Digital electrohydraulic servoactuators
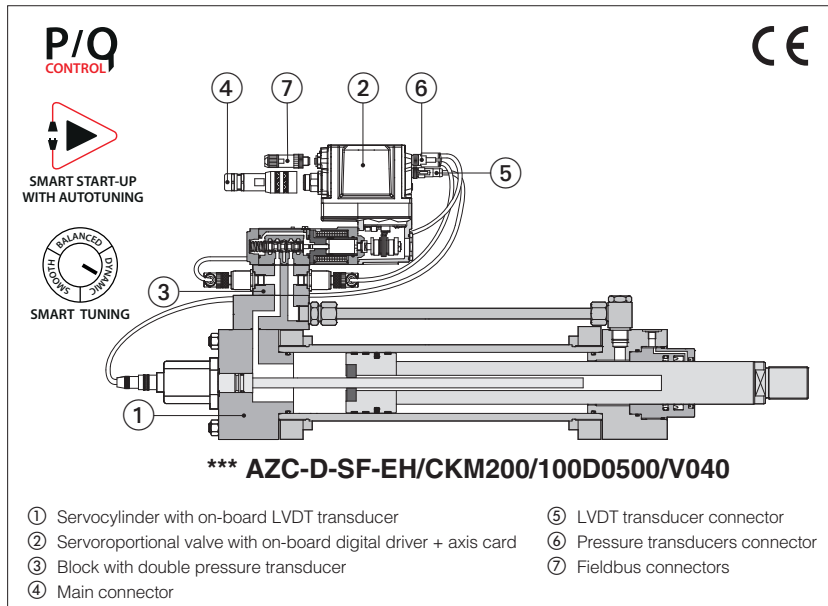
servocylinder plus servoproportional directional with on-board driver & axis card

*** AZC-D-SF-EH/CKM200/100D0500/V040

① Servocylinder with on-board LVDT transducer
② Servoroportional valve with on-board digital driver + axis card
③ Block with double pressure transducer
④ Main connector
⑤ LVDT transducer connector
⑥ Pressure transducers connector
⑦ Fieldbus connectors

AZC

Digital electrohydraulic servoactuators are stand-alone units performing closed loop position controls.

The complete motion control cycle can be operated by external signals (from machine PLC) or programmed internally to the controller.

Alternated P/Q control add the force limitation to position regulation, requiring pressure or force transducers installation.

The servoacuators are made by a servocylinder with position transducer, servoproportional valve with on-board driver plus axis card, factory assembled and tested.

They can be provided with optional fieldbus interfaces for functional parameters setting, reference signals and real time diagnostics.

Smart Start-up procedure makes the commissioning quicker and easier, thanks to the Autotuning and Smart Tuning functionalities.

Multiple PID sets allows to easily switch axis behaviour according to machine cycle.

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1 **MODEL CODE**

***	AZC	M	-	D	-	SF	-	EH	/	CK	M	200	/	100	D	0500	/	V0	40

Design number

Digital electrohydraulic servoactuator for linear axis position control

Cycle Generation type:
- = none
I = injection
M = mold
P = parison
S = synchronism
X = positioning
9 = customized

Position transducer type:
A = Analog (standard, potentiometer)
D = Digital (SSI, Encoder)

Alternated P/Q controls:
SN = none
SF = with 2 on-board pressure transducers
SL = with 1 on-board load cell
XL = with 1 remote load cell

Fieldbus interfaces, USB port always present:
NP = Not present
BC = CANopen
BP = PROFIBUS DP
EH = EtherCAT
EW = POWERLINK
EI = EtherNet/IP
EP = PROFINET RT/IRT

Servocylinder Type, tech table **B310**:
CN = ISO 6020-1, Pmax 250 bar - tech table **B180**
CK = ISO 6020-2, Pmax 250 bar - tech table **B137**
CH = ISO 6020-3, Pmax 250 bar - tech table **B160**
CC = ISO 6022, Pmax 320bar - tech table **B241**

Servoproportional valve configuration, zero spool overlap:
40 = with fail safe, sleeve execution, direct (tech table **FS610**)
60 = without fail safe, sleeve execution, direct (tech table **FS610**) or piloted (tech table **FS630**)
70 = spring central position, direct (tech table **FS620**) or piloted (tech table **FS630**)

Servoproportional valve size with axis controller:
V0 = direct, size 06
V1 = direct or piloted, size 10
V2 = piloted size 16
V4 = piloted size 25 or size 27

Stroke [mm]

Rod:
S = single rod
D = double rod

Rod diameter [mm]

Bore diameter [mm]

Actuator position transducer type, see section **9** :

