

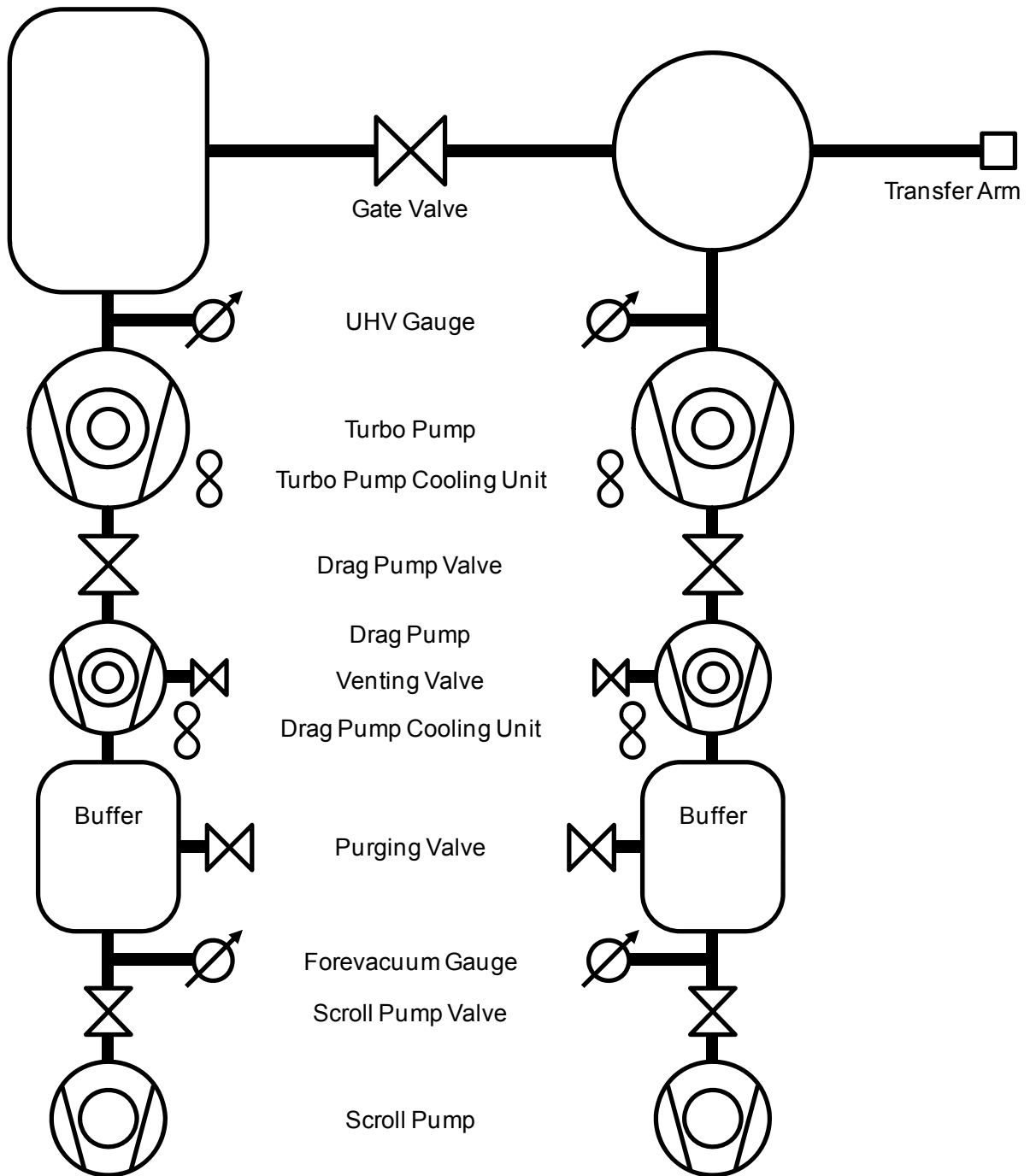
# CHILI Vacuum Control Unit

## The CHILI vacuum system

The following diagram shows all components of the CHILI vacuum system

Main Chamber

Transfer Chamber



Except for the Gate Valve and the Transfer Arm, each component exists twice. So, there is, e.g., a “Main Scroll Pump” and a “Transfer Scroll Pump”.

The following explains the different components and their electrical requirements.

