FLOWSERVE

TECHNICAL BULLETIN

Logix 510si Series

Digital Positioner

FCD LGENTB0510-01 09/09

Experience In Motion

Introduction

The Logix 510si series are single acting, user-friendly digital positioners. As all positioners within the Logix 500 family the Logix 510si uses the latest piezo-technology with inner-loop feedback to produce an improved dynamic behaviour. The complete configuration can be made by DIP switches on the device. Different gain values allow the best setup for each individual actuator size. Three coloured LED's continuously indicate the positioner status. Fast calibration and setup can be made by simply pressing the Quick-Cal button. Interchangeable components, such as circuit board, piezo drivers etc., allow an easy and economical upgrade or repair. An optional 4 - 20 mA analog feedback and proximity limit switches complete the Logix 510si.

Features and Benefits

Feature	Benefits
Easy commissioning	Commissioning is performed by simply setting a few switches and pressing the Quick-Cal button. The direct User Interface allows local access to positioner control without requiring multi-level menus, a handheld communicator or a laptop computer.
Local status LED	LEDs visible from a distance, indicate positioner's current status without removing the cover.
Internal diagnostic codes	LEDs providing instant information relating to internal diagnostic codes. These codes indicate to the user positioner status and alarms without the need for a handheld communicator or a laptop computer.
Fast and simple configuration	With its unique Direct User Interface, Logix 500 positioners provides fast and easy configuration. Local configuration switches allow the user to set all basic parameters for positioner operation.
Jog calibration	The Jog calibrate function allows the user to easily and quickly calibrate the positioner on all actuators without physical stroke stops.
Auto tune	A simple press of a button starts the self-calibration and auto-tune process, speeding up commissioning procedure and ensuring consistency between one valve and the next (regardless of who performs the procedure). Additionally, a gain selector allows the user to modify the calculated auto tune result.
Low air consumption	State-of-the art piezo technology combined with inner-loop feedback procedures provides high-performance control with minimal air consumption.
Two stage control design	Logix 500 positioners are using two-stage control to provide faster response and tighter control.
Mounting	IEC534 (NAMUR) mounting as well as VDI/VDE 3845 and 3847 mounting options allows the Logix 500 to be mounted on almost all actuators available on the market. With its unique Flowserve direct mounting option the Logix 500 can be mounted directly without tubing to Flowserve's single acting diaphragm actuators.
Limit switch options	Modular design allows reliable, inexpensive, non-contact, high resolution, build-in limit switches

Principle of Operation

The Logix 510si positioner is a digital positioner with various options. The positioner consists of three main modules:

1. The microprocessor based electronic control module includes direct local user interface switches
2. The piezo valve based electro-pneumatic converter module
3. The infinite resolution valve position sensor.

The basic positioner operation is best understood by referring to Figure 1. The complete control circuit is powered by the two-wire, 4-20 mA command signal. The analog 4-20 mA command is passed to the microprocessor, where it is compared to the measured valve stem position. The control algorithm in the processor performs control calculations and produces an output command to the piezo valve, which drives the pneumatic amplifier. The position of the pilot valve in the pneumatic amplifier is measured and relayed to the inner loop control circuit. This two-stage control provides for more responsive and tighter control than is possible with a single stage control algorithm. The pneumatic amplifier controls the airflow to the actuator. The change of pressure and volume of the air in the actuator causes the valve to stroke. As the valve approaches the desired position, the difference between the commanded position and the measured position becomes smaller and the output to the piezo is decreased. This, in turn, causes the pilot valve to close and the resulting flow to decrease, which slows the actuator movement as it approaches the new commanded position. When the valve actuator is at the desired position, the pneumatic amplifier output is held at zero, which holds the valve in a constant position.

