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Find the *VAT PL-3* at our website: *Click HERE*

Adaptive Pressure Controller

PL-2 / PL-3 for Control Butterfly



This manual is valid for product with the product indentification number:

FABR. NO. 610PL- . 6 . .

configured with Software Version

61PL.2A.00

The product identification is specified on the rear panel of each PL control unit in the following or similar way:

FABR NR : 610PL - . 6 . . - . . . . /	Made in Switzerland in 19 . .	CE
FILE NR : 610PL - . 6 . .	Patented	

Symbollegende:


Erklärung sorgfältig lesen, bevor weitere Schritte unternommen werden!


Achtung!


Produkt entspricht EG-Richtlinien sofern zutreffend!


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Gespannte Federn und/oder Luftpolster sind Gefahrenquellen!


Handschuhe tragen!


Read these **«Installation, Operating & Maintenance Instructions»** and the enclosed **«General Safety Instructions»** carefully before you start any other action!

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Imprint:

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Intended Use of Product

This product is an adaptive pressure control for VAT series 61 control valves. The product may only be operated within the ranges specified below:

Technical Data

Mains voltage	100-240 VAC (±10%), 50/60 Hz
Temperature	0 - 50 °C
Sensor input signal	0 - 10 VDC max.
Operation	only with VAT series 61 control butterfly

Additional technical information in appendix, section 1.2.

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Installation

Hardware Installation

Confirm that hardware is complete (picture 1)

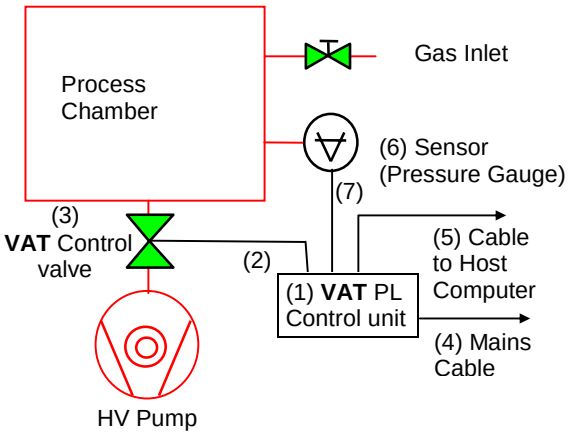
(1) Adaptive Pressure Controller, hereafter referred to as PL control unit. Confirm that battery life has not expired (check label at rear of control unit)*
(2) Connection cable valve - PL control unit (VAT part number 610CV-99L . - . . . .)
(3) VAT control butterfly
(4) Mains cable (connector to PL control unit is supplied by VAT)**
(5) Interface cable (connector to PL control unit is supplied by VAT)**
(6) Sensor and (7) sensor cable (connector for cable to PL control unit is supplied by VAT)**

* Please refer to preventive maintenance section, if battery life has expired

** For information about wiring of the mains, interface and sensor cable, please refer to appendix 1

Install hardware

- First, install VAT control butterfly (3) according to the IOMI of the VAT control butterfly
- Install sensor (6) according to the recommendations of the manufacturer
- Install PL control unit (1) in control rack
- Connect valve cable (2) to control butterfly and then to PL control unit
- Connect sensor cable (7) to sensor and sensor input on PL control unit
- For remote operation, connect interface cable (5) to PL interface board
- Connect mains cable (4) to PL control unit



Picture 1: **Hardware for Pressure Control**

PL Configuration Setup

- VAT makes a factory configuration of the PL control unit. If you use a MIXED interface, please refer to appendix 2 for details about the factory hardware configuration
- Turn on power switch on PL control unit. Valve will move to closed position. The software version is shown until the valve is closed
- If a MIXED (RS 232C) interface is used, the setup may be performed automatically by the host system

For manual setup

- Press «REM/LOC» key for 2 seconds, until «LOC» lights up
- **SENSOR SETUP:** Press «LEARN» key and simultaneously the «ZERO» key for 2 seconds (Notation used hereafter: «&» for pressing simultaneously, e. g. «LEARN» & «ZERO»). Toggle with «MODE» key to the next setup parameter. Set the value or function of the selected parameter with «↑» or «↓» keys.

