

Drivers for Pockels Cells

PCD-UHR SERIES OEM CAVITY DUMPER DRIVERS



Fig. 1. OEM version of PCD-UHR series Pockels cell driver



Fig. 2. Encased version of PCD-UHR series Pockels cell driver

FEATURES

- Fast HV rise/fall time <math><4-8\text{ ns}</math>
- HV pulse amplitude up to 3.6 kV
- Pulse repetition rate up to 3.5 MHz
- Output pulse jitter <math><50\text{ ps}</math> if trigger pulse rise time <math><0.5\text{ ns}</math>

PCD-UHR series Pockels cell drivers are designed for wide range of applications and operating modes. Repetition rate can be up to 500 kHz for standard range of drivers, up to 1 MHz enhanced and up to 3.5 MHz high rate. Standard range of possible pulse durations is from 100 ns to 5 μ s. It can be extended to infinity using pulse regeneration technique. Connection diagram can be PUSH-PULL configuration using stand-alone driver, as well as FULL BRIDGE using two drivers for one Pockels cell. FULL BRIDGE configuration gives such advantages as repetition rate doubling to reach up to 7 MHz rate, pulse

duration shortening down to zero or voltage doubling on pockels cell. Contact EKSPLA for more information and suggestions for Pockels cell driving solutions you need.

Most of PCD-UHR series units are available in two versions: „open frame“ which is ideal for OEM manufacturers incorporating drivers in their own systems and encased in aluminum housings. Encasing of Pockels cell driver in aluminum housing solves two problems: shields both humans and electronics from high voltage impact from operating Pockels cell driver, and protects driver itself from potentially harmful external contact – ensuring safe operation and driver longevity. The housed option is especially handy for researchers and custom product manufacturers who use these drivers during their own systems build-up.

PCD-UHRS modification has possibility to shorten output pulse duration down to 15 ns. Following they can be used for single pulse selection in pulse picker applications for high repetition rate lasers.



Fig. 3. Control timing charts for two-pulses controlled drivers

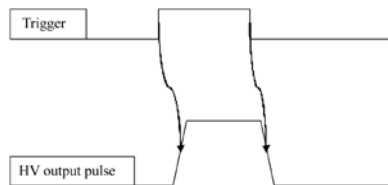


Fig. 4. Control timing charts for single pulse controlled drivers

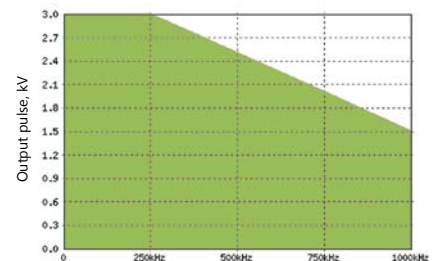


Fig. 5. Operating possibility chart for PCD-UHR standard and enhanced rate drivers. You may easily choose version of customized driver for inquiry within green area of chart

GENERAL SPECIFICATIONS TABLE FOR PCD-UHR SERIES DRIVERS ¹⁾

Driver model	PCD-UHR series	PCD-UHRS series
Maximal HV rated voltage (for testing only)	3.8 kV	
Maximal HV operating voltage	<90 % from rated voltage	
HV pulse rise time	< 4–8 ns (Fig. 7)	
HV pulse fall time	< 4–8 ns (Fig. 8)	
HV pulse duration for single driver	100–5000 ns	15–5000 ns
Max HV pulse duration for full-bridge configuration	0–5000 ns	N/A
Maximal HV pulse repetition rate	3.5 MHz	600 kHz
External triggering pulse duration requirement	>100 ns	>10 ns
External triggering pulse amplitude requirement	3.5–5 V (50 Ω load)	
External triggering pulse rise & fall time	< 20 ns	< 5 ns
Maximal length of leads to Pockels cell	10 cm	
Control diagram options:		
– single triggering pulse control	Fig. 4	
– two trigger pulses control	Fig. 3	
HV pulse delay, typical	45 ns	30 ns
External powering requirements:	depends on modification	
– high voltage supply		
– low voltage DC supply	12±0.5 V, <150 mA 14–25 V, <150 mA, on request	24±1 V, <150 mA

¹⁾ Specifications are given for Pockels cell with capacity <6 pF. Not all combinations of parameters can be possible at the same time. Specifications are subject to changes without advance notice.

