Swagelok® Electronic Pressure Controller

Programming Manual

This manual contains important information for the safe and effective operation of the Swagelok® Electronic Pressure Controller (SEPC). Users must read and understand its contents before operating the system.

Swagelok

Safety

Safety Summary

Follow any enclosed instructions and refer to the product application guide for detailed product information. When using a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user. Improper selection or misuse of the product may result in serious personal injury or property damage.

Signal Words and Safety Alert Symbols Used in This Manual

WARNING:

Statements that indicate a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION:

Statements that indicate a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE:

Statements that indicate a hazardous situation which, if not avoided, could result in damage to the equipment or other property.

⚠ Safety alert symbol indicating a potential personal injury hazard.

Warnings

⚠ **WARNING:**

Read the entire safety information section and user manual before using this product. Failure to do so can result in serious injury.

⚠ **WARNING:**

To avoid personal injury and/or damage to equipment, do not attempt to remove a Swagelok Electronic Pressure Controller (SEPC) from a system while it is under pressure.

⚠ **WARNING:**

Users must contact their gas or liquid supplier for specific safety precautions and instructions.

⚠ **WARNING:**

Do not open when an explosive atmosphere may be present.

⚠ **CAUTION:**

Swagelok Electronic Pressure Controllers are not “safety accessories” as defined in the pressure equipment directive 2014/68/EU.

⚠ **CAUTION:**

Do not use the Swagelok Electronic Pressure Controller as a shutoff device.

Contents

General Information

SEPC Function

The Swagelok Electronic Pressure Controller (SEPC) is designed to regulate the pressure of inert gas in proportion to the command signal by monitoring pressure from its installed pressure transducer. These are typically installed in conjunction with a ratio regulator to extend its functional pressure control range.

SEPC control can be configured in three modes:

- **Remote setpoint** (Default configuration)
  This is the default configuration of any SEPC setup by Swagelok. Sending a 4-20 ma signal to the R+ and R-pins will set the setpoint in relation to the calibration certificate provided.
- **Local setpoint**
  The SEPC can be reconfigured to ignore any input on the R+ and R- pins and instead be set via the front panel (see page 6).
- **Ramp setpoint**
  The SEPC can be reconfigured to ignore any input on the R+ and R- pins and instead the setpoint will follow a programmed ramp profile (see page 11).

Intent of This User Manual

This user manual assumes that your SEPC unit has already been installed in your system per the Swagelok *Electronic Pressure Controller, Hazardous Locations Safety* Manual, MS-CRD-0300 is intended to aid the user in the adjustment or alteration of the controller's settings.

⚠ WARNING:

The content and warnings of the Swagelok *Electronic Pressure Controller, Hazardous Locations Safety* Manual, MS-CRD-0300 must be followed at all times during the setup, modification, and use of this user manual.

Menu Navigation

When the SEPC is set up by Swagelok, it will automatically start on power up. If you would like to enter the setting menus, press the ⬆ button twice.

Figure 1. *Display Overview*

① Alarm Annunciators

② Negative Sign

③ Display (menu or value)

④ Program Buttons

The **UP** button moves up a level in the menu structure. Pressing and holding the ⬆ button navigates to the top level of any menu (**oPER**, **PRoG**, or **INIt**). This can be useful if you get lost in the menu structure.

The **LEFT** button moves across a set of menu choices at a given level. When changing numerical settings, press the ◄ button to make the next digit (one digit to the left) active.

The **RIGHT** button moves across a set of menu choices at a given level. The ► button also scrolls numerical values up with overflow to 0 for the flashing digit selected.

The **ENTER** button selects a menu item and goes down a level, or it enters a numerical value or parameter choice.

The menu structure of the controller is divided into three main Level 1 groups.

INIt Initialization Mode: These settings are rarely changed after initial setup. They include transducer types, calibration, etc. These settings can be password-protected.

PRoG Programming Mode: These settings are frequently changed. They include Set-points, Control Modes, Alarms, etc. These settings can be password-protected.

oPER Operating Mode: This mode allows users to switch between Run Mode, Standby Mode, Manual Mode, etc.