  Finish or quit menue by pressing «CLOSED» or «OPEN» key. If no sensor is used, select 'POS' as display parameter.
- **ZERO** (Offset compensation of sensor output): Open control butterfly completely, switch gas flow off. When the base pressure is reached, press «ZERO» key to reset the offset of the pressure sensor. Disable ZERO function in SENSOR SETUP, if the base pressure of your system is higher than 1‰ of sensor F.S.

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- **LEARN** (Determination of control characteristics of your process chamber): Bring process chamber under high vacuum, open control butterfly. Open gas inlet and set typical gas flow for your application. Press «LEARN» key for 2 seconds to perform the autolearning routine of the PL control unit. The autolearning routine may be aborted by pressing the «OPEN» key. Please note, depending on the time constant of your vacuum system the autolearning routine may take up to 20 minutes.

Operation

- Press «REM/LOC» key for 2 seconds to enable keyboard («LOC» to light up)
- **For opening and closing of valve:** Press «OPEN» key to open valve, press «CLOSE» key to close valve. The LED bar «POSITION» indicates the valve position.
- **Pressure control:** Press «MODE» key until «PRES» lights up. Use «↑» or «↓» key to select the set point value. First pressing switches 7-segment LED display «PRESSURE» from actual value to setpoint value (setpoint value flashes). Continuous pressing starts changing of the setpoint after 1 s. Releasing the key switches display back to the actual value after 3 s. Pressing «↑» or «↓» keys during remote operation the pressure setpoint is shown for 3 seconds but cannot be changed.
- While in pressure mode («PRES» lights up), by pressing «MODE» key the pressure control is interrupted and the valve position will not be changed. «POS» will light up. Press «MODE» key again to continue pressure control.
- **Valve position control:** Press «MODE» key until «POS» lights up. Use «↑» or «↓» key to move the valve to the desired position.
- **On display:** 'PRES' for pressure mode, 'POS' for position mode, 'LEARN' during auto learning, '----' during auto zero, '✸' for parameter optimization not completed yet, 'REM' for remote mode, 'LOC' for local mode, 'ERR' flashing for parameter error, 'ERR' lighting permanently for position error (refer to trouble shooting section).

Remote Operation

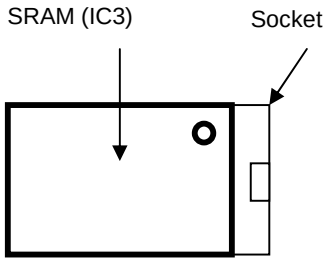
Select remote control by pressing «REM/LOC» key for 2 seconds until «REM» lights up.

Preventive Maintenance

When the battery life expires (check date specified on label in rear of PL control unit), the SRAM memory needs to be exchanged.

Procedure:

- Turn off power to PL control unit
- Disconnect power cable to PL control unit
- Open top cover of PL control unit
- Exchange SRAM (IC 3 on main board) , confirm SRAM is installed correctly (see drawing below)
- Reattach covers
- Attach new label and mark on label new expiration date: 5 years after date of installation
- Perform PL configuration routine (section 1.2)