Driver needs to be mounted on the heatsink (excluding water cooled versions). Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation.

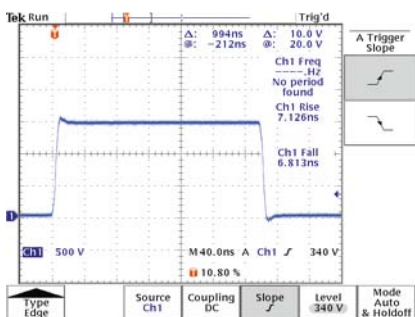


Fig. 6. Typical output pulse shape

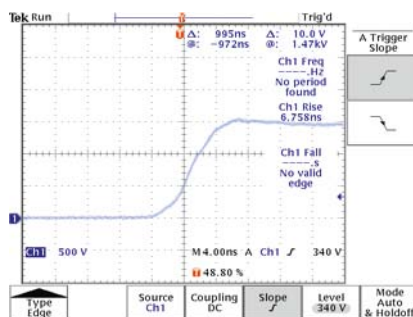


Fig. 7. Typical rising front of output pulse in detail

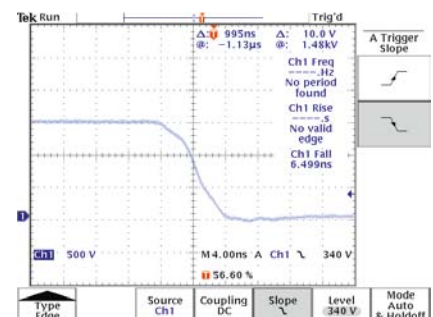
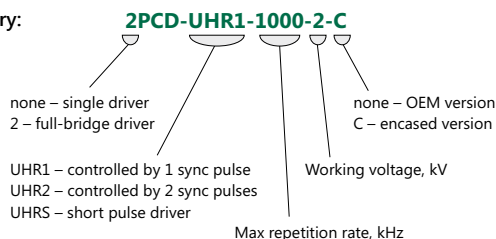


Fig. 8. Typical falling front of output pulse in detail

Ordering / Part number information

Please indicate following points by inquiry:

- Voltage
- Repetition rate
- Pulse duration (range)
- Capacitance of Pockels cell
- 24 V / 12 V option
- OEM / encased



OEM VERSION

CONFIGURATION EXAMPLES OF OEM VERSION OF PCD-UHR SERIES DRIVERS

P/N of driver	PCD-UHR1-50-3.6 PCD-UHR2-50-3.6	PCD-UHR1-400-1.5 PCD-UHR2-400-1.5	PCD-UHR1-250-3.6 PCD-UHR2-250-3.6	PCD-UHR1-250-2.5 PCD-UHR2-250-2.5	PCD-UHR1-500-2.6 PCD-UHR2-500-2.6	PCD-UHR1-1000-1.8 PCD-UHR2-1000-1.8
Maximal HV rated voltage	3.8 kV	1.6 kV	3.7 kV	2.6 kV	2.7 kV	2 kV
Maximal HV operating voltage	3.6 kV	1.5 kV	3.6 kV	2.5 kV	2.6 kV	1.8 kV
Maximal HV repetition rate	50 kHz	400 kHz	250 kHz	250 kHz	500 kHz	1000 kHz
Pulse duration	100–5000 ns					
HV pulse rise time, typical	<7 ns	<5.5 ns	<7 ns	<6 ns	<6.5 ns	<6 ns
HV pulse fall time, typical	<7 ns	<5.5 ns	<7 ns	<6 ns	<6.5 ns	<6 ns
Output polarity	positive					
HV power consumption	<20 W	<20 W	<75 W	<40 W	<90 W	<80 W
12V/24V power consumption	1 W	5.5 W	4 W	4.5 W	6 W	9 W
Dimensions	see Fig. 12			see Fig. 11		
Cooling	conductive			conductive or water		

Driver needs to be mounted on the heatsink (excluding water cooled versions).

Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation.

Please specify working voltage and required tuning range by ordering.

HV output voltage to Pockels cell is equal to HV power supply voltage.



Fig. 9. OEM version of PCD-UHR series driver with general purpose pad

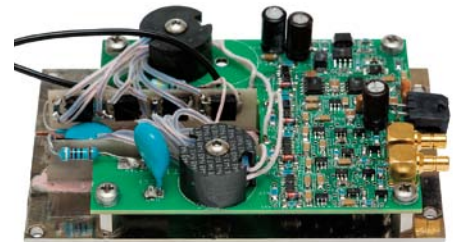


Fig. 10. OEM version of PCD-UHR series driver with conductive pad. Suitable for repetition rate up to 50 kHz

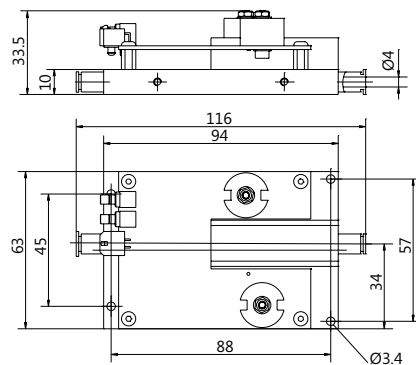


Fig. 11. Outline drawing of PCD-UHR series driver with general purpose pad

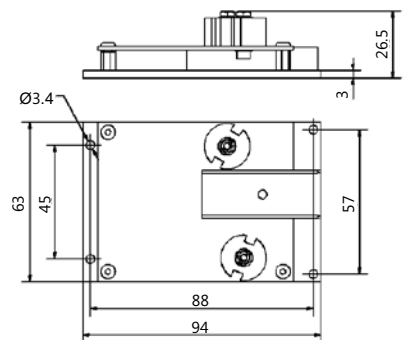


Fig. 12. Outline drawing of PCD-UHR series drivers with conductive pad

SPECIFIC FEATURES OF PCD-UHRS DRIVERS

- Short circuit protection at driver output
- Driver pad overheat sensor stops operation when overheated
- Overheat optocoupled output signal
- Switchable single pulse and two pulses control operation modes
- LED for error indication (overheat and short circuit)

OEM SHORT-PULSE VERSION

CONFIGURATION EXAMPLES OF OEM VERSION OF PCD-UHRS SERIES SHORT-PULSE DRIVERS

P/N of driver	PCD-UHRS-50-3.6	PCD-UHRS-400-1.5	PCD-UHRS-250-3.6	PCD-UHRS-250-2.5	PCD-UHRS-600-2.5	PCD-UHRS-600-1.8
Maximal HV rated voltage	3.8 kV	1.6 kV	3.7 kV	2.6 kV	2.6 kV	2 kV
Maximal HV operating voltage	3.6 kV	1.5 kV	3.6 kV	2.5 kV	2.5 kV	1.8 kV
Maximal HV repetition rate	50 kHz	400 kHz	250 kHz	250 kHz	600 kHz	600 kHz
Pulse duration	15–5000 ns	15–620 ns	15–1250 ns	15–1000 ns	15-400 ns	15-400 ns
HV pulse rise time, typical	<7 ns	<5.5 ns	<7 ns	<6 ns	<6.5 ns	<6 ns
HV pulse fall time, typical	<7 ns	<5.5 ns	<7 ns	<6 ns	<6.5 ns	<6 ns
Output polarity	positive					
HV power consumption	<20 W	<20 W	<75 W	<40 W	<100 W	<35 W
12V/24V power consumption	1 W	5.5 W	4 W	4.5 W	7 W	7 W
Dimensions	see Fig. 14			see Fig. 15		
Cooling	conductive			conductive or water		

