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# **topGUARD IO-Link Addressing & Register Description**

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## Table of Contents

<b>1</b>	<b>Introduction</b>	<b>3</b>
1.1	Purpose	3
1.2	Abbreviations	3
<b>2</b>	<b>Addressing the topGUARD station</b>	<b>4</b>
<b>3</b>	<b>Communication via IO-LINK</b>	<b>5</b>
3.1	Configuration of top Guard IO-LINK system	5
<b>4</b>	<b>Process data and parameter</b>	<b>6</b>
4.1	Process data in	6
4.2	Process data out	7
4.3	Non-cyclical I/O data of topGuard IO-LINK	7
4.3.1	Parameters for topGuard IO-LINK	7
4.3.2	System Commands for topGuard IO-LINK	16
4.3.3	Event Codes for topGuard IO-LINK	17
<b>5</b>	<b>Special Functions</b>	<b>19</b>
5.1	Tripping Current and Warning Limit Values Configuration	19
5.1.1	Alarm and Prewarning Configuration	21
5.1.2	Take over and readability of configuration	21
5.1.3	Specified range for current measurement and failure	21

Title: topGUARD IO-Link Register Description		
	DocVersion: 1.3	Review

# 1 Introduction

## 1.1 Purpose

This document describes the use of the PRO COM IO-LINK module with the topGUARD communicative electronic fuse.

## 1.2 Abbreviations

- CIOL -> The PRO COM IO-LINK module
- FIM -> The TGD FIM-C module
- TGD-ELM -> The several TGD ELM-6, TGD ELM-12 or TGD ELM-4 CL2 electronic load monitoring devices in the station  
For the TGD-ELM the data is defined as an array, where the sub index of this array is the address of corresponding topGUARD electronic load monitoring device
- ELM -> electronic load monitoring

Title: topGUARD IO-Link Register Description		
	DocVersion: 1.3	Review

## 2 Addressing the topGUARD station

Before you start the commissioning work, the following requirements must be fulfilled:

- The topGUARD station must be fully assembled and wired.
- The power supply must be connected.

### 1.) Switch on power supply

The electronic load monitors are switched off exworks. When first commissioned, the load monitors must therefore be switched on individually after finished the addressing procedure.

### 2.) Start addressing phase of topGUARD station

- a) To start the addressing phase of the installed topGUARD station the push-button (ADD) on the TGD FIM-C must be pressed.
- b) All yellow LED's (ADD) are starting flashing.
- c) Pressing the button on each electronic load monitor TGD ELM-xx will set the address of the device. It is recommending starting with the addressing procedure of each TGD ELM-xx from the left to the right.
- d) After the last TGD ELM-xx inside the topGUARD station is addressed, it is necessary to press the push-button on the TGD FIM-C again, to exit the addressing mode.

### 3.) Switching load monitors ON / OFF after addressing phase

Switch on all load monitors individually by pressing the respective reset button "R".

### 4.) Installing the PRO COM IO-LINK module

Title: topGUARD IO-Link Register Description		
	DocVersion: 1.3	Review

## 3 Communication via IO-LINK

### 3.1 Configuration of top Guard IO-LINK system

For the configuration of the top Guard IO-LINK the following points should be note:

- ➔ The Function “Data Storage” is not supported and must be disabled in the engineering tool!
- ➔ Writing an invalid value into a writeable parameter register does not evoke an error. To assure that a value has been accepted, it is necessary to read back the register and verify the content.

## 4 Process data and parameter

The topGUARD modules can be built up in a station with up to  $N \leq 32$  topGUARD electronic load monitoring devices.

The process input data delivers an array of 4 Bit values, which represent the following states for each ELM device.

- Bit 0: Device Failure
- Bit 1: Short Circuit Switch Off
- Bit 2: Load Pre-Warning
- Bit 3: Load Alarm Warning

The values are assigned to the addresses by the name of the process input data item, e.g. "Process Data In – Address 01" represents the states of the ELM device with the address 1.

