



**K M B systems, s. r. o.**

Dr. Milady Horákové 559, 460 06

Liberec VII – Horní Růžodol

460 07 Liberec

Czech Republic

Tel. +420 485 130 314

E-mail: [kmb@kmb.cz](mailto:kmb@kmb.cz), Web: [www.kmb.cz](http://www.kmb.cz)

---

App note 0028

FW extension module

# General oscillograms and trends

Document revision	Release date	For version		
		Hardware	Firmware	Software ENVIS
1.0	01.07.2024	ARTIQ, G3	≥ 4.12.0	≥ 2.2.32

# Contents

<b>1</b>	<b>Oscillograms and trends</b>	<b>3</b>
1.1	Oscillogram . . . . .	3
1.2	Trend . . . . .	3
<b>2</b>	<b>Oscillogram and trend data</b>	<b>4</b>
2.1	Settings . . . . .	4
2.1.1	Conditions . . . . .	6
2.1.2	Oscillogram settings . . . . .	8
2.1.3	Trend settings . . . . .	9
2.1.4	Typical settings . . . . .	10
2.2	Work with data . . . . .	12
2.2.1	Data download . . . . .	12
2.2.2	Data inspection . . . . .	12

# 1 Oscillograms and trends

## 1.1 Oscillogram

Oscillogram is graphical representation of quantity (voltage and current) in time. It is useful for diagnostics and analyse unexpected situations, grid defects or transients.



Recording of oscillograms is available only on devices with FW module GO - General Oscillogram.

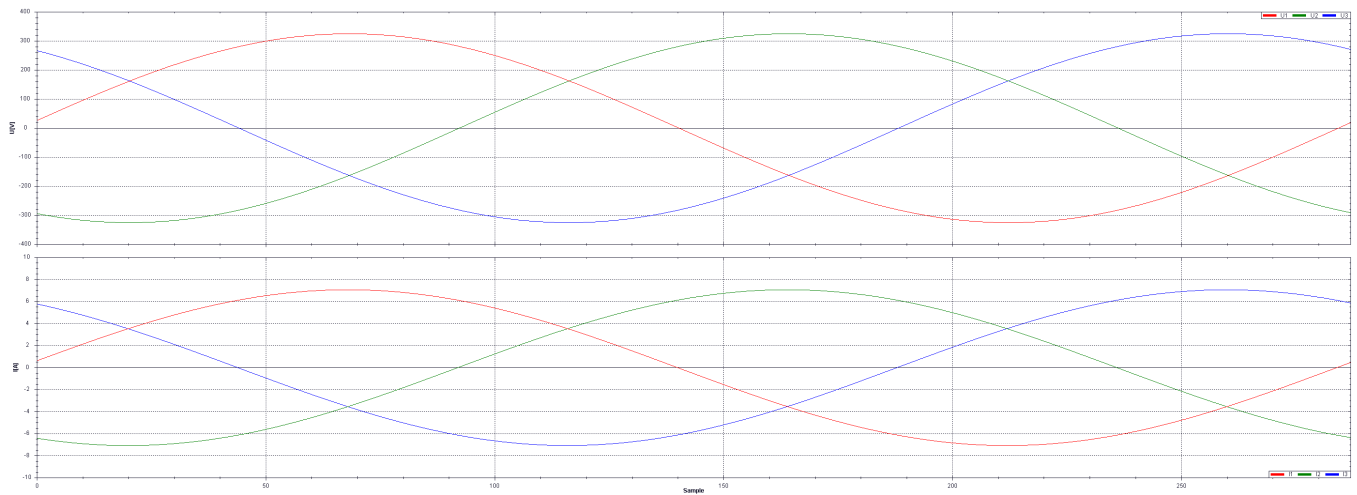


Figure 1: Example of oscillograms

## 1.2 Trend

Trend is progress of RMS values calculated every half-period. Half-period RMS values are better for detailed look, which is better for analyse and diagnostics deviations, unbalance identification and more exact consumption forecast.



Trend recording is part of FW module GO - General Oscillogram and it is available only on devices with this module.

## 2 Oscillogram and trend data

### 2.1 Settings

All settings can be done using *ENVIS.Daq* program. After connect via suitable interface (USB, RS485, Ethernet ...), open *Settings* window, *IO Management* tab. There is necessary to set input conditions and device reactions to them.

