

# Settings for digital proportionals

## 1 MAIN SOFTWARE PARAMETER SETTINGS

Valve's functional parameters and configurations, can be easily optimized using Atos E-SW programming software connected via USB port to the digital driver. For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus. The following is a brief description of the main settings and features of digital drivers. For a detailed descriptions, please refer to the user manual included in the E-SW programming software.

### 1.1 Scale

Scale function allows to set the maximum valve opening at maximum reference signal value. This regulation allows to reduce the maximum valve regulation in front of maximum reference signal.

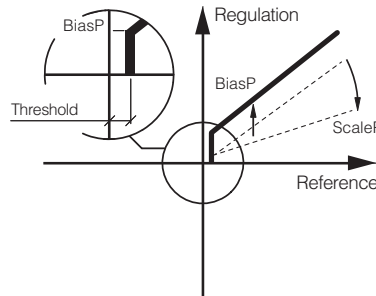
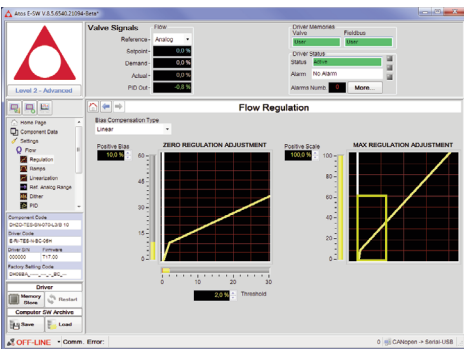
### 1.2 Bias and Threshold

According to selected code, proportional valves may have a dead band in the hydraulic regulation in correspondence of its rest position. This dead band in the valve's regulation can be compensated by activating the Bias function, which adds a preset Bias value to the reference signal (analog or fieldbus external input). The Bias function is activated when the reference signal overcome the Threshold value. The Bias setting allows to calibrate the Bias valve opening to the specific proportional valve to which the driver is coupled. The Threshold setting is useful to avoid undesired valve regulation at zero reference signal when electric noise is present on the analog input signal: smaller threshold reduces the reference signal dead band, greater values are less affected by electric noise presence. If fieldbus reference signal is active, threshold should be set to zero.

### 1.3 Offset

According to selected code, proportional valves may have zero overlapping in the hydraulic regulation in correspondence of zero reference input signal (valve's central spool position). The Offset function allows to calibrate the valve's spool central position to the specific hydraulic system setup (e.g. valve applied to cylinder with differential areas). Offset default setting is zero.

#### BIAS, SCALE and THRESHOLD: single solenoid valve, 2 positions with positive overlapping



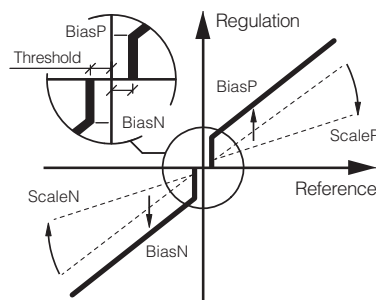
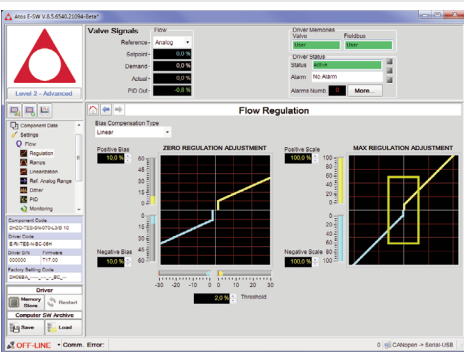
**Bias setting:** supply input signal just over the Threshold value; increase the Bias until the actuator is start moving, then lightly reduce the Bias just to stop the actuator.

