

QBU-10kV Pockels cell driver

User manual

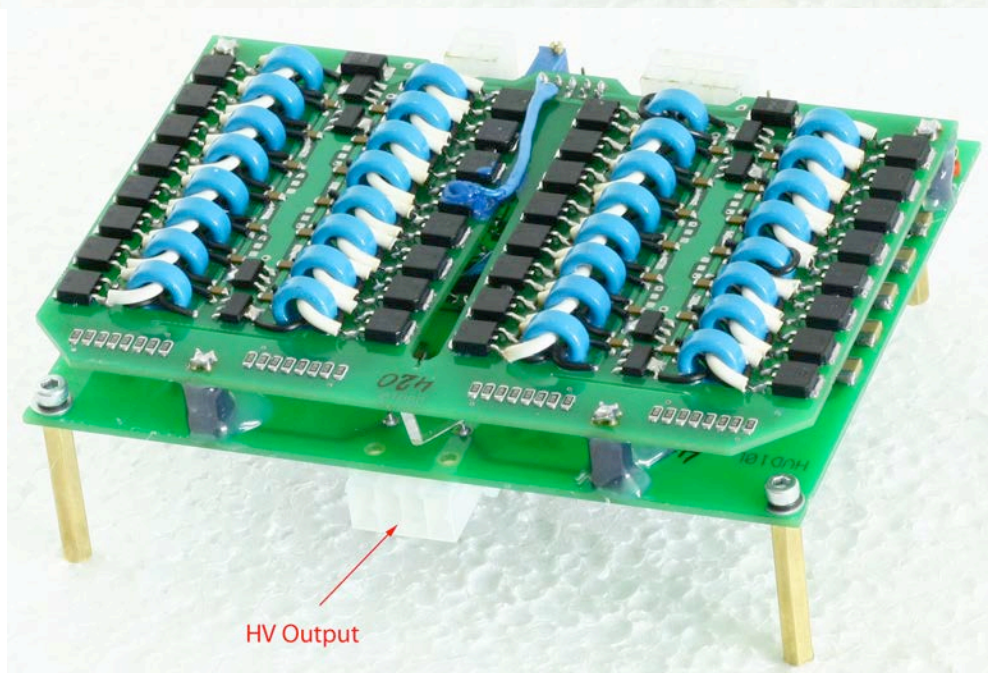
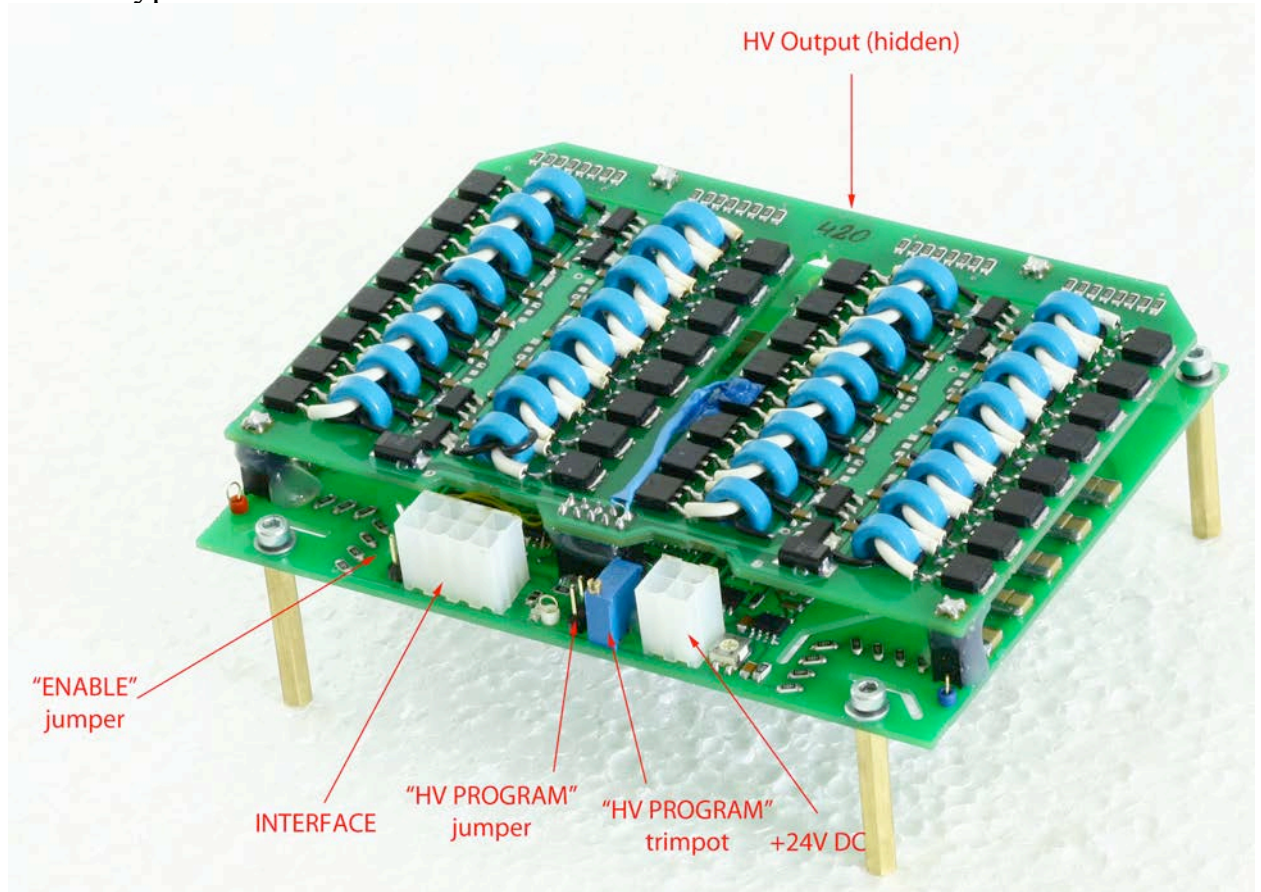
Warning! This equipment produces high voltages that can be very dangerous.
Please read user manual before starting operations.