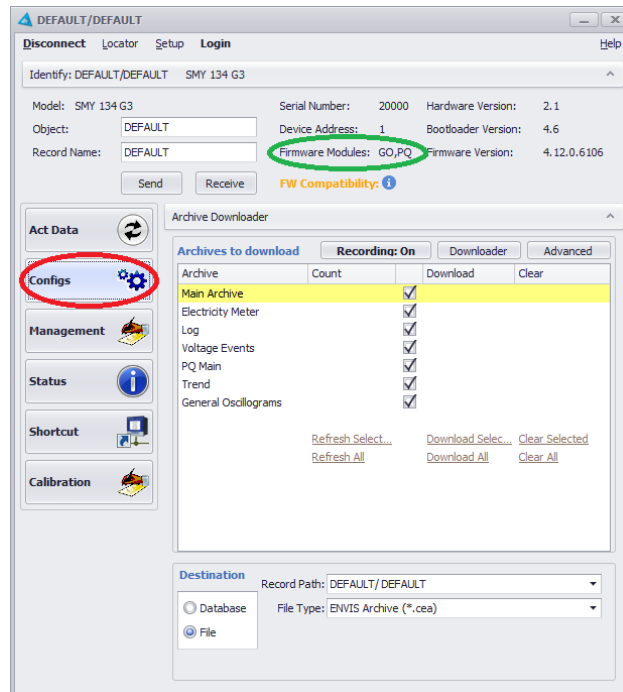


Figure 2: Main window after connect

On the left side set input conditions, that activate record and save of oscillograms into device memory for future download. Condition can be voltage event, under-voltage, over-voltage, over-current, time interval or any trigger depending on user request.

On the right side, set action at compliance of condition. There needs to be set up oscillogram record (General Oscillogram – GO) and/or trend record. At bottom, there is settings of each condition and action.