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Trouble Shooting

On front panel: display inactive	- Check mains supply, mains switch and cable - Check fuses at rear panel of PL control unit
Start-up display does not disappear after a few seconds	- Valve not connected to PL control unit - Valve connected, but closed position not detected
Controller does not react to key command	- Switch PL control unit to LOCAL
'ERR' flashes or RS232C responds with 'PAR-ER'	- New auto learning should be performed - If error occurs after new auto learning and power disruption, replace battery powered RAM memory (perform PL configuration routine acc. to section 1.2)
Pressure reading is wrong Negative pressure reading	- Confirm that sensor setup is correct - When base vacuum is reached and pressure reading is off, perform ZERO command
ZERO command does not work	- Valve is not in open position - ZERO command is disabled, check sensor setup
Display not '0' or ±1 after ZERO command	- Sensor offset voltage is larger than ±1.4V - System not pumped to base pressure
Pressure control not optimal after LEARN command	- The PL control unit reoptimizes the parameters for each set point - ZERO command was not performed before LEARN command - LEARN command was performed with different gas flow, repeat LEARN sequence
'✸' stays on display	- Pressure is outside control range
'ERR' lights permanently after closing the valve	- Valve plate might be blocked due to contamination inside valve - Clean valve
LOGIC interface installed: Controller does not respond to logic inputs	- Switch to REMOTE - Verify, that Logic interface is installed correctly
LOGIC interface installed: Controller does not respond to analog position or pressure setpoint	- OPEN or CLOSE digital inputs are activated
MIXED interface installed: Controller does not respond to RS 232 commands	- Confirm that PL control unit is in REMOTE - Verify settings of the switch S1 on the MIXED interface are correct - Confirm that MIXED interface is installed correctly - Logic inputs on Mixed interface override RS232 commands
MIXED interface installed: Controller responds with error message	- Wrong command or transmission error
MIXED interface installed: '000001' instead of '000000' in closed position or '000999' instead of '001000' in open position	- Valve plate might be blocked
MIXED interface installed: Self test: Controller responds with 'ROM-ER'	- Replace EPROM

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Spare Parts / Retrofit Options

Description	Ordering No.
Preventive maintenance kit, consisting of: SRAM, label	86706-R1
LOGIC interface, for retrofit	60569-R1
MIXED interface (RS 232C and logic signals), for retrofit	75944-R1

Repairs

Contact VAT for repair. Please check first the fabrication No. 610PL- . . . . . - . . . . - . . . .) marked on the rear panel of the PM control unit. Your VAT representative will discuss with you how the repair can be carried out best.

Warranty

Each product sold by VAT Vakuumventile AG (VAT) is warranted to be free from the manufacturing defects that adversely affect the normal functioning thereof during the one-year period immediately following delivery thereof by VAT, provided that the same is properly operated under conditions of normal use and that regular, periodic maintenance and service is performed or replacements made, in accordance with the instructions provided by VAT. The foregoing warranty shall not apply to any product or component that has been repaired or altered by anyone other than an authorized VAT representative or that has been subject to improper installation or abuse, misuse, negligence or accident. VAT shall not be liable for any damage, loss, or expense, whether consequential, special, incidental, direct or otherwise, caused by, arising out of or connected with the manufacture, delivery (including any delay in or failure to deliver), packaging, storage or use of any product sold or delivered by VAT shall fail to conform to the foregoing warranty or to the description thereof contained herein, the purchaser thereof, as its exclusive remedy, shall upon prompt notice to VAT of any such defect or failure and upon the return of the product, part or component in question to VAT at its factory, with transportation charges prepaid, and upon VAT's inspection confirming the existence of any defect inconsistent with said warranty or any such failure, be entitled to have such defect or failure cured at VAT's factory and at no charge therefor, by replacement or repair of said product, as VAT may elect. VAT MAKES NO WARRANTY OR REPRESENTATION OF ANY KIND, EXPRESS OR IMPLIED, (INCLUDING NO WARRANTY OR MERCHANTABILITY), EXCEPT FOR THE FOREGOING WARRANTY AND THE WARRANTY THAT EACH PRODUCT SHALL CONFORM TO THE DESCRIPTION THEREOF CONTAINED HEREIN, and no warranty shall be implied by law.

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Appendix 1: Wiring Information

Sensor Connector of PL Control unit

PIN	Description
1	Connect shield of sensor cable
7	(-) Sensor signal
8	(+) Sensor signal
10	+ 15 VDC, max., ±5%, 1400 mA
12	0 VDC
14	- 15 VDC, max., ±5%, 1400 mA

Recommendations:

- Use shielded sensor cable
- Keep cable as short as possible, but locate it away from noise sources
- Use power supply of the PM control unit for the sensor
- Mount the sensor, especially capacitance diaphragm gauges, at place free of mechanical shock and vibration

Mains Connector

PIN	Description
L	Phase (100 - 240 VAC, 50 - 60Hz, max. 150 VAC)
N	Neutral
⏚	Ground

Connector for MIXED Interface

Connection via 25-pole D-subminiature socket INTERFACE located on the rear of the PM control unit. A counter plug is attached to each control unit.

