

Basics for digital electronic drivers

1 WHAT IS DIGITAL PROPORTIONAL DRIVER?

Digital electronic drivers interface proportional electrohydraulic valves to the machine central unit and are used to achieve the proportional fast, smooth and accurate motions required by today's modern systems.

Drivers proportionally convert the reference input signal, generated from the machine central unit, into a current supplied to the valve solenoid.

This current is controlled through PWM modulation of the driver power supply and is proportionally transformed into a force by the valve solenoid.

Solenoid force, acting the valve spool or poppet against a reacting spring, finally provides the valve's hydraulic regulation (see tech table F001 for Basic for electronic proportional controls).

Digital driver executions include:

- **Drivers for proportional valves without transducer (open loop)**

Basic drivers that supply and control in closed loop the current to the solenoid (fig.1)

- **Drivers for proportional valves with transducer (closed loop)**

High performance drivers that supply and control in closed loop both the solenoid current and the valve spool/poppet position or pressure (fig.2)

Closed loop control grants better performances: less hysteresis, better linearity, repeatability and time response

- **Integral-to-valve**

Integral drivers, open or closed loop, are directly wired and assembled on the controlled proportional valve (fig.3) and are factory preset using automated bench to assure repetitive regulation characteristics

- **Separate**

Separate drivers (fig.4), open or closed loop, can be installed far from the controlled valve in applications with overall dimensional limits or strong environmental conditions (e.g. temperature, vibration and shock)

This format allows additional electrical connections to perform auxiliary functions (e.g. internal reference generation with external on-off commands - see tech table G030)

For complete information about the electronic drivers and characteristics, see specific technical tables.

2 COMMUNICATION INTERFACES

The communication interface is the access port to all the information contained into the digital drivers: real-time signals, alarms and functional parameters can be digitally exchanged with external programming devices without further elaboration.

- **Serial/USB interface**

Drivers with serial or USB communication interface (PS or NP execution) are designed to be connected to a desktop or notebook computer.

As analog executions, these digital drivers can be operated by the machine automation using the analog and on-off signals available on the driver connectors.

- **Fieldbus interfaces**

Drivers with fieldbus communication interface (BC - CANopen, BP - PROFIBUS DP and EH - EtherCAT executions) allow an higher level of integration with the machine automation: machine central unit (fieldbus master), wired with all the controlled devices (fieldbus node), can completely operate the driver using the digital communication (fig.5).

These driver allow:

- more information available for machine operation with better application performances
- improved accuracy and robustness of digital transmitted information
- costs reduction due to simpler and standardized wiring solutions
- costs reduction due to fast and simple installation and maintenance

3 ATOS PROGRAMMING SOFTWARE

E-SW programming software allow to set the valve's functional parameters.

It is supplied in DVD format and can be easily installed on a desktop or a notebook computer (fig.6).

The software graphic interface is organized in pages and levels related to different specific functional groups and allows to:

- simply access all the functional parameters of Atos digital proportional valves and drivers
- numerically adapt the factory preset parameters to the application requirements
- verify the actual working conditions
- identify and quickly solve fault conditions
- store the customized setting into the valve/driver or into the PC

The software automatically recognizes the connected valve model and adapts the displayed parameters. Different software versions are available depending on the driver communication interface to be programmed (see 2):

- E-SW-PS for USB (NP), Serial (PS) and Infrared (IR) communication interface
- E-SW-BC for CANopen communication interface
- E-SW-BP for PROFIBUS DP communication interface
- E-SW-EH for EtherCAT communication interface

E-SW-* software with S option is required to program digital proportional components equipped with alternate P/Q control:

- TES-S/LES-S proportional valves with S option (see tech table GS212)
- PES-S variable displacement pumps (see tech table GS215)

Note: E-SW-*/S software allows to program also standard digital components

On first supply of the E-SW software, it is required to apply for the registration in the Atos download area (www.download.atos.com) where you will find the latest releases of the Atos software, manuals, drivers and configuration files- see also tech table GS500.