### 4.1 Process data in

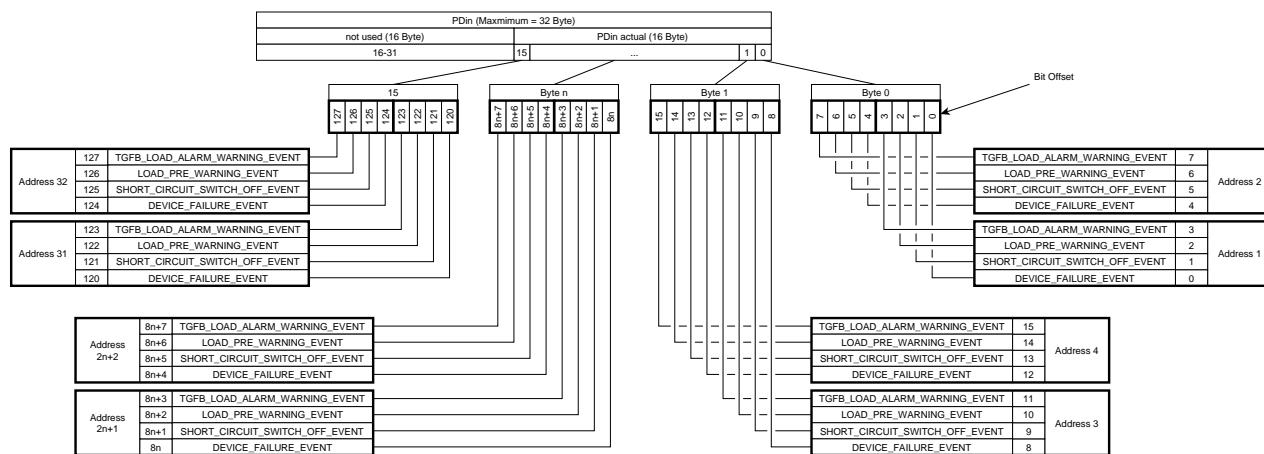


Table 1: Process data in for topGuard IO-LINK

No. of top Guard Fuse	Parameter	Type	Bit-Offset	Length [Bits]	Comment/ Description	Possible mapping (depending on PLC.)
N=1	TGD-ELM Load Alarm Warning	Bool	3	1	Event, if output current on DC-Output of corresponding top Guard ELM is higher than present "TGD-ELM Load Alarm Warning Value". Condition: $I_{out} > TGD-ELM Load Alarm Warning Value$	Byte 0:3
	TGD-ELM Load Pre-Warning	Bool	2	1	Event, if output current on DC-Output of corresponding top Guard ELM is higher than present "TGD-ELM Load Prewarning Value" Condition: $I_{out} > TGD-ELM Load Prewarning Value$	Byte 0:2

Title: topGUARD IO-Link Register Description				
	DocVersion: 1.3	Review		

	TGD-ELM Short Circuit Switch Off	Bool	1	1	Event, if switched off (tripping) the DC-Output of corresponding top Guard ELM  Condition: tripping of ELM regarding selected tripping characteristic curve at Register "TGD-ELM Tripping Characteristic Curve Select" and tripping current limit at register "TGD-ELM Tripping Current Limit".	Byte 0:1
	TGD-ELM Device Failure	Bool	0	1	Event, if top Guard ELM detects any internal failure  Condition: Internal failure occurred  0: No failure 1: Failure	Byte 0:0
N=2	TGD-ELM Load Alarm Warning	Bool	7	1	See above!	Byte 0:7
	TGD-ELM Load Pre-Warning	Bool	6	1	See above!	Byte 0:6
	TGD-ELM Short Circuit Switch Off	Bool	5	1	See above!	Byte 0:5
	TGD-ELM Device Failure	Bool	4	1	See above!	Byte 0:4
....	TGD-ELM Load Alarm Warning	Bool	...	1	See above!	...
	TGD-ELM Load Pre-Warning	Bool	...	1	See above!	...
	TGD-ELM Short Circuit Switch Off	Bool	...	1	See above!	...
	TGD-ELM Device Failure	Bool	...	1	See above!	...
N=32	TGD-ELM Load Alarm Warning	Bool	127	1	See above!	Byte 31:7
	TGD-ELM Load Pre-Warning	Bool	126	1	See above!	Byte 31:6
	TGD-ELM Short Circuit Switch Off	Bool	125	1	See above!	Byte 31:5
	TGD-ELM Device Failure	Bool	124	1	See above!	Byte 31:4
	Total size PD-IN per top Guard electronic load monitoring device			4	1/2 [Byte]	
Total size PD-IN (limit is 32 Byte PD-In)				N x 4	N/2 [Byte]	

## 4.2 Process data out

There is no data defined for "Process data out".

## 4.3 Non-cyclical I/O data of topGuard IO-LINK

### 4.3.1 Parameters for topGuard IO-LINK

Data Storage function is not implemented until now!

We have three kinds of possible data sources and sinks:

- CIOL -> The PRO COM IO-LINK module
- FIM -> The TGD FIM-C module

- TGD-ELM -> The several TGD ELM-6, TGD ELM-12 or TGD ELM-4 CL2 electronic load monitoring devices in the station.