PIN	Function	Description
	RS 232C	
2	TXD	Transmitted data from the PM control unit
3	RXD	Received data by the PM control unit
7	GND	Signal ground
1	Chassis Ground	
	Digital Inputs / Outputs	
23	Common for digital inputs	
17	OPEN valve	Valve will be opened when contact between PIN 17 and 23 is closed
15	CLOSE valve	Valve will be closed when contact between PIN 15 and 23 is closed
10	Common for digital outputs	
8	Valve in OPEN position	When valve is in open pos, contact between PIN 8 and 10 is closed, max. 70V/0.5A
9	Valve in CLOSED position	When valve is in closed pos, contact between PIN 9 and 10 is closed, max. 70V/0.5A

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Connector for LOGIC Interface

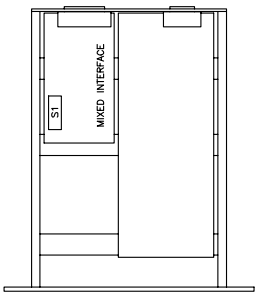
Connection via 25-pole D-subminiature socket INTERFACE located on the rear of the PM control unit. A counter plug is attached to each control unit.

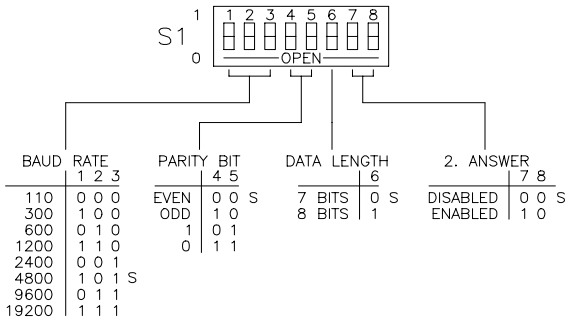
PIN	Function	Description
	Digital Inputs	**Inputs to PM control unit**
6	Common (-)	Common for all external inputs. Use relay or optocoupler.
7	Control mode	Contact closed = pressure control mode Contact open = position control mode
3	ZERO	Automatic zero adjustment for pressure sensor. Contact to be closed for minimum 0.5 s
15 17	CLOSE valve OPEN valve	Contact closed = valve closes Contact closed = valve opens ***Notice:*** The valve remains closed or open as long as the contact is closed.
19	LEARN	Contact closed = auto learning as long as contact is closed Contact open = auto learning is interrupted
5	DISABLE LOCAL	Contact closed = PL control unit is switched into remote mode, key pad REM/LOC is disabled as long as contact is closed Contact open = key pad REM/LOC enabled, PL control unit stays in remote mode
16	Hold	Contact closed = hold
	Digital Outputs	**Outputs from PM control unit to host controller**
20	Common	Common for Digital Outputs
8	Valve in OPEN position	Contact closed = valve is in open position
9	Valve in CLOSED position	Contact closed = valve is in closed position
21	PL in REMOTE mode	Contact closed = PL control unit is in REMOTE operation
22	Deviation	Contact closed during zero adjust, learn procedure, in position mode while actual valve position exceeds 0.1 % of position setpoint, in pressure mode while actual pressure exceeds 2 % of pressure setpoint
	Analog Signals	
13	Common	Analog ground
24	Position input	The voltage is proportional to the rotation angle of the rotary feedthrough (10V = 1000 = open, 0V = 0000 = closed, R_i > 100kOhm)
25	Pressure input	The voltage is proportional to the pressure set point (10V = FS of pressure range, 0V = 0, R_i > 100kOhm)
11	Position output	The voltage is proportional to the rotation angle of the rotary feedthrough (10V = 1000 = open, 0V = 0000 = closed, 1mA max.)
12	Pressure output	The voltage is proportional to the pressure set point (10V = FS of pressure range, 0V = 0, 1mA max.)
10 23	+15V +15V	Auxilliary voltage +15V, R_i = 3.9kOhm Auxilliary voltage +15V, R_i = 3.9kOhm

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Appendix 2: Mixed Interface

Change of configuration: Switch off mains supply, open top cover and set DIL switches as follows.