Basic Operation

Display

The default Swagelok setup of the proportional integral derivative (PID) controller shows the following when powered up:

Figure 2. *Display Segments*

⑤ Inlet Valve Operating

⑥ Vent Valve Operating

⑦ Negative Sign

⑧ Transducer Reading in Bar

To display the current command signal (being received by the 4-20 mA input), press ▶ to select SP1 and then ↵ to display the current setpoint. The display will flash, indicating it is showing a setpoint and not the normal transducer value. Press ↵ to return to normal operation.

Starting & Stopping the Unit

The unit will automatically start running as soon as it is powered up; however, some changes to settings may drop the unit into an off-line state until started again.

To return to a "RUN" state from any menu:

Display:		**PRoG** or **INIt**	**oPER**	**RUN**
Button:	Hold ⬆	▶	↵	↵

Sending a Command Signal

The default Swagelok setup of the PID controller is for a remote command signal to be sent to the R+ and R- pins (see the Swagelok *Electronic Pressure Controller, Hazardous Locations Safety Manual*, MS-CRD-0300 for wiring details). Sending 4 mA will set the unit at zero bar, and sending 20 mA will set the unit at its maximum setpoint.

If local control is preferred, the unit can be changed to local command as follows:

Display:	**0.0**	**RUN**	**oPER**	**PRoG**	**SP1**	**M.RMP**	**RM.SP**	**oN**	**off**
Button:	⬆	⬆	◀	↵	◀	◀	↵	▶	↵

Now any input on the R+ and R- pins will be ignored. To set a command setpoint, press ▶ to select SP1, then ↵ to display the current setpoint, then ◀ or ▶ to adjust the setpoint, and ↵ to confirm it.

Transducer Calibration

Navigating the Transducer Calibration Settings

From the “Run” screen: (Displaying the transducer reading.)

Display:	0.0	RUN	oPER	INIt	INPt	ProC	4-20	MANL	Rd.1
Button:	⬆	⬆	▶	↵	↵	↵	↵	↵	

From here there are four key settings:

- **Rd.1** Reading at low value
- **IN.1** Input at low value
- **Rd.2** Reading at high value
- **IN.2** Input at high value

The ◀ and ▶ buttons can navigate between the settings, and pressing the ↵ button will select it. The numbers can then be adjusted by pressing the ▶ button to increase the value, and the ◀ button to select the next value. Press ↵ to store the value, or ⬆ to exit without saving.

Setting Up a New Transducer

If you are replacing a transducer or installing a transducer on a bare unit, you will need to enter approximate calibration values to get the unit to work.

Input (ma)		Reading (bar)	
IN.1	4	**Rd.1**	Zero
IN.2	20	**Rd.2**	Transducer full scale reading

Calibrating a Transducer

Transducers may need periodic re-calibration to ensure their accuracy. To achieve this, the following procedure should be used:

1. Install a calibrated reference gauge as close to the transducer as practicable.
2. With the SEPC set at zero, record the “SEPC low”, and “reference low” readings.
   - The difference between “SEPC low” and “reference low” is the “Error Low”.
3. Raise the pressure to its maximum value, record the “SEPC high”, and “reference high” readings.
   - The difference between “SEPC high” and “reference high” is the “Error High”.
4. Decrease the setpoint back to zero and vent the system.
5. Adjust the **RD.1** by the Error Low amount as described above.
6. Adjust the **RD.2** by the Error High amount as described above.

   Note: If calibrating at a pressure lower than the maximum transducer reading, this error will need to be scaled. For example, if calibrating at 300 bar on a 400 bar transducer, increase the error by 1.33 times (400/300).
7. Repeat the process to verify the new calibration values.

Effect of Hydrogen on Transducers

Due to hydrogen diffusion into the sensor structures, signal drift can occur over time. The time until the occurrence of a relevant signal drift and the size of the signal drift depend mainly on the following factors:

The temperature of the hydrogen, the pressure of the hydrogen, and the hydrogen content in the medium. For this reason, transducers used on hydrogen systems may require more regular calibration than other medias.

Setpoint Calibration

Navigating the Setpoint Calibration Settings

From the “Run” screen: (Displaying the transducer reading.)