For the TGD-ELM the non-string data is defined as an array, where the sub index of this array is the address of corresponding electronic load monitoring device.

The String data is not sorted within arrays, they are accessed by their names.

Replace the “<N>” in the following overview with the address of the corresponding electronic load monitoring device.

**Table 2 Parameters for topGuard IO-LINK**

Name	Type	Length	Access	Index	Data Source/Sink	Comment/ Description
TGD-ELM Over Voltage Peaks Counter [<N>]	U16	2 bytes	R	256	TGD - ELM	The number of Over Voltage peaks at $V_{in}$ of the corresponding ELM device since production.
TGD-ELM Under Voltage Peaks Counter [<N>]	U16	2 bytes	R	257	TGD - ELM	The number of Under Voltage peaks at $V_{in}$ of the corresponding ELM device since production.
TGD-ELM Voltage Output [<N>]	S32	4 bytes	R	258	TGD - ELM	Output voltage in cV (1000=10.00V) on DC-Output of the corresponding ELM device.  <u>Remark:</u> After switching off a small voltage can be read back from the electronic load monitoring devices TGD ELM-6 up to >0,5V TGD ELM-12 up to >0,7V
TGD-ELM Current Output [<N>]	S32	4 bytes	R	259	TGD - ELM	Output current in mA (1000=1.000A) on DC-Output of the corresponding ELM device.
TGD-ELM Device Temperature [<N>]	S16	2 bytes	R	260	TGD - ELM	Internal temperature of the corresponding ELM device in hundredth of °C (3000 = 30.00°C).
TGD-ELM Device Temperature >100°C Counter [<N>]	U16	2 bytes	R	261	TGD - ELM	The number of 100°C limit crossings of the internal temperature of the corresponding ELM device since production.
TGD-ELM Voltage Input [<N>]	S32	4 bytes	R	262	TGD - ELM	Input voltage in cV (1000=10.00V) on DC- Input of the corresponding ELM device.
TGD-ELM <N> Device Type	String [32]	32 bytes	R	268 + 100*(N-1)	TGD - ELM	Product (type) name of the corresponding ELM device.
TGD-ELM <N> Device Order Number	String [10]	10 bytes	R	269 + 100*(N-1)	TGD - ELM	Order number of the corresponding ELM device.
TGD-ELM <N> Device Serial Number	String [15]	15 bytes	R	270 + 100*(N-1)	TGD - ELM	Serial number of the corresponding ELM.

**Table 2 Parameters for topGuard IO-LINK**

Name	Type	Length	Access	Index	Data Source/Sink	Comment/ Description
TGD-ELM <N> Device HW Version	String [8]	8 bytes	R	272 + 100*(N-1)	TGD - ELM	Hardware version number of the corresponding top Guard ELM device.
TGD-ELM <N> Device SW Version	String [8]	8 bytes	R	273 + 100*(N-1)	TGD - ELM	Software version number of the corresponding top Guard ELM device.
TGD-ELM <N> Device DVN Version	String [8]	8 bytes	R	274 + 100*(N-1)	TGD - ELM	DVN of the corresponding top Guard ELM device.
TGD-ELM Operating Hours Since Production Counter [<N>]	U32	4 bytes	R	275	TGD - ELM	The operating hours since production of the corresponding top Guard ELM device.
TGD-ELM <N> Device Tag	String [16]	16 bytes	R W	276 + 100*(N-1)	TGD - ELM	Configurable customer defined name for the corresponding top Guard ELM device.
TGD-ELM Reverse Voltage Output Counter	U16	2 bytes	R	289	TGD - ELM	The number of Reverse Voltage Output peaks at $V_{in}$ of the corresponding ELM device since production.
TGD-ELM Reset Short Circuit Command [<N>]	Bool	1 byte	W	297	TGD - ELM	Only valid at TGD-ELM State b011 ("fuse on" and "fuse switched off after short circuit") Otherwise it has no effect. After the ELM device receives the command, it resets the state ""fuse switched off after short circuit". New TGD-ELM State: b001 ("fuse on").
TGD-ELM Load Prewarning Counter [<N>]	U16	2 bytes	R	299	TGD - ELM	The number of Load Prewarning crossings of the corresponding ELM device since production.
TGD-ELM Load Prewarning Value [<N>]	U16	2 bytes	R W	300	TGD - ELM	Sets the threshold of the current value in mA for the Load Prewarning state of the corresponding top Guard ELM. The value can be configured between 5% and 105% of the configured TGD-ELM Tripping Current Limit, but must not be below 0.5A for the TGD ELM-6 and 2.0A for the TGD ELM-12 (see 5.1).  Default value = 80% of configured TGD-ELM Tripping Current Limit. To enable the new value the corresponding ELM device needs to be restart.