Default configuration «10100000»: 4800 Baud, EVEN parity, 7 bits, 2nd command acknowledgement (2. answer) disabled.

Note: Logic inputs override RS232 commands. Logic inputs are only executed when PL control unit is in remote operation.

A logic input is displayed on the front panel by an oscillating LED bar «POSITION». After releasing the logic input the controller will execute the previous command sent by the host computer via RS232C. Logic inputs are only executed when the PL control unit is in remote operation.

Following control commands are excepted and not buffered: **Z:, L:XXXXXX,** and **J:**
These commands are replied with the error message **E:000009**.

The inquiry command **I:** is replied with the acknowledgement **I:LOCKED** while a logic input is activated.

The following expressions are often used in the table below:
<CR>: Carriage Return (0D hexadecimal)
<LF>: Linefeed (0A hexadecimal)

Sensor Setup Command

Description	Command	Acknowledgement	Examples / Explanation	
Sensor set-up	**s: 1abcde0 <CR><LF>**	**s: <CR><LF>**	1 = sensor 1	
	a = Voltage Range	0 = 0 - 1 V	1 = 0 - 2 V	
		2 = 0 - 5 V	3 = 0 - 10 V	
	b = Display Range	0 = 0 - 1.000	1 = 0 - 2.000	2 = 0 - 5.000
		3 = 0 - 10.00	4 = 0 - 20.00	5 = 0 - 50.00
		6 = 0 - 100.0	7 = 0 - 200.0	8 = 0 - 500.0
		9 = 0 - 1000	A = 0 - 2000	B = 0 - 5000
	c = Display Unit	0 = mbar	1 = µbar	
		2 = Torr	3 = mTorr	
		4 = Pa	5 = kPa	
		6 = V	7 = %	
		8 = 1/1000	9 = none	
		A = Position Mode only		
	d = Sensor Type	0 = mbar / Pa	1 = Torr	
	e = Zero Adjust	0 = enable	1 = disable	

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Inquiry commands

After receipt of an inquiry command, the PM control unit sends back the corresponding acknowledgement within a maximum of 100 ms.

Instructions	Commands	Acknowledgements	Examples / Explanation
Actual position in 1/1000 of stroke (0 = closed, 1000 = open)	**A:<CR><LF>**	**A:xxxxxx<CR><LF>**	**A:000428<CR><LF>** = 428 * 1/1000 of stroke
Actual pressure in 1/1000 of sensor full scale	**P:<CR><LF>**	**P:xxxxxx<CR><LF>**	**P:000119<CR><LF>** = 119 * 1/1000 of sensor full scale
Pressure setpoint in 1/1000 of sensor full scale	**W:<CR><LF>**	**W:xxxxxx<CR><LF>**	**W:000119<CR><LF>** = 119 * 1/1000 of sensor full scale
Operating mode	**I:<CR><LF>**	**I:LOCAL<CR><LF>** **I:REMOTE<CR><LF>**	= LOCAL mode = REMOTE mode
Control mode	**M:<CR><LF>**	**M: POS<CR><LF>** **M: PRESS<CR><LF>**	= POSITION MODE = PRESSURE MODE
Self test	**T:<CR><LF>**	**T: OK<CR><LF>** **T: PAR-ER<CR><LF>** **T: ROM-ER<CR><LF>**	= memory o.k. = parameter error = EPROM error (see section «Trouble shooting» if «PAR-ER» or «ROM-ER» appears)
Sensor zero offset in 1/1000 of sensor full scale	**z:<CR><LF>**	**z:xxxxxx<CR><LF>**	**z:000015<CR><LF>** = 15 * 1/1000 of sensor full scale
Valve cycle counter	**c:<CR><LF>** **n:<CR><LF>**	**c:xxxxxxxxxx<CR><LF>** **n:<CR><LF>**	**c:0000125013<CR><LF>** = 125'013 cycles = set counter to zero
Software version	**v:<CR><LF>**	**v:xxxxxx<CR><LF>**	**v:2A.00<CR><LF>** = version 2A.00
Position counter error	**p:<CR><LF>** **f:<CR><LF>**	**p: OK<CR><LF>** **p:POS-ER<CR><LF>** **f:<CR><LF>**	= position counter o.k. = counter error = reset error flag

