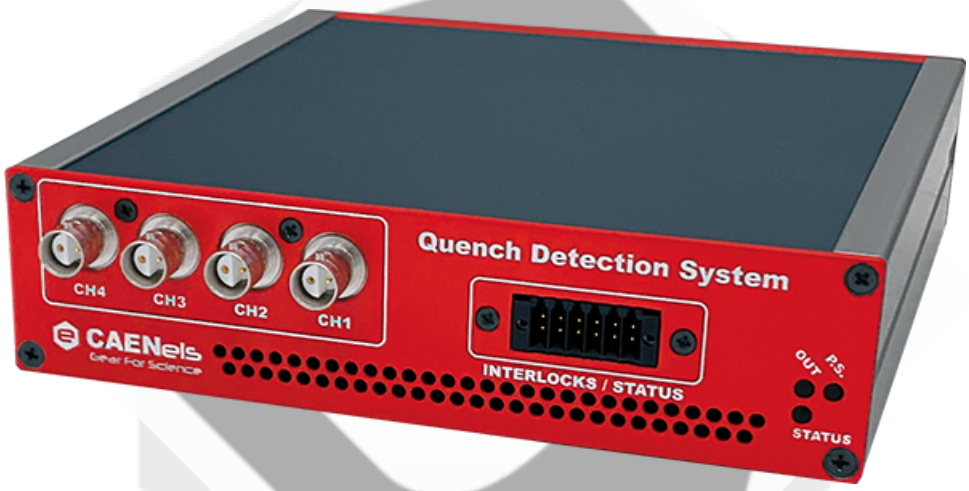
Quench Detection System
Commands Reference Manual



CAEN ELS s.r.l.

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1 Document Revisions

Document Revision	Date	Requirements
0.1	September 8th, 2021	First Release

2 QDS Commands List

2.0.1 Preliminary Notes

Numbers are transmitted in ASCII data format.

All commands are terminated with character \r\n.

Write commands respond with ACK or NAK:<error_code>. At the end of document there is a list of error codes with description.

Read commands respond with an echo.

Command are formatted as:
<COMMAND>, <COMMAND>:<OPTION> or <COMMAND>:<PARAMETER>:<OPTION>.

2.1 Basic commands

2.1.1 VER command

Reads device model and version.

R / W	Command	Response
R	VER	VER:QDS:<*version*>:<*info_1*>:<*info_2*>:...

Example:

```
VER
#VER:QDS:1.0.00:+/-20V +/-20mV
```

2.1.2 HELP command

Reads commands list.

R / W	Command	Response
R	HELP	<*command*>\t<*description*>
R	?	<*command*>\t<*description*>

Example:

```
HELP
#GET            Gets single reading
#RNG            Voltmeter input range
#ENA            Channels enabled
#WIN            Time window size
#THR            Channel thresholds
#STR            Quench status
#PRS            Persistent switch status
#USRCORR        User correction of voltages
#FLS            Full scale input
#DFLT           Restores default parameters
#SAVE           Stores current configuration
#LOAD           Configuration on startup
#VER            Displays model and version
#TEMP           Gets system temperature
#IFCONFIG       Displays interface config and stats
#HELP           Displays commands
#?              Displays commands
```

2.1.3 TEMP command

Reads internal system temperature.

R / W	Command	Response
R	TEMP	TEMP:<*value*>

Parameters:

value	Type	Unit
System temperature	int	°C

Example:

```
TEMP
#TEMP:32
```

2.1.4 IFCONFIG command

Reads interface configuration and statistics.

R / W	Command
R	IFCONFIG
R	IFCONFIG:TCP
R	IFCONFIG:LINK
R	IFCONFIG:ICMP

Example:

```
IFCONFIG
#  MAC: 00:12:5e:01:00:00
#  IP address: 192.168.1.201
#  Netmask: 255.255.255.0
#  Gateway: 192.168.1.1
#  Rx bytes: 4575482 (54730 frames), TX bytes: 2641 (35
   frames)
#  Errors:
#    Frame errors: 0, Alignment errors: 0, In errors: 0
IFCONFIG:TCP
#TCP stats:
#        xmit: 17
#        recv: 36
#        fw: 0
#        drop: 0
#        chkerr: 0
#        lenerr: 0
#        memerr: 0
#        rterr: 0
#        proterr: 0
#        opterr: 0
#        err: 0
#        cachehit: 0
IFCONFIG:LINK
#Link stats:
#        xmit: 45
#        recv: 62682
#        fw: 0
#        drop: 0
```

```
#         chkerr: 0
#         lenerr: 0
#         memerr: 0
#         rterr: 0
#         proterr: 0
#         opterr: 0
#         err: 0
#         cachehit: 0
IFCONFIG:ICMP
#ICMP stats:
#         xmit: 0
#         recv: 0
#         fw: 0
#         drop: 0
#         chkerr: 0
#         lenerr: 0
#         memerr: 0
#         rterr: 0
#         proterr: 0
#         opterr: 0
#         err: 0
#         cachehit: 0
```

2.2 QDS Commands

2.2.1 GET command

Reads single or all channels.