Important note: please measure the output with symmetrical (differential) high voltage probe only. Measurement made with inappropriate equipment is a common cause of driver's failure.



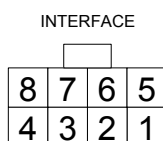
Overview

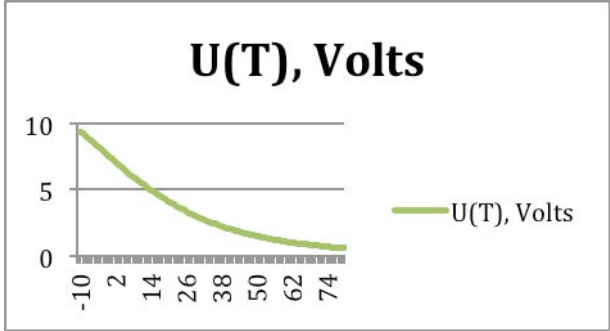
QBU-10kV Pockels cell driver produces high voltage pulses with high repetition rate, fast risetime and falltime, adjustable voltage amplitude and pulse width. Two control types are available: manual and automatic



Interfaces / signals / descriptions

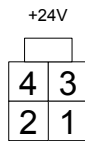
INTERFACE (Molex 39-30-1060):



PIN (color)	DESIGNATION	DESCRIPTION
1 (transparent)	Pulse	While “0” or ”1” is applied to PIN1 high voltage output is maintained correspondingly at 0V or HV level Sequences of incoming pulses with period less than approx. 200 ns will be ignored by the driver
2 (violet)	Temperature Monitor	This pin returns output voltage showing the internal temperature of the driver. Approximate U(T) dependence is given below. 
3 (red)	+15 V	Provides +15V DC output level; maximal current capability is 100mA
4 (blue)	Enable	HV output is enabled / disabled by PIN4 (“1” – enable, “0” – disable)
5, 6 (black)	Interface Return	PIN5 and PIN6 are connected to the driver’s ground circuit
7 (yellow)	HV Monitor	The voltage at PIN7 is a monitor signal proportional to the measured value of the high voltage output 10kV corresponds to 10V at PIN7, 4kV corresponds to approx. 4V at PIN7
8 (green)	HV Program	Positive DC voltage applied to PIN8 sets up high voltage value HV 10kV corresponds to 10V at PIN8, 4kV corresponds to approx. 4V at PIN8

“0” means logical 0 low level (0V), “1” means logical 1 high level (5V)

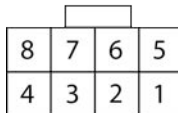
+24V (Molex 39-30-1040):



PIN (color)	DESIGNATION	DESCRIPTION
1, 2 (red)	+24V DC	INPUT positive 24V DC for turn on the Pockels cell driver
3, 4 (black)	RETURN	Return from power supply producing +24V DC

HV OUTPUT (Molex 39-30-1060):

HV Output



PIN (color)	DESIGNATION	DESCRIPTION
1 (blue)	Negative	HV Negative
4 (red)	Positive	HV Positive
2, 3, 5-8	N/C	-

“ENABLE” JUMPER:

One can use “ENABLE” JUMPER instead of “ENABLE” signal of INTERFACE. It isn’t recommended to use “ENABLE” JUMPER and “ENABLE” signal at the same time.