Driver needs to be mounted on the heatsink (excluding water cooled versions).
Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation.
Please specify working voltage and required tuning range by ordering.
HV output voltage to Pockels cell is equal to HV power supply voltage.



Fig. 13. OEM version of PCD-UHRS series driver with general purpose pad

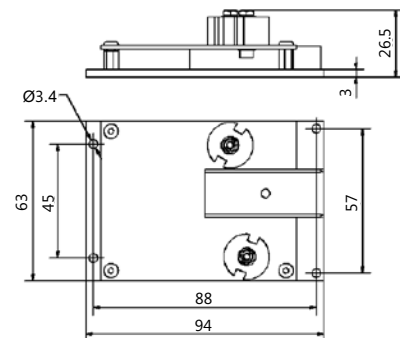


Fig. 14. Outline drawing of PCD-UHRS series drivers with conductive pad

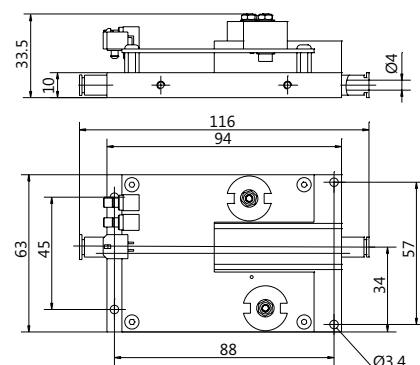


Fig. 15. Outline drawing of PCD-UHRS series driver with general purpose pad

ENCASED SHORT-PULSE VERSION

CONFIGURATION EXAMPLES OF ENCASED VERSION OF PCD-UHRS SERIES SHORT-PULSE DRIVERS

P/N of driver	PCD-UHRS-250-3.6-C	PCD-UHRS-250-2.5-C	PCD-UHRS-600-2.5-C
Maximal HV rated voltage	3.7 kV	2.6 kV	2.6 kV
Maximal HV operating voltage	3.6 kV	2.5 kV	2.5 kV
Maximal HV repetition rate	250 kHz	250 kHz	600 kHz
Pulse duration	15–1250 ns	15–1000 ns	15–400 ns
HV pulse rise time, typical	<7 ns	<6 ns	<6.5 ns
HV pulse fall time, typical	<7 ns	<6 ns	<6.5 ns
Output polarity		positive	
HV power consumption	<75 W	<40 W	<100 W
12V/24V power consumption	4 W	4.5 W	7 W
Dimensions	see Fig. 17		
Cooling	water		

Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation.

Please specify working voltage and required tuning range by ordering.

HV output voltage to Pockels cell is equal to HV power supply voltage.