R / W	Command	Response
R	GET:<*channel*>:?	GET:<*channel*>:<*value*>
R	GET:?	GET:ALL:<*value_ch1*>:<*value_ch2*>:. . . :<*value_ch34*>

Parameters:

channel	Description
CH1	Physical channel 1
CH2	Physical channel 2
CH3	Physical channel 3
CH4	Physical channel 4
CH12	Differential channel | CH1 - CH2 |
CH13	Differential channel | CH1 - CH3 |
CH14	Differential channel | CH1 - CH4 |
CH23	Differential channel | CH2 - CH3 |
CH24	Differential channel | CH2 - CH4 |
CH34	Differential channel | CH3 - CH4 |

Channels order
CH1 : CH2 : CH3 : CH4 : CH12 : CH13 : CH14 : CH23 : CH24 : CH34

value / value_chx	Description
float number (scientific notation, lowercase)	Voltage [V]
NA	Channel disabled

Example:

```
GET:CH1:?
#GET:CH1:-3.854367e-01

GET:CH24:?
```

```
#GET:CH1:NA

GET:?
#GET:-5.946926e-04:-1.568700e-05:NA:3.145415e-04:5.787789e
    -04:1.023630e-03:9.088537e-04:NA:3.300733e-04:1.147742e-04
```

2.2.2 RNG Command

Writes/Reads single or all channels range. If a channel threshold is higher than full scale value of new range, threshold is set to the full scale value.

R / W	Command	Response
W	RNG:<*channel*>:<*value*>	ACK
R	RNG:<*channel*>:?	RNG:<*channel*>:<*value*>
W	RNG:<*value*>	ACK
R	RNG:?	RNG:<*value_ch1*>:<*value_ch2*>:<*value_ch3*>:<*value_ch4*>

Parameters:

channel	Description
CH1	Physical channel 1
CH2	Physical channel 2
CH3	Physical channel 3
CH4	Physical channel 4

range	Input Full Range [V]
0 (default)	+/- 20
1	+/- 10
2	+/- 5
3	+/- 2.5
4	+/- 1.25
5	+/- 0.625
6	+/- 0.3125
7	+/- 0.15625
8	+/- 0.078125
9	+/- 0.390625
10	+/- 0.01953125

Example:

```
RNG:CH1:3
#ACK

RNG:CH4:?
```

```
#RNG:CH4:7

RNG:5
#ACK

RNG:?
#RNG:7:5:8:0
```

2.2.3 WIN Command

Writes/Reads single or all channels time windows.

R / W	Command	Response
W	WIN:<*channel*>:<*value*>	ACK
R	WIN:<*channel*>:?	WIN:<*channel*>:<*value*>
W	WIN:<*value*>	ACK
R	WIN:?	WIN:<*value_ch1*>:<*value_ch2*>:. . . :<*value_ch34*>

Parameters:

channel	Description
CH1	Physical channel 1
CH2	Physical channel 2
CH3	Physical channel 3
CH4	Physical channel 4
CH12	Differential channel | CH1 - CH2 |
CH13	Differential channel | CH1 - CH3 |
CH14	Differential channel | CH1 - CH4 |
CH23	Differential channel | CH2 - CH3 |
CH24	Differential channel | CH2 - CH4 |
CH34	Differential channel | CH3 - CH4 |

Channels order
CH1 : CH2 : CH3 : CH4 : CH12 : CH13 : CH14 : CH23 : CH24 : CH34

value / value_chx	Default	Type	Min	Max	Unit
Time window	10	int	10	500	ms

Example:

```
WIN:CH2:100
#ACK

WIN:CH24:?
#WIN:CH24:500
```

```
WIN:50
#ACK

WIN:?
#WIN:500:100:20:50:10:250:100:300:500:10
```

2.2.4 THR Command

Writes/Reads single or all channels threshold.