**Scale setting:** supply the max input signal; adjust the Scale to obtain the max actuator-speed.

**BiasP** : positive bias  
**ScaleP** : positive scale

**Threshold** = 2%  
(200mV or 0,32mA for I option)

#### BIAS, SCALE and THRESHOLD: double solenoid valve, 3 positions with positive overlapping

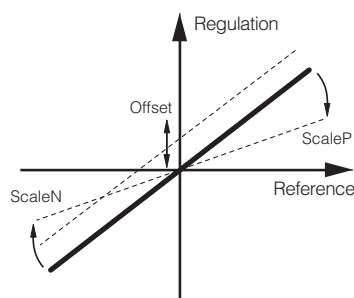
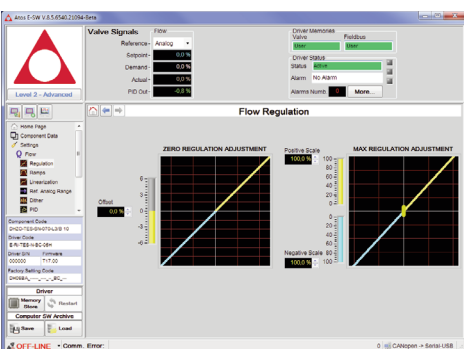


**Bias and Scale setting:** follow the same indications reported for 2 position valves for both valve's solenoids.

**BiasP** : positive bias  
**ScaleP** : positive scale  
**BiasN** : negative bias  
**ScaleN** : negative scale

**Threshold** = 2%  
(±200mV or ±0,16mA for I option)

#### OFFSET and SCALE: single or double solenoid valve, 3 positions with zero overlapping



**Offset setting:** supply the input signal equal to 0%; adjust the Offset until the actuator is stopped.

**Scale setting:** supply the max input signal (positive/negative); adjust the Scale to obtain the max actuator speed in both directions.

**ScaleP** : positive scale  
**ScaleN** : negative scale  
**Offset**

### 1.4 Ramps

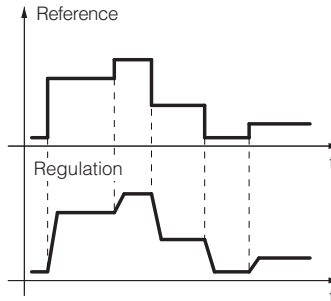
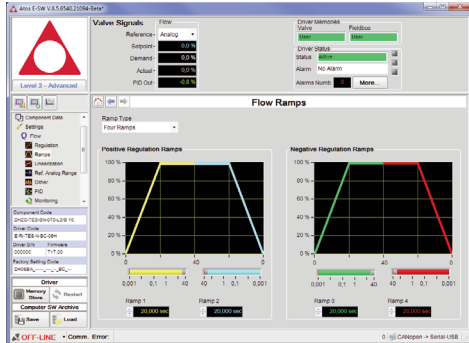
The ramp generator allows to convert a step change of electronic reference signal into smooth time-dependent increasing/decreasing of the valve opening.

Different ramp mode can be set:

- single ramp for any reference variation
- two ramps for increasing and for decreasing reference variations
- four ramps for positive/negative signal values and increasing/decreasing reference variations

Ramp generator is useful for application where smooth hydraulic actuation is necessary to avoid machine vibration and shocks.

If the proportional valve is driven by a closed loop driver, the ramps can lead to unstable behaviour, for these applications ramp function can be software disabled (default setting).



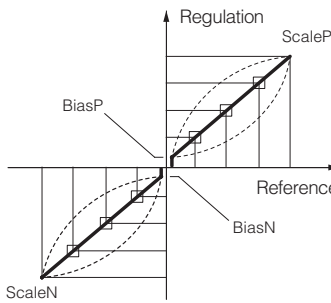
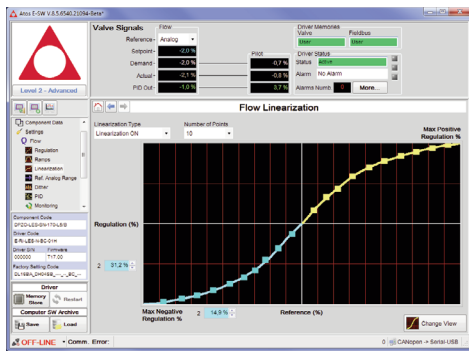
**Ramps setting:** select the required ramp configuration and adjust the ramp time to optimize the actuator's acceleration and deceleration.