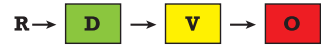


Fig.1 - open loop controls

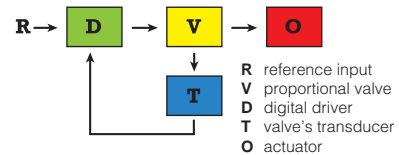


Fig.2 - closed loop controls



Fig.3 - integral-to-valve execution



Fig.4 - separate execution

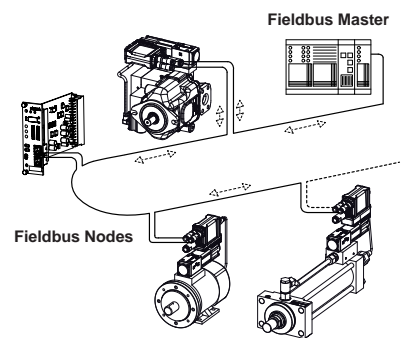
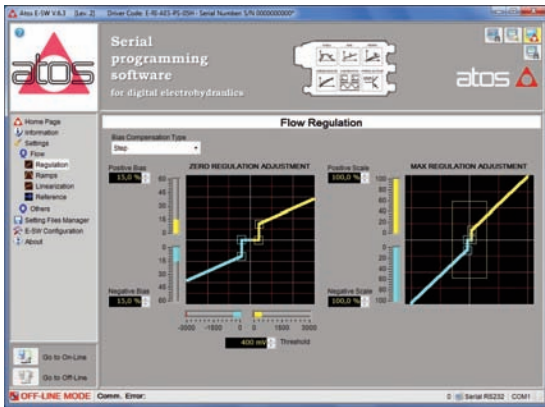


Fig.5 - fieldbus network



Fig.6 - software setting of digital parameters

4.1 Bias and Scale settings



Bias setting

Compensation of the dead band in the hydraulic regulation of proportional valve with spool positive overlap. It is useful to improve the valve regulation performances while maintaining the positive overlap function when the driver is switched off.

Scale setting

Adjustment of the maximum valve regulation at maximum reference signal value. This regulation is useful to:

- couple the driver maximum current with the maximum nominal current of the proportional valve
- adapt the valve regulation to the system requirements

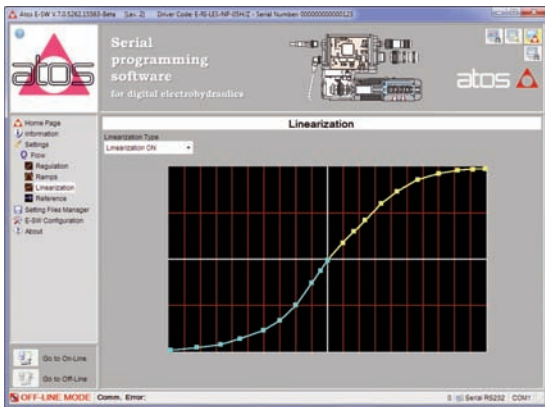
4.2 Ramps setting



Ramps setting

Introduction of a smooth time-dependent increasing/decreasing of the current supplied to the solenoid in front of a sudden change of electronic reference input signal. This function is useful for application where smooth hydraulic actuation is necessary to avoid machine vibration and shocks.

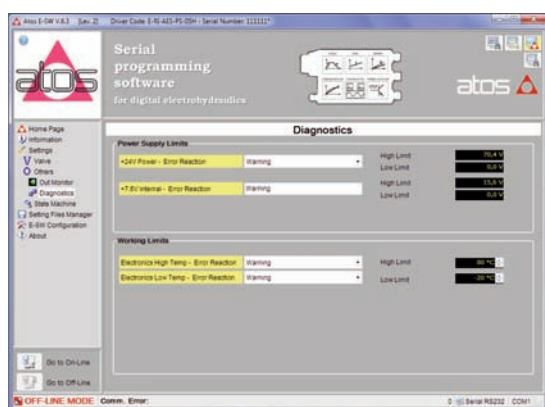
4.3 Linearization setting



Linearization setting

Adjustment of the relation between the reference input signal and the valve regulation. It is useful for applications where it is required to linearize the valve's regulation in a defined working condition.

4.4 Diagnostics

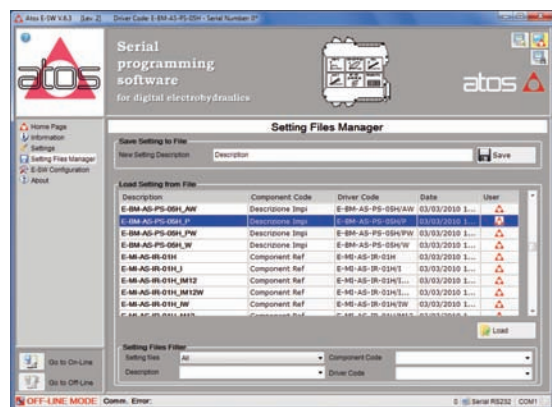


Diagnostics

Complete information about the driver and valve can be checked to verify actual working conditions and to simplify maintenance and tuning operations. Available information include:

- driver status
- alarms
- reference and actual signals
- communication errors

4.5 Setting Files Manager



Setting files manager

Save (store) and load (restore) the driver parameter set from the PC hard disk. Setting File can be used efficiently as a starting point when executing repetitive installation of the same driver. A range of preset settings, corresponding to the parameters settings of the most common proportional valves, is included in the software installation.