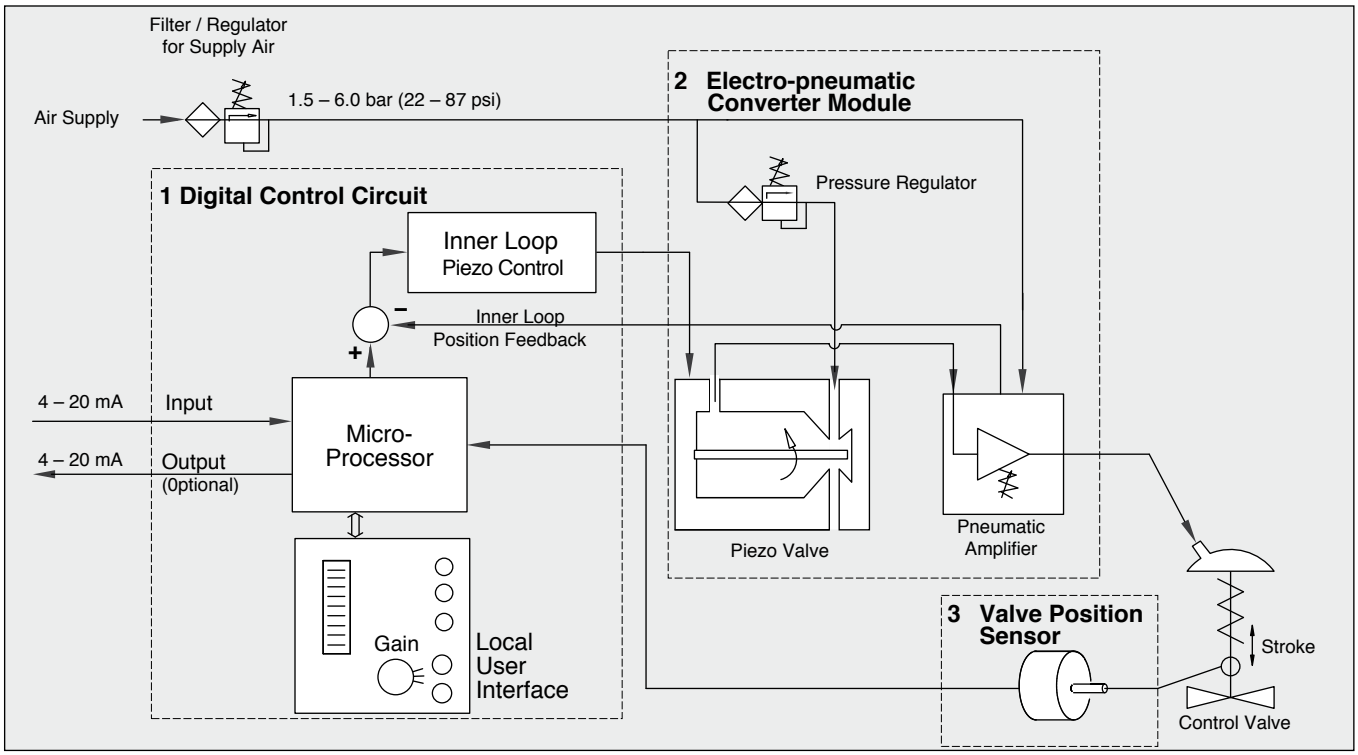

Figure 1: Logix 510si Principle of Operation

Specifications

Table 1: Input Signal	
Input Signal Range	4 - 20 mA
Compliance Voltage	6 VDC
Voltage Supply (maximum)	30 VDC
Minimum Required Operating Current	3,6 mA

Table 2: Stroke Output	
Feedback Shaft Rotation	Min. 15°, max 90° 40° recommended for linear applications

Table 3: Air Supply	
Air Supply Quality	Free from moisture, oil and dust per IEC 770 and ISA-7.0.01
Input Pressure Range	1,5 to 6,0 bar (22 to 87 psi)
Air Consumption (steady state)	0,08 Nm³/h @ 1,5 bar (0,047 SCFM @ 22 psi) 0,12 Nm³/h @ 6,0 bar (0,071 SCFM @ 87 psi)

Table 4: Output Signal	
Output Pressure Range	0 to 100% of air supply pressure
Output Flow Capacity	2,4 Nm³/h @ 1,5 bar (1,41 SCFM @ 22 psi) 7,0 Nm³/h @ 6,0 bar (4,12 SCFM @ 87 psi)

Table 5: Shipping Weights	
Base Positioner without Accessories	1,2 kg (2,65 lbs)

Table 6: Performance Characteristics (typical)	
Linearity	< +/- 1,0%
Resolution	< 0,3%
Repeatability	< 0,5%
Deadband	< 0,5%

Table 7: Environmental Conditions	
Operating Temperature Standard	-20 °C to +80 °C (-4 °F to +178 °F)
Operating Temperature Low	-40 °C to +80 °C (-40 °F to +178 °F)
Transport and Storage Temperature	-40 °C to +80 °C (-40 °F to +178 °F)
Operating Humidity	0 to 100% non-condensing

Table 8: Hazardous Area Specifications	
ATEX	II1G Ex ia IIC T4 - T6
ATEX	II3G Ex ic IIC T4 - T6
FM Non Incendive	FM Class 1, Division 2, Groups A,B,C,D Temp. Class. T4 Ta = 85 °C
FM Intrinsically Safe	FM Class 1, Division 2, Groups A,B,C,D Temp. Class. T4 Ta = 85 °C

Table 9: Limit Switches (optional)	
Type	**P&F SJ2-S1N**
Load current	< 1 mA < 3 mA
Voltage range	5 - 25 VDC
Hysteresis	0,2 %
Temperature	-25 °C to 100 °C (-13 °F to 212 °F)
Type	**P&F SJ2-SN**
Load current	< 1 mA < 3 mA
Voltage range	5 - 25 VDC
Hysteresis	0,2 %
Temperature	-40 °C to 100 °C (-40 °F to 212 °F)
Type	**P&F SJ2-N**
Load current	< 1 mA < 3 mA
Voltage range	5 - 25 VDC
Hysteresis	0,2 %
Temperature	-25 °C to 100 °C (-13 °F to 212 °F)