- No Ramp** : no ramps selected
- Single Ramp** : setup **Ramp 1**
- Double Ramp** : setup **Ramp 1** and **2**
- Four Ramps** : setup **Ramp 1, 2, 3** and **4** (available only for 3 way)

### 1.5 Linearization

Linearization function allows to set the relation between the reference input signal and the controlled valve's regulation.

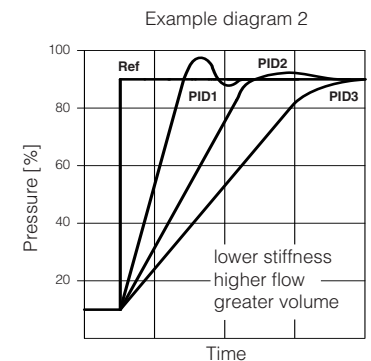
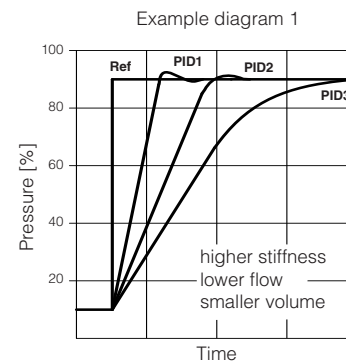
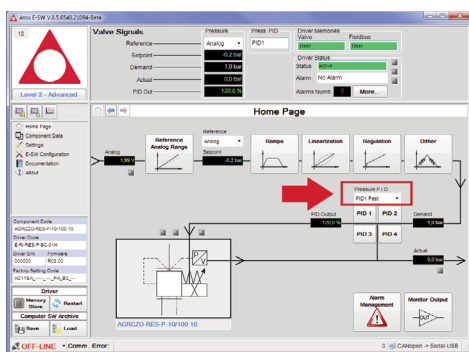
Linearization is useful to consist the non linear characteristics of the valve's regulation in a defined working condition.



**Linearization setting:** select up to 10 points for linearization and adjust the regulation and reference (positive/negative).

### 1.6 Dynamic response - only for REB and RES pressure control

The valve is provided with 4 PIDs configurations to match different hydraulic conditions. The required PID configuration can be selected before the valve commissioning, through Atos E-SW software via USB port. Only for **RES** the PID can be also selected in real time, through PLC via fieldbus.



PID	Dynamic response see example diagrams 1 and 2
1	Fast - default (1)
2	Standard
3	Smooth
4	Open Loop

Above indications have to be considered as a general guideline, being affected by hydraulic circuit stiffness, working flow and dead volume. The valve's dynamics can be further optimized on the specific application, customizing PIDs parameters.

In case of pressure instability, select PID4 to operate the valve in open loop. If the instability still persists, check eventual anomalies in the hydraulic circuit as the presence of air. If the instability disappears, select an alternative configuration within PID selection 1, 2 or 3 which better matches the application requirements. If no one of the above selection fulfills the application, tune P - I - D parameters at E-SW software level 2 to obtain the desired dynamic response.

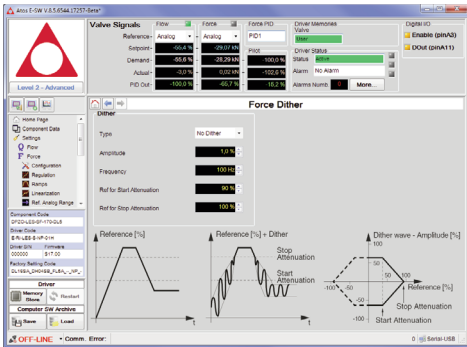
(1) interchangeable with previous TERS version

### 1.7 Dither and Variable Dither

The dither is an high frequency modulation of the current supplied to the solenoid. Varying the modulation frequencies, the valve's hysteresis may be reduced. Small vibration in the valve's hydraulic regulation considerably reduces the mechanical friction effects (e.g. due to cylinder seals).

#### DITHER - Closed Loop

Dither frequency and amplitude are software selectable; the amplitude is automatically reduced at high reference values (high regulated flow / cylinder speed) to avoid possible instability. Lower frequency and higher amplitude reduce hysteresis but also reduce the regulation stability. In some application this can lead to vibration and noise: right setting usually depends on system setup. Dither default setting is disabled.