R / W	Command	Response
W	THR:<*channel*>:<*value*>	ACK
R	THR:<*channel*>:?	THR:<*channel*>:<*value*>
W	THR:<*value*>	ACK
R	THR:?	THR:<*value_ch1*>:<*value_ch2*>:. . . :<*value_ch34*>

Parameters:

channel	Description
CH1	Physical channel 1
CH2	Physical channel 2
CH3	Physical channel 3
CH4	Physical channel 4
CH12	Differential channel | CH1 - CH2 |
CH13	Differential channel | CH1 - CH3 |
CH14	Differential channel | CH1 - CH4 |
CH23	Differential channel | CH2 - CH3 |
CH24	Differential channel | CH2 - CH4 |
CH34	Differential channel | CH3 - CH4 |

Channels order
CH1 : CH2 : CH3 : CH4 : CH12 : CH13 : CH14 : CH23 : CH24 : CH34

value / value_chx	Default	Type	Min	Max	Un
Threshold	20 (physical channels) 40 (differential channels)	float	0	Full scale value (see FLS command) Sum of physical channels full scale value (for differential channels)	V

Example:

```
THR:CH1:1
#ACK
```

```
THR:CH14:?
#THR:CH24:2.500000

THR:3
#ACK

THR:?
#THR:4.00000:1.000000:2.000000:2.400000:3.000000:
   1.000000:1.000000:5.000000:3.500000:10.000000
```

2.2.5 ENA Command

Enables/Disables channel.

R / W	Command	Response
W	ENA:<*channel*>:<*value*>	ACK
R	ENA:<*channel*>:?	RNG:<*channel*>:<*value*>
W	ENA:<*value*>	ACK
R	ENA:?	RNG:<*value_ch1*>:<*value_ch2*>:. . . :<*value_ch34*>

Parameters:

channel	Description
CH1	Physical channel 1
CH2	Physical channel 2
CH3	Physical channel 3
CH4	Physical channel 4
CH12	Differential channel | CH1 - CH2 |
CH13	Differential channel | CH1 - CH3 |
CH14	Differential channel | CH1 - CH4 |
CH23	Differential channel | CH2 - CH3 |
CH24	Differential channel | CH2 - CH4 |
CH34	Differential channel | CH3 - CH4 |

Channels order
CH1 : CH2 : CH3 : CH4 : CH12 : CH13 : CH14 : CH23 : CH24 : CH34

value / value_chx	Description
ON (default)	Channel enabled
OFF	Channel disabled

Example:

```
ENA:CH3:ON
#ACK

ENA:CH13:?
```

```
#ENA:CH13:OFF

ENA:ON
#ACK

ENA:?
#ENA:OFF:OFF:OFF:OFF:OFF:OFF:OFF:OFF:OFF:OFF
```

2.2.6 STR Command

Reads/Resets status.

R / W	Command	Response
W	STR:RESET	ACK
R	STR:?	STR:0X<*mask*>

Parameters:

mask	Description	Type	Min	Max
Status	CH1|CH2|CH3|CH4|CH12|CH13|CH14|CH23|CH24|CH34	hex	0	3FF

channel	Quench event	No quench event
CH1 quench signal ON/OFF	0b1000000000 or 0x200	0b0 or 0x0
CH2 quench signal ON/OFF	0b0100000000 or 0x100	0b0 or 0x0
CH3 quench signal ON/OFF	0b0010000000 or 0x80	0b0 or 0x0
CH4 quench signal ON/OFF	0b0001000000 or 0x40	0b0 or 0x0
CH12 quench signal ON/OFF	0b0000100000 or 0x20	0b0 or 0x0
CH13 quench signal ON/OFF	0b0000010000 or 0x10	0b0 or 0x0
CH14 quench signal ON/OFF	0b0000001000 or 0x8	0b0 or 0x0
CH23 quench signal ON/OFF	0b0000000100 or 0x4	0b0 or 0x0
CH24 quench signal ON/OFF	0b0000000010 or 0x2	0b0 or 0x0
CH34 quench signal ON/OFF	0b0000000001 or 0x1	0b0 or 0x0

Example:

```
STR:RESET
#ACK

STR:?
#STR:0X80
```

2.2.7 PRS Command

Sets/Clears persistent switch.

R / W	Command	Response
W	PRS:<*value*>	ACK
R	PRS:?	PRS:<*value*>

value	Description
ON	Set persistent switch
OFF (default)	Clear persistent switch

Example:

```
PRS:ON
#ACK

PRS:?
#PRS:OFF
```

2.2.8 USRCORR Command

Enables/Disables or write/read user correction or store values. Add user correction voltage to the acquired value.