**Table 2 Parameters for topGuard IO-LINK**

Name	Type	Length	Access	Index	Data Source/Sink	Comment/ Description
TGD-ELM Set Factory Default Command [<N>]	Bool	1 byte	W	316	TGD - ELM	<p>After the corresponding ELM device gets the command it configures its parameters to the defined default values.</p> <p>Note: The ELM will be in the same function as before.</p> <p>The reload of new values will be done after command "TGD-ELM restart Command" or after power off-on of the corresponding ELM device.</p>
TGD-ELM Power Down Cycles Counter [<N>]	U16	2 bytes	R	320	TGD - ELM	Number of power down cycles of the corresponding ELM device since production.
TGD-ELM Short Circuit Switch Off Counter [<N>]	U16	2 bytes	R	325	TGD - ELM	Number of Short Circuit Switch Off events (tripping) at the DC-Output of the corresponding ELM device since production.
TGD-ELM Load Alarm Warning Counter [<N>]	U16	2 bytes	R	326	TGD - ELM	The number of Load Alarm Warning crossings of the corresponding ELM device since production.
TGD-ELM Load Alarm Warning Value [<N>]	U16	2 bytes	R W	327	TGD - ELM	<p>Sets the threshold of the current value in mA for the Load Alarm Warning state of the corresponding top Guard ELM.</p> <p>The value can be configured between 5% and 105% of the configured TGD-ELM Tripping Current Limit, but must not be below 0.5A for the TGD ELM-6 and 2.0A for the TGD ELM-12 (see 5.1).</p> <p>Default value = 100% of configured TGD-ELM Tripping Current Limit.</p> <p>To enable the new value the corresponding ELM device needs to be restarted.</p>

**Table 2 Parameters for topGuard IO-LINK**

Name	Type	Length	Access	Index	Data Source/Sink	Comment/ Description
TGD-ELM Tripping Current Limit [<N>]	U16	2 bytes	R W	328	TGD - ELM	<p>Sets the “TGD-ELM Tripping Current Limit” in mA of DC- Output of the corresponding ELM device.</p> <p>The following tripping values can be adjusted:</p> <p>TGD ELM-6: 1000mA 2000mA 3000mA 4000mA 6000mA Default: 6000mA</p> <p>TGD ELM-12: 4000mA 6000mA 8000mA 10000mA 12000mA Default: 6000mA</p> <p>Note: The configuration of this limit automatically sets the TGD-ELM Load Prewarning Value to 80% and the TGD-ELM Load Alarm Warning Value to 100% of the configured limit. (See 5.1)</p> <p>To enable the new value the corresponding ELM device needs to be restarted.</p>
TGD-ELM restart Command [<N>]	Bool	1 byte	W	329	TGD - ELM	After the corresponding ELM device gets the command it executes a soft restart.
TGD-ELM Tripping Characteristic Curve Select [<N>]	8 Bit	1 byte	R W	330	TGD - ELM	<p>Selects the tripping characteristic of the corresponding ELM device. The following values are supported:</p> <p>0x01 = normal time 0x02 = lag time</p> <p>To enable the new value the corresponding ELM device needs to be restarted.</p>

**Table 2 Parameters for topGuard IO-LINK**

Name	Type	Length	Access	Index	Data Source/Sink	Comment/ Description
TGD-ELM Remote Off Command [<N>]	Bool	1 byte	W	332	TGD - ELM	<p>Only valid at TGD-ELM State b001 ("fuse on") or b011 ("fuse on" and "fuse switched off after short circuit")</p> <p>Otherwise it has no effect.</p> <p>After the corresponding ELM device receives the command, it sets the state "fuse off remote". The DC output channel will be switched off.</p> <p>The "fuse switched off after short circuit" state will not be changed.</p> <p>New TGD-ELM Stat: b100 ("fuse off remote") or b110 ("fuse off remote" and "fuse switched off after short circuit").</p>
TGD-ELM Remote On Command [<N>]	Bool	1 byte	W	333	TGD - ELM	<p>Only valid at TGD-ELM State b100 ("fuse off remote") or b110 ("fuse off remote" and "fuse switched off after short circuit")</p> <p>Otherwise it has no effect.</p> <p>After the corresponding ELM device receives the command, it sets the state "fuse off remote". If the state "fuse switched off after short circuit" is <b>not</b> active, the DC output channel will be switched on, otherwise it stays off.</p> <p>The "fuse switched off after short circuit" state will not be changed.</p> <p>New TGD-ELM State: b001 ("fuse on") or b011 ("fuse on" and "fuse switched off after short circuit").</p>
TGD-ELM State [<N>]	3 Bit	1 byte	R	334	TGD - ELM	<p>This information shows the actual fuse state of the corresponding ELM device.</p> <p>bit 0: "device on" state</p> <p>bit 1: "device switched off after short circuit state"</p> <p>bit 2: "device off remote" state</p> <p>If all bits are '0', then the ELM device is in state "device off".</p>