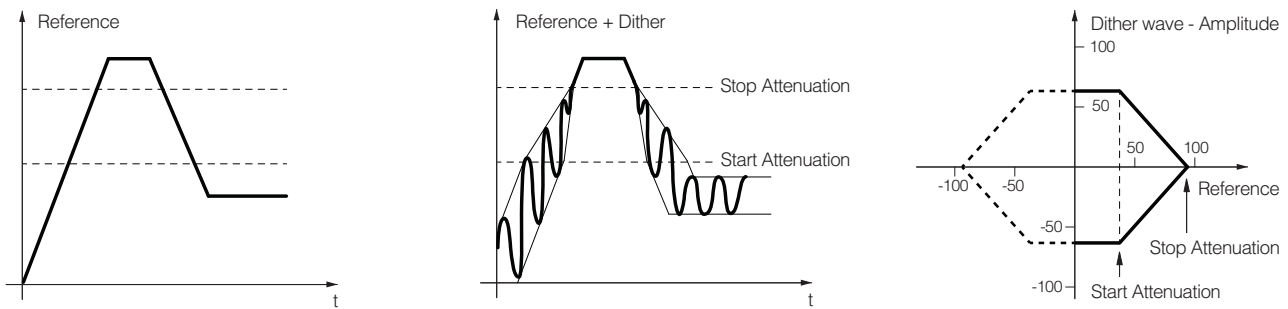
**Dither setting:** select the waveform type of the dither signal added to the reference actual signal thus obtain different effect: rough (**Square**), medium (**Triangular**), smooth (**Sine**).

**Amplitude:** adjust the dither waveform amplitude; greater value produce higher dither effects but may cause undesired system vibrations.

**Frequency:** adjust the dither waveform frequency; lower value produce higher dither effects but may cause undesired system vibrations.

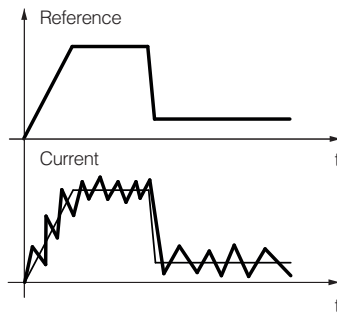
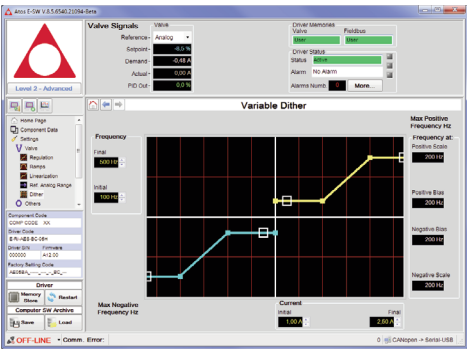
**Reference for Start Attenuation:** adjust the at which reference signal the dither amplitude attenuation has to start.

**Reference for Stop Attenuation:** adjust at which reference signal the dither amplitude attenuation has to stop; stop value must be always greater than the Start value.



#### VARIABLE DITHER - Open Loop - only for AEB and AES

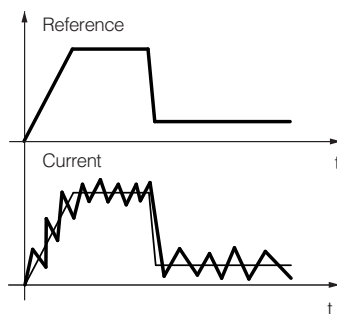
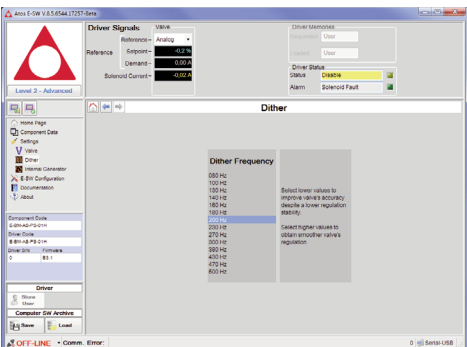
To reduce the hysteresis should be selected a lower value of frequency, despite a lower regulation stability, because a small vibration in the valve regulating parts considerably reduces static friction effects. To improve the regulation stability, should be selected a high value of frequency, despite a higher hysteresis. This solution in some application can lead to vibration and noise. Normally, the right setting is a compromise and depends on system setup. Open loop drivers allow to realize a variable dither frequency that linearly depends on the demanded current: variable dither frequency allows an higher degree of valve hysteresis optimization.



