Mihael Hribar
Current clamps	A1502 (3,000.00 A), Clamp measuring range (3,000.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A
Additional equipment	

**Events information****Swells**

	L1	L2	L3
Count	0	0	0
Max. Value [V]	N/A	N/A	N/A
Max. Duration	N/A	N/A	N/A

**Dips**

	L1	L2	L3
Count	7	5	6
Min. Value [V]	171.65	191.02	160.41
Max. Duration	090 ms	080 ms	100 ms

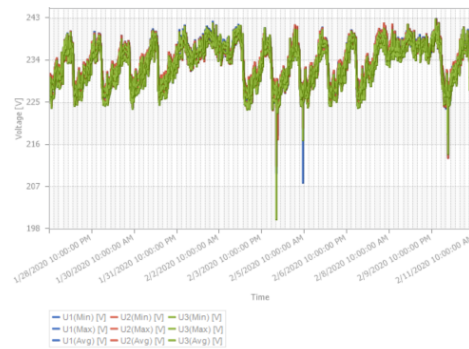
**Transients**

	L1	L2	L3	LN
Count	0	0	0	0

**Interruptions**

Count	0
-------	---

Measurement	Min	Max	Avg
U1(Min) [V]	207.87	240.01	NaN
U1(Max) [V]	226.93	242.88	NaN
U1(Avg) [V]	225.95	241.19	233.73
U2(Min) [V]	211.47	240.23	NaN
U2(Max) [V]	226.93	242.78	NaN
U2(Avg) [V]	225.93	241.18	233.79
U3(Min) [V]	200.04	240.08	NaN
U3(Max) [V]	226.66	242.78	NaN
U3(Avg) [V]	225.58	241.04	233.39



With powerful editor, it is possible editing document inserting charts, tables comments... Report could be saved in different formats, like: DOC, PDF, RTF, TXT, XML....

#### 4.4.4 GOST 32144/33073 report

GOST 32144/33073 report is custom defined for specific country. For more information, please contact local distributor.

#### 4.4.5 EN 50160 report

EN 50160, European Standard defines, describes and specifies the main characteristics of the voltage at a network user's supply terminals in public low voltage, medium and high voltage AC electricity networks under normal operating conditions.


Standard describes the limits or values within which the voltage characteristics can be expected to remain at any supply terminal in public electricity networks and does not describe the average situation usually experienced by an individual network user.

EN 50160 report based on 10 minutes measurement values. In case, that shorted period is used, it is possible to average to period of 10 minutes with PowerView.

EN 50160 covers all requested characteristics, additionally presents Swells/Dips/Transients which are under the predefined N 50160 limits.

Since EN 50160 limit values change from time to time, user has free access to change them. Default values are regularly updated to follow the values, defined in standard.

It is possible to change predefined values to the custom selected. PowerView saves these new limits inside the saved PWV file (not generally inside the EN 50160 limits).

To get predefined values, click on the  icon. Values are predefined for Low Voltage, Medium Voltage and High Voltage networks.

Edit Power Quality Criteria

Specified percent of intervals 100% of intervals Voltage harmonics Current harmonics Events

Quantity	Percent of intervals	Max. neg. difference (-)	Max. pos. difference (+)	Reference value
Voltage	95.00 %	-10.00 %	10.00 %	230.00 V
Voltage	99.00 %	-10.00 %	10.00 %	230.00 V
Voltage THD	95.00 %	0.00 %	8.00 %	0.00 %
Frequency	99.50 %	-1.00 %	1.00 %	50.00 Hz
Frequency	95.00 %	-2.00 %	2.00 %	50.00 Hz
Negative sequence voltage ratio	95.00 %	0.00 %	2.00 %	0.00 %
Flicker PLT	95.00 %	0.00	1.00	0.00
Signalling (3s)	99.00 %	0.00 %	10.00 %	0.00

Load defaults for EN50160

Ok Cancel

Button for load default limits for EN 50160

Limits for predefined monitoring intervals.  
Reference values (voltage & frequency) are taken from the Power Quality instrument

Figure 65 EN 50160 – Limits for specified percent of intervals

Specified percent of intervals					
100% of intervals					
Voltage harmonics					
Quantity	Percent of intervals	Max. neg. difference (-)	Max. pos. difference (+)	Reference value	
Voltage	100.00 %	-15.00 %	10.00 %	230.00 V	
Voltage	100.00 %	-15.00 %	15.00 %	230.00 V	
Frequency	100.00 %	-6.00 %	4.00 %	50.00 Hz	
Frequency	100.00 %	-15.00 %	15.00 %	50.00 Hz	

Figure 66 EN 50160 – Limits for 100% of intervals

Specified percent of intervals					
100% of intervals					
Voltage harmonics					
Harmonic number	Percent of intervals	Max. neg. difference (-)	Max. pos. difference (+)	Reference value	
2	95.00 %	0.00 %	2.00 %	0.00 %	
3	95.00 %	0.00 %	5.00 %	0.00 %	
4	95.00 %	0.00 %	1.00 %	0.00 %	
5	95.00 %	0.00 %	6.00 %	0.00 %	
6	95.00 %	0.00 %	0.50 %	0.00 %	
7	95.00 %	0.00 %	5.00 %	0.00 %	
8	95.00 %	0.00 %	0.50 %	0.00 %	
9	95.00 %	0.00 %	1.50 %	0.00 %	
10	95.00 %	0.00 %	0.50 %	0.00 %	
11	95.00 %	0.00 %	3.50 %	0.00 %	
12	95.00 %	0.00 %	0.50 %	0.00 %	
13	95.00 %	0.00 %	3.00 %	0.00 %	
14	95.00 %	0.00 %	0.50 %	0.00 %	
15	95.00 %	0.00 %	1.00 %	0.00 %	
16	95.00 %	0.00 %	0.50 %	0.00 %	
17	95.00 %	0.00 %	2.00 %	0.00 %	
18	95.00 %	0.00 %	0.50 %	0.00 %	
19	95.00 %	0.00 %	1.50 %	0.00 %	
20	95.00 %	0.00 %	0.50 %	0.00 %	
21	95.00 %	0.00 %	0.75 %	0.00 %	
22	95.00 %	0.00 %	0.50 %	0.00 %	
23	95.00 %	0.00 %	1.50 %	0.00 %	
24	95.00 %	0.00 %	0.50 %	0.00 %	
25	95.00 %	0.00 %	1.50 %	0.00 %	


Figure 67 EN 50160 – Voltage harmonics limits – up to 25<sup>th</sup>

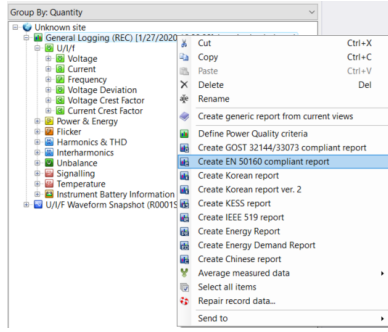
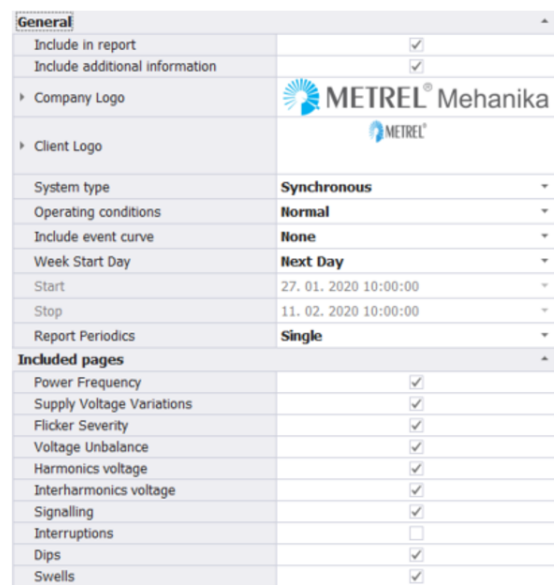
EN 50160 analyse 25<sup>th</sup> harmonics. Metrel PQI measures up to 50<sup>th</sup> harmonics component.

Specified percent of intervals	100% of intervals	Voltage harmonics	Current harmonics	Events
Event Type	Number Of Events			
Dip	100			
Short Interruption	10			
Long Interruption	10			
Short/Long interruption threshold:		3 m	0 s	

Figure 68 EN 50160 – Events limits

**Note:** Default limits are set up according EN 50160. PowerView enables user to change them.

To create report according EN 50160, press on icon  or via

General setup screen, with selection what is included.

Additional voltage curves (ITIC, CBEMA) could be included in the report.

Selection of Week Start Day: Immediately, Default, Next Day, Custom Range

Selection of Report Periodic: Single, Continuous

Selection, which measurement parameters are included in the report

Figure 69 EN 50160 report – setup screen

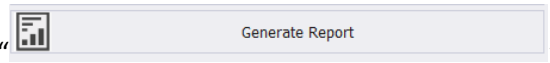
Definition of **Week Start Day**:

- Immediately – report starts with the first record
- Default – report starts with the first week date, related to the country (region) specifics: Sunday in EU; report starts at 00:00:00
- Next Day – report starts next day at 00:00:00
- Custom Range – report starts with Custom selected date (from – to) in one single report (report is not limited to seven days)

Definition of **Report Periodics** (not valid for Custom Range selection):

- Single – first SEVEN days included in the report
- Continuous – report consist of more separate reports, each of them includes seven consequent days












For creating report, press on button “

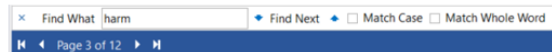


”

After report creation, it is easily to print/save/edit the report.

Table 3 Commands for report editing

-  **Print** Print EN 50160 report to local installed printer or to PDF
-  **Save** Save EN 50160 report to PDF, HTML, Excel or Word
-  Report export selection options: mdc, mdx, mdz, pdf, HTML, Excel, Word
-  Adding new page (blank) in the report
-  Delete page
-  Thumbnails
-  Find – enter field appears at display bottom
-  Editor – used for changing/correcting input strings – Company/Client
-  Full screen report presentation
-  One page report presentation
-  Page width



During EN 50160 report creation, also general Voltage Quality overview is generated.

### EN 50160 Report

Company	
Name	Janez Novak
Company	Metrel d.d.
Address	Ljubljanska c. 77
Phone	+386 1 123
Email	janez.novak@metrel.si

Client	
Name	Information Field – added from entering menu Could be edited from the Report Editor
Company	Metrel Mehanika d.d.
Address	Ljubljanska c. 71
Phone	+386 1 789 456
Email	jana.novak@metrel.si

Measurement	
Objective	
Site description	
Start time	1/27/2020 10:00:00.000
Stop time	2/3/2020 10:00:00.000
Duration	7 d 0 h 0 m 0 s
Interval	15 minutes
Connection	Three phase four wire
Nominal voltage	230.00 V
Nominal frequency	50.00 Hz
System type	Systems with synchronous connection
Effective measurement period	100.00 %
EN 50160 Limits	LV
Operating conditions	Normal

Instrument	
Instrument name	Power Master XT
Instrument model	MI 2893
Manufacturer	Metrel d.d.
Serial Number	12345678
Firmware version	1.0.3437
Operator name	Mihael Hrihar
Current clamps	A1502 (3,000.00 A). Clamp measuring range (3,000.00 A). Instrument measuring range (100 % of Clamp measuring range). Current transformer ratio: 1.00 A : 1.00 A
Additional equipment	

**Information about the used PQA, Operator, used current clamps**

Additional Information				
* for informational purposes only and not related to EN 50160 standard				
Swells				
	L1	L2	L3	
Count	0	0	0	
Max. Value [V]	N/A	N/A	N/A	
Max. Duration	N/A	N/A	N/A	
Dips				
	L1	L2	L3	
Count	0	0	0	
Min. Value [V]	N/A	N/A	N/A	
Max. Duration	N/A	N/A	N/A	
Transients				
	L1	L2	L3	LN
Count	0	0	0	0

**Swell/Dips/Transients number. Included also events, which are outside the EN 50160 specification**



EN50160 Compliance summary	
Power frequency	Passed
Supply Voltage Variations	Passed
Flicker Severity	Passed
Voltage Unbalance	Passed
Harmonic Voltages	Passed
Interharmonic Voltages	Measured
Signalling	Passed
Dips	0
Interruptions	0
Swells	0

Compliance summary, with additional info about the number of Swells/Dips/Interruptions

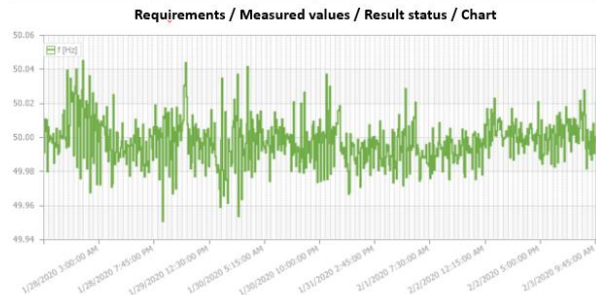
## EN 50160 Report

### Power frequency

### Criteria for measured quantity

Nominal frequency	50.00 Hz
Measured quantity	Mean value of the fundamental frequency measured over 10 seconds ( $f_{10}$ )
Criteria	Systems with synchronous connection
EN 50160 standard	Section 4.2.1

Requirements		Measured	Status
49.50 – 50.50 Hz	99.50 % of interval (week)	49.94 – 50.06 Hz	Passed
47.00 – 52.00 Hz	100.00 % of interval (week)	49.89 – 50.09 Hz	Passed



Following report pages include detail overview of measured quantity, equipped with Requirements/Measured results/Result status and Chart.

### 4.4.6 Korean reports, KESS report

Korean reports and KESS report are customized report for specific customer. For more information, please contact local distributor.

### 4.4.7 OSINERGMIN report

OSINERGMIN report is custom defined for specific country. For more information, please contact local distributor.

### 4.4.8 IEEE 519 report

IEEE 519 is a recommended practice and requirements for harmonic control in electric power systems. It is focused on harmonics measurements and recommend harmonic limits for voltage and current distortion. Report evaluate Very short (3 seconds) and Short (10 minutes) harmonic measurements.

Definition of PCC – point of common coupling:

The limits in this recommended practice are intended for application at a point of common coupling (PCC) between the system owner or operator and a user, where the PCC is usually taken as the point in the power system closest to the user where the system owner or operator could offer service to another user.

Frequently for service to industrial users (i.e., manufacturing plants) via a dedicated service transformer, the PCC is at the HV side of the transformer.

For commercial users (office parks, shopping malls, etc.) supplied through a common service transformer, the PCC is commonly at the LV side of the service transformer.

## IEEE STD 519-2014

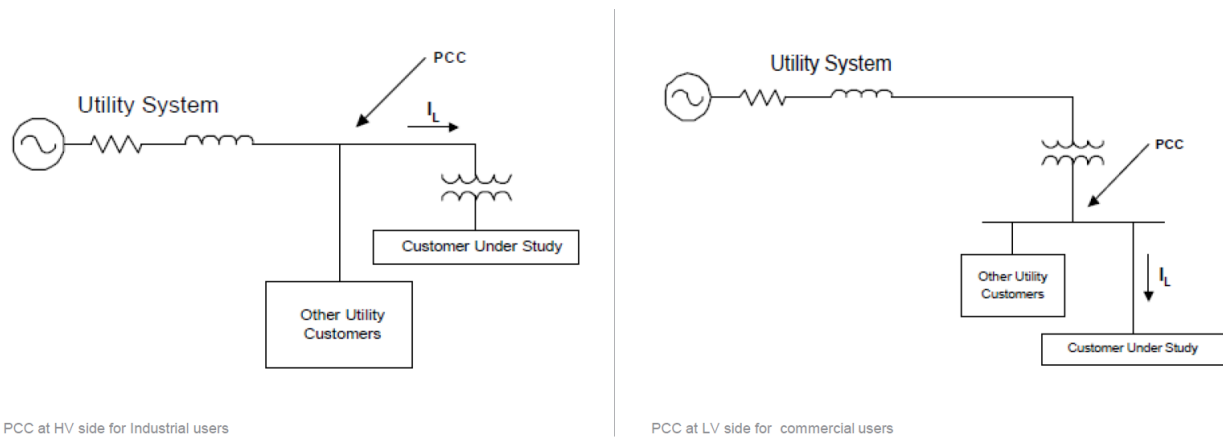


Figure 70 HV and LV PCC specification

The limits in IEEE 519 represent a shared responsibility for harmonic control between system owners or operators and users.

Responsibility to maintaining harmonics below specified levels:

- All users limit their harmonic current emissions to reasonable values determined in an equitable manner based on the inherent ownership stake each user has in the supply system and
- Each system owner or operator takes action to decrease voltage distortion levels by modifying the supply system impedance characteristics as necessary.

Definition of parameters from the IEEE 519 report:

- short-circuit ratio: At a particular location, the ratio of the available short-circuit current, in amperes, to the load current, in amperes  $\rightarrow I_{SC} / I_L$ . PowerView enables entering maximum measured load current direct from the recorder or manually enter the system maximum current.
- total demand distortion (TDD): The ratio of the root mean square of the harmonic content, considering harmonic components up to the 50<sup>th</sup> order, expressed as a percent of the maximum demand current.
- total harmonic distortion (THD): The ratio of the root mean square of the harmonic content, considering harmonic components up to the 50<sup>th</sup> order and specifically excluding interharmonics, expressed as a percent of the fundamental.

### Very short time harmonic measurements

- Very short time harmonic values are assessed over a 3-second interval based on an aggregation of 15 consecutive 12 (10) cycle windows for 60 (50) Hz power systems
- Measurement duration: 24 hours (1 day)
- For very short time harmonic measurements, the 99<sup>th</sup> percentile value (i.e., the value that is exceeded for 1% of the measurement period) should be calculated for each 24-hour period for comparison with the recommend limits

**Short time harmonic measurements:**

- Short time harmonic values are assessed over a 10-minute interval based on an aggregation of 200 consecutive very short time values for a specific frequency component
- Measurement duration: 7-day period (1 week)
- For short time harmonic measurements, the 95<sup>th</sup> and 99<sup>th</sup> percentile values (i.e., those values that are exceeded for 5% and 1% of the measurement period) should be calculated for each 7-day period for comparison with the recommended limits
- These statistics should be used for both voltage and current harmonics (exception → the 99<sup>th</sup> percentile short time value is not recommended for use with voltage harmonics).

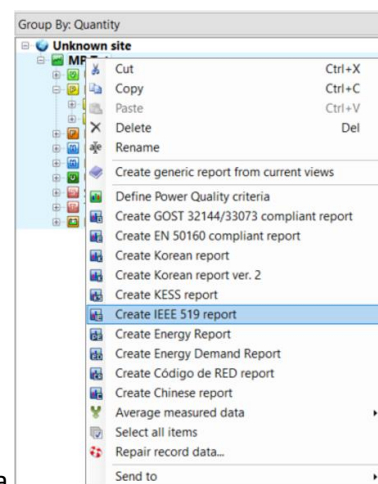
**Interpretation:**

- Current harmonics evaluate based on 95th and 99th percentile.
- Voltage harmonics evaluate based on 95th percentile only.

**Important:**

- Joint responsibility involving both end-users and system owners or operators, that harmonic limits are recommended for both voltages and currents.
- System owners or operators and users must work cooperatively to keep actual voltage distortion below objectionable levels
  - End-users limit the harmonic current injections
  - System owners or operators should take action to modify system characteristics so that voltage distortion levels are acceptable in case the efforts by end-users are insufficient
- The recommended limits apply only at the PCC and should not be applied to either individual pieces of equipment or at locations within a user's facility.

IEEE 519 report based on **3 second measurement values**, minimum monitoring time is 7 days. To fulfil measuring requirements, PQI General Recorder should be set to "LIMITED" profile, to fulfil the IEEE 519 specification.




To create report according IEEE 519, press on icon  or via


IEEE 519

Report parameters

**General**

Include in report ☒

Company Logo 

Client Logo 

Include flagged data ☐

Include interruptions ☐

Point of common coupling (PCC) **Transformer**

Week Start Day **Immediately**

**Point of common coupling (PCC)**

Bus voltage U<sub>bus</sub> at PCC 230.00

Transformer impedance [%] 3.00

Transformer capacity [kVA] 356.40

Short current I<sub>sc</sub> [A] 17,217.32

Max. demand load current I<sub>L</sub> [A] 5,395.08

**Voltage harmonics and THD (95 %)**

Include in report ☒

**Current harmonics and TDD (95 %)**

Include in report ☒

**Current harmonics and TDD (99%)**

Include in report ☒

General setup screen, with selection what is included

PCC selection: Transformer/Power generation equipment/Custom point on the system

Point of common coupling (PCC) **Power generation equipment**

Point of common coupling (PCC) **Custom point on the system**

Bus voltage U<sub>bus</sub> at PCC 230.00

Max. demand load current I<sub>L</sub> [A] 572.11

Point of common coupling (PCC) **Custom point on the system**

Bus voltage U<sub>bus</sub> at PCC 230.00

Short current I<sub>sc</sub> [A] 11,442.24

Max. demand load current I<sub>L</sub> [A] 572.11

Week start day selection:

**Immediately**

Default

Next Day

Selection what is included in the report

**Selectable parameters** → some of them are automatically get from the PQI; some of them could be manually entered.

Legend:

✓ / ✓

Get from PQA    Manual entry

	U <sub>bus</sub> at PCC	Transformer impedance	Transformer capacity	Short current	Max. demand load current
Transformer	✓ / ✓	✗ / ✓	✗ / ✓	Calculated	✓ / ✓
Power generation equipment	✓ / ✓	N/A	N/A	N/A	✓ / ✓
Custom point of the system	✓ / ✓	N/A	N/A	Calculated/✓	✓ / ✓

**Week Start Day** selection:

- Immediately – report starts with the first record
- Default – report starts with the first week date, related to the country (region) specifics: Sunday in EU; report starts at 00:00:00
- Next Day – report starts next day at 00:00:00

### IEEE 519 Report

#### Harmonic Control in Electric Power Systems

**Company**


Name	Janez Novak
Company	Metrel d.d.
Address	Ljubljanska c. 77
Phone	+386 1 123
Email	janez.novak@metrel.si

**Client**

Name	Jana Novak
Company	Metrel Mehanika d.d.
Address	Ljubljanska c. 71
Phone	+386 1 789 456
Email	jana.novak@metrel.si

**Measurement**

Objective	
Site description	
Start time	1/8/2020 1:31:27 PM
Stop time	1/16/2020 1:12:21 PM
Duration	7 d 23 h 40 m 53 s 997 ms
Interval	3 seconds / 10 minutes
Connection	Three phase four wire
Bus voltage at PCC	400.00 V <sub>L-N</sub>
Frequency	50.00 Hz
Flag data	Included
IEEE 519 limits	V <sub>u/s</sub> ≤ 1.00 kV Current: 120.00 V < V <sub>u/s</sub> ≤ 69.00 kV, 20 ≤ I <sub>sc</sub> /I <sub>N</sub> < 50
Maximum demand load current (fundamental) I <sub>N</sub>	572.11 A
Maximum short circuit current I <sub>sc</sub>	11,442.24 A



**Information Field – added from entering menu**  
**Could be edited from the Report Editor**

**Information about the Measurement place and IEEE 519 Limits**

**Daily Summary, Very Short Time 3 s, 99 %**

1/10/2020 0:00:02 - 1/10/2020 23:59:59

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

1/11/2020 0:00:02 - 1/11/2020 23:59:59

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

1/12/2020 0:00:02 - 1/12/2020 23:59:59

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

1/13/2020 0:00:02 - 1/13/2020 23:59:59

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

1/14/2020 0:00:02 - 1/14/2020 23:59:59

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

1/15/2020 0:00:02 - 1/15/2020 23:59:59

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

1/16/2020 0:00:02 - 1/16/2020 13:12:21

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

**Compliance summary, related to the measurement parameters:**

- Weekly Record Summary/Short Time (10 min)
- Daily Summary/Very Short Time (3 sec)

**Instrument**

Instrument name	Power Master XT
Instrument model	MI 2893
Manufacturer	Metrel d.d.
Serial number	18080556
Firmware version	1.0.3431
Operator name	Mihail Hribar
Current clamps	A1502 (3,000.00 A), Clamp measuring range (3,000.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A
Additional equipment	

**Information about the used PQA, Operater, used current clamps**

#### IEEE 519 Compliance Summary

##### Weekly Record Summary, Short Time 10 m

1/8/2020 13:40:00 - 1/12/2020 0:00:00, 95 %

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

1/8/2020 13:40:00 - 1/12/2020 0:00:00, 99 %

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

1/12/2020 0:10:00 - 1/16/2020 13:20:00, 95 %

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

1/12/2020 0:10:00 - 1/16/2020 13:20:00, 99 %

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

**Compliance summary, related to the measurement parameters:**

- Weekly Record Summary/Short Time (10 min)
- Daily Summary/Very Short Time (3 sec)

##### Daily Summary, Very Short Time 3 s, 99 %

1/8/2020 13:31:27 - 1/8/2020 23:59:59

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

1/9/2020 0:00:02 - 1/9/2020 23:59:59

Voltage Harmonic	Passed
Voltage THD	Passed
Current Harmonic	Passed
Total Demand Distortion	Passed

#### Short Time Voltage Harmonics and THD - for 95 % of time

1/8/2020 13:30:00 - 1/12/2020 0:00:00

Measured quantity	10 minutes mean RMS values of the harmonics and Total Harmonic Distortion (THD). All harmonic values expressed in percent (%) are rated to the bus voltage at PCC.
Bus voltage at PCC	400.00 V <sub>L-N</sub>
Bus voltage at PCC criteria	V <sub>u/s</sub> ≤ 1.00 kV
Limits	95 % of Voltage THD measurements should be less than 8 %. 95 % of individual Voltage harmonic measurements should be less than 5 %.
IEEE 519 standard	Section 5.1

Harmonic No.	Limit (%)	Voltage harmonics - L1		Voltage harmonics - L2		Voltage harmonics - L3	
		Measured (%)	Status	Measured (%)	Status	Measured (%)	Status
THD	8.00	1.69	Passed	1.69	Passed	1.63	Passed
2	5.00	0.03	Passed	0.02	Passed	0.02	Passed
3	5.00	0.26	Passed	0.14	Passed	0.26	Passed
4	5.00	0.01	Passed	0.01	Passed	0.01	Passed
5	5.00	1.29	Passed	1.34	Passed	1.33	Passed
6							
7							
8							
9							
10	5.00	0.01	Passed	0.01	Passed	0.01	Passed
11	5.00	0.52	Passed	0.43	Passed	0.38	Passed
12	5.00	0.01	Passed	0.01	Passed	0.01	Passed
13	5.00	0.20	Passed	0.22	Passed	0.18	Passed
14	5.00	0.01	Passed	0.01	Passed	0.01	Passed
15	5.00	0.08	Passed	0.07	Passed	0.06	Passed
16	5.00	0.01	Passed	0.02	Passed	0.01	Passed
17	5.00	0.10	Passed	0.12	Passed	0.10	Passed
18	5.00	0.01	Passed	0.02	Passed	0.02	Passed
19	5.00	0.07	Passed	0.08	Passed	0.07	Passed
20	5.00	0.01	Passed	0.02	Passed	0.02	Passed
21	5.00	0.07	Passed	0.08	Passed	0.08	Passed
22	5.00	0.01	Passed	0.02	Passed	0.02	Passed
23	5.00	0.09	Passed	0.07	Passed	0.09	Passed
24	5.00	0.01	Passed	0.02	Passed	0.02	Passed
25	5.00	0.06	Passed	0.04	Passed	0.06	Passed
26	5.00	0.01	Passed	0.02	Passed	0.02	Passed
27	5.00	0.04	Passed	0.04	Passed	0.04	Passed
28	5.00	0.01	Passed	0.02	Passed	0.02	Passed
29	5.00	0.07	Passed	0.04	Passed	0.05	Passed
30	5.00	0.01	Passed	0.02	Passed	0.02	Passed
31	5.00	0.04	Passed	0.03	Passed	0.05	Passed
32	5.00	0.01	Passed	0.01	Passed	0.01	Passed

**Detailed report for each measuring characteristic, with Limit specification**

#### Note:

- IEEE 519 report is created from Sunday – to Sunday, so report is split accordingly to mere separated sheets.
- Limits are automatically taken from the IEEE 519 recommended practice

#### 4.4.9 Energy/Energy Demand report

Energy/Energy Demand report enables the user managing your energy costs, based on recording data with Metrel PQI's.