**Table 2 Parameters for topGuard IO-LINK**

Name	Type	Length	Access	Index	Data Source/Sink	Comment/ Description
TGD-ELM State Select [<N>]	2 Bit	1 byte	R W	335	TGD - ELM	<p>Sets a defined TGD-ELM State of the corresponding ELM device after restart or Power up</p> <p>bit0: '0' - selection according bit1 '1' - set to previous state before restart or Power off</p> <p>bit1: '0' - set to "device off" state '1' - set to "device on" state with a delay according to the configured TGD-ELM Output Switch On Delay Time.</p> <p>Default value = "set to previous state before restart or Power off"</p> <p>The reload of new values will be done after command "TGD-ELM restart Command" or after power off-on of the corresponding ELM device.</p>
TGD-ELM Output Switch On Delay Time [<N>]	6 Bit	1 byte	R W	337	TGD - ELM	<p>Sets the TGD-ELM Output Switch On Delay Time of the DC- Output of the corresponding top Guard ELM.</p> <p>It is configured via the following bit patterns:</p> <p>00 0000 = 0: -&gt; 0ms 00 0001 = 1: -&gt; 50ms 00 0010 = 2: -&gt; 100ms 00 0011 = 3: -&gt; 150ms 00 0100 = 4: -&gt; 200ms ..... 11 1111 = 63: 3,15s (Delay Time =value * 50ms)</p> <p>Default value = 0ms</p> <p>Condition for using TGD-ELM Output Switch On Delay Time: The parameter TGD-ELM State Select must be configured as b10.</p>
FIM Device Failure State	1 Bit	1 byte	R	7026	FIM	<p>Represents the internal failure state of the FIM device.</p> <p>0: No failure 1: Failure</p>
FIM Device Type	String [32]	32 bytes	R	7027	FIM	Product (type) name of the FIM device.
FIM Device Order Number	String [10]	10 bytes	R	7028	FIM	Order number of the FIM device.

**Table 2 Parameters for topGuard IO-LINK**

Name	Type	Length	Access	Index	Data Source/Sink	Comment/ Description
FIM Device Serial Number	String [15]	15 bytes	R	7029	FIM	Serial number of the FIM device.
FIM Device HW Version	String [8]	8 bytes	R	7031	FIM	Hardware version number of the FIM device.
FIM Device SW Version	String [8]	8 bytes	R	7032	FIM	Software version number of the FIM device.
FIM Device DVN Version	String [8]	8 bytes	R	7033	FIM	DVN of the FIM device.
FIM Operation Hours Since Production Counter	U32	4 bytes	R	7034	FIM	The operating hours since production of the FIM device.
FIM Device Tag	String [16]	16 bytes	R, W	7035	FIM	Configurable customer defined name for the FIM device.
FIM Power Down Cycles Counter	U16	2 bytes	R	7043	FIM	Number of power down cycles of the FIM device since production.
FIM Count Of Valid Addresses	U16	2 bytes	R	7044	FIM	Count of available ELM devices with valid addresses after Station Addressing
FIM Address State	2 Bit	1 byte	R	7045	FIM	This information shall show internal status of addressing function at the TGD-ELM bus  bit 0: 1: Addressing at TGD-ELM bus plausibility failure 0: no failure  bit 1: 1: Addressing at TGD-ELM bus running 0: Addressing at TGD-ELM bus ready
FIM TGD-ELM Bus Communication OK State	Bool	1 byte	R	7046	FIM	Represents the state of the communication of the TGD-ELM Bus  0: No failure 1: Failure
FIM Plausibility Check OK State	Bool	1 byte	R	7047	FIM	Represents the state of the plausibility check between FIM and the ELM devices.  0: No failure 1: Failure
FIM Combi Device Failure State	Bool	1 byte	R	7048	FIM	Represents the combined device failure states of the FIM device and the TGD-ELM devices.  0: No failure 1: Failure
CIOL Device Type	String [32]	32 bytes	R	7327	CIOL	Product (type) name of CIOL device
CIOL Device Order Number	String [10]	10 bytes	R	7328	CIOL	Order number of CIOL device