Display:	**0.0**	**RUN**	**oPER**	**PRoG**	**SP1**	**M.RMP**	**RM.SP**	**oN**	**4-20**	**RS.lo**
Button:	⬆	⬆	◀	↵	◀	◀	↵	↵	↵	

From here there are four key settings:

- **RS.Lo** Setpoint at low value
- **IN.Lo** Input at low value
- **Rs.HI** Setpoint at high value
- **IN.HI** Input at high value

The ◀ and ▶ buttons can navigate between the settings, and pressing the ↵ button will select it. The numbers can then be adjusted by pressing the ▶ button to increase the value, and the ◀ button to select the next value. Press ↵ to store the value, or ⬆ to exit without saving.

Setting Up/Changing a Setpoint

If you are setting up or changing the setpoint on a unit, you will need to enter values below.

Input (ma)		**Setpoint (bar)**	
IN.Lo	Low input (default 4)	**RS.Lo**	Zero
IN.HI	High input (default 20)	**Rs.HI**	Maximum setpoint value

Calibrating a Setpoint

If the setpoint scale is changed, re-calibration may be required. To achieve this, the following procedure should be used:

1. With your system depressurized, press ▶ to select SP1 and then ↵ to display the current setpoint.
2. Send the zero setpoint signal to the SEPC (default would be 4 mA), and record “Setpoint low”.
   - The difference between “Setpoint low” and the signal being sent is the “Error Low”.
3. Send your maximum setpoint signal to the SEPC (default would be 4 mA), and record the “Setpoint high”.
   - The difference between “Setpoint high” and the signal being sent is the “Error High”.
4. Adjust the **RS.Lo** by the Error Low amount as described above.
5. Adjust the **Rs.HI** by the Error High amount as described above.
6. Repeat the process to verify the new calibration values.

PID Tuning

When a regulator is ordered with an SEPC installed, all PID settings are tuned for stable, reliable performance of the assembly. However, if a unit is purchased separately or if the performance requires adjustment, the SEPC can be tuned in situ by the user.

Swagelok's Default Settings

For reference, the settings that Swagelok uses when shipped are described below (these values are subject to change). These can be used to return a unit to "factory defaults" if needed.

Product	Control Ratio	PID PID.2 Gain			PID (Inlet Valve)				PID.2 (Vent Valve)			
		P	I	D	%Lo	%HI	oFst	dEAd	%Lo	%HI	oFst	dEAd
SGRD SGBD SHRD	1:1	100	0	0	0%	100%	5%	0.1	-100%	0%	-5%	0.1
SGRA SGBA	5:1	20	0	0				0.2				0.2
	15:1	6.7	0	0				0.6				0.6
	40:1	2.5	0	0				1.6				1.6
	70:1	1.4	0	0				2.8				2.8
SFRA	150:1	0.7	0	0				10				2

Navigating the PID Settings

From the "Run" screen: (Displaying the transducer reading.)

Display:	0.0	RUN	oPER	PRoG	SP1	M.RMP	RM.SP	Pid.2	Pid
Button:	⬆	⬆	◀	↵	◀	◀	◀	↵ or ◀	↵

From here there are nine settings / sub-menus:

- **ACtN** PID action direction. Controls if the valve will supply or vent, **DO NOT CHANGE**.
- **A.to** Autotune timeout. Autotune function is not recommended, **DO NOT CHANGE**.
- **TUNE** Initiate autotune. Autotune function is not recommended, **DO NOT USE**.
- **GAIN** Gain values. Control how open the valve is in relation to the error between the transducer reading and control setpoint.
  - **_P_** Proportional gain. P x error to accelerate progress towards the setpoint.
  - **_I_** Integral gain. I x error over time to accelerate progress to account for system losses. For example, a leak to atmosphere.
  - **_D_** Derivative gain. D x rate of change of the error to respond to sudden changes.
- **oFST** Offset value. This controls the minimum % on (pulse width) sent to the valves.
- **dEAd** Dead zone. This creates a zone where the setpoint is close enough to the setpoint. Values should be positive and are in bar.

  Example: A value of 5 on the inlet dead zone would mean the PID logic sees a pressure that is within 5 bar of the required setpoint as achieving target.
- **%Lo** Low output clamping limit. This is the minimum pulse width signal sent to the valve.
- **%Hi** High output clamping limit. This is the maximum pulse width signal sent to the valve.
- **AdPt** Adaptive tuning. Adaptive tuning is not recommended, **DO NOT CHANGE**.

Tuning & Troubleshooting

The table below can provide several ideas on how to tune your PID settings.