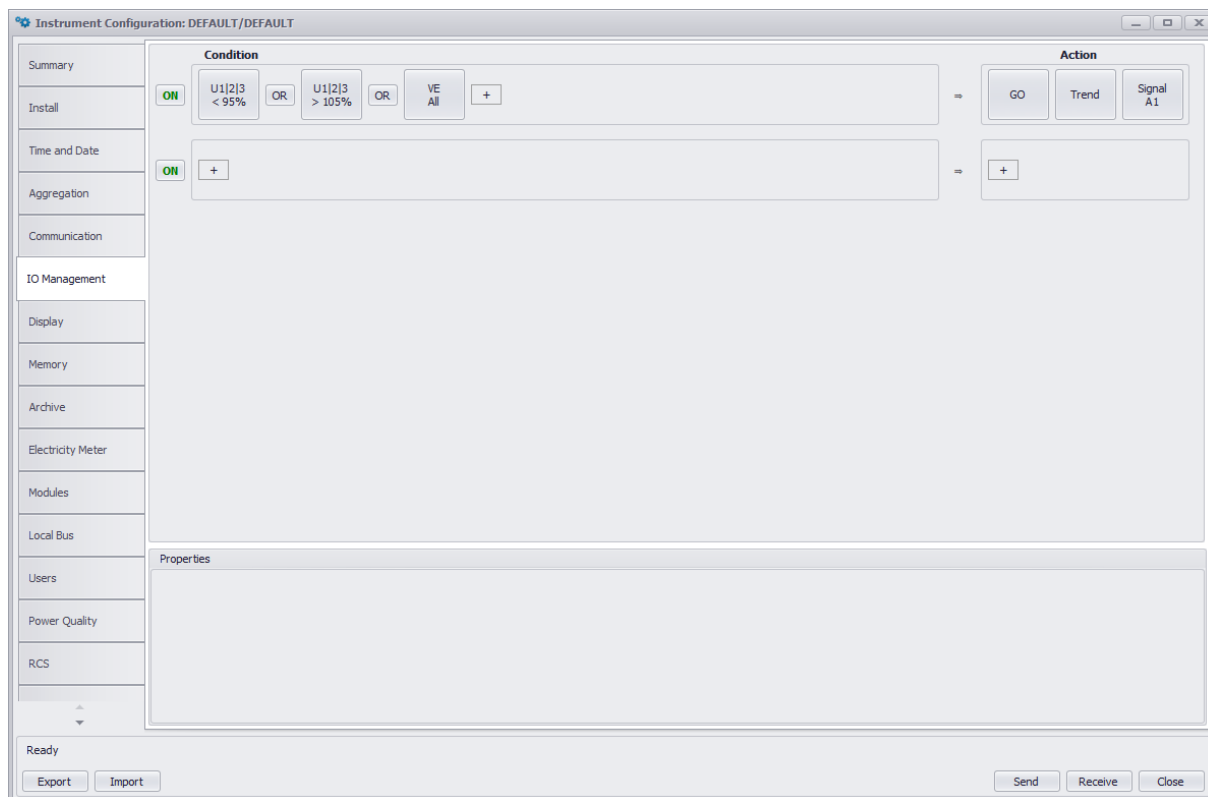


Figure 3: Conditions and actions

## 2.1.1 Conditions

**Voltage events** – events violating power quality according to EN50160. Voltage events as conditions are in *Device state* category of inputs. All parameters of voltage events can be set in *Power Quality* tab.