Fig. 16. Encased version of driver PCD-UHRS

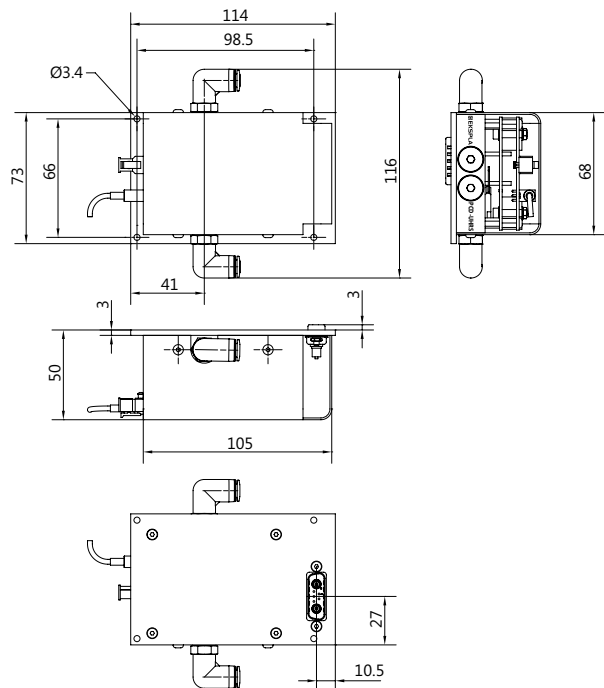


Fig. 17. Outline drawing of encased version of driver PCD-UHRS

ENCASED VERSION (unipolar drivers)

CONFIGURATION EXAMPLES OF ENCASED VERSION OF PCD-UHR SERIES DRIVERS

P/N of driver	PCD-UHR1-250-3.6-C PCD-UHR2-250-3.6-C	PCD-UHR1-250-2.5-C PCD-UHR2-250-2.5-C	PCD-UHR1-500-2.6-C PCD-UHR2-500-2.6-C	PCD-UHR1-1000-1.8-C PCD-UHR2-1000-1.8-C
Maximal HV rated voltage	3.7 kV	2.6 kV	2.7 kV	2 kV
Maximal HV operating voltage	3.6 kV	2.5 kV	2.6 kV	1.8 kV
Maximal HV repetition rate	250 kHz	250 kHz	500 kHz	1000 kHz
Pulse duration	100–5000 ns			
HV pulse rise time, typical	<7 ns	<6 ns	<6.5 ns	<6 ns
HV pulse fall time, typical	<7 ns	<6 ns	<6.5 ns	<6 ns
Output polarity	positive			
HV power consumption	<75 W	<40 W	<90 W	<80 W
12V/24V power consumption	4 W	4.5 W	6 W	9 W
Dimensions	see Fig. 19			
Cooling	water			

Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation.

HV output voltage to Pockels cell is equal to HV power supply voltage.

Please specify working voltage and required tuning range by ordering.



Fig. 18. Encased version of driver
PCD-UHR models PCD-UHRx-200-xx, PCD-UHRx-250-xx,
PCD-UHRx-500-xx, PCD-UHRx-1000-1.8

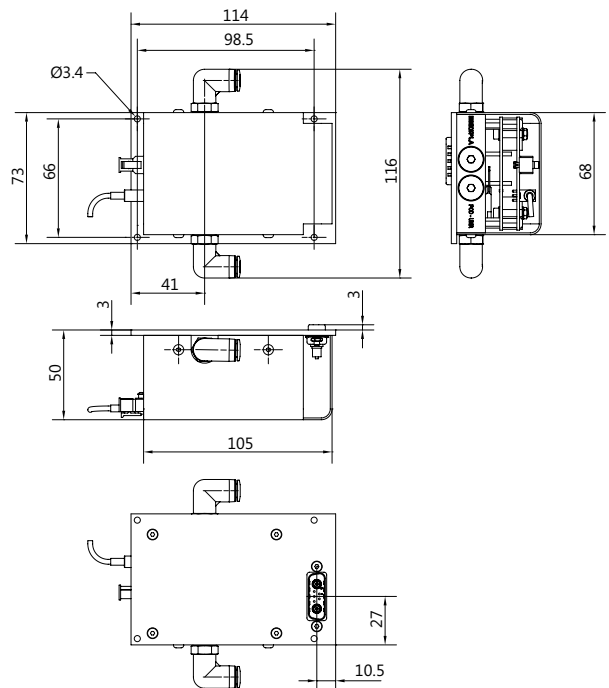


Fig. 19. Outline drawing of encased version of driver
PCD-UHR models PCD-UHRx-200-xx, PCD-UHRx-250-xx,
PCD-UHRx-500-xx, PCD-UHRx-1000-1.8