Symptom	Cause	Remedy
Sudden changes in the setpoint can cause the controller to overshoot the target.	The controller is trying to operate the inlet valve quicker than the system can respond.	Lower the **PID.1** and **PID.2 P** values to slow the controller down. or Lower the **PID.1 %Hi** and Increase the **PID.2 %Lo** to limit the maximum flow rate valves.
A sudden change in flow can cause instability in the setpoint.		
Controller is very slow to respond to changes in setpoint.	The controller is trying to operate the inlet valve too slowly.	Increase the **PID.1** and **PID.2 P** values to speed the controller up. or Increase the **PID.1** and **PID.2 D** values to speed up the controller's response to sudden changes.
Controller is very slow to respond to changes in flow.		
Controller cannot reach maximum pressure, even though it shows the inlet valve is operating.	Has insufficient control pressure to obtain maximum setpoint.	Ensure control pressure is adequate to achieve full setpoint. (Example: for a 5:1 ratio regulator to reach 50 bar, it would need at least a 10 bar supply, ideally a little more.)
	Leak in control gas system after the controller.	Find and fix the leak.
Controller keeps searching up and down when in a steady state of flow and setpoint.	The controller is trying to set to an accuracy greater than the system / regulator hysteresis can support.	Increase the **PID.1** and **PID.2 dEAd** values to give the controller a larger target / deadband.
Controller gets close to the setpoint and then stops trying to set the pressure.	The controller has been programmed with a deadband to manage system hysteresis.	Decrease the **PID.1** and **PID.2 dEAd** values to give the controller a smaller target / deadband.
Value displayed on controller is different to the actual system pressure.	Controller's transducer is out of calibration.	Calibrate the transducer. For more information, see Transducer Calibration on page 7.
Controller does not set the pressure accurately to the command signal.	Command signal is out of calibration.	Calibrate the command signal. For more information, see Setpoint Calibration on page 8.
Regulator's outlet pressure does not decrease when setting the command signal lower than the current outlet pressure.	Controller is venting the dome pressure, but the regulator is non-venting, and system is not flowing; thus outlet pressure cannot be reduced.	Change to a self-venting regulator.
Outlet pressure drops for a period when going from non-flowing to flowing conditions.		Change setpoint when there is downstream flow / demand.
When turning the unit on, the regulator outlet pressure is set higher than expected.	Pressure has been trapped in the dome of the regulator, leaving it in a set position.	Set the controller to zero and allow the dome to vent before powering off

Note: When changing the PID settings away from Swagelok's recommended/default values, it is recommended to change them in 10% increments, checking function after each adjustment.

RAMP Profile

Ramping is an option that allows the internal control of the setpoint over a pre-disclosed time frame. In this mode, any input on the R+ and R- pins will be ignored, and instead, the setpoint will be controlled by the "Ramp Program". The controller can hold 99 programs, and each program can contain up to eight segments. Profiles can be linked to each other, allowing a maximum of 792 steps if required.

RAMP Operation

If **R.CtL** is set to ON, then as soon as the unit is powered on, the program set in **S.PRG** will start to run. Once running, a program will start to increase/decrease the setpoint to its first target **MSt.1** over the duration of the time set in **MRt.1**. If for example, a target of 100 bar were set over 2 minutes, the unit would increase the setpoint by 1 bar every 1.2 seconds for a total of 120 seconds. Once the ramp section has finished, the setpoint will be held at target for the duration specified in **MSt.1**.

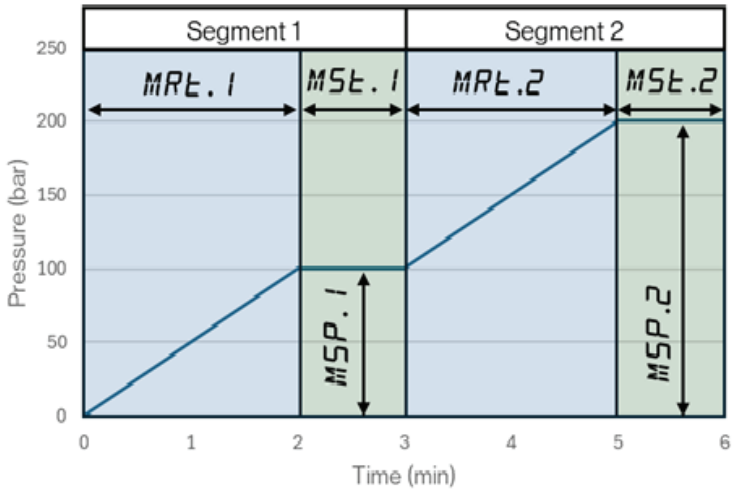

Figure 3. *RAMP Graph*

If the actual pressure achieved does not meet the prescribed setpoint, the operation will stop and display a failure message **E008**. The specifics of this clause depend on the option selected in **M.tRk** and are described below.