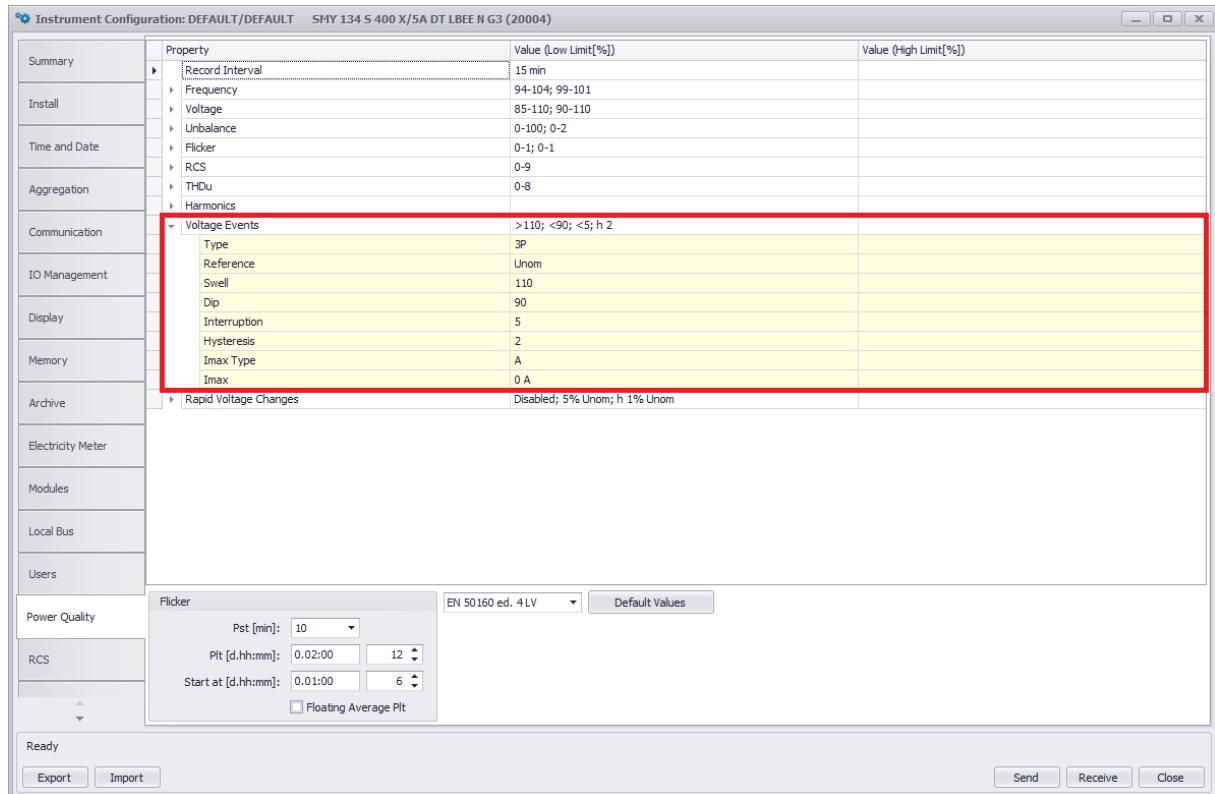


Figure 4: Voltage events settings

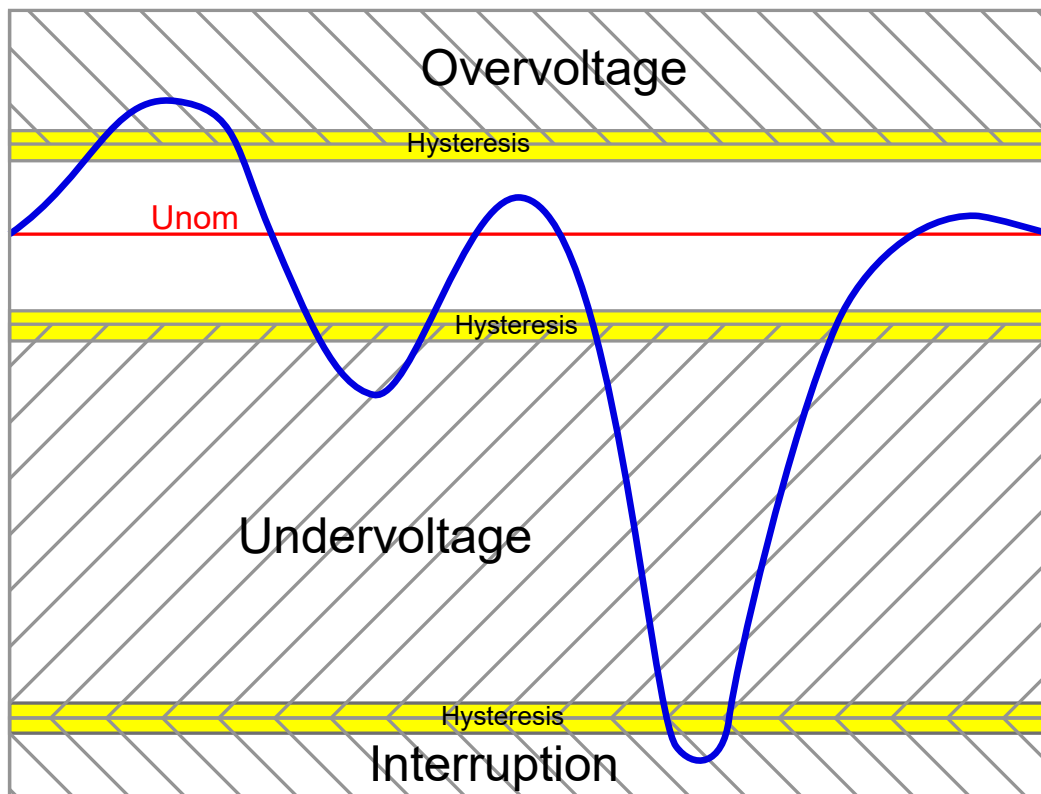


Figure 5: Over-voltage, under-voltage and interruption

- Properties – tracked parameter of voltage event
  - Swell (over-voltage) is standardly over 110% of nominal voltage.
  - Dip (under-voltage) is standardly under 90% of nominal voltage.
  - Interruption is standardly under 5% of nominal voltage.
  - Power quality event trigger watches voltage, harmonics, THDu, unbalance and flicker and compares them with EN50160 match in 95% or 100% of samples.
  - Rapid voltage changes caused by switching (induction) devices in grid.
  - Protection watches over-voltage, under-voltage and frequency with adjustable delay depending on severity.
- Control
  - **1**: Condition is active during whole (voltage) event – record of whole defect.
  - **0->1**: Impulse when condition is fulfilled – for record of defect beginning and combination with record length.
  - Behaviour of control is shown in next picture.
    - \* Condition input can be voltage event. It's length is same as defect length.
    - \* Condition output depends on control setting (1 or 0->1) and shows, how long is condition active.
    - \* Charts bellow show length of record depending on settings. Pre-trigger (green), trigger (yellow) and post-trigger (red) are shown.

