

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, Web: www.kmb.cz

App note 0028

FW extension module

General oscillograms and trends

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revision	date	Hardware	Firmware	Software ENVIS
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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.

\land DEFAULT/DEFA	AULT						_	
Disconnect Loc	ator S	etup Login						He
Identify: DEFAULT	r/defaul	T SMY 134 G3						~
Model: SMY 134	G3		Serial	Number:	20000	Hardware Version:	2.1	
Object:	DEFAUL	т	Device	e Address:	1	Bootloader Version	1: 4.6	
Record Name:	DEFAUL	Т	Firmw	are Modules:	GO,PQ	Firmware Version:	4.12.0.61	.06
	Send	Receive	FW C	ompatibility	y: 🚹			
Act Data	2	Archive Download	er					^
		Archives to do	wnload	Recon	ding: On	Downloader	Advanced	1
Confins	0.44	Archive		Count		Download	Clear	
	~	Main Archive			\checkmark			
Management		Electricity Meter			\checkmark			
		PQ Main			\checkmark			
Status		Trend			\checkmark			
		General Oscillog	rams		\checkmark			
Shortcut				Refresh Sele	<u>ect</u>	Download Selec	Clear Selected	
Calibration	۶			<u>Refresh All</u>		Download All	<u>Clear All</u>	
		Destination	Record Pa	ath: DEFAULT	T/ DEFAUL	т		•
		O Database	File Ty	pe: ENVIS A	rchive (*.	:ea)		•
		File						

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.

🍄 Instrument Configu	uration:	DEFAULT/DEFAULT					×
Summary		Condition			Action		
Install	ON	U1 2 3 < 95% OR U1 2 3 > 105% OR VE +		GO	Trend	Signal A1	
Time and Date	ON	+	⇒	+			
Aggregation							
Communication							
IO Management							
Display							
Memory							
Archive							
Electricity Meter							
Modules	_						
Local Bus							
Users	Prope	rties					
Power Quality							
RCS							
* •							
Ready							
Export Import				Send	Receive	Close	

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.

🍄 Instrument Config	juratio	on: DEFAULT/DEFAULT SMY 134 5 400 X/5A D	T LBEE N G3 (2)	0004)					_	
	F	roperty	V	alue (Low Lin	it[%])		Value (High Limit[%])			
Summary	+	Record Interval	1	5 min						
		Frequency	9	4-104; 99-10	1					
Install		Voltage	8	5-110; 90-11	0					
		Unbalance	0	-100; 0-2						
Time and Date		Flicker	0	-1; 0-1						
	-	RCS	0	-9						
Aggregation		THDu	0	-8						
		Harmonics								
Communication		Voltage Events	>	110; <90; <	5; h 2					
		Туре	3	>						
IO Management		Reference	U	nom						
To Hundgement		Swell	1	10						
Diselau		Dip	9	D						
Display		Interruption	5							
		Hysteresis	2							
Memory	н	Imax Type	A							
	14	Imax	0	A						
Archive		Rapid Voltage Changes	D	isabled; 5%	Jnom; h 1% Unom					
Electricity Meter										
Modules										
Local Bus										
Users						<u>ــــــــــــــــــــــــــــــــــــ</u>				
Power Quality	Fli	cker Pst [min]: 10 🔻	EN 50160 ed. 4	LV 👻	Default Values					
DCS		Plt [d.hh:mm]: 0.02:00 12 🚖								
RCS	_	Start at [d,hh:mm]: 0.01:00 6 1								
~		Hoating Average Pit								
Ready										
Export Impor	t							Send	Receive	Close

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.
 - $\ast\,$ 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 posttrigger (red) are shown.



Figure 6: Control behaviour

Properties		
Voltage Event - All	•	Control: 0->1 🔻
Event on Phase 1 Phase 2 Phase 3		

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 $U=90\%~U_{\rm nom}.$
 - * Deactivation with $U=92\%~U_{\rm nom}.$
- Delay is time of waiting before activation or deactivation of condition after it's fulfilment.