Energy management is the process of monitoring, controlling and conserving energy and is an essential measure to reduce and optimize the electricity costs. With proper energy management, you can achieve better business results through:

- Reduction of maintenance costs of equipment
- Usage of more effective equipment
- Shifting your energy use to the period when energy is at lower tariff (rate)
- Improving your business results by keeping track on your energy use

**Energy report** → presentation of consumed energy, based on hourly/daily/weekly intervals in kWh or by implementation of different tariff's (rate's) deeply analyse inside which period energy (or cost) exceeds predefined limits.

**Energy Demand report** → provides information about energy consumption in monitoring period, three highest maximum demands and (in pie chart) presentation of positive sequence of consumed active power vs positive sequence of consumed fundamental reactive power vs unbalance apparent power vs harmonic apparent power. Based on the relations between these parameters it is possible to take appropriate actions to improve the entire system.

**Energy report** includes both parts of Report: Energy and Demand Report; **Energy Demand report** includes only Demand Report.

**Example:** Consumption comparison → estimating of consumption of Load A & Load C comparing to Total comparison

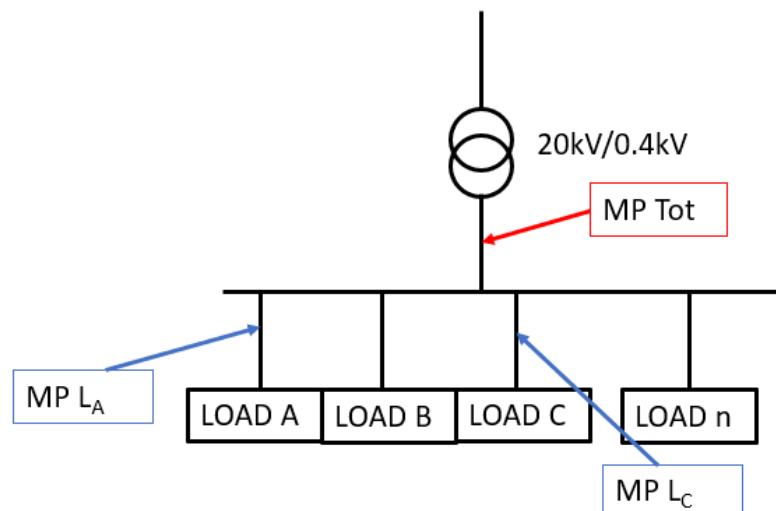


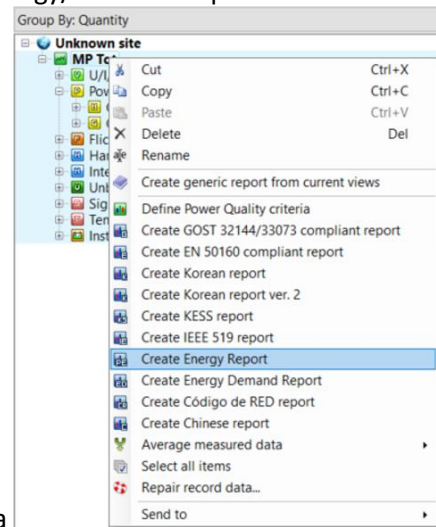
Figure 71 Connection diagram


Legend:

- MP  $L_A$  – connection point for measuring consumption of Load A
- MP  $L_C$  – connection point for measuring consumption of Load C
- MP Tot – connection point for measuring Total consumption

How to prepare Energy Report, with three recorder data:

1. Open all Recorder Data, which should be included in the Energy/Demand Report



2. To create Energy/Energy Demand, press on icon  or via
3. Import Company/Client information from the Contact list

Select contacts to use in report

Energy Report

Company and Client Logo/Information

Selection, if Energy Demand report is included in the report  
Start Week day definition: Default – Sunday, Next following day  
Consumed/Generated data selection  
Currency – enter local currency symbol

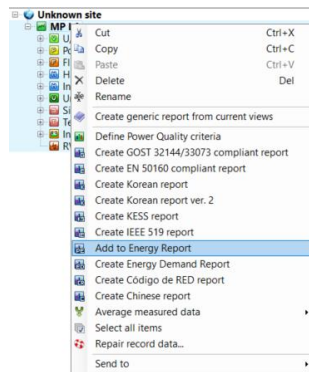
Recorder data selection

Interval selection:  
- Hourly  
- Daily  
- Weekly  
All intervals could be selected

kWh/MWh selector

4. Adding new Recorder into same Energy/Energy Demand Report → select new Record and select "Add to Energy Report"





5. Add as many Recorders you want to single Energy/Energy Demand Report.

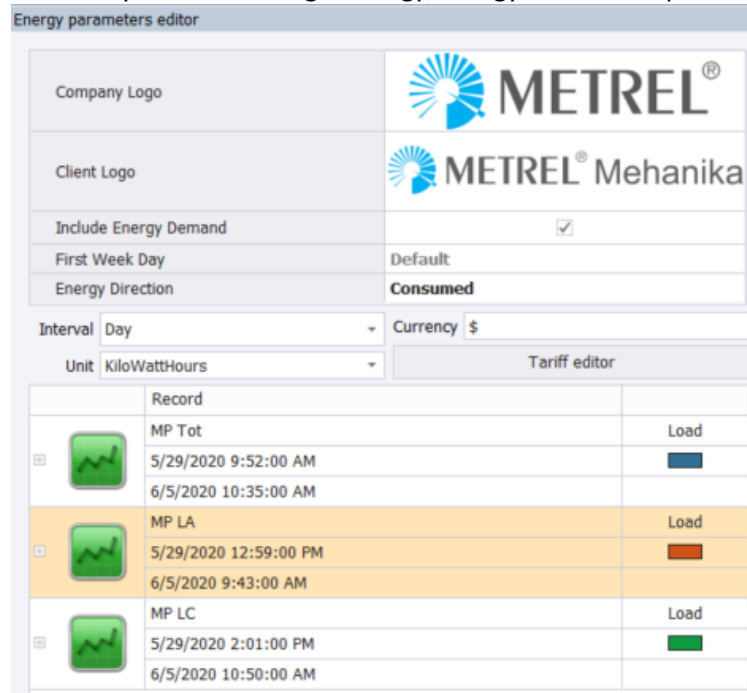
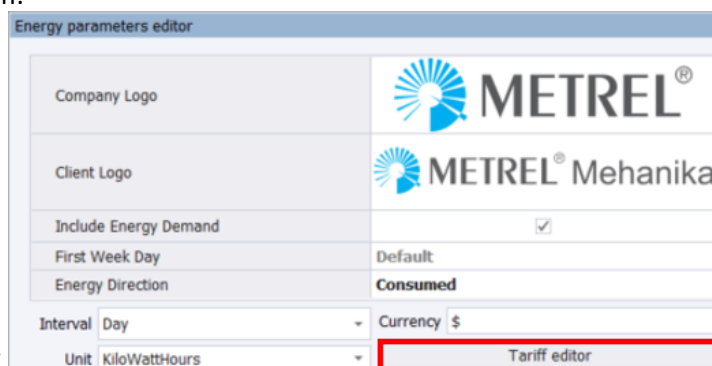


Figure 72 Energy Report with three independent Recorders

6. Adding "Tariff program" to specific recorder
  - For each recorder an unique tariff program could be loaded/created
7. Creating Tariff program:



- Click on "Tariff editor"

Tariff import

File

<input type="checkbox"/>	Name	Price	Recurrence	Start Time	Stop Time	Duration
<input type="checkbox"/>	Profile Name: ESCOM winter					
<input type="checkbox"/>	Profile Name: Test 1					
<input type="checkbox"/>	Profile Name: Test Tariff					

Add Delete Edit Cancel

**Add** – Adding new Tariff program

**Delete** – Delete selected Tariff program

**Edit** – Edit selected Tariff program

**Cancel** - return back to Energy Report

Tariff import

File

<input type="checkbox"/>	Name	Price	Recurrence	Start Time	Stop Time	Duration
<input checked="" type="checkbox"/>	Profile Name: ESCOM winter					
<input type="checkbox"/>	Low	0.67000	Every weekday	12:00:00 AM	6:00:00 AM	06:00:00
<input type="checkbox"/>	High	1.50000	Every weekday	6:00:00 AM	5:00:00 PM	11:00:00
<input type="checkbox"/>	Medium	0.95000	Every weekday	5:00:00 PM	10:00:00 PM	05:00:00
<input type="checkbox"/>	Low	0.67000	Every weekday	10:00:00 PM	11:59:59 PM	02:00:00
<input type="checkbox"/>	Low	0.67000	Every weekend	12:00:00 AM	11:59:59 PM	1.00:00:00
<input checked="" type="checkbox"/>	Profile Name: Test 1					
<input type="checkbox"/>	Unit one	0.50000	Base	12:00:00 AM	11:59:59 PM	23:59:59
<input type="checkbox"/>	tzu	1.00000	Every day	12:00:00 AM	11:59:59 PM	1.00:00:00
<input checked="" type="checkbox"/>	Profile Name: Test Tariff					
<input type="checkbox"/>	T2	0.50000	Every weekday	12:00:00 AM	6:00:00 AM	06:00:00
<input type="checkbox"/>	T2	0.50000	Every weekday	10:00:00 PM	11:59:59 PM	01:59:59
<input type="checkbox"/>	T2	0.50000	Every weekend	12:00:00 AM	11:59:59 PM	23:59:59
<input type="checkbox"/>	T1	1.00000	Every weekday	6:00:00 AM	7:00:00 AM	01:00:00
<input type="checkbox"/>	T1	1.00000	Every weekday	10:00:00 AM	10:00:00 PM	12:00:00
<input type="checkbox"/>	T3	2.00000	Every weekday	7:00:00 AM	10:00:00 AM	03:00:00
<input type="checkbox"/>	T2	0.50000	Once 4/27/2018	12:00:00 AM	11:59:59 PM	23:59:59
<input type="checkbox"/>	T2	0.50000	Once 5/1/2018	12:00:00 AM	11:59:59 PM	23:59:59
<input type="checkbox"/>	T2	0.50000	Once 5/2/2018	12:00:00 AM	11:59:59 PM	23:59:59

Add Delete Edit Cancel

**Name** – tariff name (T1, T2, T3, Low, Medium, High....)

**Price** – price per tariff rate

**Start time** – tariff rate start time

**Stop time** – tariff rate stop time

**Duration** – Calculated tariff rate duration

Creating Tariff program:

**Tariff Editor**

Basic info

Profile: Test #1 Unit: KiloWattHours

Name: T1

Price: 0.85

Interval

Start: Friday, January 1, 2016 12:00:00 AM

Stop: Friday, January 1, 2016 6:00:00 AM Day End

Pattern: Every day

Duration: 06:00:00

Ok Cancel

**Tariff Editor**

Basic info

Profile: Test #1 Unit: KiloWattHours

Name: T2

Price: 1

Interval

Start: Friday, January 1, 2016 12:00:00 AM

Stop: Friday, January 1, 2016 11:59:59 PM Day End

Pattern: Every day

Duration: 23:59:59

Ok Cancel

**Profile Name: Test #1**

Profile	Name	Price	Recurrence	Start Time	Stop Time	Duration
<input checked="" type="checkbox"/>	T1	0.85000	Every day	12:00:00 AM	6:00:00 AM	06:00:00
<input type="checkbox"/>	T2	1.00000	Every day	12:00:00 AM	11:59:59 PM	23:59:59

... complete tariff program

8. Load tariff program – for each recorder. Separate tariff program could load for specific recorder

**Energy parameters editor**

Company Logo: METREL®

Client Logo: METREL® Mehanika

Include Energy Demand: ☒

First Week Day: Default

Energy Direction: Consumed

Interval: Day

Currency: \$

Unit: KiloWattHours

Tariff editor

Record

MP Tot: 5/29/2020 9:52:00 AM 6/5/2020 10:35:00 AM Load

MP LA: 5/29/2020 12:59:00 PM 6/5/2020 9:43:00 AM Load

MP LC: 5/28/2020 2:01:00 PM 6/5/2020 10:50:00 AM Load


**Tariff import**


File

Profile	Name	Price	Recurrence	Start Time	Stop Time	Duration
<input checked="" type="checkbox"/>	Profile Name: ESCOM selector					
<input type="checkbox"/>	Low	0.67000	Every weekday	12:00:00 AM	6:00:00 AM	06:00:00
<input type="checkbox"/>	High	1.50000	Every weekday	6:00:00 AM	5:00:00 PM	11:00:00
<input type="checkbox"/>	Medium	0.95000	Every weekday	5:00:00 PM	10:00:00 PM	05:00:00
<input type="checkbox"/>	Low	0.67000	Every weekday	10:00:00 PM	11:59:59 PM	02:00:00
<input type="checkbox"/>	Low	0.67000	Every weekend	12:00:00 AM	11:59:59 PM	1:00:00:00
<input checked="" type="checkbox"/>	Profile Name: Test #1					
<input type="checkbox"/>	T1	0.85000	Every day	12:00:00 AM	6:00:00 AM	06:00:00
<input type="checkbox"/>	T2	1.00000	Every day	12:00:00 AM	11:59:59 PM	23:59:59
<input checked="" type="checkbox"/>	Profile Name: Test 1					
<input type="checkbox"/>	Unit one	0.50000	Base	12:00:00 AM	11:59:59 PM	23:59:59
<input type="checkbox"/>	tsu	1.00000	Every day	12:00:00 AM	11:59:59 PM	1:00:00:00
<input checked="" type="checkbox"/>	Profile Name: Test Tariff					
<input checked="" type="checkbox"/>	T2	0.50000	Every weekday	12:00:00 AM	6:00:00 AM	06:00:00
<input checked="" type="checkbox"/>	T2	0.50000	Every weekday	10:00:00 PM	11:59:59 PM	01:59:59
<input checked="" type="checkbox"/>	T2	0.50000	Every weekend	12:00:00 AM	11:59:59 PM	23:59:59
<input checked="" type="checkbox"/>	T1	1.00000	Every weekday	6:00:00 AM	7:00:00 AM	01:00:00
<input checked="" type="checkbox"/>	T1	1.00000	Every weekday	10:00:00 AM	10:00:00 PM	12:00:00
<input checked="" type="checkbox"/>	T3	2.00000	Every weekday	7:00:00 AM	10:00:00 AM	03:00:00
<input checked="" type="checkbox"/>	T2	0.50000	Once 4/27/2018	12:00:00 AM	11:59:59 PM	23:59:59
<input checked="" type="checkbox"/>	T2	0.50000	Once 5/1/2018	12:00:00 AM	11:59:59 PM	23:59:59
<input checked="" type="checkbox"/>	T2	0.50000	Once 5/2/2018	12:00:00 AM	11:59:59 PM	23:59:59

Load Cancel

Energy parameters editor

Company Logo 

Client Logo 

Include Energy Demand ☒

First Week Day Default

Energy Direction Consumed

Interval Day Currency \$

Unit KiloWattHours Tariff editor

Record	Load
MP Tot	
5/29/2020 9:52:00 AM	
6/5/2020 10:35:00 AM	

Tariffs

Tariff
T2
T2
T2
T1
T1
T3
T2
T2
T2

Record	Load
MP LA	
5/29/2020 12:59:00 PM	
6/5/2020 9:43:00 AM	

Tariffs

Tariff
Unit one
tzv

Record	Load
MP LC	
5/29/2020 2:01:00 PM	
6/5/2020 10:50:00 AM	

Tariffs

Tariff
Low
High
Medium

Tariff program for specific recorder

## Energy Report

Company	
Name	Janez Novak
Company	Metrel d.d.
Address	Ljubljanska c. 77
Phone	+386 1 123
Email	janez.novak@metrel.si



Client	
Name	Jana Novak
Company	Metrel Mehanika d.d.
Address	Ljubljanska c. 71
Phone	+386 1 789 456
Email	jana.novak@metrel.si



Company and Client information

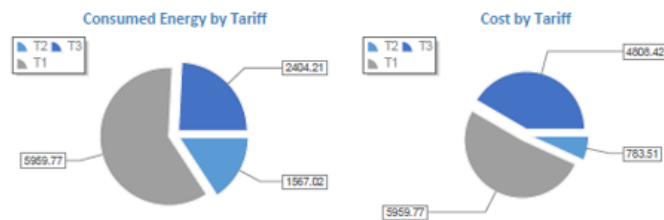
### Energy Summary

Record	Start time	Interval	Duration	Total consumed energy (kWh)	Total cost [\$]
MP Tot	5/30/2020 12:00:00 AM	1 d	6 d	9931	11551.7

Information about selected record

Tariff name	Consumed energy (kWh)	Consumed energy [%]	Cost [\$]	Cost [%]
T2	1,567.02	15.78	783.51	6.78
T1	5,959.77	60.01	5,959.77	51.59
T3	2,404.21	24.21	4,808.42	41.63

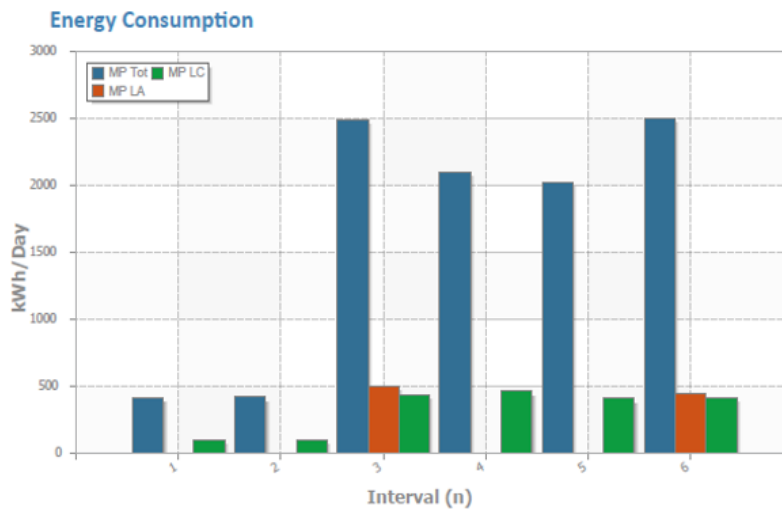
Energy / Cost presentation by tariff  
- Value and percentage presentation



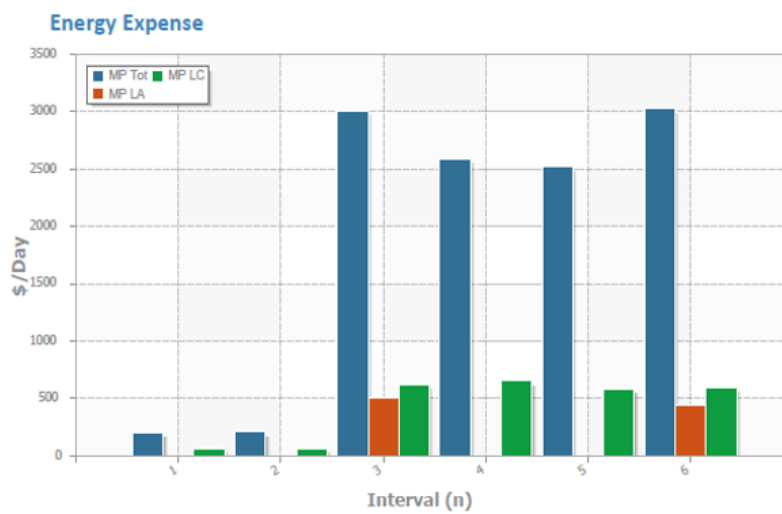
Pie chart Energy/Cost presentation – consumption by tariff

Tariff name	Start time	Duration	Pattern	Cost [\$]
T2	12:00 AM	6 h	Every weekday	0.5
T2	10:00 PM	1 h 59 m 59 s	Every weekday	0.5
T2	12:00 AM	23 h 59 m 59 s	Every weekend	0.5
T1	6:00 AM	1 h	Every weekday	1
T1	10:00 AM	12 h	Every weekday	1
T3	7:00 AM	3 h	Every weekday	2
T2	12:00 AM	23 h 59 m 59 s	Once 4/27/2018	0.5
T2	12:00 AM	23 h 59 m 59 s	Once 5/1/2018	0.5

Tariff program



Energy Consumption presentation for three recorders: Total, Load A and Load C



Energy Expense presentation for three recorders: Total, Load A and Load C

Record	Interval	Average energy consumption (per interval) [kWh]	Average cost (per interval) [\$]
MP Tot	1 Day	1655.17	1925.28
MP LA	1 Day	157.84	157.84
MP LC	1 Day	319.98	433.72

Average consumption/cost per selected monitoring interval (1 Day)

n	Record	Start time	Consumed energy [kWh]	Cost [\$]
1	MP Tot	5/30/2020 12:00:00 AM	412.92	206.46
1	MP LA	5/30/2020 12:00:00 AM	1.43	1.43
1	MP LC	5/30/2020 12:00:00 AM	101.11	67.74
2	MP Tot	5/31/2020 12:00:00 AM	417.10	208.55
2	MP LA	5/31/2020 12:00:00 AM	1.32	1.32
2	MP LC	5/31/2020 12:00:00 AM	100.91	67.61
3	MP Tot	6/1/2020 12:00:00 AM	2,490.13	3,007.16
3	MP LA	6/1/2020 12:00:00 AM	499.87	499.87
3	MP LC	6/1/2020 12:00:00 AM	434.21	626.02
4	MP Tot	6/2/2020 12:00:00 AM	2,095.16	2,586.29
4	MP LA	6/2/2020 12:00:00 AM	2.13	2.13
4	MP LC	6/2/2020 12:00:00 AM	460.79	654.11
5	MP Tot	6/3/2020 12:00:00 AM	2,017.55	2,518.06
5	MP LA	6/3/2020 12:00:00 AM	2.07	2.07
5	MP LC	6/3/2020 12:00:00 AM	407.81	587.36
6	MP Tot	6/4/2020 12:00:00 AM	2,498.12	3,025.18
6	MP LA	6/4/2020 12:00:00 AM	440.24	440.24
6	MP LC	6/4/2020 12:00:00 AM	415.05	599.48

Consumption/cost per Day 1

Consumption/cost per Day 2

Consumption/cost per Day n



## Energy Demand Report

Time frame: 5/29/2020 0:00:00 - 6/4/2020 0:00:00, Interval: 1 Day

### Energy Demand

Description	Symbol	Total	Per 1 Day
Consumed active energy	Ep <sup>+</sup>	9930997.00 Wh	1655166.21 Wh
Generated active energy	Ep <sup>-</sup>	0.00 Wh	0.00 Wh
Consumed reactive energy	Eq <sup>+</sup>	967860.13 varh	161310.02 varh
Generated reactive energy	Eq <sup>-</sup>	407002.91 varh	67833.82 varh

Average interval Energy consumption (1 Day)

- Active consumed/generated
- Reactive consumed/generated

### Maximum Power Demand P<sub>tot</sub>

	Time start	Time stop	Total Power P <sub>tot</sub> (kW)
1	6/4/2020 13:10:00	6/4/2020 13:11:00	307.15
2	6/4/2020 13:09:00	6/4/2020 13:10:00	301.77
3	6/4/2020 13:06:00	6/4/2020 13:07:00	291.85

Three maximum demands with time stamp

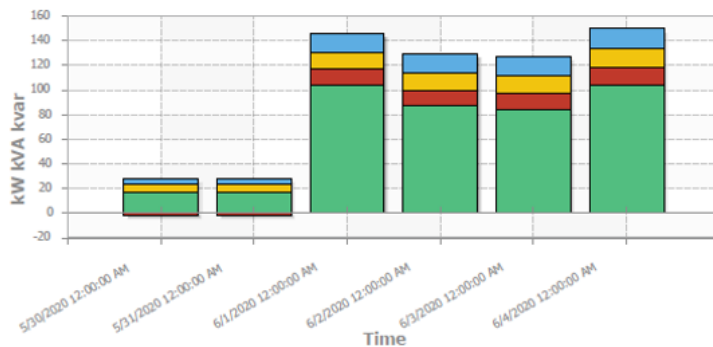
### Average Power Demand

Description	Symbol	Demand
Active Power	P <sub>tot</sub>	68.96 kW
Positive sequence of Consumed Active Power	P <sup>+</sup>	68.75 kW
Positive sequence of Consumed fundamental reactive power	Q <sup>+</sup>	12.46 kvar
Positive sequence of Generated fundamental reactive power	Q <sup>-</sup>	4.01 kvar
Unbalance apparent power	S <sub>u</sub>	11.32 kVA
Nonfundamental (harmonic) apparent power	S <sub>uh</sub>	12.14 kVA
Harmonic pollution	HP	19.26 %
Load unbalance	LU	21.23 %



System status overview (averaged to 1 hour):

- From selected pie chart it is possible to define:
  - If compensation is needed (red pie size)
  - If filters are needed (blue pie size)
  - If load unbalance should be improved (orange pie size)



Daily "System status overview"

### 4.4.10Codigo de RED Ver. 2.0 report

Codigo de RED Ver. 2.0 report is custom defined for specific country. For more information, please contact local distributor.

### 4.4.11 Chinese report

Chinese report is custom defined for specific country. For more information, please contact local distributor.

### 4.4.12 Custom defined limits for EN 50160/GOST/Chinese report

User could easily change the predefined limits for EN 50160, GOST or Chinese report parameters and save them under custom defined name. Default parameters could not be changed. This could be useful in case, that standard change some specific parameters which are not upgraded in the PowerView yet or in case, when user wants to monitor the measurement results with different specific limits.

Step by step procedure:

1. Open the PQ parameters according the desired PQ report, that you want to create (for example EN 50160)
2. Change parameter (s) → Unom in this example from 230 V to 240 V

Edit Power Quality Criteria

Quantity	Percent of intervals	Max. neg. difference (-)	Max. pos. difference (+)	Reference value
Voltage	95,00 %	-10,00 %	10,00 %	240,00 V
Voltage	99,00 %	-10,00 %	10,00 %	240,00 V
Voltage THD	95,00 %	0,00 %	8,00 %	0,00 %
Frequency	99,50 %	-1,00 %	1,00 %	50,00 Hz
Frequency	95,00 %	-2,00 %	2,00 %	50,00 Hz
Negative sequence voltage ratio	95,00 %	0,00 %	2,00 %	0,00 %
Flicker PLT	95,00 %	0,00	1,00	0,00
Signalling (3s)	99,00 %	0,00 %	10,00 %	0,00

Load defaults for EN50160 Save Save As... Delete Ok Cancel

### 3. Save corrected parameters under specific name → Save As → Ok

Edit Power Quality Criteria

Quantity	Percent of intervals	Max. neg. difference (-)	Max. pos. difference (+)	Reference value
Voltage	95,00 %	-10,00 %	10,00 %	240,00 V
Voltage	99,00 %	-10,00 %	10,00 %	240,00 V
Voltage THD	95,00 %	0,00 %	8,00 %	0,00 %
Frequency	99,50 %	-1,00 %	1,00 %	50,00 Hz
Frequency	95,00 %	-2,00 %	2,00 %	50,00 Hz
Negative sequence voltage ratio	95,00 %	0,00 %	2,00 %	0,00 %
Flicker PLT			1,00	0,00
Signalling (3s)			10,00 %	0,00

Load defaults for EN50160 Save Save As... Delete Ok Cancel

Name: Unom 240V  
Ok Cancel

### 4. Create PQ report

### 5. Next opened PQ parameters will be the last saved one under "Report saved criteria – EN 50160"

Report saved criteria - EN 50160 Save Save As... Delete Ok Cancel

### 6. If you want to open default parameters for the supported report, then you just need to Load one of them, from the Default parameters scheme from the table.