## **CHILI Vacuum Control Unit (VCU)**

The basic idea behind the VCU is to have an interface that controls all vacuum components and connects them to the computer via the National Instruments board. The VCU should allow to switch some pumps and valves manually that can also be controlled by the computer.

## **Pressure Gauge Control Unit – Pfeiffer TPG 256 A MaxiGauge**

There are two types of pressure gauges, forevacuum gauges and ultra-high vacuum (UHV) gauges. They are all controlled

For a detailed description see the manual: [BG5186BE\\_B\\_oKE.pdf](#)

The only communication between the MaxiGauge and the VCU is referring to some switching functions using the Relay output (see pages 12, 13, 22, 23, and 42ff of the manual). For both lines (Main and Transfer) the following behavior should be achieved:

When Relay A (B) switches ON, the Main (Transfer) Scroll Pump should switch on, and, after a delay of ~3 s (tbc), the Main (Transfer) Scroll Pump Valve should open. The Valve should not open, if the Scroll Pump is not working (draws no current).

When Relay A (B) switches OFF, the Main (Transfer) Scroll Pump Valve should close, and, after a delay of ~1 s, the Main (Transfer) Scroll Pump should switch off.

This control loop should be activated with a switch (for each line) on the VCU. When deactivated, switching of Scroll Pumps and Scroll Pump Valves should be possible with switches on the VCU as well as with the Computer.

## **Valves**

### **Scroll Pump Valves – Edwards LCPV25EKA**

For a detailed description, see the manual: [LCPVEK\\_valves.pdf](#)

We have the 24 V AC/DC version.

The electrical data are (see page 5 of the manual):

Nominal Supply: 24 V AC/DC (-10 % / +15 %)

Power: 95 W for 60 ms

2.5–4 W continuously

For opening/closing the valves, the 24 V power should be switched with a relay.

It should be possible to switch this from the computer through the National Instruments board and manually with a switch on the VCU. In addition, these valves can also be controlled with the control loops as described above.

The status of the valve should be displayed on the VCU with a green LED: OPEN (power on)=green light, CLOSED (power off)=no light

### **Purging Valves – Edwards LCPV25EKA**

These are the same valves as the Scroll Pump Valves

It should be possible to switch this from the computer through the National Instruments board and manually with a switch on the VCU.

The status of the valve should be displayed on the VCU with a red LED: OPEN (power on)=red light, CLOSED (power off)=no light

### **Venting Valves – Pfeiffer TVF 005**

These valves are part of the Drag Pumps and controlled together with them.

### **Drag Pump Valves – Pfeiffer AVC 040**

For a detailed description, see the manuals: [BP5272BE\\_A.pdf](#)

The valves should be run in “Remote mode” (see manual page 5). This means that the supply voltage of 115 V AC is constantly fed and the valve is driven by the control voltage of 24 V DC. It should be possible to switch this from the computer through the National Instruments board and manually with a switch on the VCU.

The position indicator information (red and green LEDs) should be available to the computer and displayed by red and green LEDs on the VCU.

### **Gate Valve – MDC GV-3000M-P-01-11**

For a detailed description, see the pages from the catalog including a photo showing the pin assignment for the connector: [GateValve.pdf](#)

We have the 120 V AC version of the valve.

It should not be possible to operate (open or close) the valve when the Transfer Arm is not fully retracted. Therefore, at the end of the Transfer Arm, a micro switch has to be positioned that is only closed, whenever the arm is fully retracted.

It should be possible to open and close this valve with a switch at the VCU and with the computer.

### **Scroll Pumps – Edwards XDS 10**

For a detailed description, see the manual: [XDS10\\_A726-01-880.pdf](#)

We have the version 906 (115–120V, 60 Hz, single phase)

The electrical data are (see page 11 of the manual):

Nominal Supply: 115–120 V

Frequency: 60 Hz

Power: 300 W

Current: 6.4 A

Recommended Fuse: 10 A

These pumps just need to be switched on/off by switching the main power with a relay.

It should be possible to switch this from the computer through the National Instruments board and manually with a switch on the VCU. In addition, these pumps can also be controlled with the control loops as described above.