**Table 2 Parameters for topGuard IO-LINK**

Name	Type	Length	Access	Index	Data Source/Sink	Comment/ Description
CIOL Device Serial Number	String [15]	15 bytes	R	7329	CIOL	Serial number of CIOL device
CIOL Device HW Version	String [8]	8 bytes	R	7331	CIOL	Hardware version number of CIOL device
CIOL Device SW Version	String [8]	8 bytes	R	7332	CIOL	Software version number of CIOL device
CIOL Device DVN Version	String [8]	8 bytes	R	7333	CIOL	Device version number of the CIOL device.
CIOL Operation Hours Since Production Counter	U32	4 bytes	R	7334	CIOL	The operating hours since production of the CIOL device.
CIOL Device Temperature	S16	2 bytes	R	7340	CIOL	Internal temperature of CIOL device in hundred of °C (3000 = 30.00°C)
CIOL Device Temperature >60°C Counter	U16	2 bytes	R	7341	CIOL	The number of 60°C limit crossings of the internal temperature of the CIOL device since production.
CIOL Device Temperature >70°C Counter	U16	2 bytes	R	7342	CIOL	The number of 70°C limit crossings of the internal temperature of the CIOL device since production.
CIOL Device Temperature <-25°C Counter	U16	2 bytes	R	7343	CIOL	The number of -25°C limit crossings of the internal temperature of the CIOL device since production.
CIOL Device Temperature <-40°C Counter	U16	2 bytes	R	7344	CIOL	The number of -40°C limit crossings of the internal temperature of the CIOL device since production.
CIOL Device Tag	String [16]	16 bytes	R, W	7345	CIOL	Configurable customer defined name for the CIOL device.
CIOL Power Down Cycles Counter	U16	2 bytes	R	7346	CIOL	Number of power down cycles of the CIOL device since production.
Combi Device Failure State	Bool	1 byte	R	7351	no	Represents the combined device failure states of the CIOL device, the FIM device and the TGD-ELM devices. 0: No failure 1: Failure
Combi Device ID Switch Changed State	Bool	1 byte	R	7352	no	Represents the Device ID Switch changed state of the CIOL device. 0: Device ID Switch not changed 1: Device ID Switch changed

Title: topGUARD IO-Link Register Description		
	DocVersion: 1.3	Review

#### 4.3.2 System Commands for topGuard IO-LINK

Table 3: System Commands for top Guard IO-LINK		Comment/ Description
Command Name	Command Number	
Combi Restart Command	160	After the CIOL device gets the command it executes a soft restart the following steps are executed. (1) Soft restart of all TGD-ELMs (2) Soft restart of the FIM (3) Soft restart of the CIOL
FIM Restart Command	161	After the FIM device gets the command it executes a soft restart.
FIM Set Factory Default Command	164	After the FIM device gets the command it configures its parameters to the defined default values.
CIOL Restart Command	167	After the CIOL device gets the command it executes a soft restart.
CIOL Set Factory Default Command	168	After the CIOL device gets the command it configures its parameters to the defined default values.

### 4.3.3 Event Codes for topGuard IO-LINK

In some engineering tools the event codes are prefixed with 0xFFFF.

**Table 4 Events Codes for top Guard IO-LINK**

Event Name	Event Code	Event Type	Event Mode	Length [Bits]	Comment/ Description
TGD-ELM <N> - Over Voltage Peak	6144 + N-1	Information	Singleshot	1 bit	Signals an Over Voltage Peak at the corresponding ELM device. Condition: $U_{in} > 32V$ for $t > 200ms$
TGD-ELM <N> - Under Voltage Peak	6208 + N-1	Information	Singleshot	1 bit	Signals an Under Voltage Peak at the corresponding ELM device. Condition: $U_{in} < 17.5V$ for $t > 200ms$
TGD-ELM <N> - Device Temperature >100°C	6272 + N-1	Warning	Appears / Dis-appears	1 bit	Signals, that temperature on corresponding ELM device exceeds 100°C. Condition: $T > 100^{\circ}C$
TGD-ELM <N> - Reverse Voltage Output	6336 + N-1	Information	Singleshot	1 bit	Signals an Reverse Voltage Peak at the corresponding ELM device. Condition: $U_{out} > 5V$ for $t > 2s$ , when DC Output is disabled
TGD-ELM <N> - Off	36000 + N-1	Information	Singleshot	1 bit	Signals, that the TGD-ELM State of the corresponding ELM device is switched to "device off". Condition: Switch to state "device on" via push button or after start up regarding to the "TGD-ELM State Select" configuration.
TGD-ELM <N> - On	36064 + N-1	Information	Singleshot	1 bit	Signals, that the TGD-ELM State of the corresponding ELM device is switched to "device on" Switch to state "device off" via push button or after start up regarding to the "TGD-ELM State Select" configuration.
FIM - Device Failure	36320	Error	Appears / Dis-appears	1 bit	Signals an internal failure of the FIM device.
CIOL - Device Temperature >60°C	36321	Information	Singleshot	1 bit	Signals, that temperature on CIOL device exceeds 60°C. Condition: $T > 60^{\circ}C$