Report saved criteria - EN 50160

Report saved criteria - EN 50160

Load defaults for EN50160

Load defaults for GOST 32144/33073

Load defaults for CHINESE

300 - EN 50160

gost test - GOST 32144/33073

200 - EN 50160

### Hints:

- Default parameters could not be changed
- Customer saved parameters could be modified, Saved, Save As under specific name or Deleted

## 4.5 ITIC/CBEMA/IEC 61000-4-11 Voltage events view

**ITIC curve** is published by Information Technology Industry Council (ITIC) formerly known as Computer & Business Equipment Manufacturer's Association (CBEMA). This curve provides an AC voltage boundary

that most information technology equipment (ITE) can tolerate or ride through without experiencing unexpected shutdowns or malfunctions.

The CBEMA curve is a precursor to ITIC curve and was published in the 1970'.

Even though both ITIC and CBEMA names are used interchangeably there are subtle differences.

The curve is primarily intended for 120V, 120/208V and 120/240V 60Hz systems. Other voltages are not specifically part of this and it is the responsibility of the user to verify that the curve is applied correctly at other voltages. People tend to extrapolate these curves to 480V or even higher voltages and also as a general metric of incoming power quality. While there is no harm in using this as a reference to establish a baseline power quality, it is important to recognize that the original intent of the curve was for 120V single phase computer equipment. The curve describes an AC voltage envelop which typically can be tolerate by ITE equipment. The curve describes both steady state and transitory conditions.

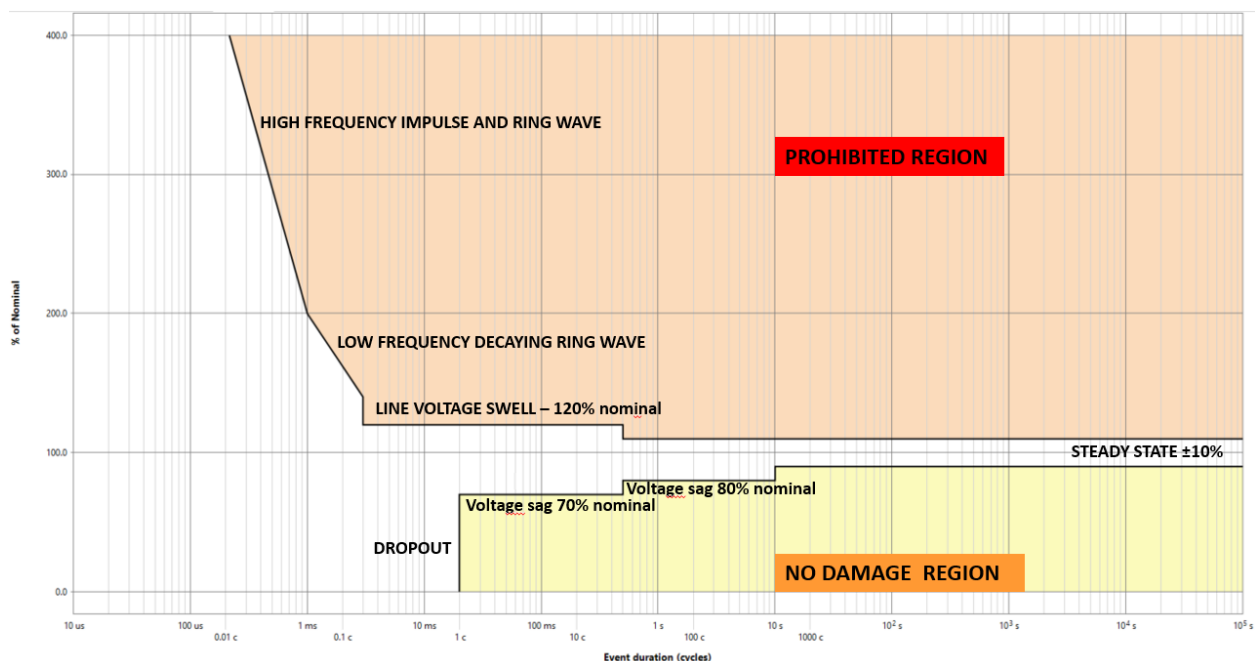


Figure 73 ITIC Curve - definitions

**Steady State:**  $\pm 10\%$  from the nominal voltage.

**Line Voltage Swell:** Up to 120% of the RMS nominal voltage with duration of up to 0.5 seconds.

**Low Frequency Decaying Ring wave:** This region describes the decaying ringwave which results from capacitor banks switching. The frequency of transient may range from 200Hz to 5KHz. The magnitude of transient is expressed as a percentage of the peak of 50/60Hz nominal voltage (not the RMS value). Transient is assumed to occur near the peak of the nominal voltage waveform. The transient is assumed to be completely decayed by the end of half-cycle in which it occurs. The amplitude of transient varies from 140% to 200%.

**High-Frequency Impulse and Ring wave:** This region above 200% describes the transients that typically result from lightning strikes.

**Voltage Sag:** Two different RMS voltage sags are described. Sags to 80% of nominal for up to 10 seconds and sags to 70% of nominal for up to 0.5 seconds. Voltage sag is an RMS reduction in the AC voltage, at

the power frequency, for duration from half cycle to few seconds. The IEC terminology for this phenomenon is voltage dip. Voltage sags are most often caused by faults on the utility system although they may be caused by faults within the facility or by large motor starts.

**Dropout:** Voltage dropout includes both severe RMS voltage sags and complete interruptions of the applied voltage, followed by immediate re-application of the nominal voltage. Interruption may last up to 20 milliseconds.

**No Damage Region:** Voltage sags, dropouts, and steady state voltages in this region are not expected to damage the ITE equipment. Normal functioning of ITE equipment is also not expected in region.

**Prohibited Region:** Any surges or swell in this region could result in damage to the ITE equipment.

**CBEMA Curve** is one of the most commonly used power acceptance curves. It was developed by the Computer Business Equipment Manufacturers Association in the 1970s, as a guideline for the organization's members in designing their power supplies. Basically, the CBEMA curve was originally derived to describe the tolerance of mainframe computer business equipment to the magnitude and duration of voltage variations on the power system.

The association designed the curve to point out ways in which system reliability could be provided for electronic equipment. It became a standard design target for sensitive equipment to be applied on the power system and a common format for reporting power quality variation data.

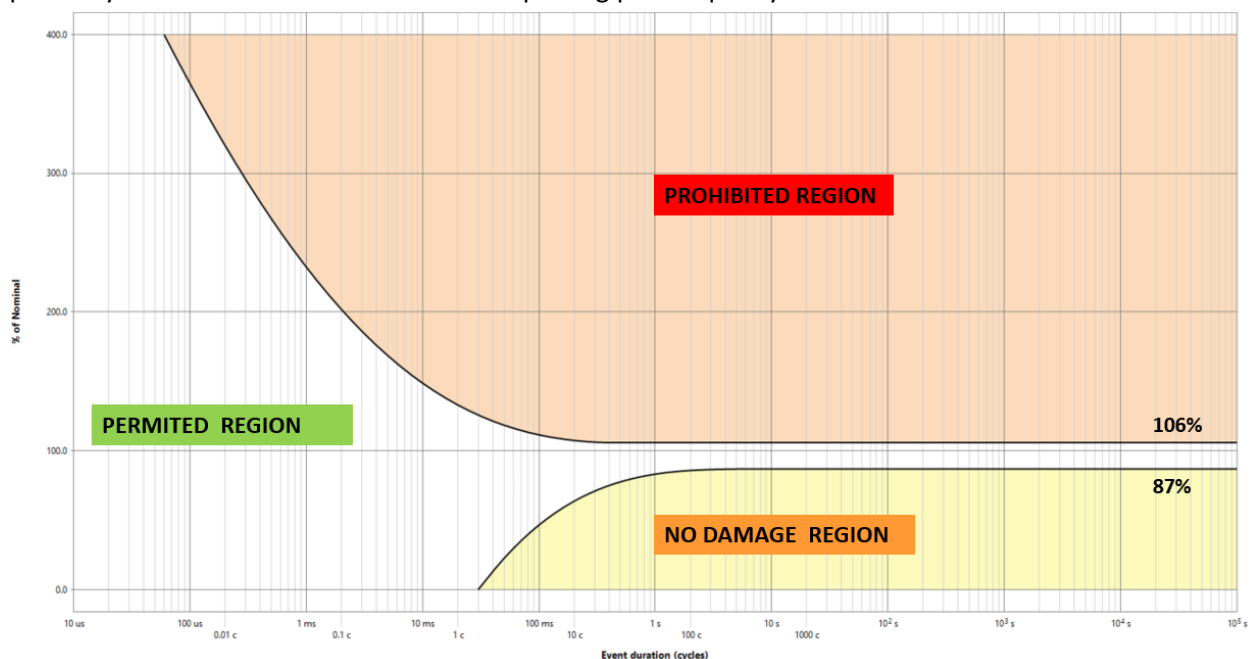


Figure 74 CBEMA Curve - definitions

**IEC 61000-4-11** - defines the immunity test methods and range of preferred test levels for electrical and electronic equipment connected to low-voltage power supply networks for voltage dips, short interruptions, and voltage variations. Specification applies to electrical and electronic equipment with nominal current less than 16 A per phase, for connection to 50 Hz or 60 Hz networks. PowerView supports presentation of voltage dips for two classes:

- Class 2  
This class applies to points of common coupling (PCCs for consumer systems) and in-plant points of common coupling (IPCs) in the industrial environment in general. The compatibility levels in this class are identical to those of public networks; therefore components designed for application in public networks may be used in this class of

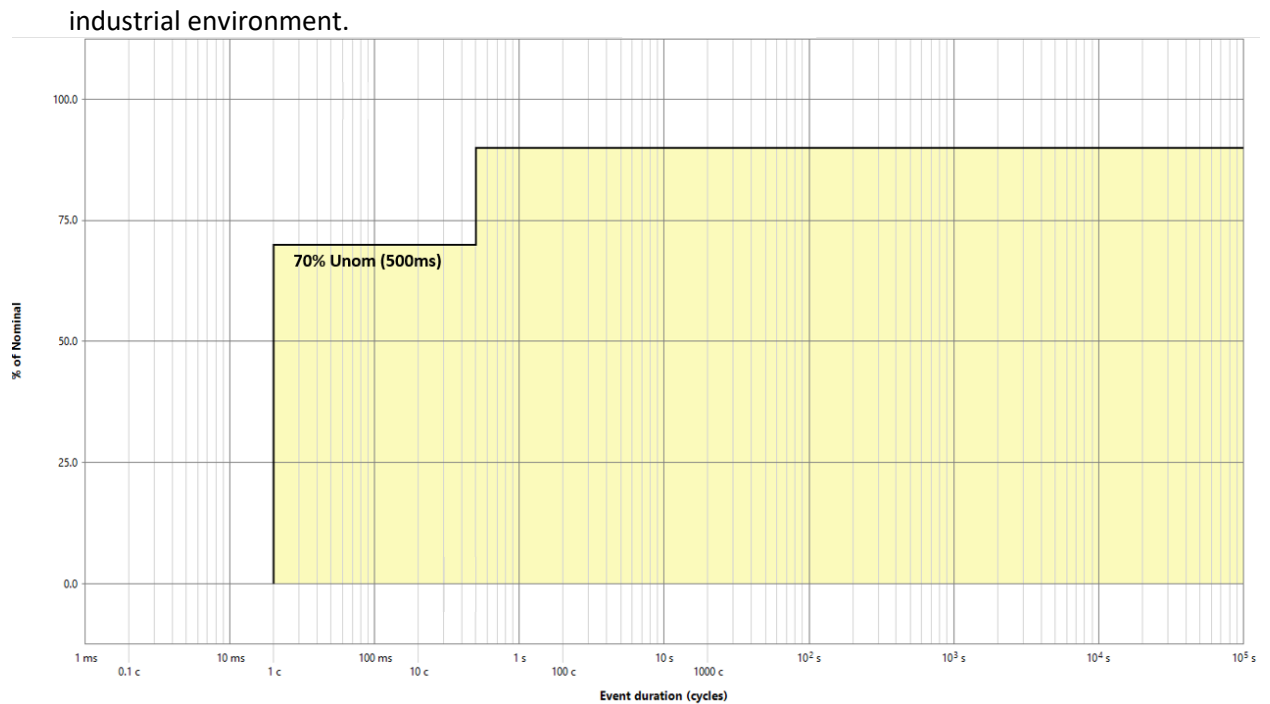


Figure 75 IEC 61000-4-11 Class 2 – level definition

- Class 3

This class applies only to IPCs in industrial environments. It has higher compatibility levels than those of class 2 for some disturbance phenomena. For instance, this class should be considered when any of the following conditions are met:

- a major part of the load is fed through converters;
- welding machines are present;
- large motors are frequently started;
- loads vary rapidly.

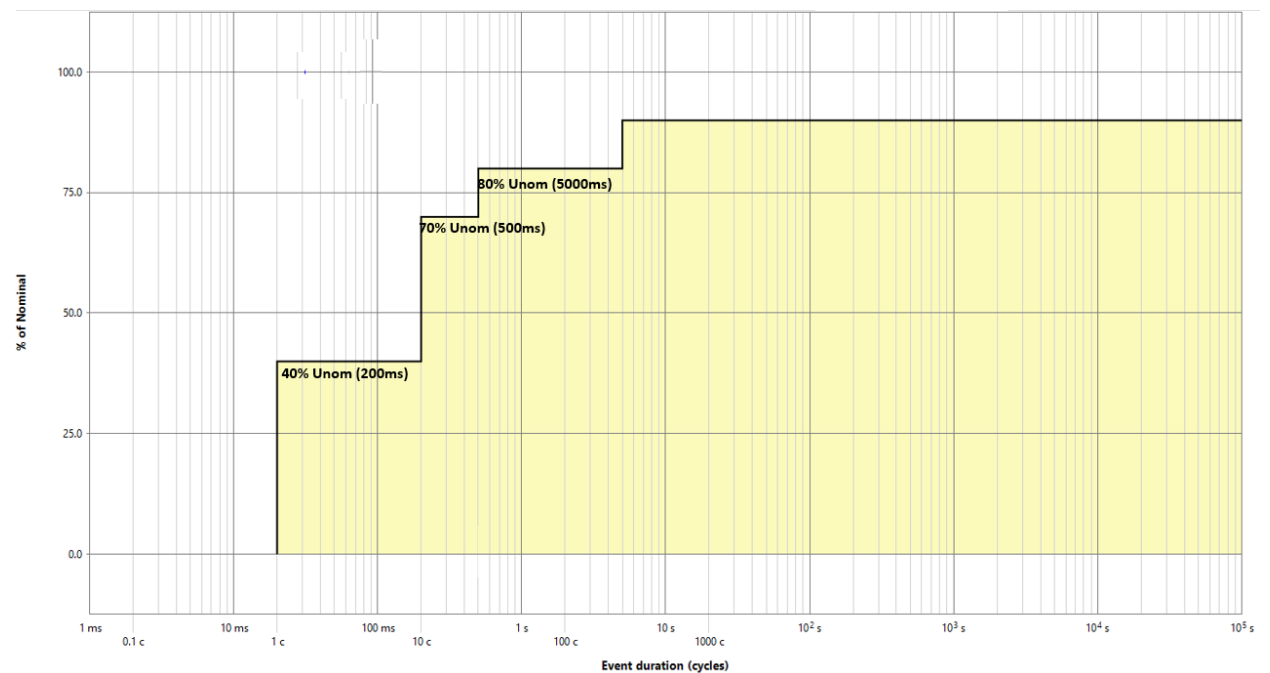
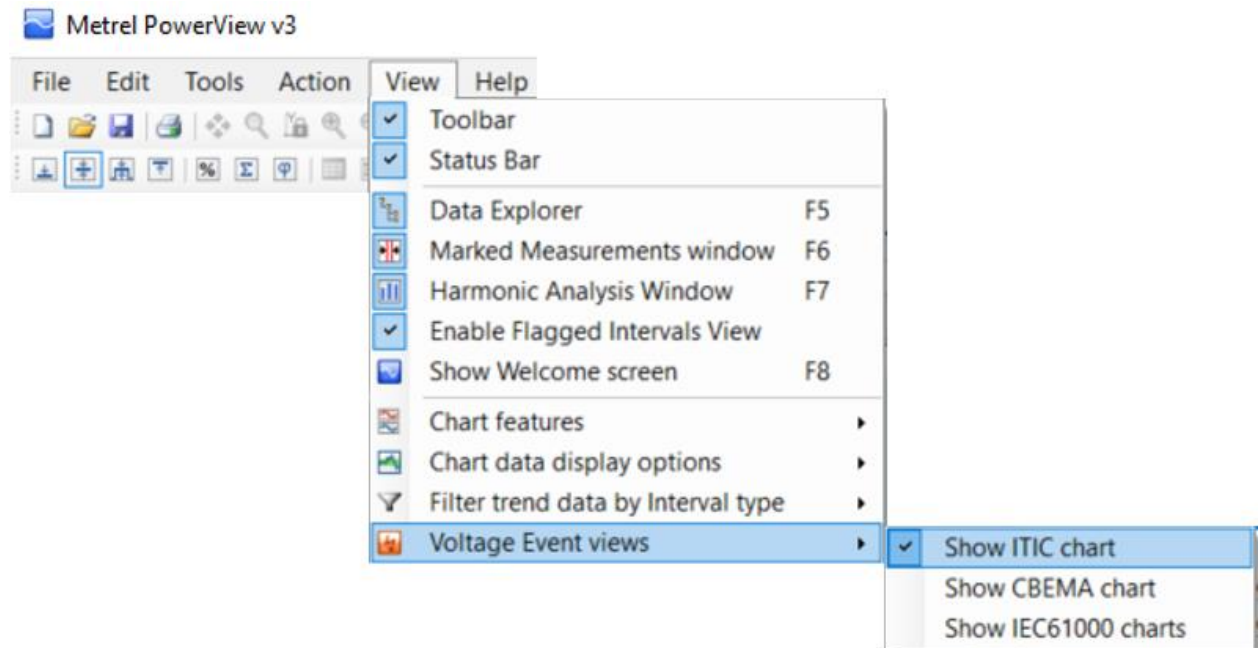


Figure 76 IEC 61000-4-11 Class 3 – levels definition

**To present voltage event through ITIC/CBEMA/IEC 61000 charts:**

VIEW → Voltage Events view → ITIC/CBEMA/IEC 61000



All Voltage charts could be presented in same time; each one in separate folder.

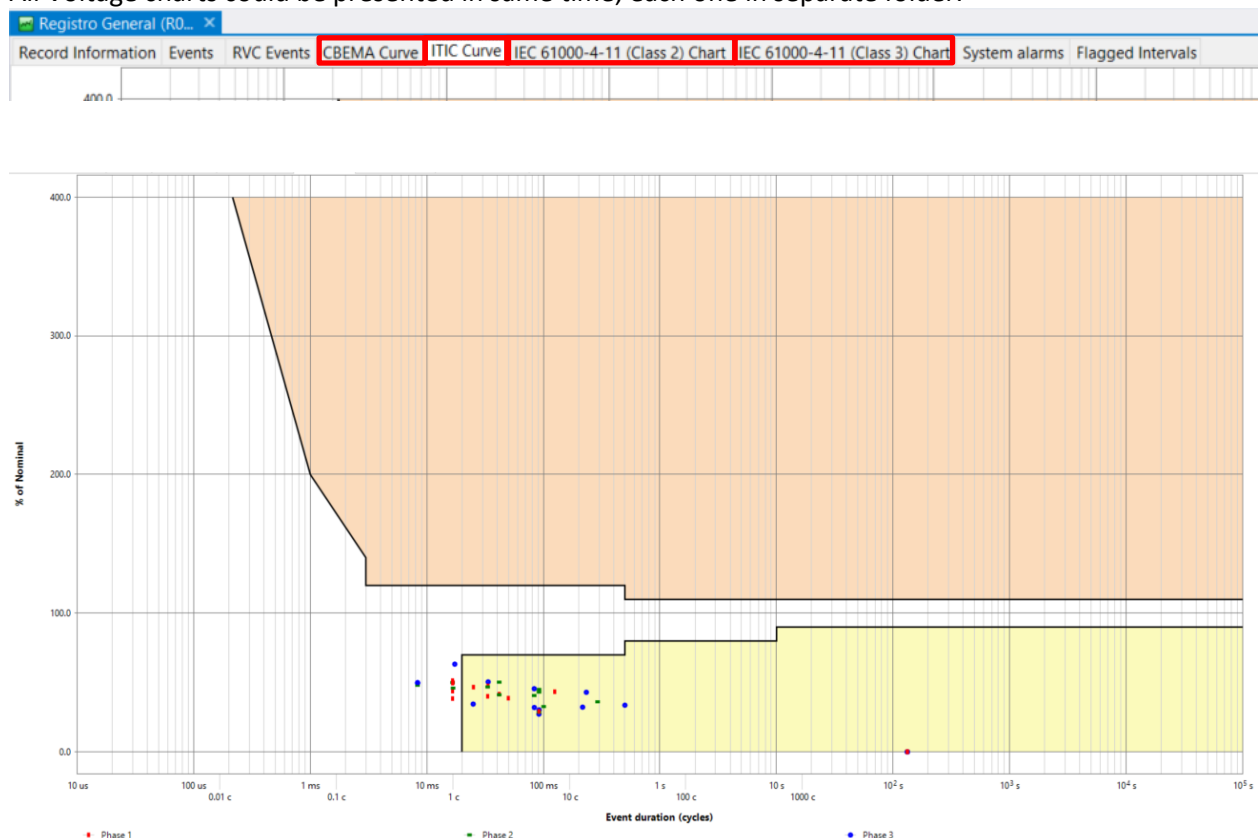


Figure 77 ITIC Curve - example

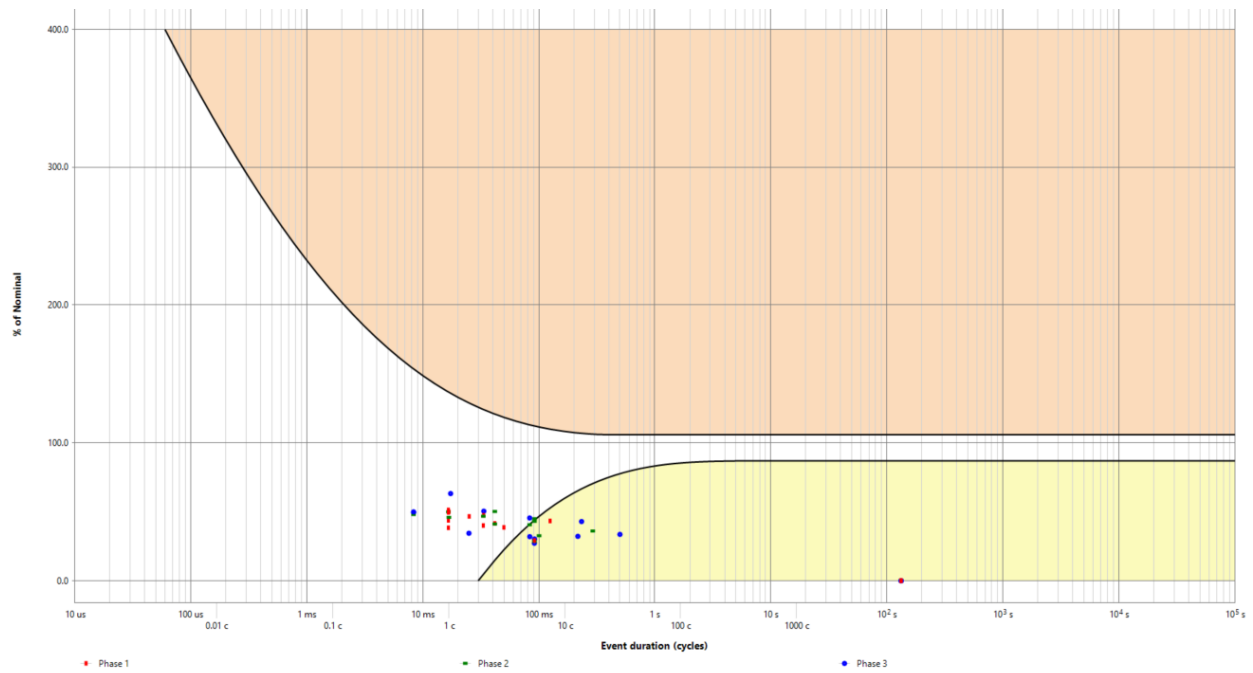


Figure 78 CBEMA Curve - example

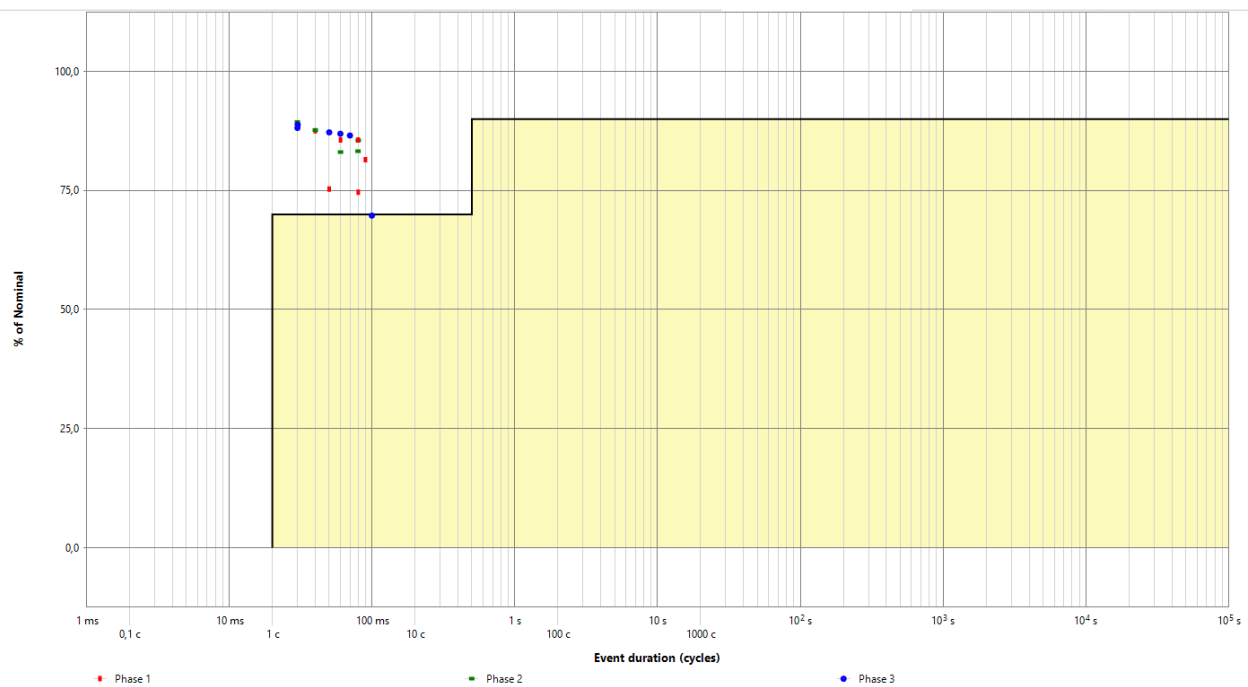


Figure 79 IEC 61000-4-11 Class 2 - example



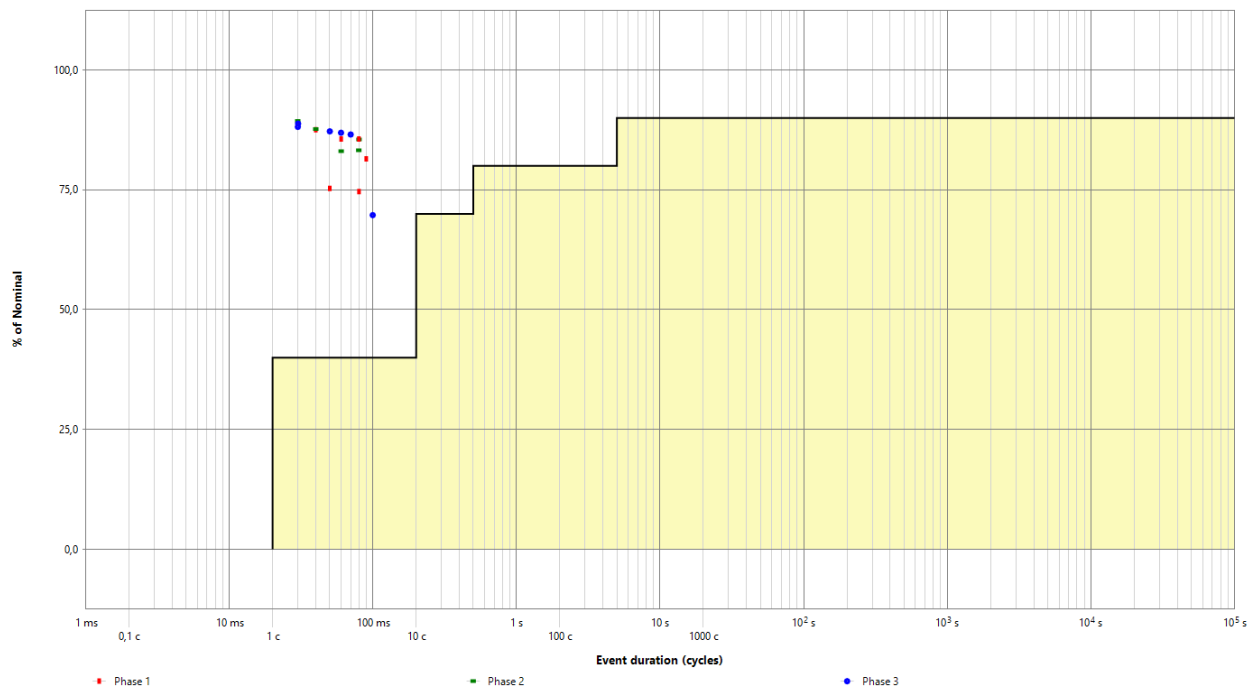


Figure 80 IEC 61000-4-11 Class 3 - example

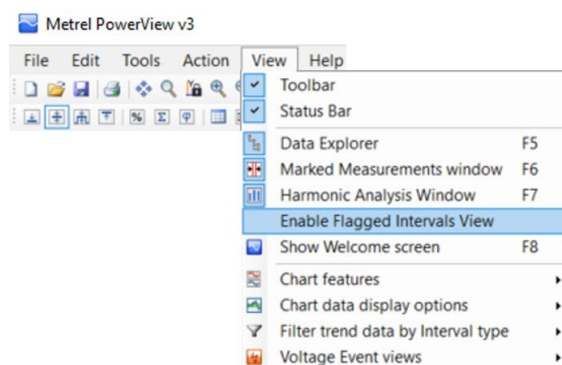
## 4.6 Flagged intervals

During a dip, swell, or interruption, the measurement algorithm for other parameters (for example, frequency measurement) might produce an unreliable value. The flagging concept avoids counting a single event more than once in different parameters (for example, counting a single dip as both a dip and a voltage variation), and indicates that an aggregated value might be unreliable.