Analog (only for AZC-A)
P = potentiometer, max stroke 700mm
F = analog magnetosonic, max stroke 2500mm
N = analog magnetostrictive, max stroke 3000mm
T = LVDT, max stroke 16mm
L = LVDT, max stroke 30mm
V = inductive, max stroke 1000mm

Digital (only for AZC-D)
M = SSI magnetosonic, max stroke 2500mm
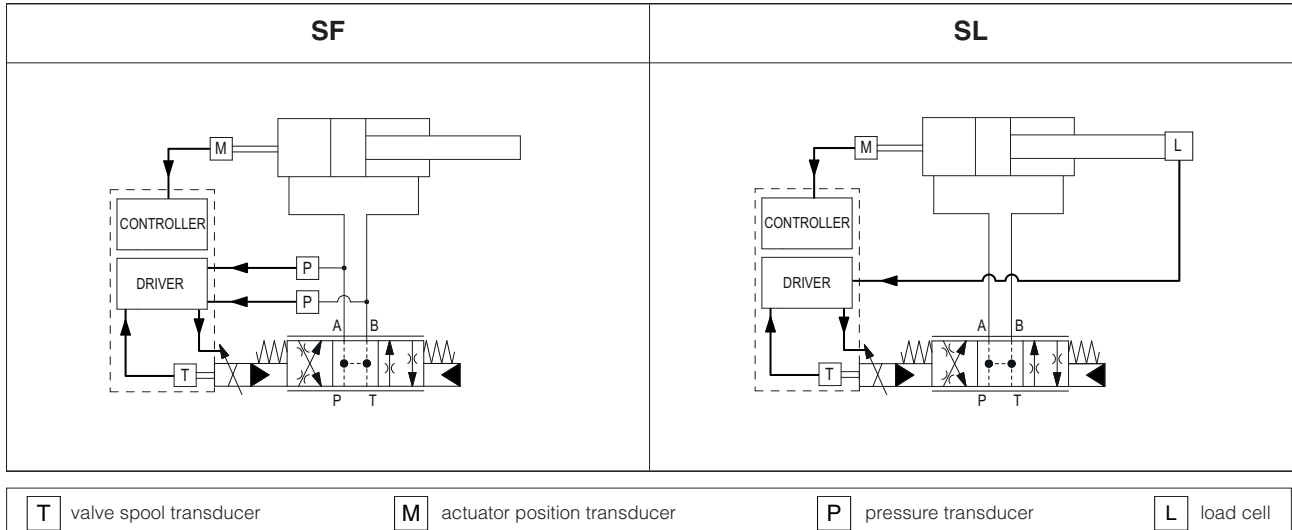
Analog or Digital
9 = special
X = remoted

2 | MAIN CHARACTERISTICS

Assembly position		Any position	
Ambient temperature range		standard execution = -20°C ÷ +60°C	
Storage temperature range		Standard execution = -20°C ÷ +70°C	
Protection degree to EN60529		IP66 / IP67	
Duty factor		Continuous rating (ED=100%)	
Recommended fluid temperature		-20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C	
Recommended viscosity		20 ÷ 100 mm²/s - max allowed range 15 ÷ 380 mm²/s	
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at www.atos.com or KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	

Hydraulic fluid	Classification	Ref. Standard
Mineral oils	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	HFDU, HFDR	ISO 12922
Flame resistant with water	HFC	

3 | POSITION CONTROL

Digital servoproportionals direct or pilot operated include valve with on-board digital driver plus axis card to perform the position closed loop of hydraulic actuator. Axis controllers are operated by an external or internally generated reference position signal.
For detailed information about integral axis controller see tech tables **FS610**, **FS620**, **FS630**.

4 | ALTERNATED POSITION / FORCE CONTROL

SF and **SL** controls add the alternated force closed loop control to the actuator standard position control.
A dedicated algorithm alternates pressure (force) depending on the actual hydraulic system conditions.
For detailed information about SF, SL controls, see tech table **FS500**.

SF	SL

T	valve spool transducer	M	actuator position transducer	P	pressure transducer	L	load cell

5 SMART START-UP

The automatic procedure supports the user during the commissioning phases of the axis control with guided procedures:

● **General setting**

It assists the user in system data setup, as like cylinder stroke, diameters, load mass, configure analog/digital signals and communication interface, position transducer setup.

● **System check**

It automatically executes position open loop movements to set axis control parameters, position transducer calibration and verify cylinder stroke.

● **Position autotuning**

It automatically determines the optimal PID parametrization of the position control adapting the dynamic response to guarantee control precision and axis stability. Once the procedure is started, the control performs few automatic position open loop movements of the actuator, during which control parameters are calculated and stored.

6 SMART TUNING

Once the Smart Start-up procedure has been completed, the Smart tuning feature allows to further refine the position control response by choosing from 3 different levels of performance in positioning:

- **dynamic** best dynamics and accuracy (default factory setting)

- **balanced** average dynamics and accuracy

- **smooth** attenuated dynamics and accuracy to improve control stability in critical applications or in environments with electrical disturbances

Settings can be changed any time via Z-SW software or fieldbus.