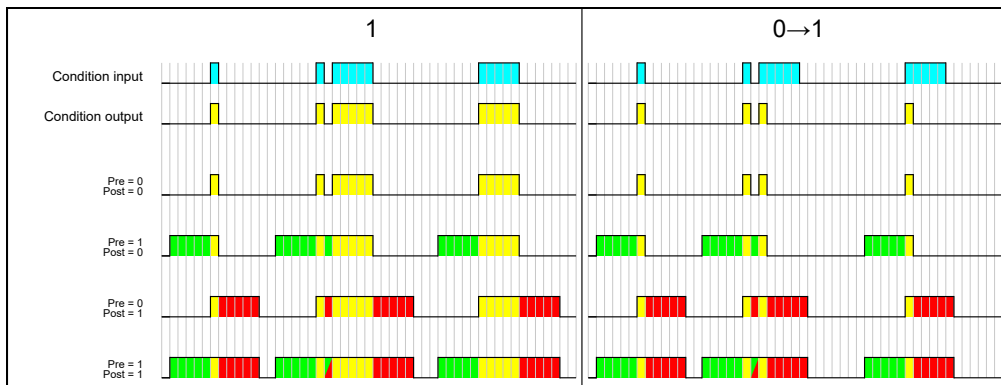


Figure 6: Control behaviour

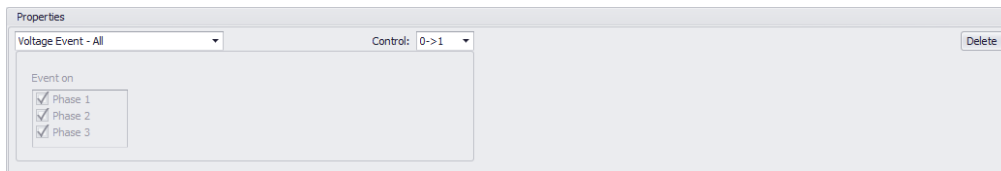


Figure 7: Voltage event as input condition

**Measured quantity** – quantity watching and reaction to it's value

- Any measured quantity can be chosen (voltage/current/power...).
- Phase can be selected one, any (1/2/3) or all (1&2&3).
- Rule sets, if condition is active when value is greater or smaller than set value.
- Limit is requested value. Can be absolute value or relative to nominal value.
- Hysteresis is deviation around limit value. Activation of condition is with fulfilment limit + hysteresis value, to it's deactivation, value must be smaller than limit - hysteresis.
  - example: Over-voltage watch: limit = 91%  $U_{nom}$ ; hysteresis = 1%:
    - \* Activation with  $U = 90\% U_{nom}$ .
    - \* Deactivation with  $U = 92\% U_{nom}$ .
- Delay is time of waiting before activation or deactivation of condition after it's fulfilment.

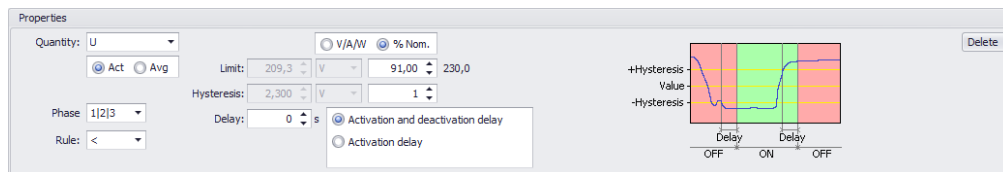


Figure 8: Measured quantity as input condition

## 2.1.2 Oscillogram settings

**Recorded quantity** – selection of recorded quantities (voltage/current) and their phases.

**Sampling rate** – default setting is good for typical application

- Adaptive or fixed sampling rate
  - Adaptive adapts sampling rate to signal frequency and holds constant amount of samples per period (spp).
  - Fixed holds same sampling rate without signal frequency affect – still same amount of samples per second (sps).



**Record length** – length of record before and after condition

- Start before condition saves oscillogram with possible reason of defect, which can help with repair.
- End after condition can be good to see defect repair
  - With  $VE:0 \rightarrow 1$  control, only set time around defect is recorded.
  - With  $VE:1$  control, whole defect is recorded plus time after end of condition.



Oscillogram record with start before condition greater than 0,2s use a lot of device memory and can damage memory. This setting is not recommended for longterm use. Record after condition is not limited.

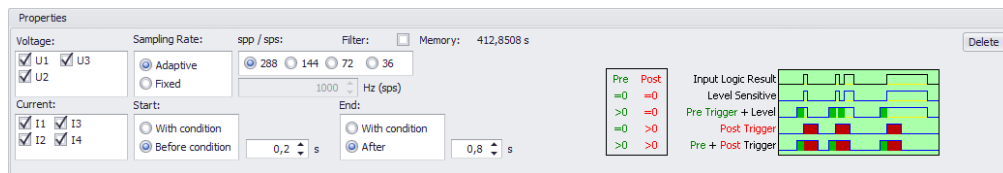


Figure 9: Settings of oscillogram recording

### 2.1.3 Trend settings

**Measured quantity** – selection of recorded quantities (voltage/current/power) and their phases.

**Record length** – length of record before and after condition

- Start before condition saves trend before condition, which can help to see defect origin.
- End after condition can be good to see defect repair