Properties				
Quantity:	U ·	•	🔘 V/A/W 🍥 % Nom.	Delete
	Act O Avg	Limit: 209,3 🖕	V 👻 91,00 🗘 230,0	+Hysteresis
		Hysteresis: 2,300 🌲	V 🗸 1 🗘	-Hysteresis
Phase	1 2 3 -	Delay: 0 🌲 s	Activation and deactivation delay	
Rule:	< •		O Activation delay	Delay Delay OFF ON OFF

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->1 control, only set time around defect is recorded.
 - With $V\!E:\!1$ 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.

Properties							
Voltage:	Sampling Rate:	spp / sps:	Filter: 🗌 M	lemory: 412,8508 s			Delete
✓ U1 ✓ U3 ✓ U2	 Adaptive Fixed 	288 ① 144	 72 36 100 Hz (sps) 		Pre Post	Input Logic Result	-
Current: I1 I I3 I2 I4	Start:		End:		>0 =0 >0 =0 =0 >0 >0 >0	Pre trigger + Level	
	Contract contantion	0,2 - 5	- Alto	0,0 , s			

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

Start: End:
Voltage: 🗹 U1 🗹 U2 🗹 U3
Current: 🗹 I1 🗹 I2 🗹 I3 💿 Before condition 💿 After
Power: 🗹 P1 🗹 P2 🗹 P3 🗹 3P 1,0 🗘 s 4,0 🗘

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

Properties		
Voltage Event - All	•	Control: 0->1 -
Event en		
Event on		
Phase 1		
Phase 3		

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
 - $\ast\,$ Start: Before condition; 0,2s
 - $\ast\,$ End: After condition; 0,8s

Sampling Rate:	spp / sps:	Filter: Memory:	412,8508 s			Delet
Adaptive	288 ① 144 ①	72 0 36				
O Fixed	1000) 1 Hz (sps)		Pre Post	Input Logic Result	
Start:		End:		=0 =0	Pre Trigger + Level	
With condition		O With condition		=0 >0	Post Trigger	
Before condition	0,2 🗘 s	After	D,8 🗘 s	>0 >0	Pre + Post Trigger	
	Sampling Rate: Adaptive Fixed Start: With condition Before condition	Sampling Rate: spp / sps: 	Sampling Rate: spp / sps: Filter: Memory: 	Sampling Rate: spp / sps: Filter: Memory: 412,8508 s @ Adaptive @ 288 144 72 36 1000 °; Hz (sps) Start: End: 0,8 °; s s 0/00 °; Hz (sps)	Sampling Rate: spp / sps: Filter: Memory: 412,8508 s	Sampling Rate: spp / sps: Filter: Memory: 412,8508 s

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

Voltage: VUI VU VU VU VU VUI VUI VUI VUI VUI VUI
Current: VI I1 VI I2 VI I3 O Before condition
Power: 🗹 P1 🗹 P2 🗹 P3 🗹 3P 1,0 🗘 s 4,0 🗘 s

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.

\land DEFAULT/DEFAULT					_ x
Disconnect Locator Set	up Login				Help
Identify: DEFAULT/DEFAULT	SMY 134 G3				^
Model: SMY 134 G3		Serial Number:	20000	Hardware Version:	2.1
Object: DEFAULT		Device Address:	1	Bootloader Version:	4.6
Record Name: DEFAULT		Firmware Modules:	GO,PQ	Firmware Version:	4.12.0.6106
Send	Receive	FW Compatibility	y: 🚺		
Act Data					
	Archives to down	nload Recon	ding: On	Downloader	Advanced
Configs	Archive	Count		Download Cle	ear
	Main Archive				
Management	Log		V		
	Voltage Events		\checkmark		
a	PQ Main		\checkmark		
Status	Trend		\checkmark		
	General Oscilogra	ns	¥		
Shortcut		Refresh Sele	ect	Download Selec Cle	ear Selected
		Refresh All		Download All	ear All
Calibration 🥭					
	Destination				
	Record Path: DEFAULT/DEFAULT				•
	O Database	File Type: ENVIS A	rchive (*.o	tea)	•
	File				

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 Web: www.kmb.cz

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