“HV PROGRAM” JUMPER AND “HV PROGRAM” TRIMPOD:

One can use “HV PROGRAM” JUMPER instead of “HV PROGRAM” signal of INTERFACE. If this jumper is set on, the output voltage is defined with “HV PROGRAM” TRIMPOD state. It isn’t recommended to use “HV PROGRAM” JUMPER and “HV PROGRAM” signal at the same time.

Safety

**Warning! This equipment produces high voltages that can be very dangerous.
Don't be careless around this equipment**

- Avoid casual contacts of personnel with output cables and with the load
- Do not connect / disconnect cables while driver is turned on
- Do not operate with disconnected load
- Be very careful setting jumpers on and off and using HV Program trimpot; accidental contact to the board may be fatal; from the same point of view it's recommended to control the driver not manually, but remotely via Interface connector
- Be careful with driver's neighborhood; do not store disordered items close to any side of the driver
- Do not turn the driver on if it was already damaged with water, chemicals, mechanical or electrical shock; do not self-repair the driver

Operations (Manual control)

1. Connect +24VDC power supply, pulse generator and Pockels cell
2. Set up “HV PROGRAM” JUMPER
3. Turn on +24VDC power supply
4. Set up “ENABLE” JUMPER
5. Use “HV PROGRAM” TRIMPOD to set up required output voltage
6. Send driving pulses from pulse generator to PIN1 of INTERFACE.
Set pulse width longer than 200 ns
7. To power down the driver, turn off +24VDC power supply or remove “ENABLE” JUMPER

Operations (Automatic control)

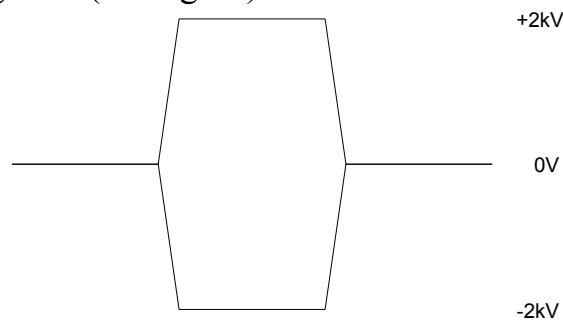
1. Connect +24V, INTERFACE and HV OUTPUT connectors to the board
2. Remove “HV PROGRAM” JUMPER, remove “ENABLE” JUMPER
3. DISABLE the high voltage output
4. Apply the correct nominal DC INPUT power to the module
5. Set up the required output voltage by applying a DC voltage to the HV PROGRAM PIN8 of INTERFACE
6. ENABLE the high voltage output
7. Send driving pulses to PIN1 of INTERFACE.
Set pulse width longer than 200 ns
8. To power down the driver, remove DC INPUT power or DISABLE high voltage output

Technical notes

- **Performance of the module greatly depends on load capacitance.** Full performance is achievable at load capacitance < 11 pF.

Higher load capacitance decreases maximal allowed repetition rate

- **Module's output is bipolar.** This means that e.g. 4kV pulse is physically formed by applying +2kV to the positive output wire and -2kV to the negative (see figure)



Nevertheless, all descriptions of HV output are given in terms of voltage differences. Please keep it in mind!

- **Sometimes output is delayed.** If no switching of the output voltage occurs for a long time (about 100 us) the driver needs to refresh its state. During refreshment it's prohibited to switch the output.

As a result if pulse width is more than 100 us or if the distance between two sequential pulses is more than 100 us, sometimes switching of the high voltage output may be delayed. The delay time is about 150 ns.

Specifications

ELECTRICAL SPECIFICATION

Input	+24V DC; 0.5 A max
Output	
Working mode	repetition of the input TTL signal
HV higher level ¹	adjustable in 4 – 10 kV range
HV lower level ¹	0 V, fixed
Pulse width	200 ns – DC
Max. repetition rate	> 5 kHz at the full load (10 kV, 11 pF)
Risetime / falltime	< 20 ns / <25 ns ²
Jitter	~ 1,5 ns
Delay time	~ 150 ns
Protections	from overheating (approx. 72 °C)
Environment	
Operation temperature	+10...+40 °C
Storage temperature	-20...+60 °C
Humidity	90%, non-condensing

¹ In terms of bipolar output (see also Technical notes section)

² 10-90% level, warranted at load capacitance 11 pF and below

MECHANICAL SPECIFICATION

Size (LxWxH)	132x105x50 mm
Weight	< 0,2 kg