The status should be displayed on the VCU with a LED: ON=green light, OFF=no light

### **Drag Pumps – Pfeiffer TMH 071YP with Electronic Drive Unit TC 600 and Display and Operating Unit DCU 100**

For a detailed description, see the manuals: [TMH071\\_PM0504BE\\_M.pdf](#)

and for the DCU 100: [DCU\\_PM0477BE\\_K.pdf](#)

the pumping operations are described in: [PumpingOperationsDCU\\_PM547BE\\_U.pdf](#)

The Drag Pumps receive their power from the DCU 100 and are constantly supplied with power. For operating the Drag Pumps, the remote plug situated on the TC 600 (part of the pump), is used. The Pin arrangement is explained on page 13 of the pump manual and page 11 of the operating manual.

Since everything can be controlled with the DCU 100, which will sit next to the VCU, the VCU should only display the status with green/red LEDs. The following inputs/outputs should be available during Computer/Manual Control:

Pin No	Function	Computer Control	Manual Control VCU
1	+24 V		
2	Venting released/blocked	yes	no
3	Motor/Remote priority on/off	yes	no
4	Pumping station on/off	yes	no
5	Heating on/off and Reset (<2 s)	yes (reset only)	no
6	Standby on/off	yes	no
7	Rotation speed setting mode	no	no
8	Output switchpoint		
9	Output malfunction		
10	Ground		
11	Output 1 (switchpoint)	yes	green light
12	Output 1 (switchpoint)		
13	Output 2 (malfunction)	yes	red light
14	Output 2 (malfunction)		
15	Analog output (rotation speed)	yes	no

## Drag Pump Cooling Units

The Cooling Units for the Drag Pumps are usually controlled by the pumps. However, it should be possible to disable the units by interrupting the connection between the cooling units and the pumps with a relay controlled by the computer. For safety reasons, these relays should be closed in the powerless state. This means that the Cooling Units can be intentionally switched off by the computer if necessary, while they are normally controlled by the pump. No switch is needed for this on the VCU.

## Turbo Pumps

While all other components are identical for the Main and the Transfer lines, the turbo pumps used are different.

### Main Turbo Pump – Edwards STP 1003 with Controller SCU-XL800

For a detailed description, see the manuals: [MT39E101A.pdf](#)

and for the SCU-XL800: [MT57E101A.pdf](#)

The pump should be controlled remotely via the computer using the REMOTE X7 connector described in the controller manual (p. 47 ff).

The following input signal pins of the remote connector should be accessible by the computer:  
pins 1, 3, 5, 21, 22

The following output signal pins of the remote connector should be accessible by the computer:  
pins 8–27, 9–28, 10–29, 11/12–30, 13–32, 14/15–33, 24/25–6

The following pins should be ignored: pins 16/35–17, 7–26

The following pins are not used: pins 2, 19, 20, 31, 34

For a detailed description of all pins, please see the controller manual.

If pins 11–30 are closed, a green light should light up on the VCU.

If pins 14–33 are closed, a red light should light up on the VCU.

### **Main Turbo Pump Cooling Unit**

*We don't have all the necessary information about this cooler yet. However, it is the same as the cooler for the Transfer Turbo Pump (see below) and should work accordingly. I should get further information soon.*

### **Transfer Turbo Pump – Edwards STP-L301 with Controller SCU-301/451**

For a detailed description, see the manual: [STP-L301\\_MT47E001F.pdf](#)

The pump should be controlled remotely via the computer using the TB1 and TB2 Remote Input/Output Signal Terminal Blocks as described in the manual (p. 8-1 ff).

In the following the various pins of TB1 and TB2 are discussed:

**TB1, Pins 1–2 and 3–4** are used for operating the Cooling Unit

**TB1, Pins 5–6** are not used

**TB1, Pins 7–8** should be read by the computer

**TB1, Pins 9/11–10** should be read by the computer. If pins 9–10 are closed, a red light should light up on the VCU.

**TB1, Pins 12–14** should be read by the computer

**TB1, Pins 13/15–16** should be read by the computer. If pins 13–16 are closed, a green light should light up on the VCU.

**TB1, Pins 17–18** should be read by the computer

**TB1, Pins 19–20** should be read by the computer

**TB2, all pins** should be controlled by the computer

### **Transfer Turbo Pump Cooling Unit**

The Cooling Unit for the Transfer Turbo Pump is usually controlled by the pump and connected to the controller using pins 1–4 of TB1. However, it should be possible to disable the units by interrupting the power (pins 1+2) with a relay controlled by the computer. For safety reasons, these relays should be closed in the powerless state. This means that the Cooling Unit can be intentionally switched off by the computer if necessary, while it is normally controlled by the pump. No switch is needed for this on the VCU.