**Dither setting:** adjust dither frequency applied when demanded current corresponds to Initial and Final current; afterwards adjust the demanded current from which dither frequency start and stop changing.

#### DITHER - Open Loop - only for E-BM-AS and E-MI-AS-IR

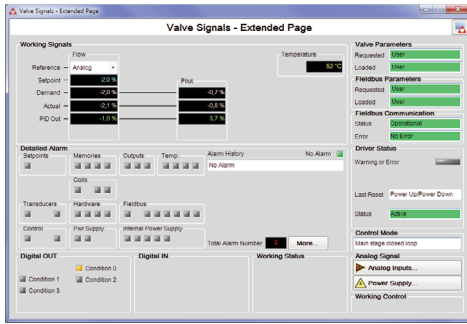
To improve the regulation stability, should be selected a high value of frequency, despite a higher hysteresis. This solution in some application can lead to vibration and noise. Normally, the right setting is a compromise and depends on system setup.



**Dither setting:** select the frequency of the modulation to be applied to the current supplied to the solenoid.

### 1.8 Diagnostic - Valve Signals

Complete information about the valve are available in order to verify actual working conditions.

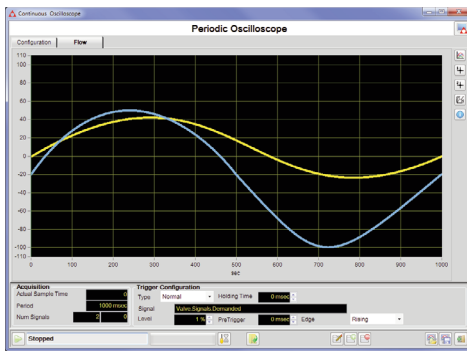


Available information about:

- reference and actual signals
- control status
- analog signal
- fieldbus communication status and errors
- alarms
- digitals IN/OUT
- power supply status
- driver temperature

### 1.9 Diagnostic - Oscilloscope

Dynamic response of the valve can be verified through the oscilloscope. It could be used to analyze the time trends of the selected signals. Two different oscilloscope function are available: periodic and continuous.

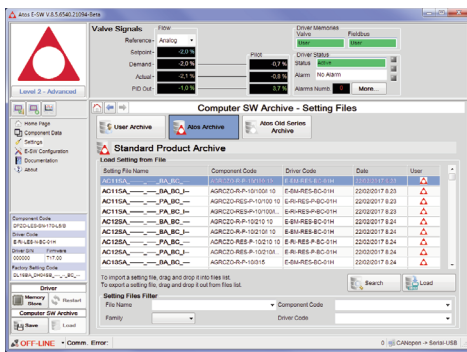


**Periodic:** select this oscilloscope mode to analyze with periodic acquisition a specific time window in detail mode (constant sampling). Trigger function can be used to detect defined events. Signal sampling up to 1 msec.

**Continuous:** select this oscilloscope mode to analyze with continuous acquisition the complete cycle machine (variable sampling). Trigger function not available. Signal sampling depends by PC communication exchange rate.

### 1.10 Setting files

Driver parameter settings can be saved or loaded into computer's archive. Setting file can be used efficiently as a starting point for repetitive installation of the same driver. A range of preset settings, corresponding to the most common proportional valves, is included in the software installation.



**User Archive:** select this archive to open the user setting database. It is used to save the setting files customized by the user.

**Atos Archive:** select this archive to open the standard products archive. It is used to load the factory setting of standard products.

**Atos Old Series Archive:** select this archive to open the old series products archive. It is used to load the factory setting of old products.