**Note:** for most of reports, there is possibility to select, if flagged intervals are included in the report or not.

Flagged intervals could be presented in special folder “Flagged intervals”, if they are selected. Selection is done by:

**VIEW → Enable Flagged Intervals View**



General Logging (RE- ...)

Record Information	Trend Chart	Table	Events	RVC Events	System alarms	Flagged Intervals
			Measurements	Pst	Pst	Pst(1min)
2/28/2020 1:40:00 PM			L1, L3	---	L1, L3	L1, L3
2/28/2020 2:00:00 PM			L1, L2, L3, Overcurrent LN, Synchronization	L1, L2, L3, Overcurrent LN, Synchronization	L1, L2, L3, Overcurrent LN, Synchronization	---
2/28/2020 2:10:00 PM			---	L1, L2, L3, Overcurrent LN, Synchronization	---	---
2/28/2020 2:20:00 PM			---	L1, L2, L3, Overcurrent LN, Synchronization	---	---
2/28/2020 2:30:00 PM			---	L1, L2, L3, Overcurrent LN, Synchronization	---	---
2/28/2020 2:40:00 PM			---	L1, L2, L3, Overcurrent LN, Synchronization	---	---
2/28/2020 2:50:00 PM			L1, L2, L3, Synchronization	L1, L2, L3, Overcurrent LN, Synchronization	L1, L2, L3, Synchronization	---
2/28/2020 3:00:00 PM			---	L1, L2, L3, Overcurrent LN, Synchronization	---	---
2/28/2020 3:10:00 PM			---	L1, L2, L3, Overcurrent LN, Synchronization	---	---
2/28/2020 3:20:00 PM			---	L1, L2, L3, Overcurrent LN, Synchronization	---	---
2/28/2020 3:30:00 PM			---	L1, L2, L3, Overcurrent LN, Synchronization	---	---
2/28/2020 3:40:00 PM			---	L1, L2, L3, Overcurrent LN, Synchronization	---	---
2/28/2020 3:50:00 PM			---	L1, L2, L3, Overcurrent LN, Synchronization	---	---
2/28/2020 4:00:00 PM			---	L1, L2, L3, Synchronization	---	---
2/28/2020 4:10:00 PM			---	L1, L2, L3, Synchronization	---	---
2/28/2020 4:20:00 PM			---	L1, L2, L3, Synchronization	---	---
2/28/2020 4:30:00 PM			---	L1, L2, L3, Synchronization	---	---

Figure 81 Table "Flagg's" presentation

Flagg's are related to:

- Measurement period;
- Flicker period (Plt, Pst, Pst(1min)).

#### Legend:

L1, L2, L3 .... voltage dip, swell, interruption

Overcurrent L1, L2, L3, LN .... overcurrent detected

Synchronization ... synchronization performed


Flagg's, related to measurement period are presented also in Trend Chart. To enable this function, click on the icon . Flagged intervals are indicated by a vertical line.



Figure 82 Chart measurements "Flagg's" presentation

## 4.7 RVC presentation

A rapid voltage change (RVC) is one of the power-quality (PQ) issue related to voltage disturbance. "According to IEC 61000-4-30, Ed. 3 standard, RVC is defined as "a quick transition in root means square (r.m.s.) voltage occurring between two steady-state conditions, and during which the r.m.s. voltage does not exceed the dip/swell thresholds."

The main known effect of rapid voltage changes is light flicker, but other non-flicker effects also have been reported.

The RVC voltage disturbance level is not as big as a dip and swell. While RVC events generally are not destructive for electronic equipment, it can be annoying for final users as they may influence light flicker.

RVC could be caused by the switching on of a specific load or by a sudden change in source voltage; for example: in solar grids when the sun is obscured by clouds or in wind farms when then wind speed decreases. Load switching can cause a rapid voltage change if the rating of the load is a significant fraction of the fault level of the supply voltage.

Record Information	Trend Chart	Table	Events	RVC Events	System alarms
Start time	Duration	$\Delta U_{max}$	$\Delta U_{ss}$	Phase	
2/27/2020 11:15:16.776	010 ms	9.367	9.109	L1	
2/27/2020 11:15:16.779	010 ms	9.804	9.600	L3	
2/27/2020 11:15:16.783	010 ms	9.736	9.500	L2	
2/27/2020 11:15:59.051	010 ms	9.084	8.563	L3	
2/27/2020 11:15:59.055	010 ms	9.465	8.681	L2	
2/27/2020 11:15:59.068	010 ms	8.937	8.015	L1	
2/28/2020 13:39:53.103	691 ms	20.385	1.341	L2	
2/28/2020 13:40:24.054	061 ms	14.658	2.819	L1	
2/28/2020 13:40:24.058	051 ms	11.135	2.766	L3	
2/28/2020 13:40:24.061	031 ms	8.680	2.425	L2	
2/28/2020 13:49:18.359	030 ms	7.442	1.475	L3	
2/28/2020 13:49:18.363	060 ms	10.681	1.500	L2	
2/28/2020 13:49:53.063	080 ms	16.287	2.990	L2	
2/28/2020 13:49:53.066	040 ms	10.064	2.703	L1	
2/28/2020 13:49:53.069	030 ms	11.913	2.820	L3	
2/28/2020 14:43:50.236	021 ms	7.496	1.509	L2	

Figure 83 RVC presentation

RVC are presented in tabular form and data can be sorted across all columns; single phase or all phase presentation.

## 4.8 Events presentation (Dips/Swells/Interruptions)

All Metrel PQ Analysers records different type of events, some of them (MI 2884/2885/2892/2893) could record also waveform signal → Inrush and Waveform preview.

Events are presented in special folder “Events”:

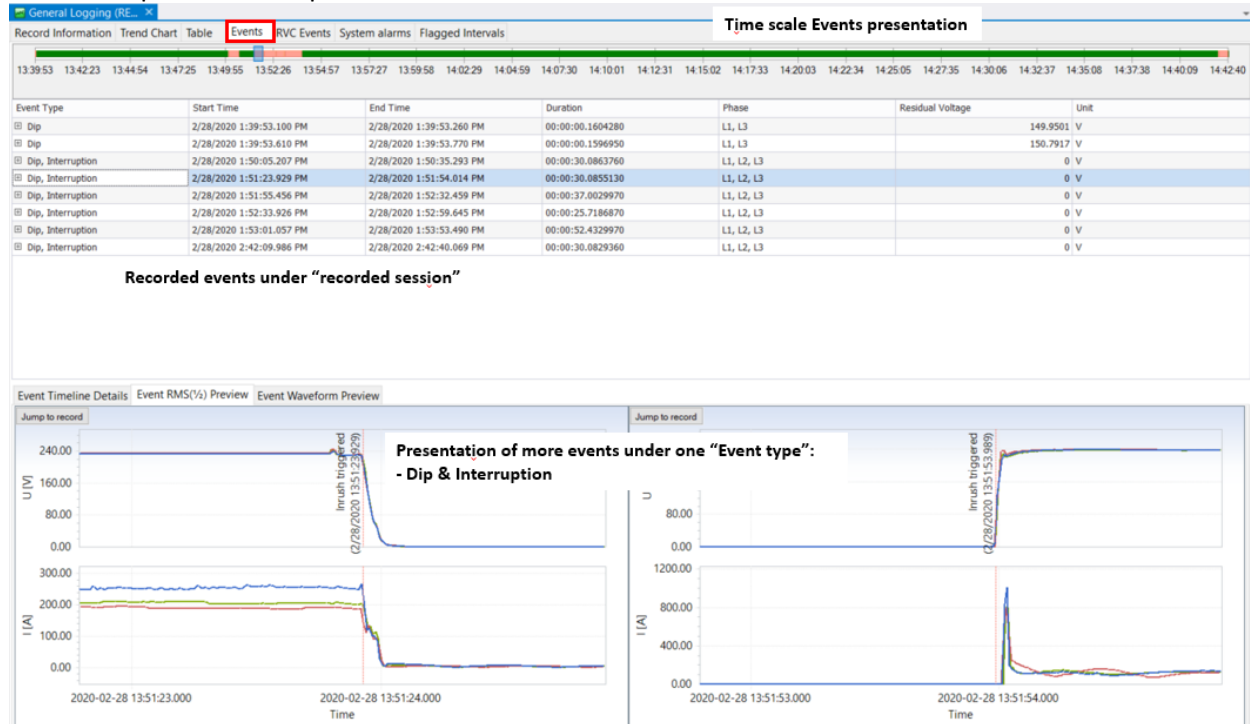


Figure 84 Events presentation

Events type	Events start time	Events stop time	Events Duration	On which phase were events detected	Events Residual voltage	
Event Type	Start Time	End Time	Duration	Phase	Residual Voltage	Unit
Dip	2/28/2020 1:39:53.100 PM	2/28/2020 1:39:53.260 PM	00:00:00.1604280	L1, L3	149.9501	V
Dip	2/28/2020 1:39:53.610 PM	2/28/2020 1:39:53.770 PM	00:00:00.1596950	L1, L3	150.7917	V
Dip, Interruption	2/28/2020 1:50:05.207 PM	2/28/2020 1:50:35.293 PM	00:00:30.0863760	L1, L2, L3	0	V
Dip, Interruption	2/28/2020 1:51:23.929 PM	2/28/2020 1:51:54.014 PM	00:00:30.0855130	L1, L2, L3	0	V
Dip, Interruption	2/28/2020 1:51:55.456 PM	2/28/2020 1:52:32.459 PM	00:00:37.0029970	L1, L2, L3	0	V
Dip, Interruption	2/28/2020 1:52:33.926 PM	2/28/2020 1:52:59.645 PM	00:00:25.7186870	L1, L2, L3	0	V
Dip, Interruption	2/28/2020 1:53:01.057 PM	2/28/2020 1:53:53.490 PM	00:00:52.4329970	L1, L2, L3	0	V
Dip, Interruption	2/28/2020 2:42:09.986 PM	2/28/2020 2:42:40.069 PM	00:00:30.0829360	L1, L2, L3	0	V

Figure 85 Events explanation - general

Dip, Interruption		2/28/2020 1:50:05.207 PM	2/28/2020 1:50:35.293 PM	00:00:30.0863760	L1, L2, L3		0 V
Sub Events							
Number	Event Type	Start Time	End Time	Duration	Recorded Value	Unit	Phase
5	Interruption	2/28/2020 1:50:05.327 PM	2/28/2020 1:50:35.266 PM	00:00:29.9397160	0.01858021	V	L2
6	Dip	2/28/2020 1:50:05.207 PM	2/28/2020 1:50:35.286 PM	00:00:30.0796380	0.01858021	V	L2
7	Interruption	2/28/2020 1:50:05.320 PM	2/28/2020 1:50:35.270 PM	00:00:29.9496080	0	V	L1
8	Dip	2/28/2020 1:50:05.210 PM	2/28/2020 1:50:35.290 PM	00:00:30.0796379	0	V	L1
9	Interruption	2/28/2020 1:50:05.323 PM	2/28/2020 1:50:35.273 PM	00:00:29.9496080	0.02764188	V	L3
10	Dip	2/28/2020 1:50:05.213 PM	2/28/2020 1:50:35.293 PM	00:00:30.0796380	0.02764188	V	L3

Figure 86 Events explanation – more events detected under one general

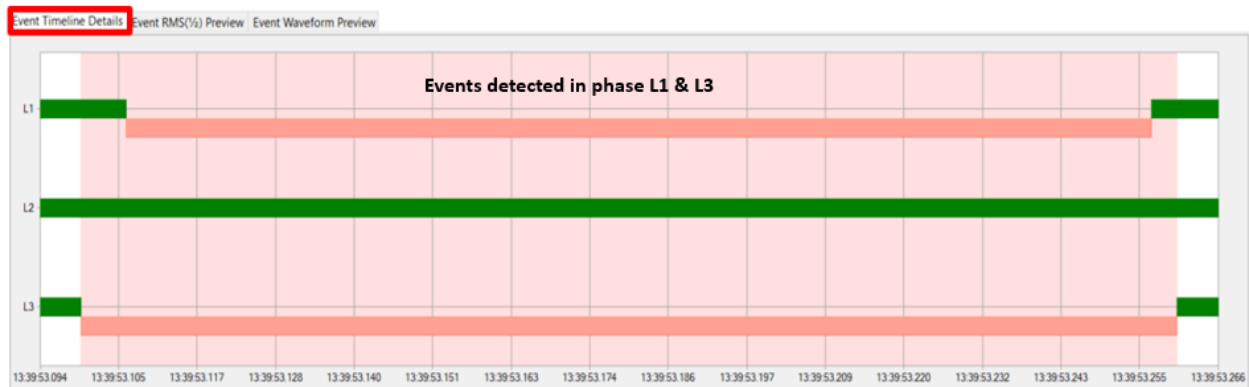


Figure 87 Events Timeline details

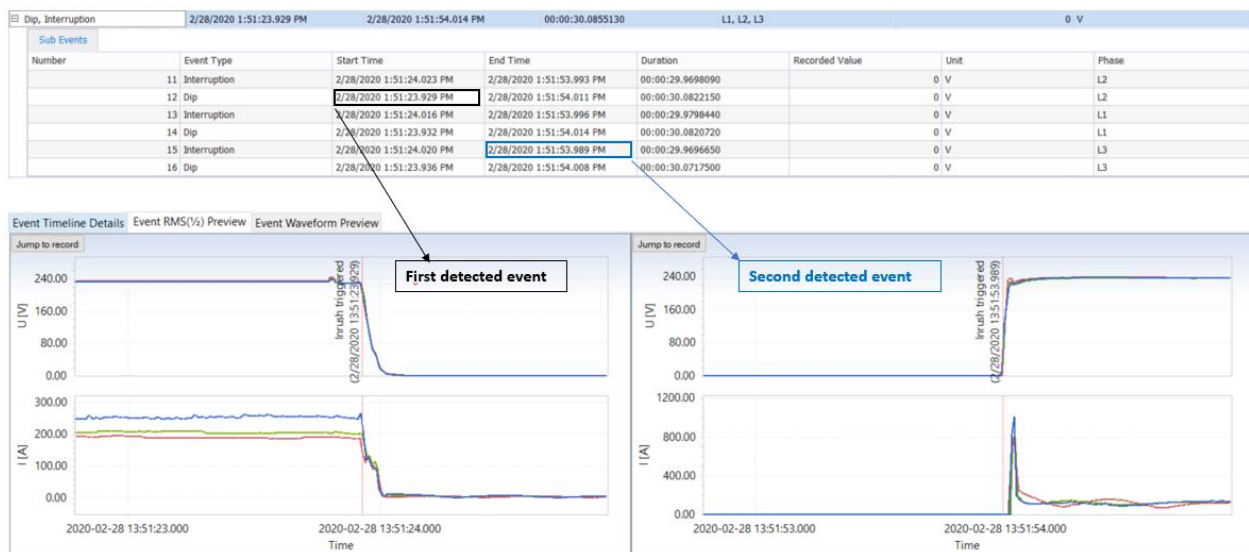


Figure 88 Events "Inrush" (RMS(1/2)) preview – more events detected in same time frame

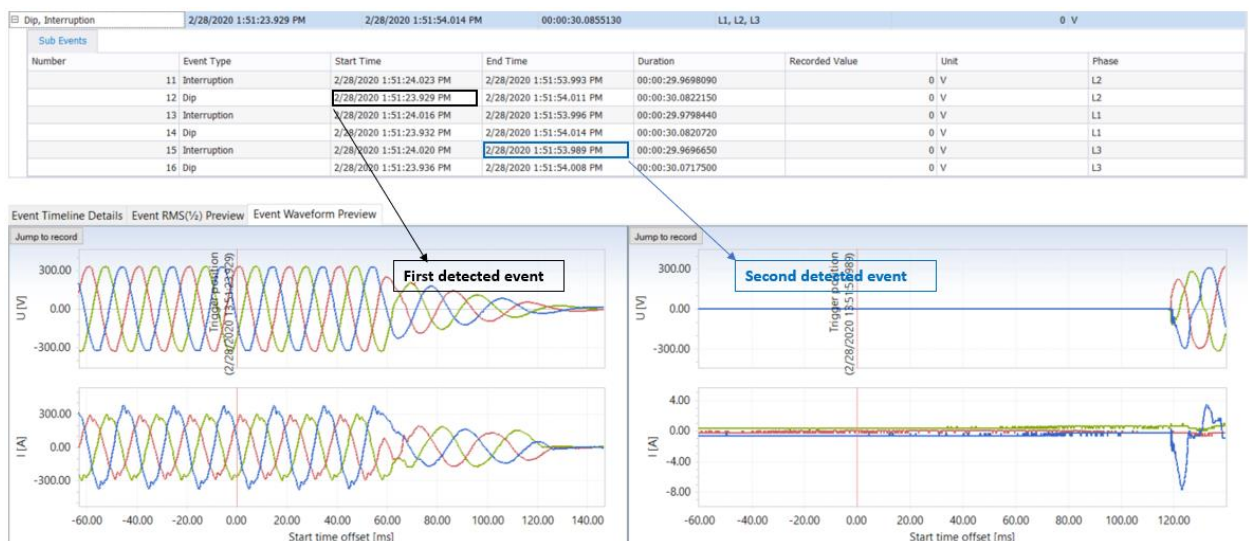


Figure 89 Events Waveform preview – more events detected in same time frame





Figure 90 Events Inrush preview

General Logging (RE...) Inrush Logging (R0002INR) [2/28/2020 13:39:53]

Record Information | Inrush Trend | Table

Inrush Logging, recorded on 2/28/2020 13:39:51, duration: 2 s.  
[Click here to add record description](#)

**Record Properties**

Profile: Standard  
 Start time: 2/28/2020 13:39:51.923  
 Stop time: 2/28/2020 13:39:54.017  
 Duration: 2 s 094 ms  
 Number of intervals: 631  
 Interval duration: 009 ms  
 Stop cause: Finished Successfully  
 File name: R0002INR.REC  
 Clock synchronisation: RTC  
 File version: 41

**Measurement Settings**

Nominal voltage: 230.00 V L-N  
 I1/2/3 Clamp: A1502 (3,000.00 A), Clamp measuring range (3,000.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A  
 IN Clamp: A1227 (300.00 A), Clamp measuring range (300.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A  
 Nominal frequency: 50.00 Hz  
 Frequency sync: U1  
 Connection: 4W

**Inrush Trigger Settings**

Sample Duration (1 cycle RMS, refreshed each half-cycle): 9.48 ms  
 Trigger source: Events  
 Trigger detected on channel: 4  
 Trigger date: 2/28/2020 13:39:53.100

**Event Settings**

Nominal voltage: 230.00 V L-N  
 L-N Dip threshold: 90.00 % (207.00 V)  
 L-N Swell threshold: 110.00 % (253.00 V)  
 L-N Interruption threshold: 5.00 % (11.50 V)

**Instrument Properties**

Model: MI 2893  
 Instrument name: Power Master XT  
 Hardware version: 8  
 Firmware version: 1.0.3437  
 S/n: 18080556  
 Calibration date: 3/5/2018 14:05:02

**Miscellaneous Information**

Downloaded on: 3/3/2020 12:21:43.724  
 Downloaded by: Mihael Hribar  
 Downloaded using: Metrel PowerView v3.0.0.4505 (64-bit), en-US  
 Windows version: Windows 10 64-bit (Microsoft Windows NT 10.0.18362.0)

Figure 91 Events Inrush preview – Recorder details



Figure 92 Events Inrush preview – Current & Voltage details

On the Chart Inrush data, it is possible to perform same operations as on the “regular” charts; like detail analyse with Markers.



General Logging (RE...) Inrush Logging (R00... X				
Record Information Inrush Trend Table				
	Voltage		Current	
	U1	U3	I1	I3
	1 cycle RMS [V]	1 cycle RMS [V]	1 cycle RMS [A]	1 cycle RMS [A]
2/28/2020 13:39:51.916	230.15	---	239.98	---
2/28/2020 13:39:51.919	---	230.45	---	221.00
2/28/2020 13:39:51.923	---	---	---	---
2/28/2020 13:39:51.926	230.44	---	241.72	---
2/28/2020 13:39:51.929	---	230.44	---	217.37
2/28/2020 13:39:51.933	---	---	---	---
2/28/2020 13:39:51.936	230.29	---	237.00	---
2/28/2020 13:39:51.939	---	230.28	---	216.41
2/28/2020 13:39:51.943	---	---	---	---
2/28/2020 13:39:51.946	230.24	---	232.85	---
2/28/2020 13:39:51.949	---	230.33	---	216.07
2/28/2020 13:39:51.952	---	---	---	---
2/28/2020 13:39:51.956	230.33	---	232.71	---
2/28/2020 13:39:51.959	---	230.27	---	220.37
2/28/2020 13:39:51.963	---	---	---	---
2/28/2020 13:39:51.966	230.36	---	231.70	---
2/28/2020 13:39:51.969	---	230.41	---	226.24
2/28/2020 13:39:51.973	---	---	---	---
2/28/2020 13:39:51.976	230.41	---	251.29	---
2/28/2020 13:39:51.979	---	230.44	---	243.04
2/28/2020 13:39:51.983	---	---	---	---
2/28/2020 13:39:51.986	230.16	---	270.07	---
2/28/2020 13:39:51.989	---	230.22	---	259.18
2/28/2020 13:39:51.992	---	---	---	---
2/28/2020 13:39:51.996	229.93	---	262.61	---
2/28/2020 13:39:51.999	---	230.13	---	250.76

Only “effected” values presented in Table form (by default)

Figure 93 Events Inrush preview – Table data

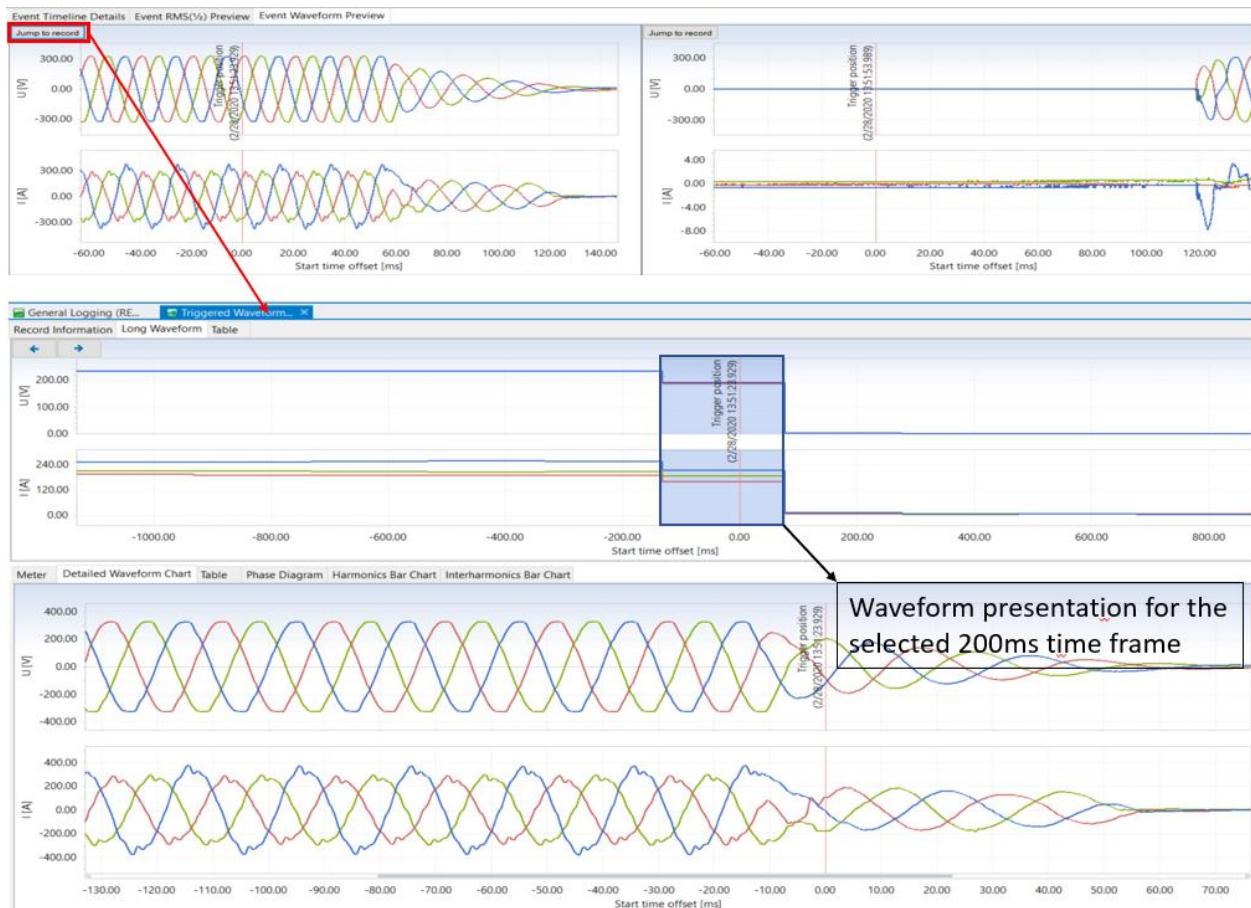


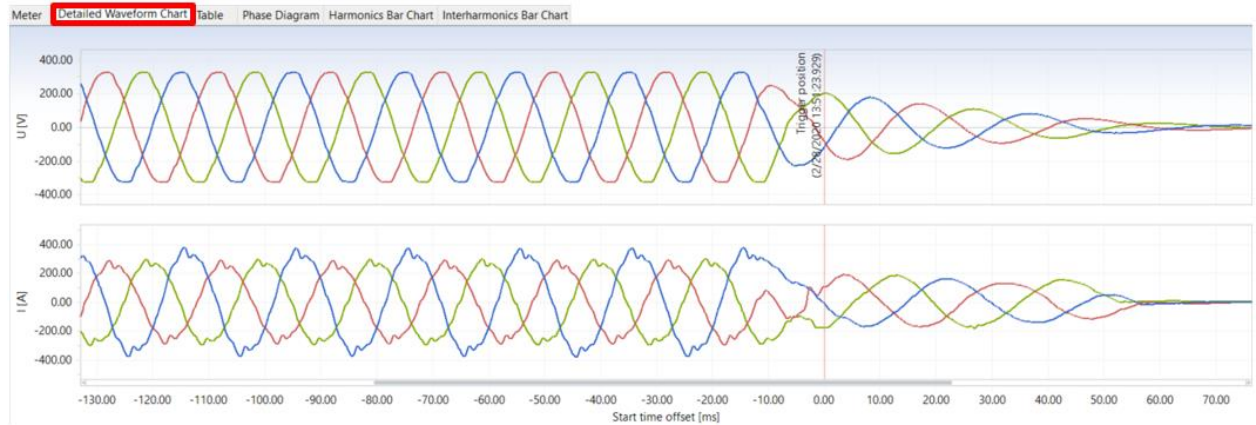
Figure 94 Events Waveform preview

Each selected 200ms time frame includes detail information about:

- Detail "Meter" information

Meter								
Detailed Waveform Chart Table Phase Diagram Harmonics Bar Chart Interharmonics Bar Chart								
Phase values								
Symbol	Name	L1	L2	L3	LN	Total	Unit	
U	Voltage	191.24	187.63	188.36	45.631	---	V	
I	Current	212.54	156.91	186.06	59.593	---	A	
f	Frequency	49.575	---	---	---	---	Hz	
THD U	Voltage THD	8.5745	6.5898	12.246	7.7933	---	V	
THD I	Voltage THD	4.9244	3.7475	6.9469	37.684	---	%	
THD I	Current THD	16.935	9.3020	11.355	21.931	---	A	
THD I	Current THD	9.4372	6.9474	7.6748	49.057	---	%	
CFu	Voltage Crest Factor	8.9445	1.7439	1.7361	32.293	---		
CFi	Current Crest Factor	9.685	3.2900	14.165	7.8857	---		
Plt	Flicker PLT	0.5283	0.5669	0.5157	0.0000	---		
Pst	Flicker PST	1.1943	1.3309	1.1477	0.0000	---		
Pst(1min)	Flicker PST 1min	11.987	11.988	12.006	0.0000	---		
Line values								
Peak Values (since last user reset)								
IEEE 1459 Power Measurement								
Arithmetic Power Measurement								
Vector Power Measurement								
Energy Measurement								
Unbalance Measurement								

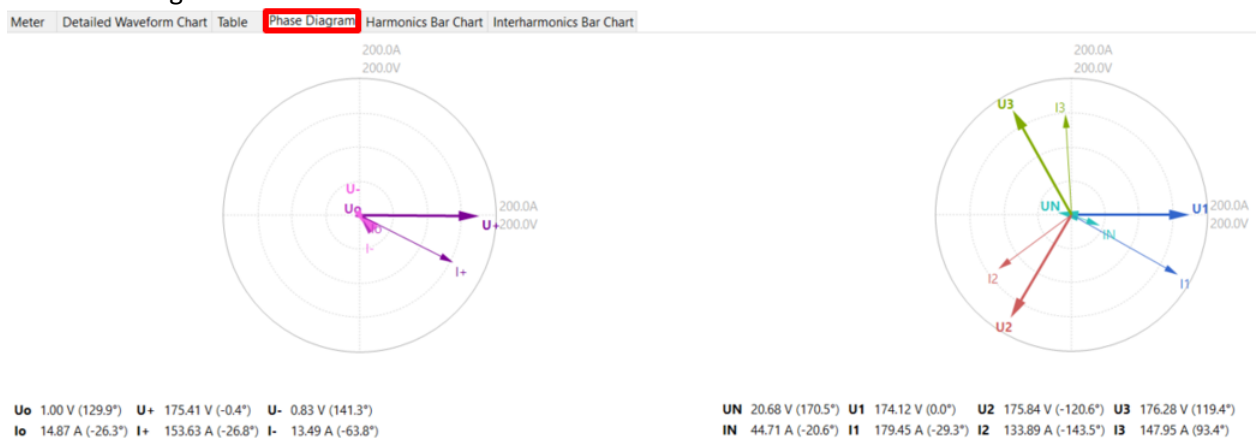
- Detailed Waveform Chart



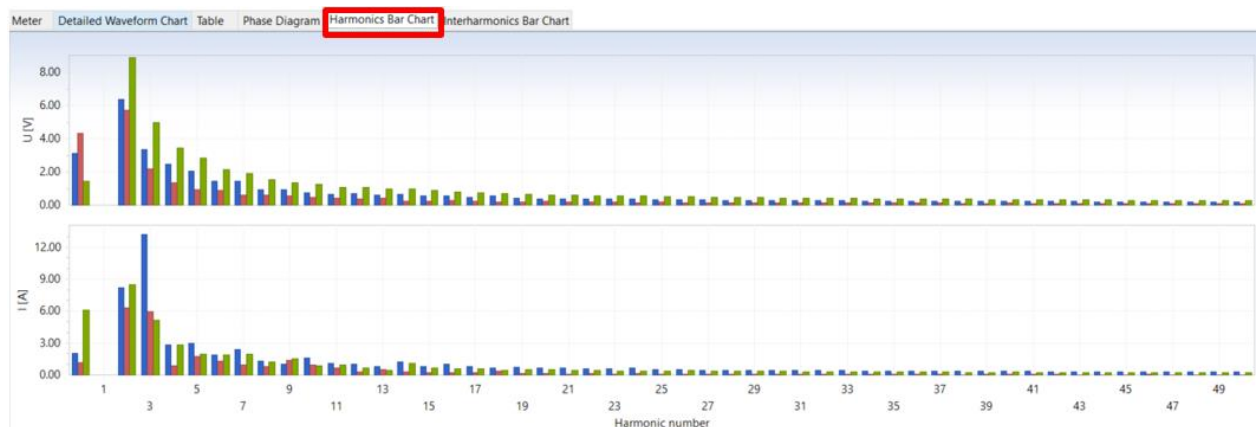
- Table data presentation

Meter	Detailed Waveform Chart	Table	Phase Diagram	Harmonics Bar Chart	Interharmonics Bar Chart		
		<div><div><div>Voltage</div></div><div><div>Current</div></div></div>					
		U1 [V]	U2 [V]	U3 [V]	I1 [A]	I2 [A]	I3 [A]
2/28/2020 13:51:23.6922971		273.20	-306.41	23.03	190.20	-234.54	156.77
2/28/2020 13:51:23.6924405		280.75	-296.00	7.78	206.21	-227.18	148.43
2/28/2020 13:51:23.6925839		288.00	-284.42	-7.68	220.90	-224.83	141.38
2/28/2020 13:51:23.6927272		295.05	-272.84	-22.54	232.91	-227.51	133.68
2/28/2020 13:51:23.6928706		301.81	-261.95	-36.62	241.92	-233.87	123.43
2/28/2020 13:51:23.6930140		307.97	-251.84	-50.40	249.26	-240.89	110.60
2/28/2020 13:51:23.6931573		313.33	-242.22	-64.28	255.26	-246.58	94.57
2/28/2020 13:51:23.6933007		317.40	-232.90	-78.75	261.94	-249.59	76.94
2/28/2020 13:51:23.6934440		319.49	-223.48	-93.42	269.61	-248.25	58.99
2/28/2020 13:51:23.6935874		320.58	-213.46	-108.28	279.62	-242.57	42.32
2/28/2020 13:51:23.6937308		321.58	-202.57	-123.25	291.30	-234.87	27.89

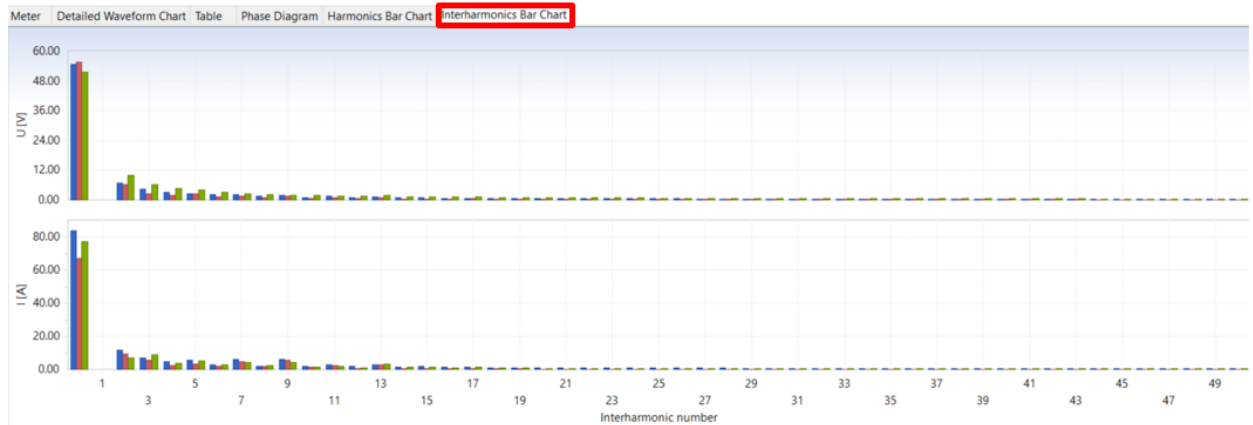
- Phase diagram



- Harmonics bar chart



- Interharmonics bar chart



- Frequency presentation

- It should be selected from the Data Explorer

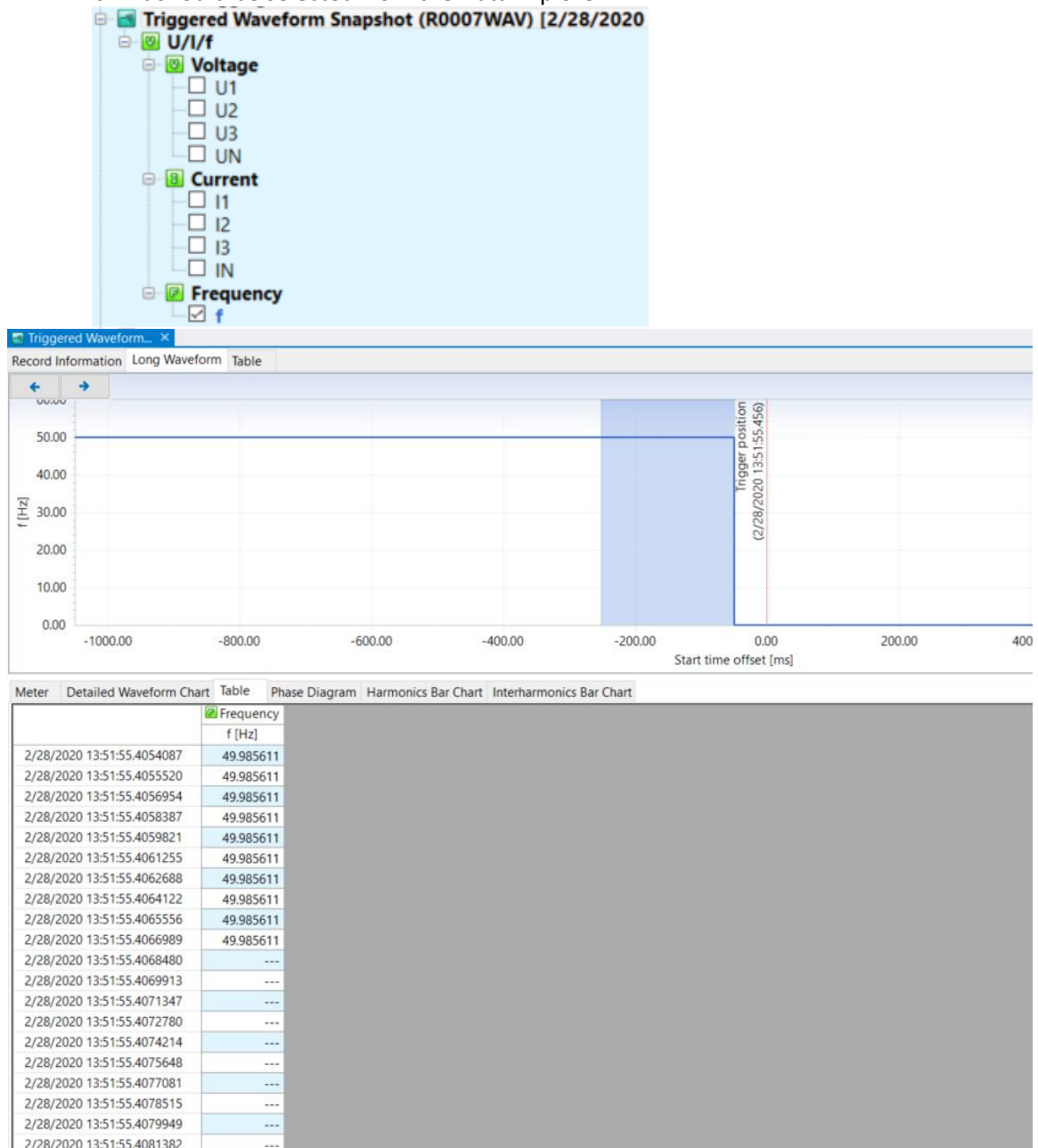


Figure 95 Frequency long waveform and Table presentation

**Note:**

In case, that Waveform Recorder runs as independent recorder, for data presentation please follow item 4.10.2

## 4.9 Alarms presentation

Metrel PQI enables setting of up seven customer defined alarms which are recorded together with the waveform (programmable option). Similar operation and presentation as it is described under “Events presentation”.

Alarms are presented in special folder “Alarms”:

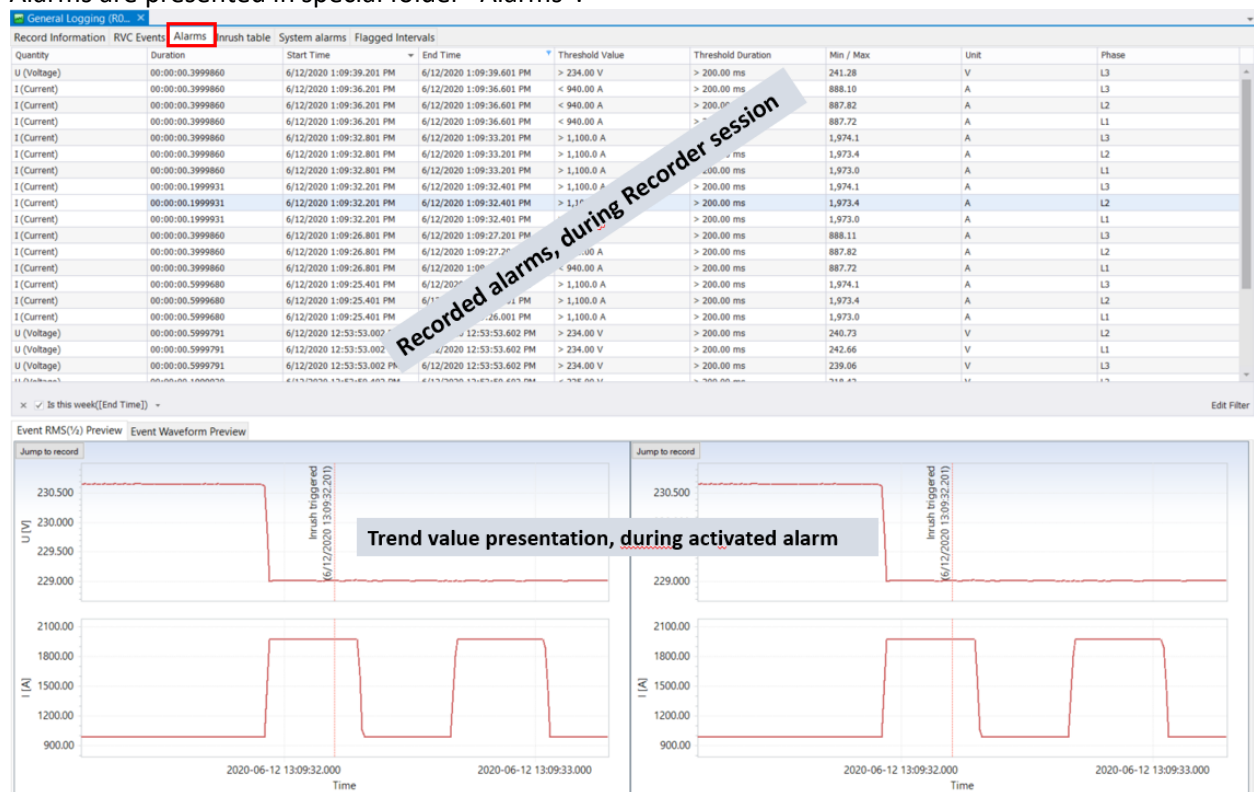


Figure 96 Alarms presentation

Quantity, which trigger Alarm	Alarm duration	Alarm Start Time	Alarm Stop Time	Threshold setup	Threshold Duration	Min/Max recorderd value	Alarm detected on Phase
Quantity	Duration	Start Time	End Time	Threshold Value	Threshold Duration	Min / Max	Unit Phase
U (Voltage)	00:00:00.3999860	6/12/2020 1:09:39.201 PM	6/12/2020 1:09:39.601 PM	> 234.00 V	> 200.00 ms	241.28	V L3
I (Current)	00:00:00.3999860	6/12/2020 1:09:36.201 PM	6/12/2020 1:09:36.601 PM	< 940.00 A	> 200.00 ms	888.10	A L3
I (Current)	00:00:00.3999860	6/12/2020 1:09:36.201 PM	6/12/2020 1:09:36.601 PM	< 940.00 A	> 200.00 ms	887.82	A L2
I (Current)	00:00:00.3999860	6/12/2020 1:09:36.201 PM	6/12/2020 1:09:36.601 PM	< 940.00 A	> 200.00 ms	887.72	A L1
I (Current)	00:00:00.3999860	6/12/2020 1:09:32.801 PM	6/12/2020 1:09:33.201 PM	> 1,100.0 A	> 200.00 ms	1,974.1	A L3
I (Current)	00:00:00.3999860	6/12/2020 1:09:32.801 PM	6/12/2020 1:09:33.201 PM	> 1,100.0 A	> 200.00 ms	1,973.4	A L2
I (Current)	00:00:00.3999860	6/12/2020 1:09:32.801 PM	6/12/2020 1:09:33.201 PM	> 1,100.0 A	> 200.00 ms	1,973.0	A L1
I (Current)	00:00:00.3999931	6/12/2020 1:09:32.201 PM	6/12/2020 1:09:32.401 PM	> 1,100.0 A	> 200.00 ms	1,974.1	A L3
I (Current)	00:00:00.3999931	6/12/2020 1:09:32.201 PM	6/12/2020 1:09:32.401 PM	> 1,100.0 A	> 200.00 ms	1,973.4	A L2
I (Current)	00:00:00.3999931	6/12/2020 1:09:32.201 PM	6/12/2020 1:09:32.401 PM	> 1,100.0 A	> 200.00 ms	1,973.0	A L1
I (Current)	00:00:00.3999860	6/12/2020 1:09:26.801 PM	6/12/2020 1:09:27.201 PM	< 940.00 A	> 200.00 ms	888.11	A L3
I (Current)	00:00:00.3999860	6/12/2020 1:09:26.801 PM	6/12/2020 1:09:27.201 PM	< 940.00 A	> 200.00 ms	887.82	A L2
I (Current)	00:00:00.3999860	6/12/2020 1:09:26.801 PM	6/12/2020 1:09:27.201 PM	< 940.00 A	> 200.00 ms	887.72	A L1
I (Current)	00:00:00.3999680	6/12/2020 1:09:25.401 PM	6/12/2020 1:09:25.801 PM	> 1,100.0 A	> 200.00 ms	1,974.1	A L3
I (Current)	00:00:00.3999680	6/12/2020 1:09:25.401 PM	6/12/2020 1:09:25.801 PM	> 1,100.0 A	> 200.00 ms	1,973.4	A L2
I (Current)	00:00:00.3999680	6/12/2020 1:09:25.401 PM	6/12/2020 1:09:25.801 PM	> 1,100.0 A	> 200.00 ms	1,973.0	A L1
U (Voltage)	00:00:00.5999791	6/12/2020 12:53:53.002 PM	6/12/2020 12:53:53.602 PM	> 234.00 V	> 200.00 ms	240.73	V L2
U (Voltage)	00:00:00.5999791	6/12/2020 12:53:53.002 PM	6/12/2020 12:53:53.602 PM	> 234.00 V	> 200.00 ms	242.66	V L1
U (Voltage)	00:00:00.5999791	6/12/2020 12:53:53.002 PM	6/12/2020 12:53:53.602 PM	> 234.00 V	> 200.00 ms	239.06	V L3

Figure 97 Alarms explanation - general



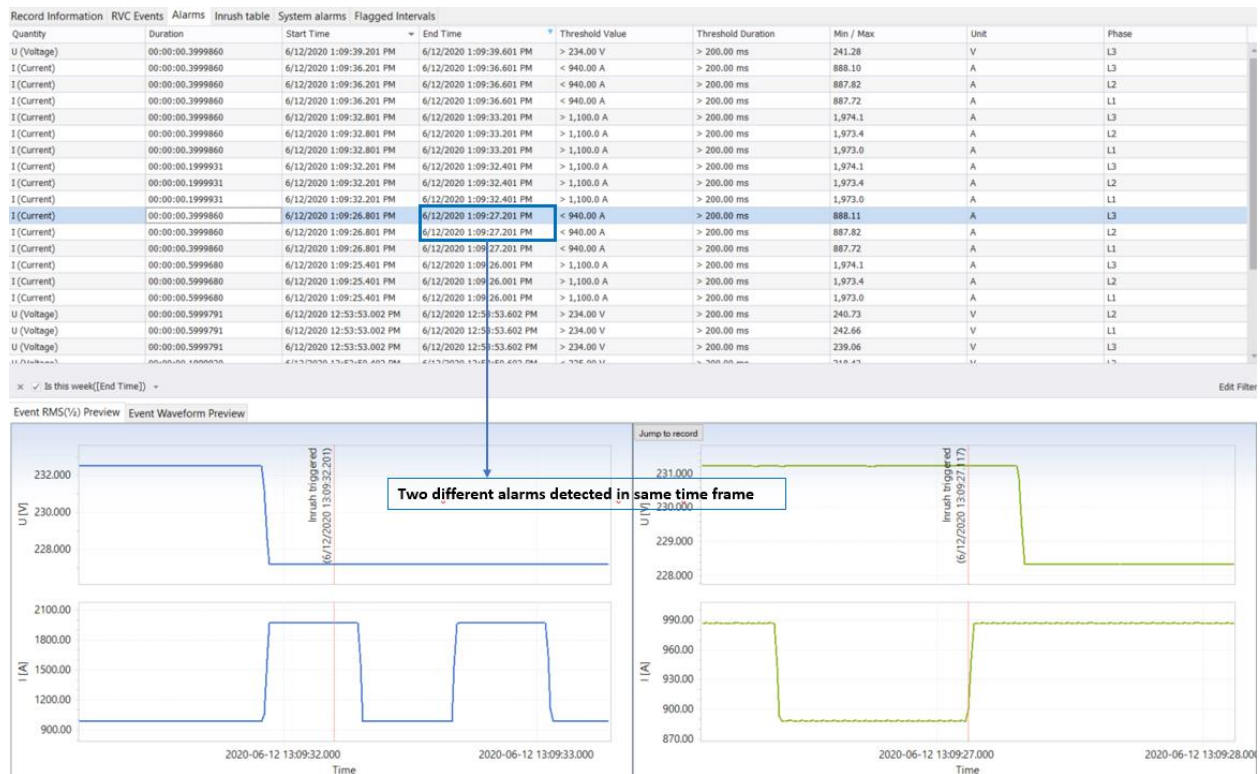


Figure 98 Alarms "Inrush" (RMS(1/2)) preview – more events detected in same time frame

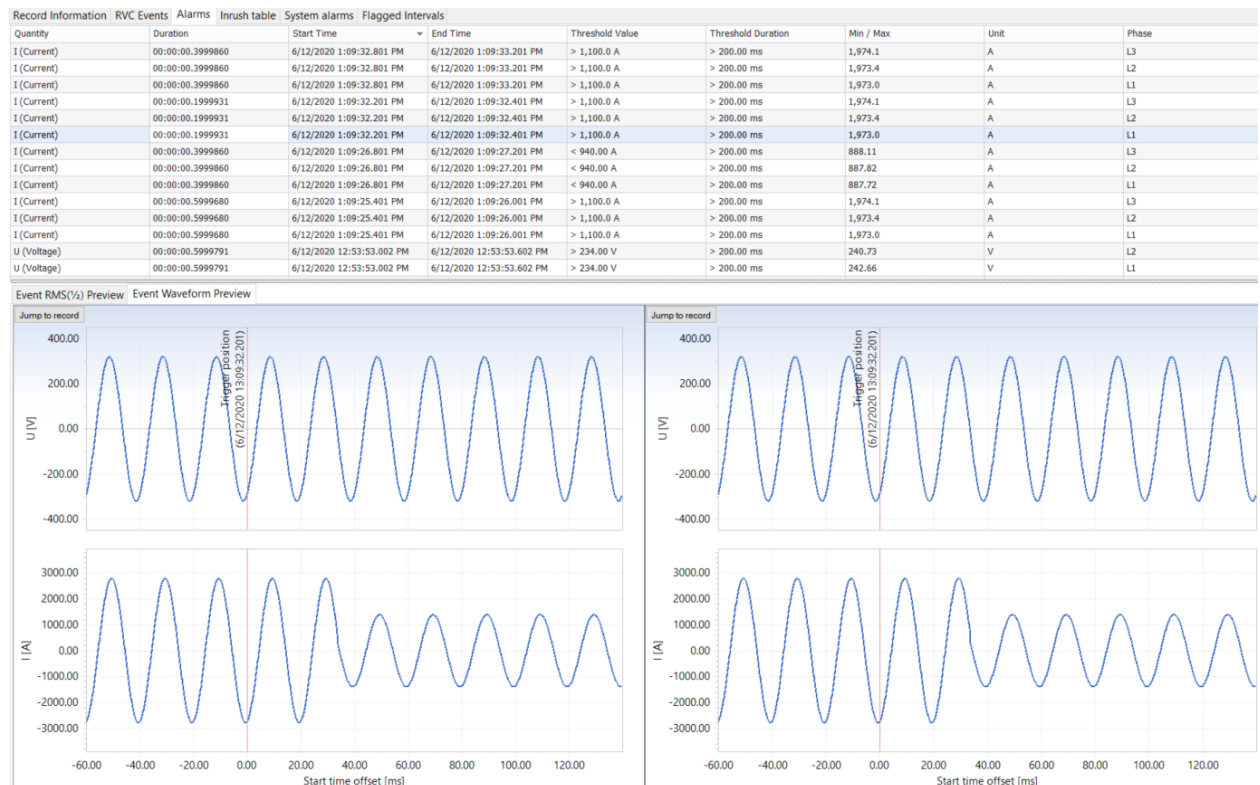


Figure 99 Alarms Waveform preview

Note: if more alarms are activated during single waveform time frame, than only the first waveform is recorded.