Once a segment is completed (ramp and soak), the controller will load the next segment in the program.

Once a program has completed all segments, the program can either stop, hold pressure, or link and start another program, depending on the parameters set in E.ACt.

Navigating the Setpoint Calibration Settings

From the “Run” screen: (Displaying the transducer reading.)

Display:	**0.0**	**RUN**	**oPER**	**PRoG**	**SP1**	**M.RMP**
Button:	↑	↑	◀	↵	◀	↵

Ramp Settings

R.CtL Activate Multi-Ramp/Sock Mode:

- **No** Turned off
- **Yes** Enabled (default will auto start on power on)

S.PRG Selects a program number to be used/edited.

M.tRk Program tracking mode:

- **RAMP** Ramp Mode:

  If the soak setpoint is not reached within the specified Ramp Time, the Ramp Soak cycle will terminate, the outputs will be disabled, and a failure message (**E008**) will be displayed.
- **SoAK** Soak Mode:

  If the soak setpoint is not reached within the specified Ramp Time, the system will continue to Ramp and not transition to the Soak Mode until the Soak point is reached. The full specified Soak time is preserved.
- **CYCL** Cycle Mode:

  If the soak setpoint is not reached within the specified Ramp Time, the unit will continue to ramp until that setpoint is reached. The additional ramp time required is subtracted from the soak time so that the specified cycle time (ramp time + soak time) is preserved. If the soak setpoint is still not reached at the end of total cycle time, the ramp and soak program will terminate, the outputs will be disabled, and the failure message (**E008**) will be displayed.

tIM.F Time Format for ramping:

HH:MM or **MM:SS**

E.ACt Action to perform at the end of a program:

- **StOP** Enter standby mode, displaying **RUN**.
- **HoLd** Hold at the final soak setpoint.
- **LINk** Link to another profile.

  Specifying **0** will repeat the program specified by **S.PRG,** which can provide for cycling through a series of linked programs.

  Specifying **100** will restart the last program run in a sequence of linked programs.

N.SEG Specifies the number of segments the current program contains.

S.SEG Selects a segment in the current program to edit and has the following sub menus (note: the number on the submenus represents the current segment being edited);

- **MRt.1** Ramp time: The setpoint target will gradually be changed over this time.
- **MRE.1** Ramp events: Must be **oFF**, other options not compatible with SEPC controllers.
- **MSP.1** Setpoint value: The setpoint value in bar that the ramp and soak time will be aiming for.
- **MSt.1** Soak time: The setpoint target will be maintained for this time.
- **MSE.1** Soak events: Must be **oFF**, other options not compatible with SEPC controllers.

Appendix A: Full List of Settings and Swagelok Defaults

Initialization Menu (INIt)