Figure 10: Settings of trend recording

## 2.1.4 Typical settings

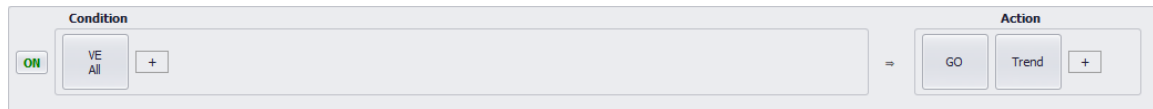


Figure 11: Typical setting of voltage events, oscillograms and trends

### Input condition

- *Device state:* PQ – Voltage event – All
  - Control: 0->1

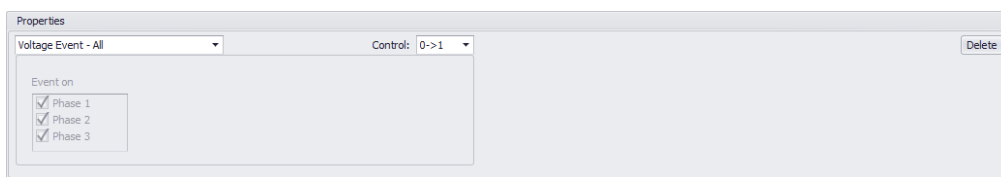


Figure 12: Typical setting of voltage events

## Output condition

- General oscillogram – GO
  - Recorded quantity: all (U1, U2, U3, I1, I2, I3, (I4))
  - Sampling rate: Adaptive, 288spp
  - Record length
    - \* Start: Before condition; 0,2s
    - \* End: After condition; 0,8s

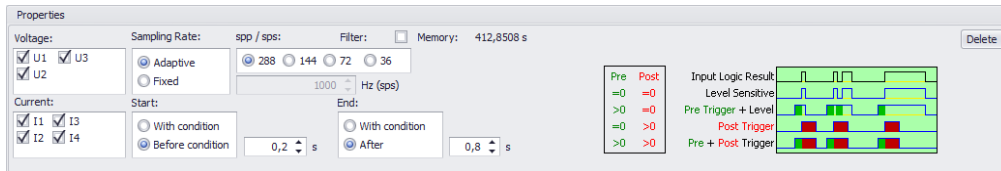


Figure 13: Typical setting of oscillograms

- Trend
  - Measured quantity: all (U1, U2, U3, I1, I2, I3, P1, P2, P3, 3P)
  - Record length
    - \* Start: Before condition; 1s
    - \* End: After condition; 4s



Figure 14: Typical setting of trends

## 2.2 Work with data

### 2.2.1 Data download

Data downloading is made with *ENVIS.Daq* program after connecting to device. With *Refresh all* button, refresh record count in each category. Then choose format (database or local file) and with button *Download all* or *Download selected*, download records.

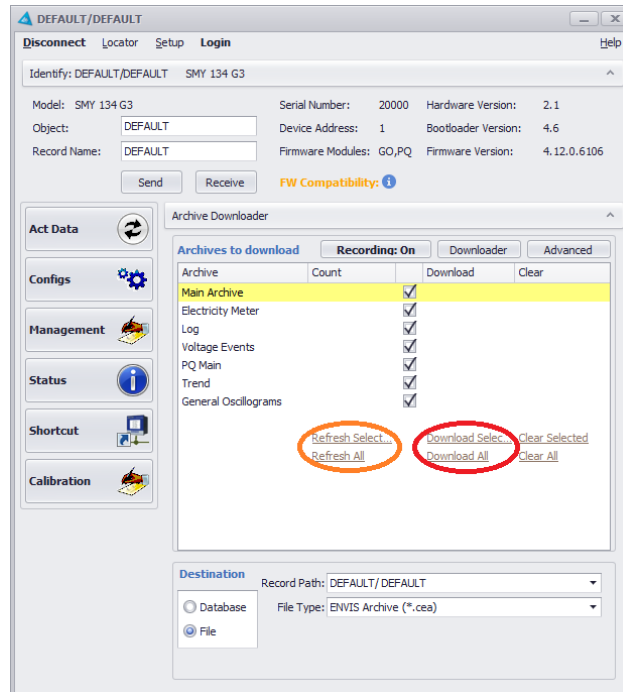


Figure 15: Main window after connect

### 2.2.2 Data inspection

Locally downloaded data in *.cea* format open with *ENVIS* program.