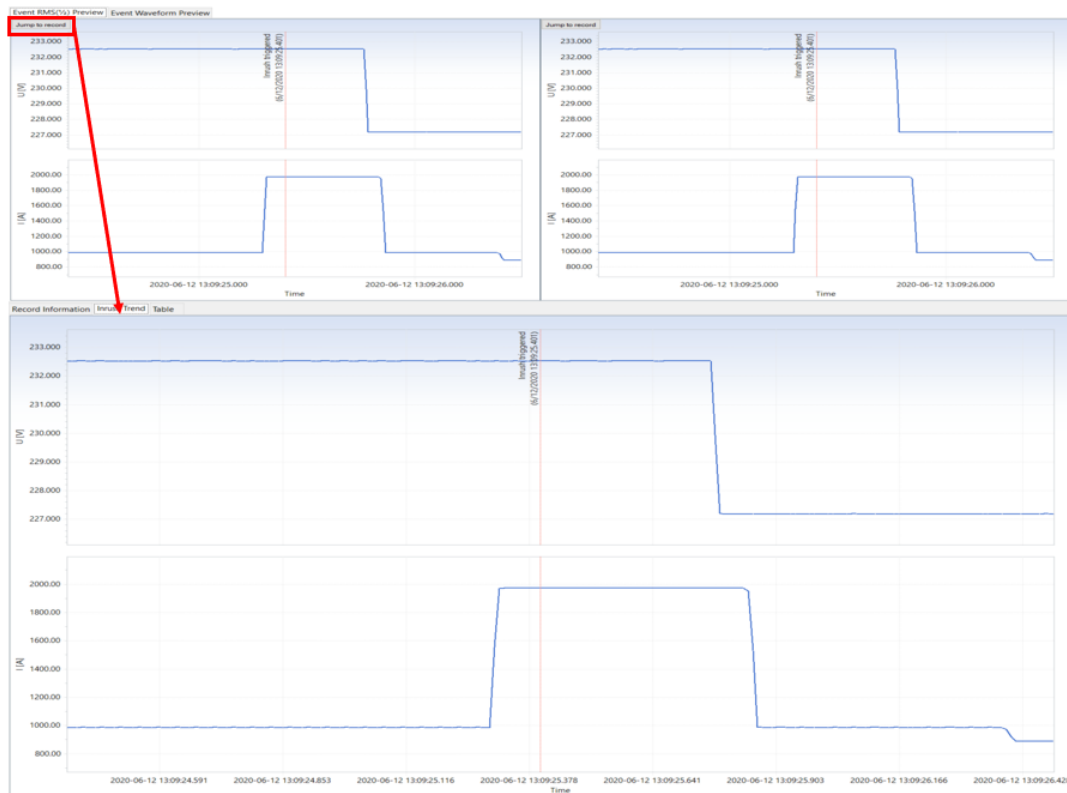


Figure 100 Alarm Inrush Trend – Current &amp; Voltage preview

Record Information	Inrush Trend	Table
<b>Inrush Logging (R0004INR) [6/12/2020 13:09:25]</b> Inrush Logging, recorded on 6/12/2020 13:09:24, duration: 2 s. <a href="#">Click here to add record description</a>		
<b>Record Properties</b> Profile: Standard Start time: 6/12/2020 13:09:24.401 Stop time: 6/12/2020 13:09:26.494 Duration: 2 s 093 ms Number of intervals: 631 Interval duration: 009 ms Stop cause: Finished Successfully File name: R0004INR.REC Clock synchronisation: RTC File version: 41		
<b>Measurement Settings</b> Nominal voltage: 230.00 V L-N I1/2/3 Clamp: A1033 (1,000.00 A), Clamp measuring range (100 % of Clamp measuring range), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A IN Clamp: Smart Clamps (0.00 A), Clamp measuring range (0.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A Nominal frequency: 50.00 Hz Frequency sync: U1 Connection: 4W		
<b>Inrush Trigger Settings</b> Sample Duration (1 cycle RMS, refreshed each half-cycle): 9.48 ms Trigger source: Alarms Trigger detected on channel: 4 Trigger date: 6/12/2020 13:09:25.401		
<b>Instrument Properties</b> Model: MI 2885 Instrument name: Master Q4 Hardware version: 8 Firmware version: 3.0.3475 S/n: 15410784 Calibration date: 5/18/2020 11:11:39		
<b>Miscellaneous Information</b> Downloaded on: 6/12/2020 13:12:11.757 Downloaded by: Mihael Hribar Downloaded using: Metrel PowerView v3.0.0.4770 (64-bit), en-US Windows version: Windows 10 64-bit (Microsoft Windows NT 10.0.18362.0)		

Figure 101 Alarm Inrush Trend – Recorder details



On the Chart Inrush data, it is possible to perform same operations as on the “regular” charts; like detail analyse with Markers.

Record Information	Voltage	Current
	U1	I1
	1 cycle RMS [V]	1 cycle RMS [A]
6/12/2020 13:09:24.394	232.523	986.74
6/12/2020 13:09:24.397	---	---
6/12/2020 13:09:24.401	---	---
6/12/2020 13:09:24.404	232.514	986.10
6/12/2020 13:09:24.407	---	---
6/12/2020 13:09:24.411	---	---
6/12/2020 13:09:24.414	232.527	986.12
6/12/2020 13:09:24.417	---	---
6/12/2020 13:09:24.421	---	---
6/12/2020 13:09:24.424	232.524	986.76
6/12/2020 13:09:24.427	---	---
6/12/2020 13:09:24.431	---	---
6/12/2020 13:09:24.434	232.526	986.74
6/12/2020 13:09:24.437	---	---
6/12/2020 13:09:24.441	---	---
6/12/2020 13:09:24.444	232.515	986.10
6/12/2020 13:09:24.447	---	---
6/12/2020 13:09:24.451	---	---
6/12/2020 13:09:24.454	232.526	986.12
6/12/2020 13:09:24.457	---	---
6/12/2020 13:09:24.461	---	---
6/12/2020 13:09:24.464	232.520	986.76

Only “effected” values presented in Table form (by default)

Figure 102 Alarm Inrush preview – Table data

#### Note:

In case, that Waveform Recorder runs as independent recorder, for data presentation please follow item 4.10.2

## 4.10 Inrush presentation

Metrel PQI enables registration of Inrush (Level I) current. This function is available under:

- Independent (Inrush) functionality under General Recorder (MI 2893)
- Waveform recorder (Level I functionality) (MI 2892/2885/2884)

### 4.10.1 Inrush presentation on the MI 2893

On the MI 2893, Inrush events could run simultaneously with the General recorder and Inrush’s are presented in special folder “Inrush Table”:

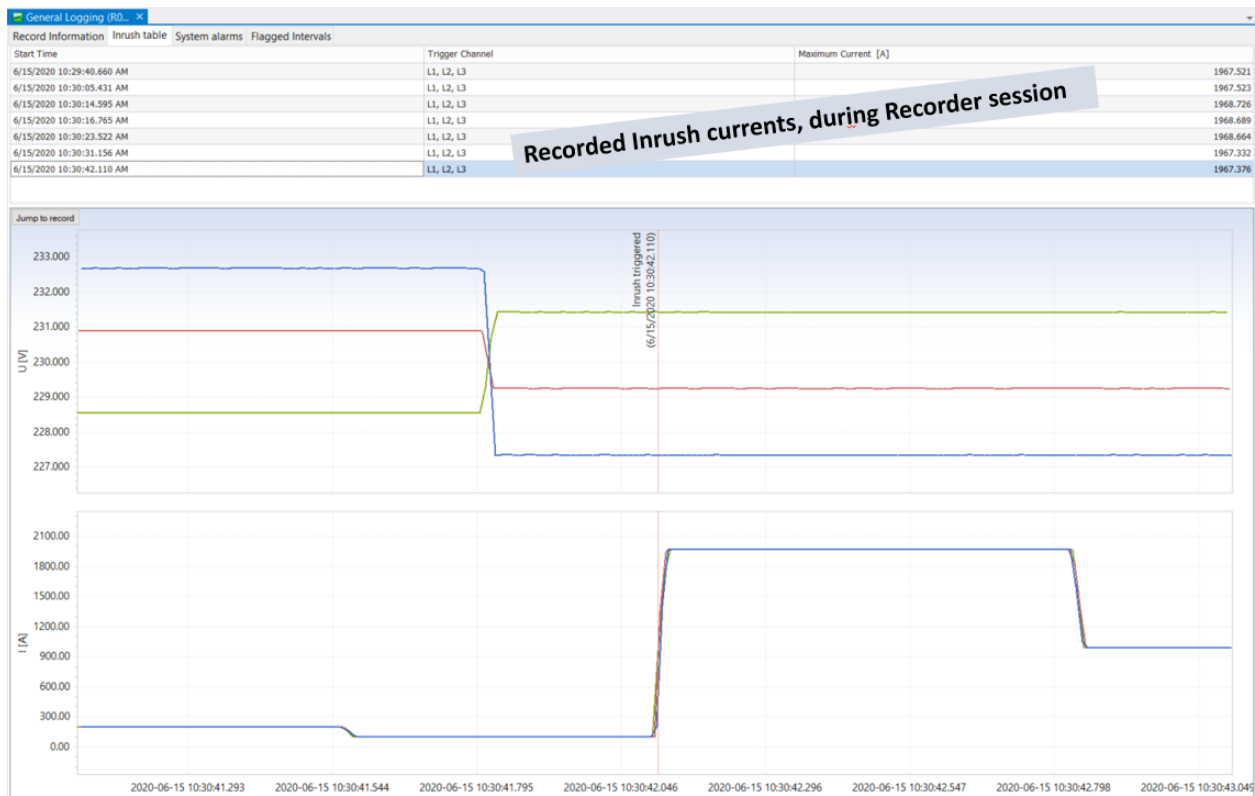


Figure 103 Inrush currents presentation

Inrush Start Time	Inrush detected on ...	Detected maximum current during Inrush
Start Time	Trigger Channel	Maximum Current [A]
6/15/2020 10:29:40.660 AM	L1, L2, L3	1967.521
6/15/2020 10:30:05.431 AM	L1, L2, L3	1967.523
6/15/2020 10:30:14.595 AM	L1, L2, L3	1968.726
6/15/2020 10:30:16.765 AM	L1, L2, L3	1968.689
6/15/2020 10:30:23.522 AM	L1, L2, L3	1968.664
6/15/2020 10:30:31.156 AM	L1, L2, L3	1967.332
6/15/2020 10:30:42.110 AM	L1, L2, L3	1967.376

Figure 104 Inrush Table explanation



Figure 105 Inrush Trend – Current & Voltage preview

Record Information	Inrush Trend	Table
<b>Inrush Logging (R0004INC) [6/15/2020 10:30:14]</b> Inrush Logging, recorded on 6/15/2020 10:30:13, duration: 2 s. <a href="#">Click here to add record description</a>		
<b>Record Properties</b> Profile: Standard Start time: 6/15/2020 10:30:13.595 Stop time: 6/15/2020 10:30:15.595 Duration: 2 s Number of intervals: 602 Interval duration: 010 ms Stop cause: Finished Successfully File name: R0004INC.REC Clock synchronisation: RTC File version: 41		
<b>Measurement Settings</b> Nominal voltage: 230.00 V L-N I1/2/3 Clamp: A1033 (1,000.00 A), Clamp measuring range (1,000.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A IN Clamp: Smart Clamps (0.00 A), Clamp measuring range (0.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A Nominal frequency: 50.00 Hz Frequency sync: U1 Connection: 4W		
<b>Inrush Trigger Settings</b> Sample Duration (1 cycle RMS, refreshed each half-cycle): 10.00 ms Max. measured value: 1,968.73 A Trigger slope: Rise Trigger date: 6/15/2020 10:30:14.595 Level: 900.00 A (90.00 %) Slope: Rise Duration: 2.00 s Pretrigger: 1.00 s		
<b>Instrument Properties</b> Model: MI 2893 Instrument name: Power Master XT Hardware version: 8 Firmware version: 3.0.3477 S/n: 16280308 Calibration date: 4/17/2019 8:08:23		
<b>Miscellaneous Information</b> Downloaded on: 6/15/2020 10:31:39.451 Downloaded by: Mihael Hribar Downloaded using: Metrel PowerView v3.0.0.4770 (64-bit), en-US Windows version: Windows 10 64-bit (Microsoft Windows NT 10.0.18362.0)		

Figure 106 Inrush Trend – Recorder details

On the Chart Inrush data, it is possible to perform same operations as on the “regular” charts; like detail analyse with Markers.

General Logging (R00...) Inrush Logging (R00...)						
Record Information Inrush Trend Table						
	Voltage			Current		
	U1	U2	U3	I1	I2	I3
	1 cycle RMS [V]	1 cycle RMS [V]	1 cycle RMS [V]	1 cycle RMS [A]	1 cycle RMS [A]	1 cycle RMS [A]
6/15/2020 10:30:13.588	---	---	228.533	---	---	690.22
6/15/2020 10:30:13.592	---	230.885	---	---	690.15	---
6/15/2020 10:30:13.595	232.678	---	---	690.41	---	---
6/15/2020 10:30:13.598	---	---	228.544	---	---	690.75
6/15/2020 10:30:13.602	---	230.890	---	---	690.65	---
6/15/2020 10:30:13.605	232.683	---	---	690.41	---	---
6/15/2020 10:30:13.609	---	---	228.550	---	---	691.16
6/15/2020 10:30:13.612	---	230.894	---	---	691.16	---
6/15/2020 10:30:13.615	232.684	---	---	690.39	---	---
6/15/2020 10:30:13.618	---	---	228.541	---	---	690.72
6/15/2020 10:30:13.622	---	230.886	---	---	690.62	---
6/15/2020 10:30:13.625	232.681	---	---	690.37	---	---
6/15/2020 10:30:13.628	---	---	228.536	---	---	690.29
6/15/2020 10:30:13.632	---	230.886	---	---	690.22	---
6/15/2020 10:30:13.635	232.676	---	---	690.35	---	---
6/15/2020 10:30:13.638	---	---	228.541	---	---	690.69
6/15/2020 10:30:13.642	---	230.888	---	---	690.24	---
6/15/2020 10:30:13.645	232.674	---	---	689.95	---	---
6/15/2020 10:30:13.649	---	---	228.540	---	---	690.68

Only "effected" values presented in Table form (by default)

Figure 107 Inrush preview – Table data

#### Note:

In case, that Waveform Recorder runs as independent recorder, for data presentation please follow item 4.10.2

### 4.10.2 Inrush presentation on the MI 2892/2885/2884

Inrush recorder is implemented on MI 2892/2885/2884 as "independent" recorder under Waveform recorder. Inrush recorders are presented under Data Explorer view.

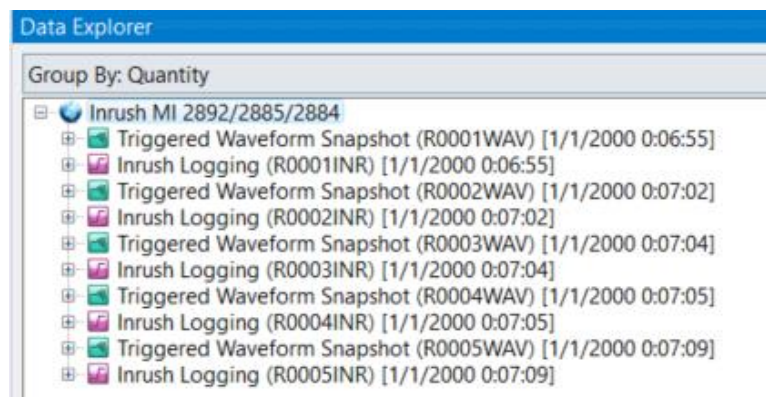
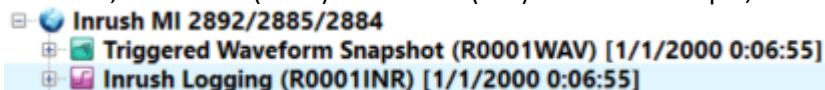


Figure 108 Inrush recorded data – preview

Two files; waveform (WAV) and Inrush (INR) create the couple, related to single event.



Comparing to MI 2893 presentation, here we also have waveform snapshot and all additional info: meter data, waveform chart, table data, phase diagram, harmonics and interharmonics bar chart. Data are present and analysed in separate folders.



For more details, about Inrush data presentation click on 4.10.1.

For more details, about waveform data presentation click on 4.8.

## 4.11E-Meter recorder

E-Meter recorder is used for accuracy measurements of electronic as well as mechanical (inductive) meters. For accuracy measurements, comparison method is used. Voltage and current which flow through the tested object is also connected to the reference Power Quality Instrument. Function is supported on MI 2892 or MI 2885 Power Quality Instrument.

E-Meter recorder runs as independent recorder on the PQI. Data are saved under “EME” file and include only data related to the tested object.

Recorded data are presented under “**E-Meter**” folder, all information related to the E-Meter recorder setup is available under “**Record Information**” folder.

Record Information	E-Meter
E-Meter (R0001EME) [Unspecified] E-Meter , recorded on 22.3.2022. 10:43:29, duration: 1 min 3 s 160 ms. <a href="#">Click here to add record description</a>	
<b>Record Properties</b> Start button pressed: 22.3.2022. 10:43:13,799 Start time: 22.3.2022. 10:43:29,387 Stop time: 22.3.2022. 10:44:32,547 File name: R0001EME.REC File version: 53	
<b>Measurement Settings</b> I1/2/3 Clamp: Smart Clamps (0,00 A), Clamp measuring range (0,00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1,00 A : 1,00 A IN Clamp: None (0,00 A), Clamp measuring range (0,00 A), Instrument measuring range (100 % of Clamp measuring range) Connection: 4W	
<b>Measurement Place</b> Measurement Place Name: E-Meter SN: 0 E-Meter Nominal Data:	
<b>Measurement Setup</b> Measured Value: Active Meter Constant: 10000 Imp/kWh CT Ratio: 1/1 VT Ratio: 100/5 Number Of Pulses: 30 Accumulated Energy: 0,06 kWh Number Of Measurements: 5 Selected Q/Q+: Q	
<b>Miscellaneous Information</b> Instrument name: PSL001 Downloaded on: 22.3.2022. 10:45:59,931 Downloaded by: Mihael Hribar Downloaded using: Metrel PowerView v3.0.0.5562 (64-bit), sr-Cyri-BA Windows version: Windows 10 64-bit (Microsoft Windows NT 10.0.19041.0)	

### Record information folder:

Record Information	E-Meter
E-Meter (R0001EME) [Unspecified] E-Meter , recorded on 22.3.2022. 10:43:29, duration: 1 min 3 s 160 ms. <a href="#">Click here to add record description</a>	
<b>Record Properties</b> Start button pressed: 22.3.2022. 10:43:13,799 Start time: 22.3.2022. 10:43:29,387 Stop time: 22.3.2022. 10:44:32,547 File name: R0001EME.REC File version: 53	Recorder name & time and duration
<b>Measurement Settings</b> I1/2/3 Clamp: Smart Clamps (0,00 A), Clamp measuring range (0,00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1,00 A : 1,00 A IN Clamp: None (0,00 A), Clamp measuring range (0,00 A), Instrument measuring range (100 % of Clamp measuring range) Connection: 4W	Recorder start & stop time, basic info about the recorded file
<b>Measurement Place</b> Measurement Place Name: E-Meter SN: 0 E-Meter Nominal Data:	Info about used current clamps, connection
<b>Measurement Setup</b> Measured Value: Active Meter Constant: 10000 Imp/kWh CT Ratio: 1/1 VT Ratio: 100/5 Number Of Pulses: 30 Accumulated Energy: 0,06 kWh Number Of Measurements: 5 Selected Q/Q+: Q	Info about tested E-Meter and measurement place
<b>Miscellaneous Information</b> Instrument name: PSL001 Downloaded on: 22.3.2022. 10:45:59,931 Downloaded by: Mihael Hribar Downloaded using: Metrel PowerView v3.0.0.5562 (64-bit), sr-Cyri-BA Windows version: Windows 10 64-bit (Microsoft Windows NT 10.0.19041.0)	Metrological data about tested E-Meter Number of selected pulses, accumulated energy and measurements
	Info about <u>PowerView</u> , PC system and operator

## E-Meter folder data:

E-Meter: (00001EME) X											
Record Information E-Meter											
No	Error [%]	Registered Energy [W...]	Registered Meter Ene...	U1 [V]	U2 [V]	U3 [V]	I1 [A]	I2 [A]	I3 [A]	Plot [W]	PFtot []
1	-0,02	20,0041	20,0000	228,25	229,16	228,65	2,45	2,28	2,37	1594,68	0,97
2	-0,06	20,0112	20,0000	227,80	228,57	228,13	2,60	2,50	2,55	1723,65	0,98
3	-0,05	20,0105	20,0000	227,46	228,26	227,83	2,83	2,63	2,68	1829,78	0,98
4	0,07	19,9862	20,0000	228,58	228,57	228,16	2,78	2,59	2,59	1792,23	0,98
5	0,00	20,0002	20,0000	227,75	228,78	228,30	2,81	2,57	2,65	1810,11	0,98
Average: -0,01											

Number of the measurement

Measurement error

Energy registered by the PQI

Energy registered by the tested E-Meter

L1 Avg Voltage during measurement

L2 Avg Voltage during measurement

L3 Avg Voltage during measurement

L1 Avg Current during measurement

L2 Avg Current during measurement

L3 Avg Current during measurement

Avg Active/Reactive demand during measurement

Avg Power Factor during measurement

## 4.12 Transient presentation

Metrel PQI enables registration of Transients on voltage and current. This function is available under:

- Independent functionality under General Recorder (MI 2893)
- Transient recorder (MI 2892/2885/2884)

### 4.12.1 Transient presentation on the MI 2893

On the MI 2893, Transient recorder could run simultaneously with the General recorder and Transient's are presented in special folder "Transient Table". Since transient sampling frequency is 1 MHz, only record of 10 ms is recorded.

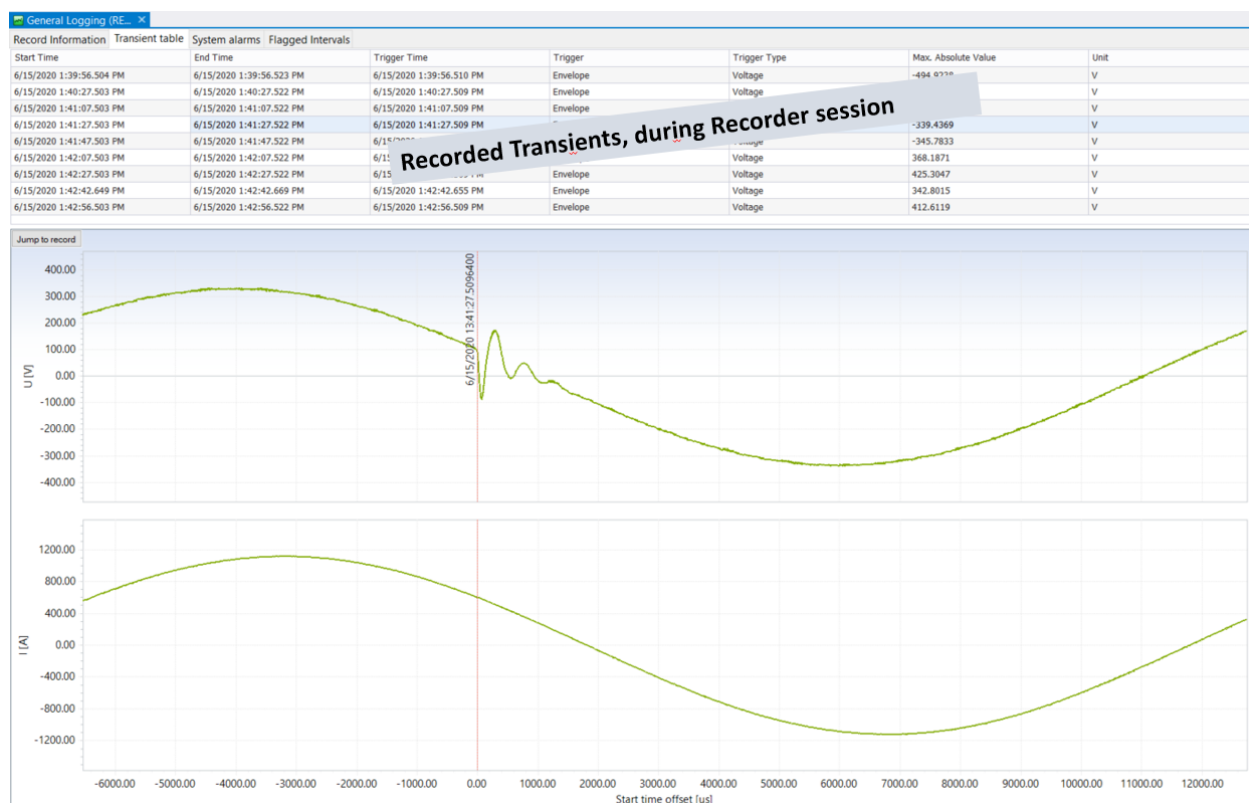


Figure 109 Transients presentation



Transient Start time	Transient Stop time	Trigger timestamp	Trigger type: Envelope/Value	Trigger type	Max. detected value	
Start Time	End Time	Trigger Time	Trigger	Trigger Type	Max. Absolute Value	Unit
6/15/2020 1:39:56.504 PM	6/15/2020 1:39:56.523 PM	6/15/2020 1:39:56.510 PM	Envelope	Voltage	-494.9238	V
6/15/2020 1:40:27.503 PM	6/15/2020 1:40:27.522 PM	6/15/2020 1:40:27.509 PM	Envelope	Voltage	-453.6722	V
6/15/2020 1:41:07.503 PM	6/15/2020 1:41:07.522 PM	6/15/2020 1:41:07.509 PM	Envelope	Voltage	-342.6101	V
6/15/2020 1:41:27.503 PM	6/15/2020 1:41:27.522 PM	6/15/2020 1:41:27.509 PM	Envelope	Voltage	-339.4369	V
6/15/2020 1:41:47.503 PM	6/15/2020 1:41:47.522 PM	6/15/2020 1:41:47.509 PM	Envelope	Voltage	-345.7833	V
6/15/2020 1:42:07.503 PM	6/15/2020 1:42:07.522 PM	6/15/2020 1:42:07.509 PM	Envelope	Voltage	368.1871	V
6/15/2020 1:42:27.503 PM	6/15/2020 1:42:27.522 PM	6/15/2020 1:42:27.509 PM	Envelope	Voltage	425.3047	V
6/15/2020 1:42:42.649 PM	6/15/2020 1:42:42.669 PM	6/15/2020 1:42:42.655 PM	Envelope	Voltage	342.8015	V
6/15/2020 1:42:56.503 PM	6/15/2020 1:42:56.522 PM	6/15/2020 1:42:56.509 PM	Envelope	Voltage	412.6119	V