ENCASED VERSION (bipolar drivers)

CONFIGURATION EXAMPLES OF ENCASED VERSION OF PCD-UHR SERIES BIPOLAR DRIVERS

P/N of driver	PCD-UHR1-1000-2.9-C PCD-UHR2-1000-2.9-C	PCD-UHR1-350-4-C PCD-UHR2-350-4-C	PCD-UHR1-300-4.6-C PCD-UHR2-300-4.6-C	PCD-UHR1-250-5.2-C PCD-UHR2-250-5.2-C
Maximal HV rated voltage	3.0 kV	4.2 kV	4.8 kV	5.3 kV
Maximal HV operating voltage	2.9 kV	4.0 kV	4.6 kV	5.2 kV
Maximal HV repetition rate	1000 kHz	350 kHz	300 kHz	250 kHz
Pulse duration	100–5000 ns			
HV pulse rise time, typical	<7.5 ns	<7.5 ns	<8.0 ns	<8.5 ns
HV pulse fall time, typical	<7.5 ns	<7.5 ns	<8.0 ns	<8.5 ns
Output polarity	bipolar			
HV power consumption *	<120 W	<100 W	<100 W	<100 W
12 V / 24 V power consumption	9 W			
Dimensions	see Fig. 21			
Cooling	conductive or water			

Driver needs to be mounted on the heatsink (excluding water cooled versions).
 Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation.
 HV output voltage to Pockels cell is equal to HV power supply voltage
 i.e. sum of positive and negative HV values.
 Please specify working voltage and required tuning range by ordering.

* Bipolar HV power supply HV2x60Wm is specifically designed for these drivers.



Fig. 20. Encased version of driver PCD-UHR models PCD-UHRx-1000-XX, PCD-UHRx-350-XX, PCD-UHRx-300-XX, PCD-UHRx-250-XX. Water cooled version

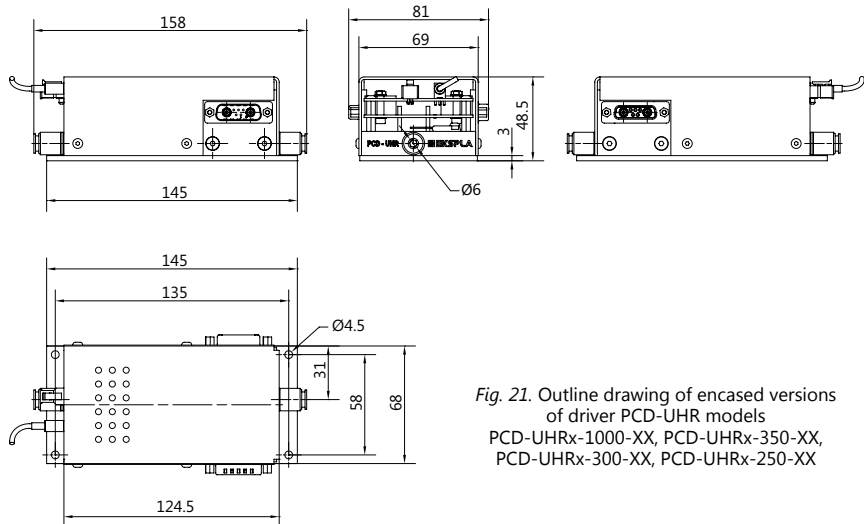


Fig. 21. Outline drawing of encased versions of driver PCD-UHR models PCD-UHRx-1000-XX, PCD-UHRx-350-XX, PCD-UHRx-300-XX, PCD-UHRx-250-XX