CIOL - Device Temperature >70°C	36322	Warning	Appears / Dis-appears	1 bit	Signals, that temperature on CIOL device exceeds 70°C. Condition: $T > 70^\circ\text{C}$
CIOL - Device Temperature <-25°C	36323	Information	Singleshot	1 bit	Signals, that temperature on CIOL device exceeds -25°C. Condition: $T < -25^\circ\text{C}$
CIOL - Device Temperature <-40°C	36324	Warning	Appears / Dis-appears	1 bit	Signals, that temperature on CIOL device exceeds -40°C. Condition: $T < -40^\circ\text{C}$
CIOL Device Failure	36325	Error	Appears / Dis-appears	1 bit	Signals an internal failure of the CIOL device.

## 5 Special Functions

### 5.1 Tripping Current and Warning Limit Values Configuration

The TGD ELM can be configured to operate at different tripping current with 2 different characteristics (medium and lag time).

The tripping current limit can only be configured to fix values matching the entries in the table.

TGD ELM-6: 1A (1000), 2A (2000), 3A (3000), 4A (4000) and 6A (6000)

TGD ELM-12: 4A (4000), 6A (6000), 8A (8000), 10A (10000) and 12A (12000)

Changing the tripping current limit value to a valid new one will reset the Alarm and Prewarning limit values to 100% (Alarm) and 80% (Prewarning) of the configured tripping current.

Changing the tripping current limit to an invalid value will not reset the Alarm and Prewarning limit values to default. They remain in the last configured state.

**Table 5: Tripping characteristic medium TGD ELM-6**

Switch off time in ms	Warning limit value:	Current (I) in A 1A Range	Current (I) in A 2A Range	Current (I) in A 3A Range	Current (I) in A 4A Range	Current (I) in A 5A Range	Current (I) in A 6A Range
n.a.	<b>Prewarning (Alarm1):</b> default value	I > 0.80A	I > 1.60A	I > 2.40A	I > 3.20A	n.a.	I > 4.80A
	<b>Alarm (Alarm2):</b> default value	I > 1.00A	I > 2.00A	I > 3.00A	I > 4.00A	n.a.	I > 6.00A
<b>t = ∞</b>		I < 1.10A	I < 2.20A	I < 3.30A	I < 4.40A	n.a.	I < 6.60A
<b>t = 5000</b>		I < 2.00A	I < 3.00A	I < 4.00A	I < 5.00A	n.a.	I < 7.40A
<b>t = 1000</b>		I < 3.00A	I < 4.40A	I < 5.00A	I < 6.00A	n.a.	I < 9.00A
<b>t = 100</b>		I < 6.00A	I < 8.00A	I < 9.00A	I < 10.00A	n.a.	I < 14.00A
<b>t = 10</b>		I < 14.00A	I < 14.00A	I < 17.00A	I < 18.00A	n.a.	I < 18.00A
<b>t = 5</b>		I > 14.00A	I > 14.00A	I > 17.00A	I > 18.00A	n.a.	I > 18.00A