Figure 110 Transient table explanation

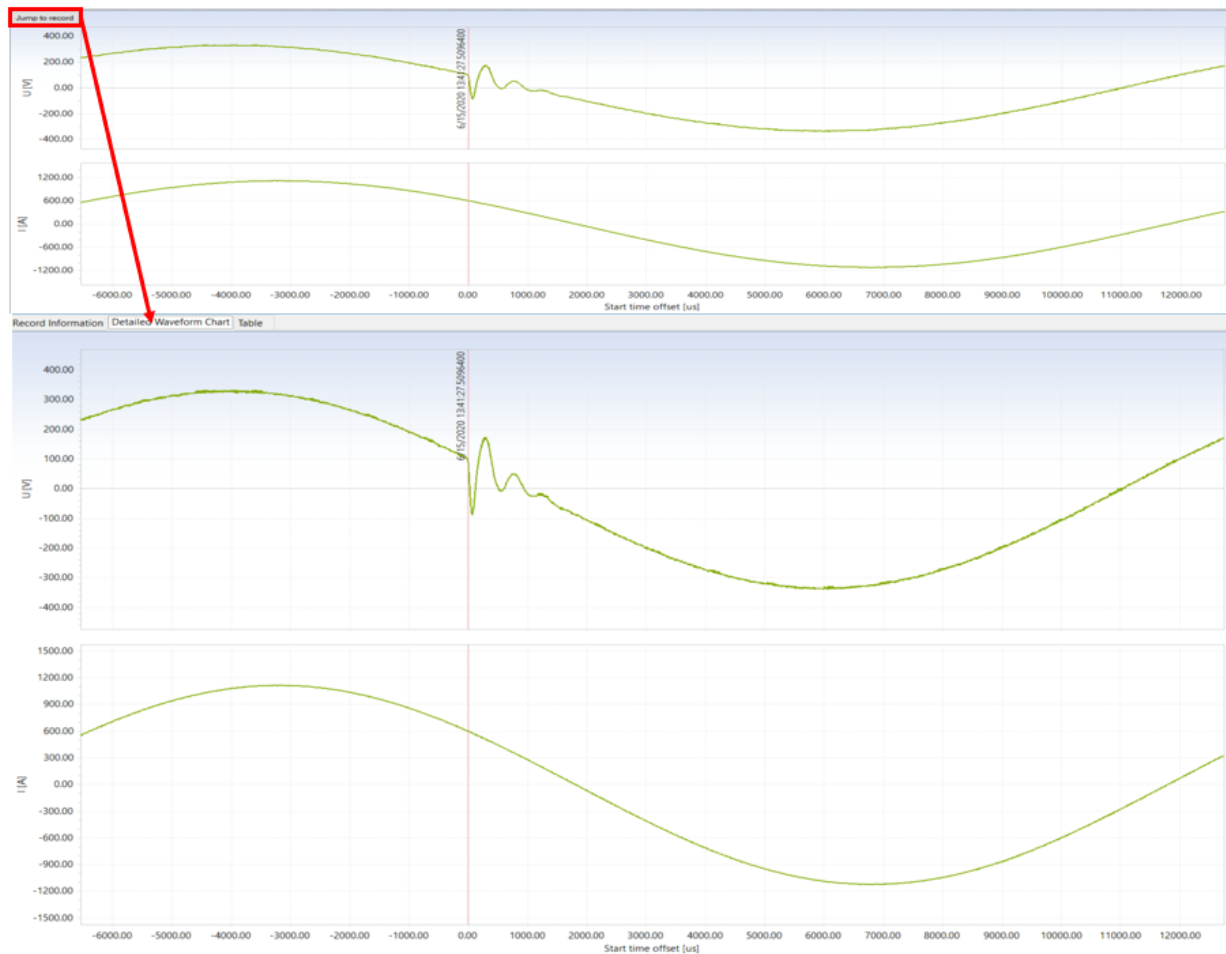


Figure 111 Transient preview

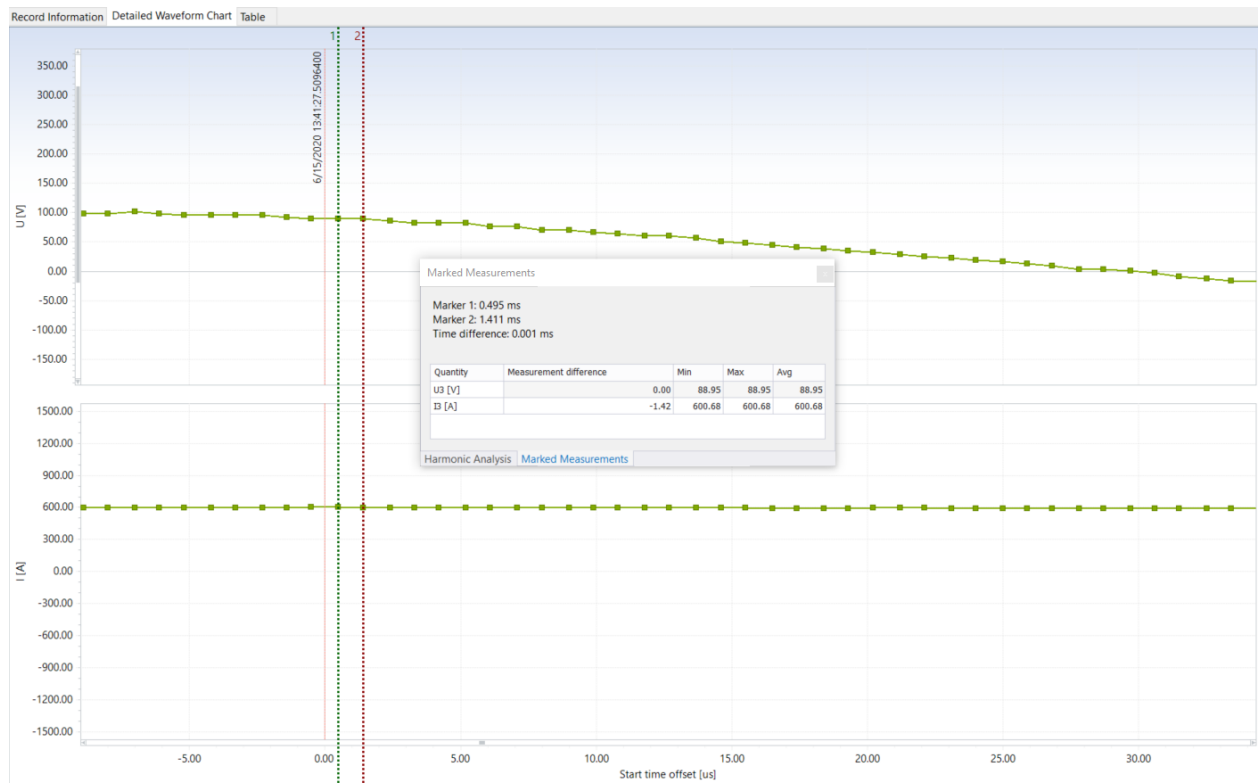


Figure 112 Transient detail preview

**Transient Record (R0005TRA) [6/15/2020 13:41:27]**

Transient Record, recorded on 6/15/2020 13:41:27, duration: 019 ms.

[Click here to add record description](#)**Record Properties**

Profile: Standard  
Start time: 6/15/2020 13:41:27.503  
Stop time: 6/15/2020 13:41:27.522  
Snapshot length: 19.27 ms (20480 samples)  
Stop cause: Finished Successfully  
File name: R0005TRA.REC  
Clock synchronisation: RTC  
File version: 41

**Measurement Settings**

Nominal voltage: 230.00 V L-N  
I1/2/3 Clamp: A1033 (1,000.00 A), Clamp measuring range (1,000.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A  
IN Clamp: Smart Clamps (0.00 A), Clamp measuring range (0.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A  
Nominal frequency: 50.00 Hz  
Frequency sync: U1  
Connection: 4W

**Transient Trigger Settings**

Trigger source: Envelope UL-N  
Trigger detected on channel: UL<sub>3</sub>-N  
Triggered value: 10.00 V  
Maximum measured value: -339.44 V  
Transient occurrence on channels: Envelope UL<sub>1</sub>-N, Envelope UL<sub>2</sub>-N, Envelope UL<sub>3</sub>-N

Level UL-N: Off  
Level UN-GND: Off  
Level L: Off  
Level IGND: Off  
Envelope UL-N: 10.00 V  
Envelope L: Off  
Envelope IGND: Off

**Instrument Properties**

Model: MI 2893  
Instrument name: Power Master XT  
Hardware version: 8  
Firmware version: 3.0.3477  
S/n: 16280308  
Calibration date: 4/17/2019 8:08:23

**Miscellaneous Information**

Downloaded on: 6/15/2020 13:43:51.206  
Downloaded by: Mihael Hribar  
Downloaded using: Metrel PowerView v3.0.0.4770 (64-bit), en-US  
Windows version: Windows 10 64-bit (Microsoft Windows NT 10.0.18362.0)

*Figure 113 Transient Recorder details*

On the Transient Chart data, it is possible to perform same operations as on the “regular” charts; like detail analyse with Markers.

General Logging (R00...) Inrush Logging (R00...)						
Record Information Inrush Trend Table						
	Voltage			Current		
	U1	U2	U3	I1	I2	I3
	1 cycle RMS [V]	1 cycle RMS [V]	1 cycle RMS [V]	1 cycle RMS [A]	1 cycle RMS [A]	1 cycle RMS [A]
6/15/2020 10:30:13.588	---	---	228.533	---	---	690.22
6/15/2020 10:30:13.592	---	230.885	---	---	690.15	---
6/15/2020 10:30:13.595	232.678	---	---	690.41	---	---
6/15/2020 10:30:13.598	---	---	228.544	---	---	690.75
6/15/2020 10:30:13.602	---	230.890	---	---	690.65	---
6/15/2020 10:30:13.605	232.683	---	---	690.41	---	---
6/15/2020 10:30:13.609	---	---	228.550	---	---	691.16
6/15/2020 10:30:13.612	---	230.894	---	---	691.16	---
6/15/2020 10:30:13.615	232.684	---	---	690.39	---	---
6/15/2020 10:30:13.618	---	---	228.541	---	---	690.72
6/15/2020 10:30:13.622	---	230.886	---	---	690.62	---
6/15/2020 10:30:13.625	232.681	---	---	690.37	---	---
6/15/2020 10:30:13.628	---	---	228.536	---	---	690.29
6/15/2020 10:30:13.632	---	230.886	---	---	690.22	---
6/15/2020 10:30:13.635	232.676	---	---	690.35	---	---
6/15/2020 10:30:13.638	---	---	228.541	---	---	690.69
6/15/2020 10:30:13.642	---	230.888	---	---	690.24	---
6/15/2020 10:30:13.645	232.674	---	---	689.95	---	---
6/15/2020 10:30:13.649	---	---	228.540	---	---	690.68

Only "effected" values presented in Table form (by default)

Figure 114 Inrush preview – Table data

#### Note:

In case, that Waveform Recorder runs as independent recorder, for data presentation please follow item 4.10.2

### 4.12.2 Transient presentation on the MI 2892/2884

Transient recorder is implemented on MI 2892/2885/2884 as "independent" recorder. Captured transients are presented under Data Explorer view.

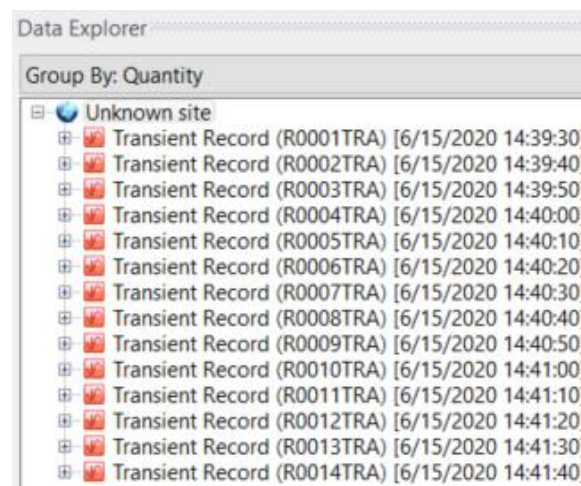


Figure 115 Recorded transients – preview

With double click on selected transients, Transient record information is opened:

**Transient Record (R0001TRA) [6/15/2020 14:39:30]**  
Transient Record, recorded on 6/15/2020 14:39:30, duration: 020 ms.  
[Click here to add record description](#)

**Record Properties**  
Profile: Standard  
Start time: 6/15/2020 14:39:30.944  
Stop time: 6/15/2020 14:39:30.964  
Snapshot length: 19.97 ms (613 samples)  
Stop cause: Finished Successfully  
File name: R0001TRA.REC  
Clock synchronisation: RTC  
File version: 311

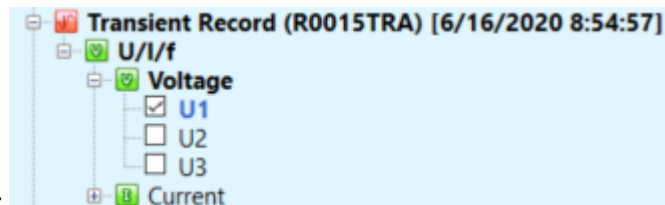
**Measurement Settings**  
Nominal voltage: 230.00 V L-N  
I1/2/3 Clamp: A1033 (1,000.00 A), Clamp measuring range (1,000.00 A), Instrument measuring range (100 % of Clamp measuring range), Current transformer ratio: 1.00 A : 1.00 A  
IN Clamp: None (0.00 A), Clamp measuring range (0.00 A), Instrument measuring range (100 % of Clamp measuring range)  
Nominal frequency: 50.00 Hz  
Frequency sync: U1  
Connection: 4W

**Transient Trigger Settings**  
Trigger source: Envelope  
Trigger detected on channel: U1 **← Information, on which channel was transient detected**  
Triggered value: 10.00 V

**Instrument Properties**  
Model: MI 2884  
Instrument name: Energy Master XA  
Hardware version: 4  
Firmware version: 1.0.2393  
S/n: 00000009  
Calibration date: 1/4/2019 14:52:56

**Miscellaneous Information**  
Downloaded on: 6/15/2020 14:42:13.482  
Downloaded by: Mihael Hribar  
Downloaded using: Metrel PowerView v3.0.0.4770 (64-bit), en-US  
Windows version: Windows 10 64-bit (Microsoft Windows NT 10.0.18362.0)

Figure 116 Transient Recorder information – MI 2892/2884



Select voltage U1 from the Explorer view:

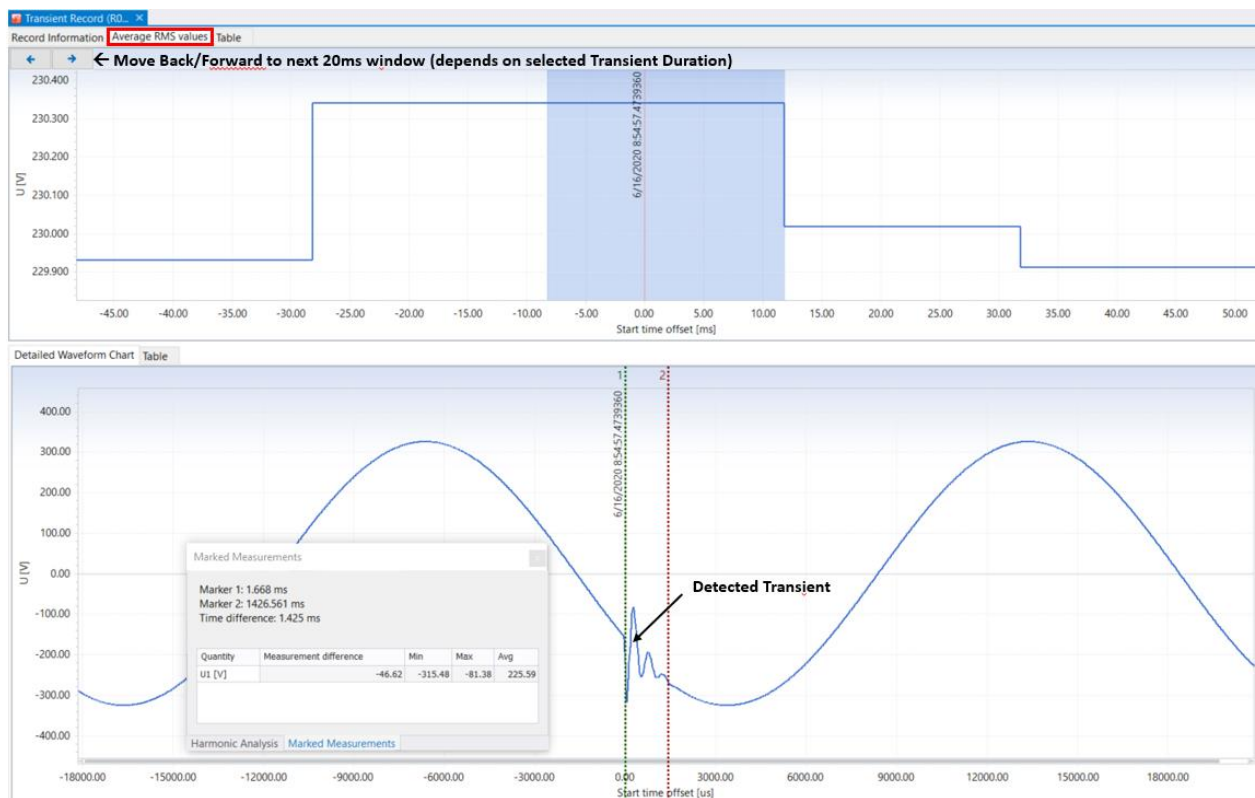



Figure 117 Transient Recorder presentation - waveform

All data are also presented in table form: for MI 2884, with resolution of 32 $\mu$ s (sampling frequency 30.6 kHz).

Record Information		Average RMS values	Table
		Voltage	
		U1 [V]	
6/16/2020 8:54:57.4257780		288.37	
6/16/2020 8:54:57.4258106		289.90	
6/16/2020 8:54:57.4258432		291.31	
6/16/2020 8:54:57.4258758		292.84	
6/16/2020 8:54:57.4259085		294.25	
6/16/2020 8:54:57.4259411		295.72	
6/16/2020 8:54:57.4259737		297.06	
6/16/2020 8:54:57.4260063		298.35	
6/16/2020 8:54:57.4260390		299.63	
6/16/2020 8:54:57.4260716		300.98	
6/16/2020 8:54:57.4261042		302.20	
6/16/2020 8:54:57.4261369		303.42	
6/16/2020 8:54:57.4261695		304.59	
6/16/2020 8:54:57.4262021		305.81	
6/16/2020 8:54:57.4262347		306.85	
6/16/2020 8:54:57.4262674		308.01	

Figure 118 Transient Recorder presentation – Table data

## 4.13 Instrument Configuration Tool

PQI, with Ethernet port (MI 2893/2892/2885) could be setup remotely, by clicking on  icon. Available operations:

- Reading instrument setup
- Writing setup to instrument
- Time synchronisation/setting
- Recorder's Start/Stop

Note: Same operation is possible to perform also via USB port (for all PQI's).

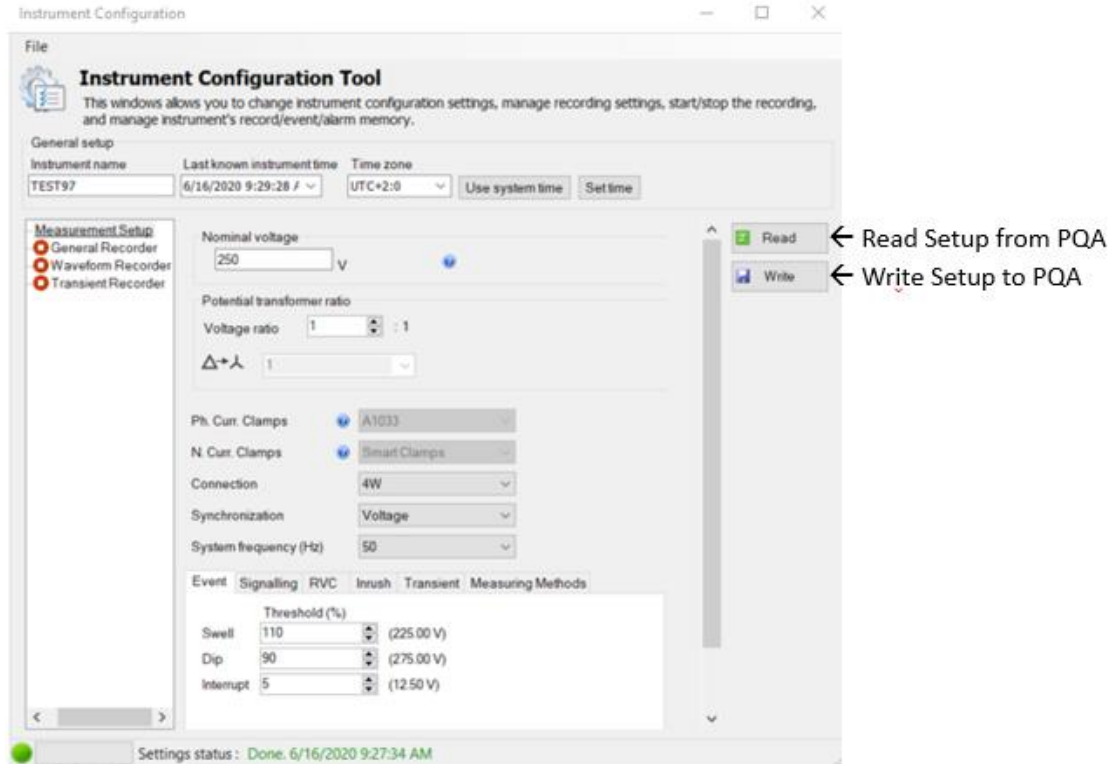


Figure 119 Instrument Configuration tool (MI 2893)

Note: SD card should be inserted into the PQI, for remote configuration reading/changing

#### 4.13.1 Instrument name/Time setting

Instrument name and time could be changed remotely. For the time setting, user could select time manually or use PC system time. We recommend the second option, since PC time could be synchronised with the accurate network time.



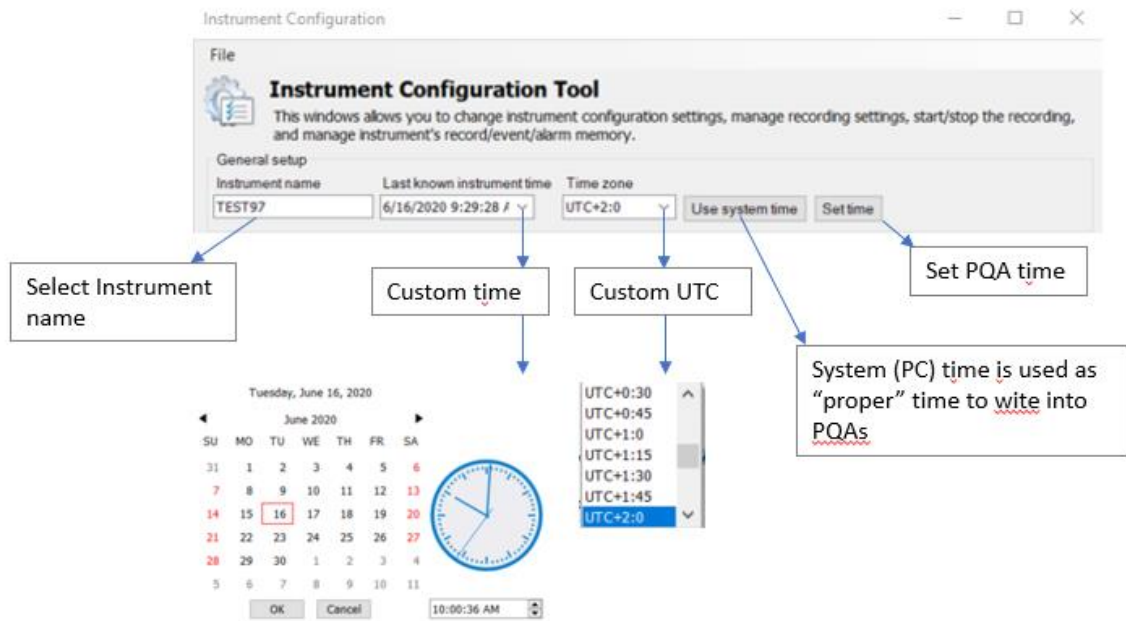


Figure 120 Instrument Name and Time setting screen

#### 4.13.2 Measurement setup

Under Measurement setup all PQ functionality settings could be setup, except the current clamp selection and range settings.

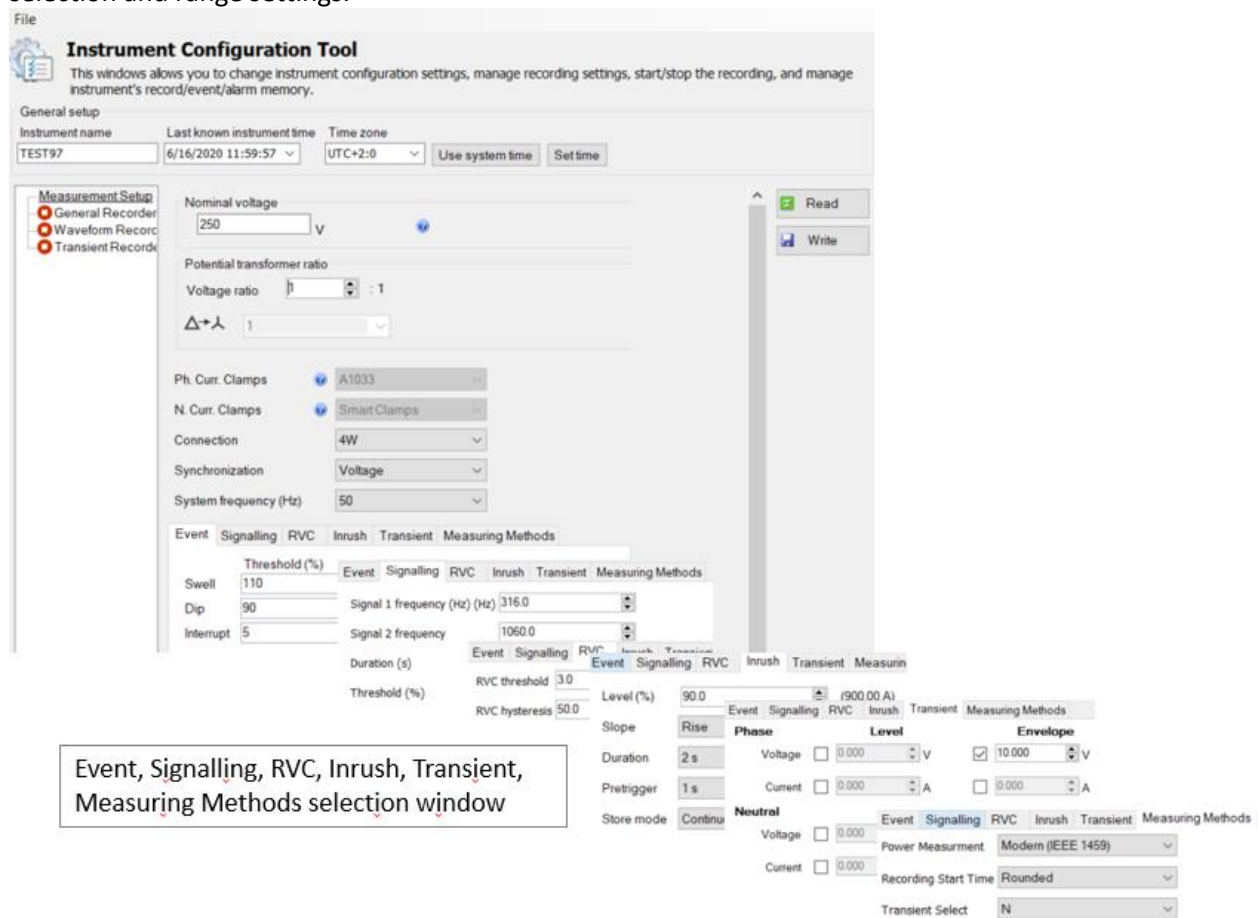
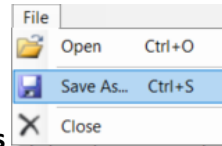


Figure 121 Measurement setup selection screen

Change the settings, save them through **File → Save As** and write them into the instrument by using **Write** icon.