Menu name	Description	Default settings	Alternative settings
INPt	Transducer input type	**PRoC/4-20** 4–20 mA transducer input	**PRoC/0-20** 0–20 mA transducer input (other menu options will not work with the SEPC)
INPt/PRoC/4-20/MANL	Manual calibration of the feedback transducer	For more information, see Transducer Calibration on page 7	
tARE	Tare the feedback value, setting its zero point	**dSbL** Disabled	**ENbL** enabled on **oPER** menu
LNIR	10 point linearization option, to calibrate non linear inputs	**dSbL** Disabled	**MANL** enter Rd display, IN input values for scaling **LIVE** enter Rd display, IN live values from current reading
RdG/dEC.P	Reading format decimal places	Pressure < 1000 bar **FFF.F** one decimal place Pressure ≥ 1000 bar **FFFF** no decimal places	**FF.FF** two decimal places **F.FFF** three decimal places
RdG/°F°C	Shows temperature annunciator	**NoNE** Disabled	(Other menu options will not work with the SEPC)
RdG/d.RNd	Display rounding	**0** Disabled	Any number, for example a 5 will round the display to 0, 5, 10, 15, etc.
RdG/FLtR	Input filtering, averages the transducer signal to remove noise	**2** Average of two readings. Gives a response time of 0.1 seconds	**1, 4, 8, 16, 32, 64, 128** Larger samples will reduce the response time and can cause the PID to overshoot. Each sample takes 0.05 seconds, thus 128 is 6.4 seconds
RdG/ANN.n	Controls when the alarm annunciator lights up	**ANN.1 =DC1** **ANN.2 = DC2**	
RdG/NCLR	Display color	**GRN** = Green	**REd** = red, **AMbR** = amber
RdG/bRGt	Display brightness	**HIGH**	**MEd, Low**
ECtN	Transducer excitation voltage	**24V**	**0V, 5V, 10V, 12V**
CoMM/USB/Prot	USB communications protocol	**oMEG**	**M.bUS**
CoMM/USB/AddR	USB communications address	**1**	
SFtY/PwoN	Power on state	**RUN** Runs automatically at power up	**RSM** Runs at power up if no logged faults **wAIt** Paused at power up
SFtY/RUN.M	Requires confirmation to start run mode (two presses of Enter).	**dSbL** Disabled	**ENbL** Enabled
SFtY/SP.LM/SP.Lo	Setpoint low limit	**-1000** Limits set by analog input	Any pressure in bar
SFtY/ SP.LM/SP.HI	Setpoint high limit	**+2000** Limits set by analogue input	Any pressure in bar
SFtY/SEN.M/LPbk	Transducer fault timeout. If the transducer value does not change for x time, trigger alarm.	**dSbL** Disabled	**ENbL** Enabled, set time in mm.ss

Initialization Menu (INIt) continued

Menu name	Description	Default settings	Alternative settings
SFtY/SEN.M/o.CRk	Open input circuit detection. For 4-20 mA inputs, if the value drops below 4 mA, an alarm is triggered.	**ENbL** Enabled	**dSbL** Disabled
SFtY/SEN.M/E.LAt	Latch input sensor errors, requiring operator input to resume.	**dSbL** Disabled	**ENbL** Enabled
SFtY/oUt.M/dC1/o.bRk (inlet valve)	Output break detection. If the output does not reach the specified value in the specified time when at 100% saturation, trigger alarm.	**dSbL** Disabled	**ENbL** Enabled **P.dEV** Process condition in bar **T.dEV** Time condition in minutes
SFtY/oUt.M/dC2/o.bRk (vent valve)		**dSbL** Disabled	
SFtY/oUt.M/E.LAt	Latch output errors, requiring operator input to resume.	**dSbL** Disabled	**ENbL** Enabled
t.CAL	Manual temperature calibration	**dSbL** Disabled	(Other menu options will not work with the SEPC)
SAVE	Downloads current setting to USB drive.	Select a numerical file name to save/load. Files are saved in a tab-delimited text file. **E010** = No USB drive installed **E003** = Load operation failed **E004** = Save operation failed **doNE** = Operation successful	
LoAd	Uploads settings from USB drive.		
VER.N	Displays firmware versions number.	**1.04.0** at product launch	
VER.U	Updates firmware from USB drive.	Pressing Enter will update firmware from USB drive. Note: All settings will be lost. It is recommended to save the settings to a USB drive first so that they can be loaded after the update.	
F.dFt	Resets all settings to factory default.	**NOT RECOMMENDED:** Pressing Enter will reset all settings to the PID manufactures default, losing all Swagelok settings.	
I.Pwd	Password-protected initialization mode settings	**No**	**Yes** Enter a 4-digit numerical password.
P.Pwd	Password-protected programming mode settings	**No**	**Yes** Enter a 4-digit numerical password.