**Table 6: Tripping characteristic lag TGD ELM-6**

Switch off time in ms	Warning limit default	Current (I) in A 1A Range	Current (I) in A 2A Range	Current (I) in A 3A Range	Current (I) in A 4A Range	Current (I) in A 5A Range	Current (I) in A 6A Range
n.a.	<b>Prewarning (Alarm1):</b> default value	I > 0.80A	I > 1.60A	I > 2.40A	I > 3.20A	n.a.	I > 4.80A
	<b>Alarm (Alarm2):</b> default value	I > 1.00A	I > 2.00A	I > 3.00A	I > 4.00A	n.a.	I > 6.00A
<b>t = ∞</b>	n.a.	I < 1.10A	I < 2.20A	I < 3.30A	I < 4.40A	n.a.	I < 6.60A
<b>t = 5000</b>		I < 2.00A	I < 3.00A	I < 4.00A	I < 5.00A	n.a.	I < 7.40A
<b>t = 1000</b>		I < 3.00A	I < 4.40A	I < 5.00A	I < 6.00A	n.a.	I < 9.00A
<b>t = 100</b>		I < 6.00A	I < 8.00A	I < 9.00A	I < 10.00A	n.a.	I < 14.00A
<b>t = 30</b>		I < 12.00A	I < 13.00A	I < 15.00A	I < 18.00A	n.a.	I < 18.00A
<b>t = 10</b>		I < 15.00A	I < 15.00A	I < 18.00A	I < 20.00A	n.a.	I < 20.00A
<b>t = 5</b>		I > 15.00A	I > 15.00A	I > 18.00A	I > 20.00A	n.a.	I > 20.00A

**Table 7: Tripping characteristic medium time TGD ELM-12**

Switch off time in ms	Warning limit default	Current (I) in A 4A Range	Current (I) in A 6A Range	Current (I) in A 8A Range	Current (I) in A 10A Range	Current (I) in A 12A Range
n.a.	<b>Prewarning (Alarm1):</b> default value	I > 3.20A	I > 4.80A	I > 6.40A	I > 8.00A	I > 9.60A
	<b>Alarm (Alarm2):</b> default value	I > 4.00A	I > 6.00A	I > 8.00A	I > 10.00A	I > 12.00A
<b>t = ∞</b>	n.a.	I < 4.40A	I < 6.60A	I < 8.80A	I < 11.00A	I < 13.20A
<b>t = 5000</b>		I < 5.00A	I < 7.40A	I < 9.50A	I < 14.00A	I < 18.00A
<b>t = 1000</b>		I < 6.00A	I < 9.00A	I < 14.00A	I < 18.00A	I < 20.00A
<b>t = 100</b>		I < 10.00A	I < 14.00A	I < 19.00A	I < 20.00A	I < 22.00A
<b>t = 10</b>		I < 18.00A	I < 18.00A	I < 40.00A	I < 40.00A	I < 40.00A
<b>t = 5</b>		I > 18.00A	I > 18.00A	I > 40.00A	I > 40.00A	I > 40.00A

Table 8: Tripping characteristic lag time TGD ELM-12						
Switch off time in ms	Warning limit default	Current (I) in A 4A Range	Current (I) in A 6A Range	Current (I) in A 8A Range	Current (I) in A 10A Range	Current (I) in A 12A Range
n.a.	<b>Prewarning (Alarm1):</b> default value	I > 3.20A	I > 4.80A	I > 6.40A	I > 8.00A	I > 9.60A
	<b>Alarm (Alarm2):</b> default value	I > 4.00A	I > 6.00A	I > 8.00A	I > 10.00A	I > 12.00A
<b>t = ∞</b>	n.a.	I < 4.40A	I < 6.60A	I < 8.80A	I < 11.00A	I < 13.20A
<b>t = 5000</b>		I < 5.00A	I < 7.40A	I < 9.50A	I < 14.00A	I < 18.00A
<b>t = 1000</b>		I < 6.00A	I < 9.00A	I < 14.00A	I < 18.00A	I < 20.00A
<b>t = 100</b>		I < 10.00A	I < 14.00A	I < 18.00A	I < 20.00A	I < 24.00A
<b>t = 30</b>		I < 18.00A	I < 18.00A	I < 28.00A	I < 30.00A	I < 34.00A
<b>t = 10</b>		I < 20.00A	I < 20.00A	I < 44.00A	I < 48.00A	I < 48.00A
<b>t = 5</b>		I > 20.00A	I > 20.00A	I > 44.00A	I > 48.00A	I > 48.00A

### 5.1.1 Alarm and Prewarning Configuration

The Alarm and Prewarning level can be configured in range of 5..105% with a step width of 1mA.

### 5.1.2 Take over and readability of configuration

Any parameterization of characteristic, tripping current limit or other parameter can be read back immediately after write process, but changes will not be active. The TGD ELM device will continue to operate according the prior settings.

To take over the latest configuration it is necessary to either perform a power cycle, execute the reset device command or by switching the output off and on again through the push button.

### 5.1.3 Specified range for current measurement and failure

TGD ELM-6: 0.50A ... 24.00A; failure: < 400mA

TGD ELM-12: 2.00A ... 50.00A; failure: < 1,5A