### 4.13.3 General Recorder setup

Through the General Recorder setup window, it is possible to manage Recorder parameters as well as perform Remote Start/Stop of the recorder. Setup screen (functions) is related to the type of the PQI.

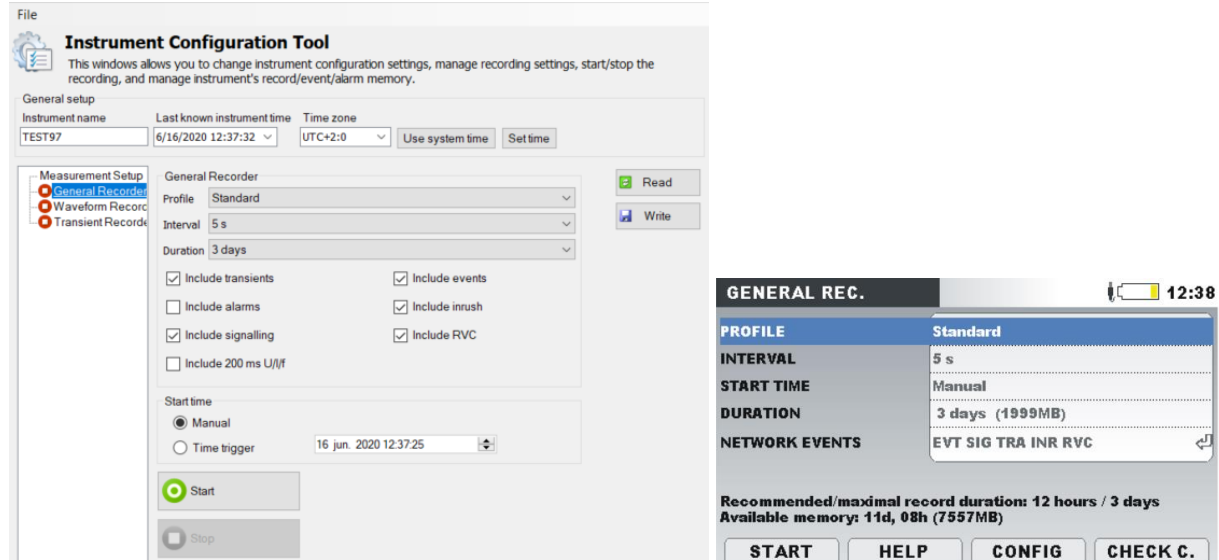


Figure 122 General Recorder setup screen vs Instrument screen menu

### 4.13.4 Waveform Recorder setup

Through the General Recorder setup window, it is possible to manage Recorder parameters as well as perform Remote Start/Stop of the recorder. Setup screen (functions) is related to the type of the PQI.

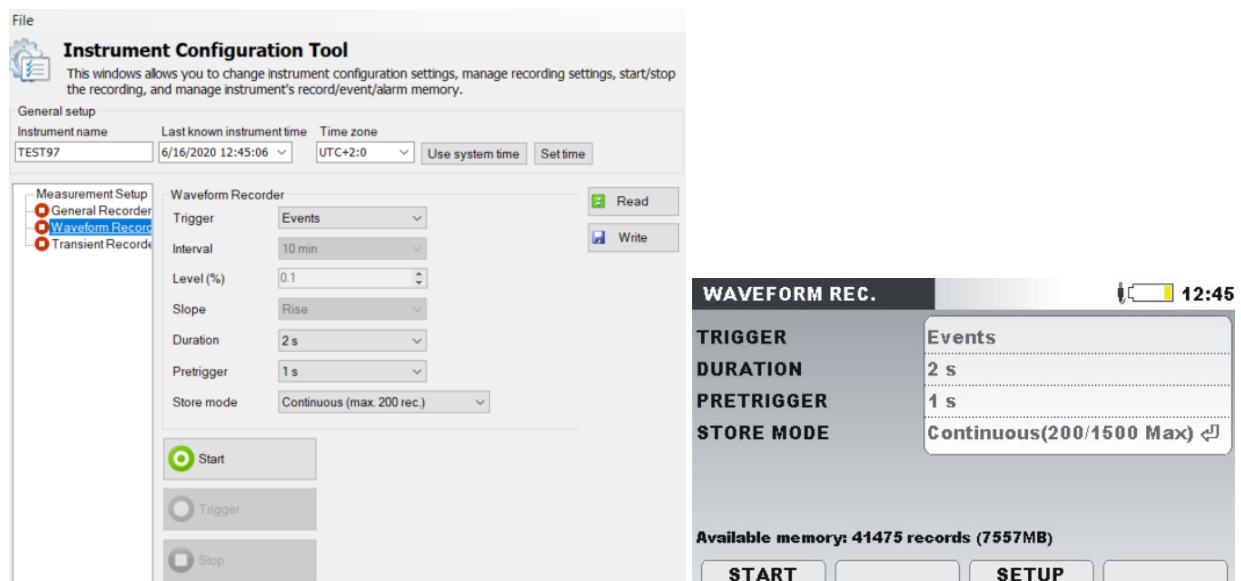


Figure 123 Waveform Recorder setup screen vs Instrument screen menu

### 4.13.5 Transient Recorder setup

Through the General Recorder setup window, it is possible to manage Transient Recorder parameters as well as perform Remote Start/Stop of the recorder. Setup screen (functions) is related to the type of the PQI.

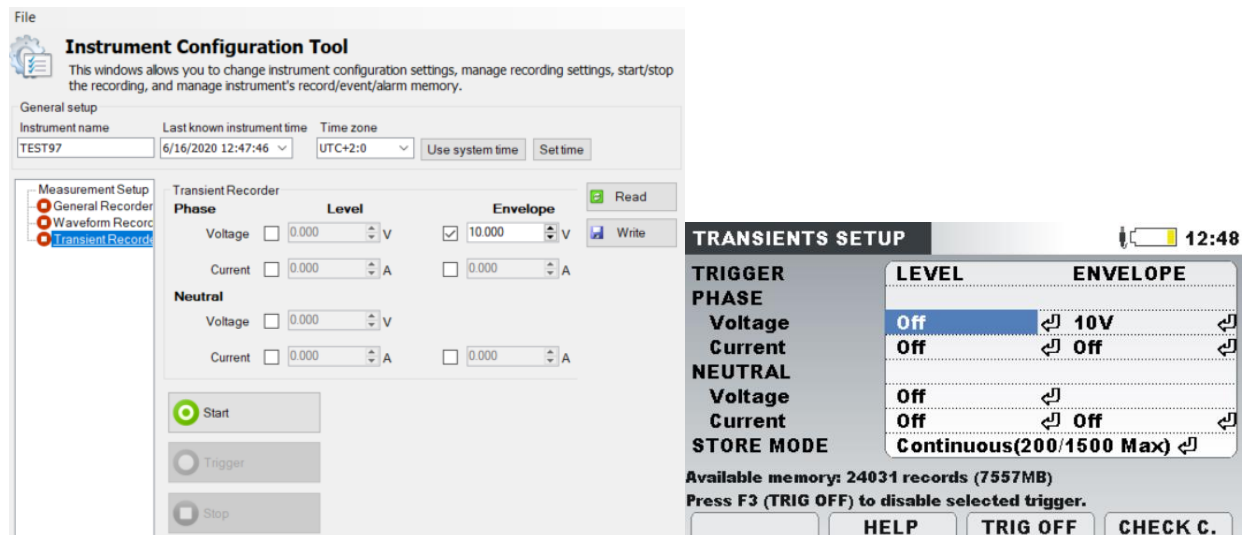
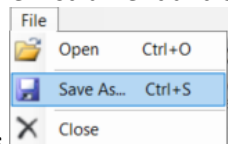


Figure 124 Transient Recorder setup screen vs Instrument screen menu

### 4.13.6 Save/Open Instrument configuration file

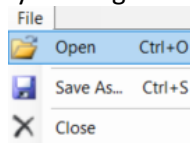
Instrument settings could be read out from the instrument and saved as \*.SET file.



Setup could be saved through File → **Save As**

Opening already saved file:

Establish connection with the PQI by reading Instrument Configuration Tool; after that open already



saved setup through File → **Open**

With this approach It is possible to perform same setup for the entire fleet of the PQI.

#### Note:

Configuration setup refers to a specific instrument model and could be re-used on the same type of the instrument.

Example:

Configuration setup from MI 2893 could not be used for MI 2884 PQI.

## 4.14 System alarms

System alarms give information about the PQI status before recorder start and registered system events.

Recorder starting conditions:

Record Starting Conditions	
Charger Status	CONNECTED
Charger Voltage	11.8V
Battery Voltage	8.4V
Time Stamp	2/27/2020 9:40:00 AM
Battery Temperature	36.6°C
SD Card Info	14881MB / 14932MB
GPS Status	DISCONNECTED
Frequency Synchronization Status	SYNCHRONIZED
Clock Synchronization Status	RTC
Events Capture Enabled	YES
Alarms Capture Enabled	NO

System alarm presentation:

Record Information	Events	RVC Events	System alarms	Flagged Intervals
Id	Description		Date and time	Message
1	Charger disconnected.		2/28/2020 1:50:06 PM	/
2	Current over range.		2/28/2020 1:50:35 PM	/
3	Current in range.		2/28/2020 1:50:35 PM	/
4	Charger connected.		2/28/2020 1:50:37 PM	/
5	GPRS status.		2/28/2020 1:50:51 PM	Could not reach gprs.metrel.si at port 80.
6	Charger disconnected.		2/28/2020 1:51:25 PM	/
7	Current over range.		2/28/2020 1:51:54 PM	/
8	Current in range.		2/28/2020 1:51:54 PM	/
9	Charger connected.		2/28/2020 1:51:55 PM	/
10	Charger disconnected.		2/28/2020 1:51:57 PM	/
11	Charger connected.		2/28/2020 1:52:33 PM	/
12	Charger disconnected.		2/28/2020 1:52:35 PM	/
13	Charger connected.		2/28/2020 1:53:00 PM	/
14	Charger disconnected.		2/28/2020 1:53:02 PM	/
15	Current over range.		2/28/2020 1:53:53 PM	/
16	Current in range.		2/28/2020 1:53:53 PM	/
17	Charger connected.		2/28/2020 1:53:55 PM	/
18	GPRS status.		2/28/2020 1:55:01 PM	gprs.metrel.si reached at port 3.
19	Charger disconnected.		2/28/2020 2:42:10 PM	/
20	Charger connected.		2/28/2020 2:42:15 PM	/
21	GPRS status.		2/28/2020 2:42:53 PM	Could not reach gprs.metrel.si at port 80.
22	GPRS status.		2/28/2020 2:43:51 PM	gprs.metrel.si reached at port 3.
23	GPRS status.		2/28/2020 2:50:12 PM	Could not reach gprs.metrel.si at port 80.
24	GPRS status.		2/28/2020 2:51:11 PM	gprs.metrel.si reached at port 3.
25	GPRS status.		2/29/2020 12:48:24 AM	Could not reach gprs.metrel.si at port 80.
26	GPRS status.		2/29/2020 12:49:29 AM	gprs.metrel.si reached at port 3.
27	GPRS status.		3/2/2020 10:09:43 AM	Could not reach gprs.metrel.si at port 7781.
28	GPRS status.		3/2/2020 10:10:41 AM	gprs.metrel.si reached at port 3.

Figure 125 System alarms presentation

PQI register different type of events, which could appear during the recording session:

- Recorder has stopped,
- Low battery alarm has been signalled,
- GPS status changed,
- Voltage over range,
- Voltage in range,
- Current over range,
- Current in range,
- Charger connected,
- Charger disconnected,
- Battery overheating,
- Battery freezing,

- Frequency synchronization established,
- Frequency synchronization lost,
- Wrong PIN number was entered,
- Clock synchronization source has changed,
- Battery temperature sensor error,
- GPS change VALID-INVALID diff,
- Wrong IDECO password entered,
- Wrong IDECO2 password entered,
- GPRS status,
  - o Could not reach gprs.metrel.si at port XX,
  - o gprs.metrel.si reached at port xx,
- Smart clamp detection,
- GPS synchronization,
- General record restarted,
- Current auto range,
- Recorder has finished,
- Transient module WD reset,
- Battery temperature back to normal.

## 5 Automatic notification about PowerView and PQI firmware update

After starting PowerView, it checks automatically if newer release is available on the server. In this case following information appears on the screen:

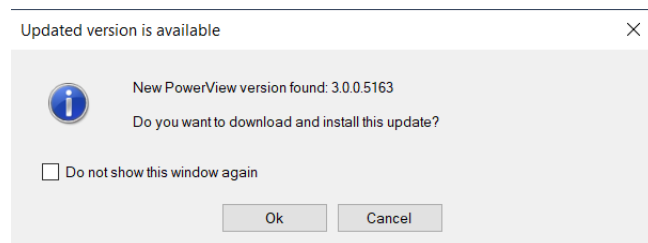


Figure 126 Notification about new available PowerView release

By pressing:

- OK, new PowerView will be automatically installed
- Cancel, PowerView will not be installed

If you do not want, that PowerView inform you automatically about available new releases, then select window:

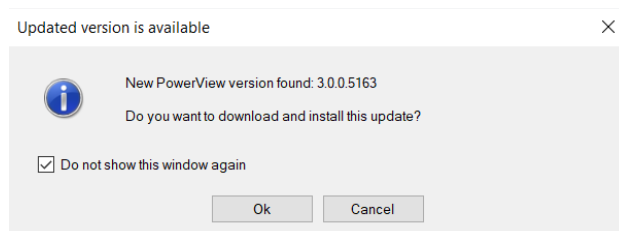


Figure 127 Selection of not showing the notification about new PowerView release

Or generally disable this notification under **Options** icon:

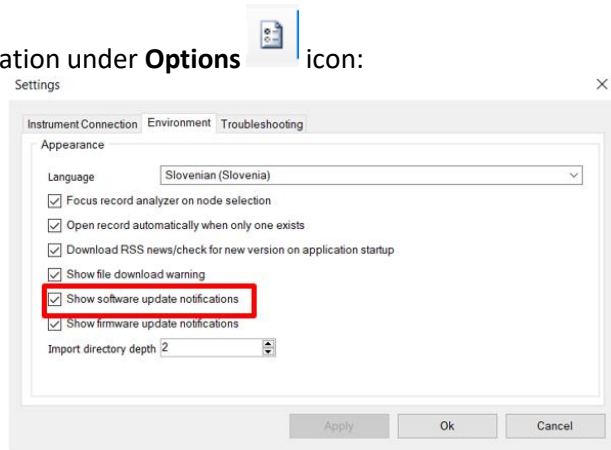


Figure 128 Selection of not showing the notification about new PowerView release

Same approach is used also for FW release. During each PQI reading, PowerView checks if there is newer release available on the server and offer the user to upgrade it:

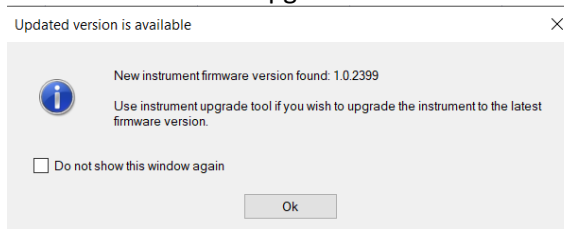


Figure 129 Notification about new available PowerView release

By pressing "OK", new Firmware will be automatically installed.

If you do not want, that PowerView inform you automatically about available new FW releases, then select window "Do not how this window again" (valid for detected instrument serial number).

It is possible to generally disable this notification under **Options** icon:

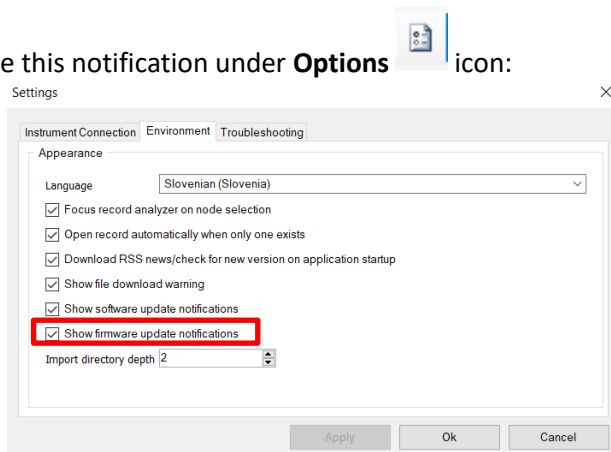


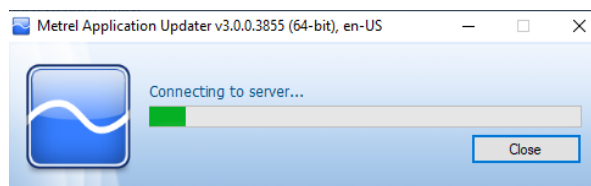
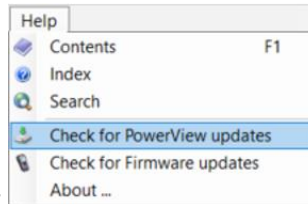
Figure 130 Selection of not showing the notification about new FW release

## 6 Manual PowerView update

PowerView is subject to constant innovation and improvements, which brings several new features and improvements. Update could be done directly via PowerView, by checking if the installed PowerView version is older than available one on the server.

To check for the available PowerView updates, your PC should be connected to Internet.

1. Select **Help** → **Check for PowerView updates**;

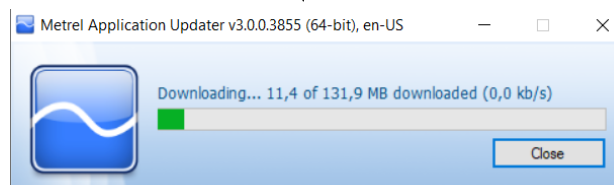


Updated version is available

**i** New version found: 3.0.0.4336  
Do you want to download and install this update?

Yes

No



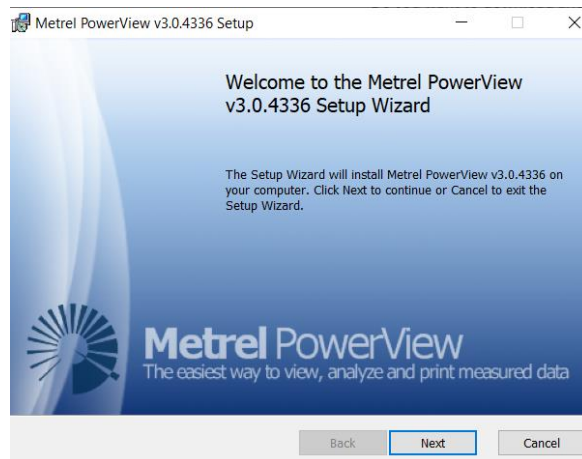
Download complete - must close PowerView

**i** Updater will now close PowerView, and Windows Installer will be started to update the application. Please save any open files before continuing.

Note: Setup can also be started manually. Write down the location of the setup files in case you need to restart it:  
C:\Users\Mihael  
Hribar\Documents\Metrel\PowerView\Updates\Version3.0.0.4336\Setup\PowerView.v3.0.0.4336.x64

OK





Follow the setup instructions.

## 7 Manual PQI Firmware update

Through the PowerView it is possible to upgrade the PQI Firmware.

Procedure:

1. Connect PC and instrument with USB cable
2. Establish USB communication between them. In PowerView, go to **Tools→Options** menu and set USB connection as shown on figure below.

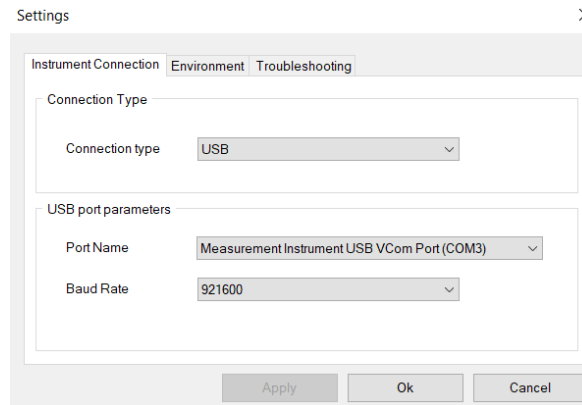


Figure 131: Selecting USB communication

3. Click on **Help → Check for Firmware updates**.

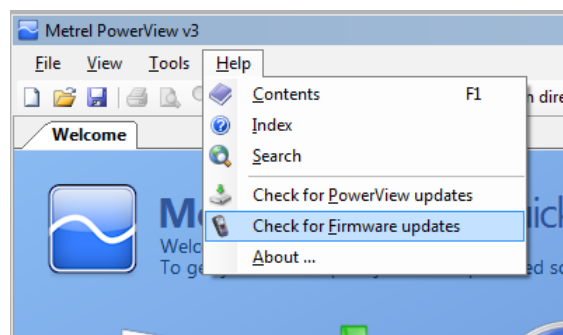


Figure 132: Check for Firmware upgrade

4. Version checker window will appear on the screen. Click on **Start** button.

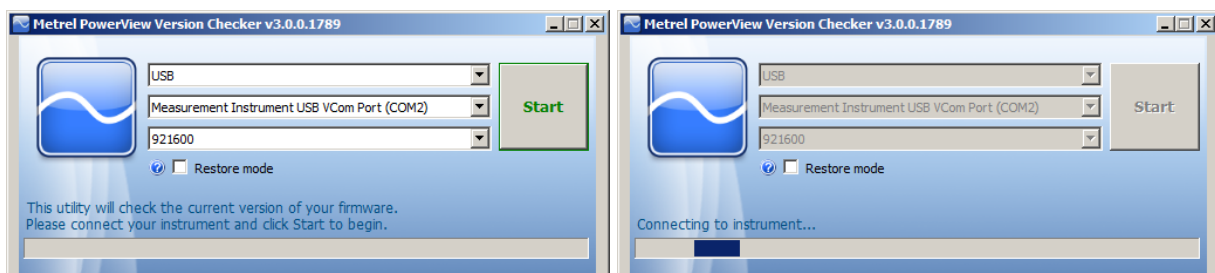


Figure 133: Check for Firmware upgrade

5. If your instrument has older FW, PowerView will notify you that new version of FW is available. Click on **Yes** to proceed.

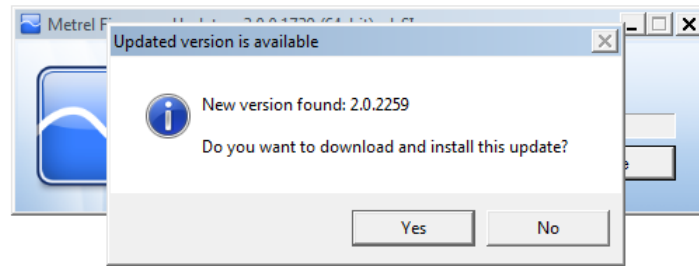


Figure 134: New PowerView firmware is available for download

6. After update is downloaded, FlashMe application will be launched. This application will actually upgrade instrument FW. Click on RUN to proceed.

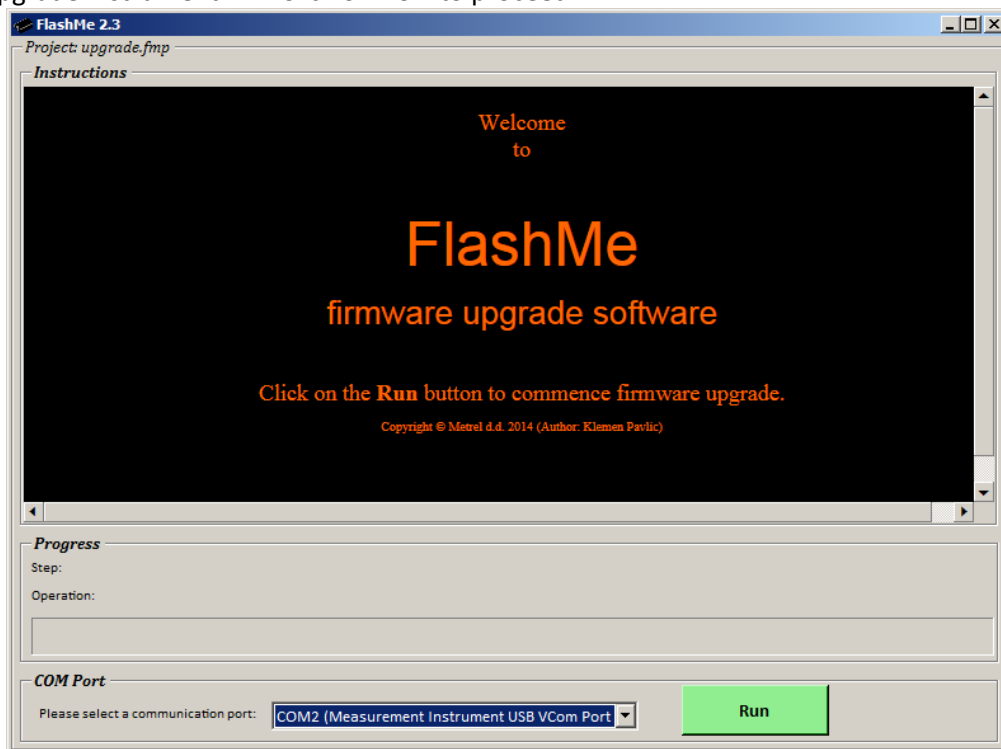


Figure 135: FlashMe firmware upgrade software

7. FlashMe will automatically detect PQ instrument, which can be seen in COM port selection menu. In some rare cases user should point FlashMe manually to COM port where instrument is connected. Click then on Continue to proceed.



Figure 136: FlashMe configuration screen

8. Instrument upgrade process should begin. Please wait until all steps are finished. Note that this step should not be interrupted; as instrument will not work properly. If upgrade process goes wrong, please contact your distributor or Metrel directly. We will help you to resolve issue and recover instrument.



Figure 137: FlashMe programming screen

## 8 Reporting problems to Metrel

This section deals with unexpected problems, errors and exceptions that may occur during usage of Metrel PowerView. If you have encountered an error while using Metrel PowerView, the best thing to do is to report this issue to our support at <metrel@metrel.si>. This will help us find a solution quickly, and provide you with an updated version, hotfix, or help you extract the data from your instrument if the issue prevents you from doing so.

### 8.1 Bug report checklist

This section contains a brief list of items which your bug report should contain. For detailed information about each step, consult the next section.

1. Regardless of the problem you are reporting, the minimum amount of information we need is:

- A short description of the problem and, most importantly, steps needed to reproduce it;
- Metrel PowerView log file (located in :\\Users\\<user>\\Documents\\Metrel\\PowerView\\Log folder).

## 9 How to get support?

### 9.1 Contact us directly

Metrel d.d. Slovenia  
Ljubljanska cesta 77  
Horjul, SI-1354 Slovenia  
Phone: +386 1 7558 200  
Fax: +386 1 7549 226  
E-mail: metrel@metrel.si  
Web site: www.metrel.si [<http://www.metrel.si/>]

### 9.2 Use the online contact form

You can also contact us using our Contact form <https://www.metrel.si>

## 10 Version of document

#	Document version	Description of changes
5	1.6.1	Added improvements from the PowerView 3.0 release, Ver. 5675
4	1.5.1	Added improvements from the PowerView 3.0 release, Ver. 5555
3	1.4.1	Added improvements from the PowerView 3.0 release, Ver. 5429
2	1.3.1	Added improvements from the PowerView 3.0 release, Ver. 5396
1	1.2.1	Added improvements from the PowerView 3.0 release, Ver. 5059