Programming Menu (PRoG)

Menu name	Description	Default settings	Alternative settings
SP1	Manual input of primary setpoint. Not functional if using remote (4-20 mA) setpoint		Any pressure in bar
SP2	Secondary setpoint. Not used by SEPC	**ASbo** absolute	**dEVI** Offset value from SP1
ALM.1	Alarm 1 configuration	**oFF**	(Other menu options are not optimized for the SEPC)
ALM.2	Alarm 2 configuration	**oFF**	
dC1/ModE	Inlet valve control mode	**Pid/ACtN/RVRS**	(Other menu options will not work with the SEPC)
dC1/CYCL	PWM pulse width in seconds	**0.1**	
dC2/ModE	Inlet valve control mode	**Pid2/ACtN/dRCt**	
dC2/CYCL	PWM pulse width in seconds	**0.1**	
Pid/ACtN	PID direction	**RVRS** Increase to SP1	
Pid/A.to	Autotune timeout	**0.5** seconds	
Pid/tUNE	Initiate autotune	**Not Recommended**	
Pid/GAIN	PID settings	For more information, see PID Tuning on page 9	
Pid/oFSt	Control offset	**5** PID output starts at 5%	(Other menu options will not work with the SEPC)
Pid/dEAd	Deadband	For more information, see PID Tuning on page 9.	
Pid/%Lo	Low clamping limit for pulse	**0**	(Other menu options will not work with the SEPC)
Pid/%Hi	High clamping limit for pulse	**100**	
Pid/AdPt	Enable fuzzy logic adaptive tuning	**dSbL** Disabled	**ENbL** Enabled
Pid2/ACtN	PID direction	**dRCt** Decrease to SP1	(Other menu options will not work with the SEPC)
Pid2/A.to	Autotune timeout	**0.5** seconds	
Pid2/tUNE	Initiate autotune	**Not Recommended**	
Pid2/GAIN	PID settings	See section PID tuning	
Pid2/oFSt	Control offset	**-5** PID output starts at - 5%	(Other menu options will not work with the SEPC)
Pid2/dEAd	Deadband	See section PID tuning	
Pid2/%Lo	Low clamping limit for pulse	**-100**	(Other menu options will not work with the SEPC)
Pid2/%Hi	High clamping limit for pulse	**0**	
Pid2/AdPt	Enable fuzzy logic adaptive tuning	**dSbL** Disabled	**ENbL** Enabled
RM.SP	Remote setpoint, setpoint is changed via analogue input	**On/4-20** 4–20 mA	**oFF** Use SP1 in menus **On/0-1mA** 0–1v **On/0-10mA** 0–10v **On/0-24mA** 0–24 mA
M.RMP	Ramp profile settings	See section RAMP Profile	

Operating Menu (oPER)

Menu name	Description
RUN	Starts the PID controller. When running the process, value will be displayed.
SP1	Shortcut to the setpoint menu, allowing manual input of primary setpoint. Not functional if using remote (4-20 mA) setpoint.
SP2	Secondary setpoint. Not used by SEPC.
MANL/M.CNt	Manual Output control. Allows the user to manually open the inlet valve for debugging purposes.
MANL/M.INP	Manual Input control. Allows the user to simulate a transducer signal for debugging purposes.
PAUS	Pauses the operation.
StoP	Stops the PID controller. When stopped, the process value will flash.
L.RSt	Clears any latched alarms.
VALY	Displays the lowest transducer reading. Pressing Enter will clear.
PEAk	Displays the highest transducer reading. Pressing Enter will clear.

Error Codes

Error Code	Error Description	Remedy
E001	File not found during load operation	Saving or loading settings to a USB device requires the USB to be formatted in FAT16.
E002	Bad file format during load operation	
E003	File read error during load operation	
E004	File write error during save operation	
E005	Device not found for read or write operation	
E006	Loop break timeout	**LPbk** has been enabled by user, disable or modify value per appendix A.
E007	Autotune timeout	Autotune is not supported.
E008	Ramp and Soak program tracking error	For more information, see RAMP profile on page 11.
E009	Input signal out of range	Check transducer wiring, operation, and calibration.
RNGE		
E010	Communications device not ready (USB, Serial, etc.)	Communication protocols not supported by SEPC unit. Use the analogue input for control.
E011	Communications install error	
E012	Failed attempt to open a communications device	
E013	Failed attempt to read from a communication device	
E014	Failed attempt to write to a communication device	
E015	Bad reboot, attempt to reboot from an unknown source	Firmware has been corrupted by bad load from USB or hardware issues. Restart device. If error persists, contact your authorized Swagelok Sales and Service Center.
E016	Unable to autotune because input signal is on wrong side of setpoint	Autotune is not supported.
E017	Signal too unstable to perform autotune	
E01D	Autotune measurement error	

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit swagelok.com or contact your authorized Swagelok representative.

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