**Oscillogram** is possible to show on same-named tab. On tab, choose record time/date on left side. Chosen oscillogram show, which we can zoom or hide phases we don't need.

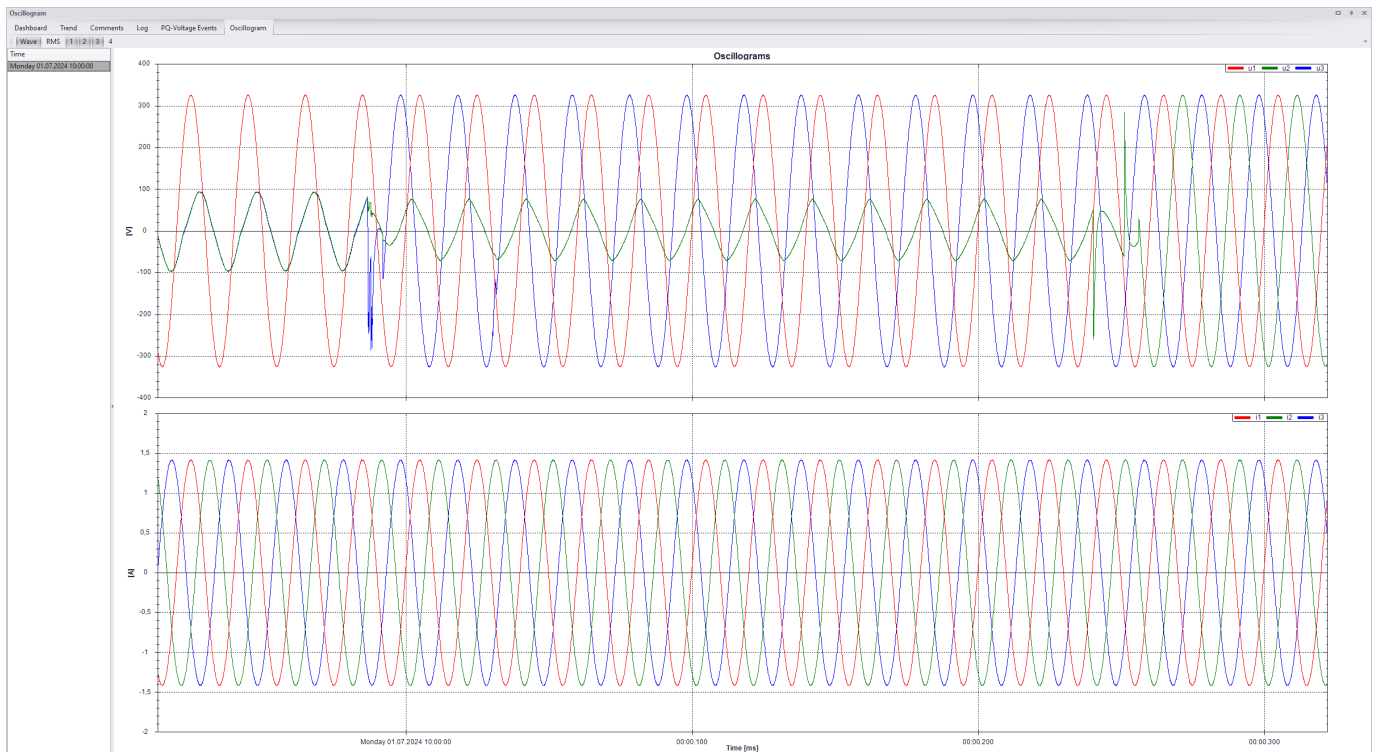


Figure 16: Oscillogram of defect

**Trend** is also on same-named tab. On left side choose time/date of record and it shows.



Figure 17: Trend during defect



**K M B systems, s. r. o.**  
Dr. Milady Horákové 559  
Liberec VII - Horní Růžodol  
460 07 Liberec, Czech Republic

Tel.: +420 485 130 314  
E-mail: [kmb@kmb.cz](mailto:kmb@kmb.cz)  
Web: [www.kmb.cz](http://www.kmb.cz)