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Control commands

Control commands are only accepted, while the PL control unit is in REMOTE mode, except of the command 'U:01<CR><LF>'

Control commands are acknowledged according to the following table in different ways:

1st acknowledgement: Confirmation that command has been received, within 100 ms

2nd acknowledgement: If enabled, confirmation that command has been executed

Description	**Commands**	**Acknowledgements** 2nd acknowledgement in parenthesis	**Examples / Explanation**
Pressure setpoint in 1/1000 of sensor full scale	**S:00xxxx<CR><LF>**	**S:<CR><LF>** (S:<CR><LF>)	**S:000119<CR><LF>** = 119 * 1/1000 of sensor full scale
Hold mode	**H:<CR><LF>** **K:<CR><LF>**	**H:<CR><LF>** **K:<CR><LF>**	= set = terminate
Position setpoint in 1/1000 of stroke (0 = closed, 1000 = open)	**R:xxxxxx<CR><LF>**	**R:<CR><LF>** (R:<CR><LF>)	**R:000428<CR><LF>** = 428 * 1/1000 of stroke
Reduced positioning speed in 1/1000 of maximum speed (remains stored until next speed is given and is set to 1000 when mains is switched off)	**1. V:xxxxxx<CR><LF>** **2. R:xxxxxx<CR><LF>**	1. **V:<CR><LF>** 2. **R:<CR><LF>** (R:<CR><LF>)	**V:000200<CR><LF>** **R:000428<CR><LF>** = position 428 * 1/1000 is reached at 200 * 1/1000 of maximum speed
Open/Close only at maximum speed	**C:<CR><LF>** **O:<CR><LF>**	**C:<CR><LF>** (C:<CR<<LF>) **O:<CR><LF>** (O:<CR<<LF>)	= close = open
Zero	**Z:<CR><LF>**	**Z:<CR><LF>**	automatic zero adjustment
Learn up to maximum pressure to be learned in 1/1000 of sensor full scale	**L:xxxxxx<CR><LF>**	**L:<CR><LF>**	**L:001000<CR><LF>** = up to sensor full scale **L:000100<CR><LF>** = up to 100 * 1/1000 = 10%
Remote / Local	**U:01<CR><LF>** **U:02<CR><LF>** **U:03<CR><LF>** **U:04<CR><LF>**	**U:<CR><LF>** **U:<CR><LF>** **U:<CR><LF>** **U:<CR><LF>**	= switch to Remote = switch to Local = interlock Local/Remote buttons = release Local/Remote buttons

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Error Messages

Error messages	Description
E:000001<CR><LF>	Parity error
E:000002<CR><LF>	<CR> or <LF> is missing
E:000003<CR><LF>	«**:**» is missing
E:000004<CR><LF>	Wrong letter code
E:000005<CR><LF>	Numerical value not given in 6 digits
E:000006<CR><LF>	Numerical value larger 1000
E:000007<CR><LF>	PRESSURE MODE, ZERO or LEARN have been selected with no sensor connected (display format set for no sensor)
E:000008<CR><LF>	Instruction given in operating mode LOCAL
E:000009<CR><LF>	RS232 commands ***Z:***, ***L:XXXXXX*** or ***J:*** given while a logic input is activated
E:000101<CR><LF>	Error with LEARN Pressure at closed valve is smaller than 5% of the sensor full scale
E:000200<CR><LF>	Error with ZERO - valve is not in open position - PL control unit is switched in control mode PRESSURE MODE - function ZERO blocked (= DISABLED)

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