If required, control performance can be further customized by modifying PID parameter via Z-SW software.

1 = position reference signal
2 = generated position trajectory
3 = dynamic
4 = balanced
5 = smooth
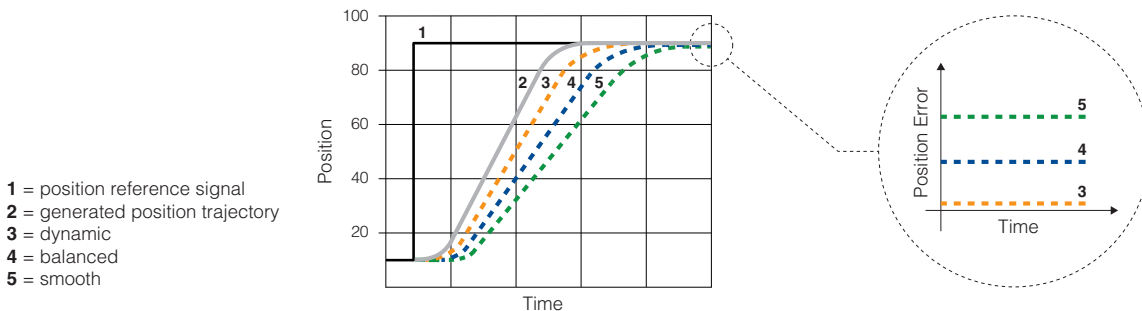
7 MULTIPLE SETS

Multiple PID sets allows to easily switch axis behaviour according to machine cycle, selecting between independent groups of parameters for:

- **position control PID**

- **force control PID and P/Q logics switching criteria**

Settings can be changed any time via Z-SW software, fieldbus or digital input signals.

8 FIELDBUS - see tech. table **GS510**

Fieldbus allows valve direct communication with machine control unit for digital reference, valve diagnostics and settings. These execution allow to operate the valves through fieldbus or analog signals available on the main connector.

9 ACTUATOR'S TRANSDUCER CHARACTERISTICS

9.1 Position transducers

The accuracy of the position control is strongly dependent to the selected position transducer. Four different transducer interfaces are available on the axis cards, depending to the system requirements: potentiometer or analog signal (A execution), SSI or Encoder (D execution).

Transducers with digital interface allow high resolution and accurate measures, that combined with fieldbus communication grants highest performances.

Transducers with analog interface grant simple and cost effective solutions.

9.2 Pressure/force transducers

The accuracy of the force control is strongly dependent to the selected pressure/force transducer.

Alternated force controls require to install pressure transducers or load cell to measure the actual pressure/force values.

Pressure transducers allow easy system integration and cost effective solution for alternated position/force controls (see tech table **GS465** for pressure transducers details).

Load cell transducers allow the user to get high accuracy and precise regulations for alternated position/force control.

The characteristics of the remote pressure/force transducers must be always selected to match the application requirements and to obtain the best performances: transducer nominal range should be at least 115%÷120% of the maximum regulated pressure/force.

9.3 Transducers characteristics & interfaces - following values are just for reference, for details please consult the transducer's datasheet

	Position				Pressure/Force
Execution	**A**		**D**		**SF, SL**
Input type	Potentiometer	Analog **(3)**	SSI **(4) (5)**	Incremental Encoder	Analog
Power supply **(1)**	10 ÷ 30 V$_{DC}$	+24 V$_{DC}$	+24 V$_{DC}$	+5 V$_{DC}$ / +24 V$_{DC}$	+24 V$_{DC}$
Controller Interface	0 ÷ 10 V	0 ÷ 10V 4 ÷ 20 mA	Serial SSI binary/gray	TTL 5Vpp - 150 KHz	±10 V$_{DC}$ 4 ÷ 20 mA
Max speed	0,5 m/s	1 m/s	1 m/s	2 m/s	-
Max Resolution	< 0.4 % FS	< 0.2 % FS	5 µm	1 µm (@ 0.15 m/s)	< 0.4 % FS
Linearity error **(2)**	± 0.1% FS	< ±0.02% FS	< ± 0.02 % FS	< ± 0.001 % FS	< ±0.25% FS
Repeatability **(2)**	± 0.05% FS	< ± 0.005% FS	< ± 0.005 % FS	< ± 0.001 % FS	< ±0.1% FS

(1) power supply provided by digital controller
(2) percentage of total stroke
(3) Output derived from 4 different types of transducers, see tech table B310
(4) Output derived from 2 different types of transducers, see tech table B310
(5) Balluff BTL7 with SSI interface is not supported