R / W	Command	Response
W	USRCORR:<*state*>	ACK
R	USRCORR:?	USRCORR:<*state*>
W	USRCORR:RNG<*r*>CH<*ch*>OFFS:<*v*>	ACK
R	USRCORR:RNG<*r*>CH<*ch*>OFFS:?	USRCORR:RNG<*r*>CH<*ch*>OFFS:<*v*>
W	USRCORR:SAVE	ACK

- where *r*, *ch* and *v* stand for *range*, *channel* and *value* respectively.

Parameters:

state	Description
ON	User correction enabled
OFF (default)	User correction disabled

range	Description
0	+/- 20 V Full scale voltage
1	+/- 10 V Full scale voltage
2	+/- 5 V Full scale voltage
3	+/- 2.5 V Full scale voltage
4	+/- 1.25 V Full scale voltage
5	+/- 0.625 V Full scale voltage
6	+/- 0.3125 V Full scale voltage
7	+/- 0.15625 V Full scale voltage
8	+/- 0.078125 V Full scale voltage
9	+/- 0.0390625 V Full scale voltage
10	+/- 0.01953125 V Full scale voltage

channel	Description
CH1	Physical channel 1
CH2	Physical channel 2

channel	Description
CH3	Physical channel 3
CH4	Physical channel 4

value	default	Type	Unit
offset correction	0	float	V

Example:

```
USRCORR:OFF
#ACK

USRCORR:?
#USRCORR:ON

USRCORR:RNG10CH2OFFS:-1.564598
#ACK

USRCORR:RNG8CH1OFFS:?
#USRCORR:RNG8CH1OFFS:2.682657

USRCORR:SAVE
```

2.2.9 FLS Command

Reads channel/range full scale. Differential channel full scale value is the sum of physical channel full scale values.

R / W	Command	Response
R	FLS:<*channel*>:?	FLS:<*channel*>:<*value*>
R	FLS:<*range*>:?	FLS:<*range*>:<*value*>

Parameters:

channel	Description
CH1	Physical channel 1
CH2	Physical channel 2
CH3	Physical channel 3
CH4	Physical channel 4
CH12	Differential channel | CH1 - CH2 |
CH13	Differential channel | CH1 - CH3 |
CH14	Differential channel | CH1 - CH4 |
CH23	Differential channel | CH2 - CH3 |
CH24	Differential channel | CH2 - CH4 |
CH34	Differential channel | CH3 - CH4 |

range	Available Full Scale Voltage [V]
0	20
1	10
2	5
3	2.5
4	1.25
5	0.625
6	0.3125
7	0.15625
8	0.078125
9	0.0390625
10	0.01953125

Example:

```
FLS:CH1:?
#FLS:CH1:2.500000

FLS:RNG6:?
#FLS:RNG6:0.312500
```

2.2.10 DFLT Command

Restores default parameters.

R / W	Command	Response
W	DFLT	ACK

Parameter	Default value
Range	0
Time window [ms]	10
Enable	ON
Threshold [V]	20 (physical channel) 40 (differential channel)
User correction	OFF
Status	0x0

Example:

```
DFLT
#ACK
```

2.2.11 SAVE Command

Saves configuration: channels enabled, time windows, thresholds and user correction enable/disable. On startup range is always set to 0.

R / W	Command	Response
W	SAVE	ACK

Example:

```
SAVE
#ACK
```

2.2.12 LOAD Command

Configuration to load on startup (default or user parameters).

R / W	Command	Response
R	LOAD:?	LOAD:<*setting*>
W	LOAD:<*setting*>	ACK

Parameters:

setting	Description
DFLT	Default setting
USER	User setting saved

Example:

```
LOAD:?
#LOAD:DFLT

LOAD:USER
#ACK
```

2.2.13 DEVID Command

Configuration to load on startup (default or user parameters).

R / W	Command	Response
R	DEVID:?	DEVID:<*dev_id*>
W	DEVID:SAVE:<*dev_id*>	ACK

Parameters:

dev_id	Description
CELS	Default value Only 4 characters are allowed

Example:

```
DEVID:SAVE:QDS1
#ACK

DEVID:?
#DEVID:QDS1

DEVID:SAVE:ABCDE
#NAK:96
```

2.3 QDS Errors

2.3.1 Errors list

Code	Description
0	Invalid command
18	error_wrong_config
19	error_wrong_channel
20	error_wrong_enable
21	error_wrong_thr
22	error_wrong_range
23	error_wrong_usrcorr
24	error_wrong_timeWindow
25	error_wrong_status
96	error_wrong_dev_id