FULL-BRIDGE VERSION

CONFIGURATION EXAMPLES OF FULL-BRIDGE CONFIGURATION DRIVERS

P/N of FULL-BRIDGE driver	2PCD-UHR1-1000-2.4-C 2PCD-UHR2-1000-2.4-C	2PCD-UHR1-2000-1.6-C 2PCD-UHR2-2000-1.6-C
Base driver	PCD-UHR1-500-2.5 PCD-UHR2-500-2.5	PCD-UHR1-1000-1.8 PCD-UHR2-1000-1.8
Maximal HV operating voltage	2.4 kV	1.6 kV
Maximal HV repetition rate	1000 kHz	2000 kHz
HV pulse duration range	0–5000 ns	
HV pulse rise time	<6.5 ns	<6 ns
HV pulse fall time	<6.5 ns	<6 ns
Maximal capacitance of Pockel's cell	<6 pF	
HV power consumption	<160 W *	
Case	see Fig. 25	
Cooling	water	

Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation.
 HV output voltage pulse to Pockels cell appears as difference of pulses OUT1 and OUT2
 and is lower as HV power supply voltage.
 Contact Ekspla for technical details based on your request.

* Two HV power supplies HV80Wm are recommended

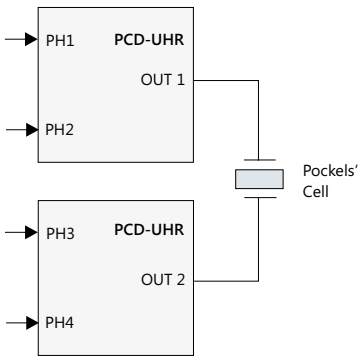


Fig. 22. Diagram of Pockels cell full-bridge connection to driver



Fig. 23. External view of full-bridge driver

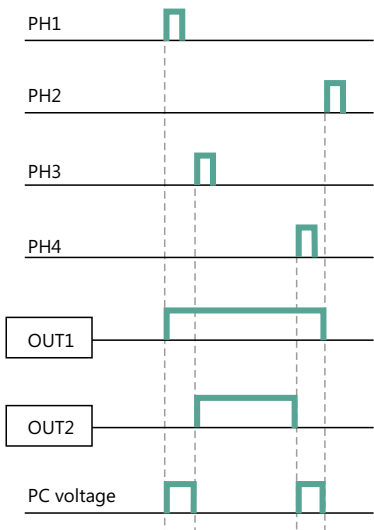


Fig. 24. Principle of 4-phase control of FULL-BRIDGE driver configuration.

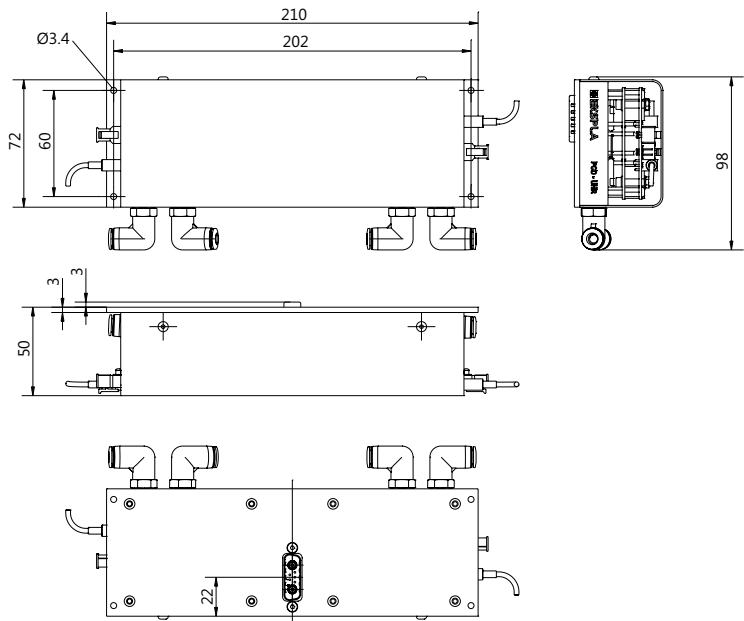


Fig. 25. Outline drawing of case for full-bridge drivers