Ordering Information

Family	Series	Communication / Diagnostic	Software	Certifications	Housing	Threaded Conn.	Feedback Shaft	Temperature	Language	Position Indicator	Options	Add-in Electronics	Limit Switches
Logix	5	XX	XX	XX	X	X	X	X	X	X	X	X	X
		AA	BB	CC	D	E	F	G	H	I	J	K	L

Positioner Model

Standard	5

Communication and Diagnostic

510 - Digital	10	si

Certifications

Intrinsically Safe Class I, Div 1, Groups A,B,C,D (Factory Mutual / CSA)	-02-
Nonincendive Class I, Div.2 (FM), Class I, Div.2 (CSA)	-08-
General Purpose	-14-
Ex ia IIC, ATEX II 1G	-15-
Ex ic IIC, ATEX II 3G	-32-

Housing

Flowserve: Aluminum, Black with white cover	W
Flowserve: Aluminum, Black with yellow cover	Y
Flowserve: Aluminum, Black	B

Threaded Connections

1/2 NPT conduit, 1/4 NPT pneumatic	1
M20 conduit, 1/4 NPT pneumatic	2
1/2 NPT conduit, 1/4 NPT pneumatic, $^1/_8$ NPT aux. vent	3
M20 conduit, 1/4 NPT pneumatic, $^1/_8$ NPT aux. vent	4

Feedback Shaft

D Shaft - 316SS (Valtek Standard)	D
VDI/VDE 3845 (NAMUR)	R

Temperature

Standard -20 °C to 85 °C (-4 °F to 185 °F)	S
Extended -40 °C to 85 °C (-40 °F to 185 °F)	E

Language

English	E-
French	F-
German	G-

Position Indicator

No indicator	0
Flat	F
Domed	D

Special Options

Standard	0

Add-in Electronic Circuits

None	0
4-20 mA Feedback	F

Limit Switches

No switches	0
Slot type Namur sensor, P+F SJ2 S1N	4
Slot type Namur sensor, P+F SJ2 SN	5
Slot type Namur sensor, P+F SJ2N	6

Manifold and Gauge Options Ordering Information

	Manifold Options	Gauge Options
	XX	X
-	MM	N

Manifold Options (MM)	
No manifold	00
Double acting	DA
Gauge adapter	GA
Gauge manifold - NPT Threads	GM
Gauge manifold - G Threads	GC
VDI/VDE 3847 semi-integrated manifold	VE

Gauge Options (N)		DA	GA	GM	
No gauges		x	x	x	0
Output, PSI/BAR/KPA Stainless steel with brass internals	(qty. 1)		x	x	1
Output + Supply, PSI/BAR/KPA Stainless steel with brass internals	(qty. 2)			x	2
Output + Output PSI/BAR/KPA Stainless steel with brass internals	(qty. 2)	x			3
Output, PSI/BAR/KPA Stainless steel with stainless steel internals	(qty. 1)		x	x	4
Output + Supply, PSI/BAR/KPA Stainless steel with stainless steel internals	(qty. 2)			x	5
Output + Output, PSI/BAR/KPA Stainless steel with stainless steel internals	(qty. 2)	x			6
Output, Kg/Cm2/PSI Stainless steel with brass internals	(qty. 1)		x	x	7
Output + Supply, Kg/Cm²/PSI Stainless steel with brass internals	(qty. 2)			x	8
Output + Output, Kg/Cm²/PSI Stainless steel with brass internals	(qty. 2)	x			9
Output, Kg/Cm2/PSI Stainless steel with stainless internals	(qty. 1)		x	x	A
Output + Supply, Kg/Cm²/PSI Stainless steel with stainless steel internals	(qty. 2)			x	B
Output + Output, Kg/Cm²/PSI Stainless steel with stainless steel internals	(qty. 2)	x			C
Any KPA gauges		x	x	x	D
Output + Output + Supply, PSI/BAR/KPA Stainless steel with brass internals	(qty. 3)	x			E
Output + Output + Supply, PSI/BAR/KPA Stainless with stainless steel internals	(qty. 3)	x			F
Output + Output + Supply, Kg/Cm²/PSI Stainless steel with brass internals	(qty. 3)	x			G
Output + Output + Supply, Kg/Cm²/PSI Stainless with stainless steel internals	(qty. 3)				H
VE Gauge Options - Consult Factory					

Certifications

Noified Body	Certification Option	Approval	Entity Parameters	Temperature Codes	Enclosure Rating
FM APPROVED	-02	Intrinsically Safe Class I Division 1 Groups A,B,C,D	Ui = 30V Ii = 100mA Pi = 800mW Ci = 0 Li = 0	T4 T_{amb} <85 °C (185 °F)	NEMA 4 X
	-08	Nonincendive Class I Division 2 Goups A,B,C,D	Install per NEC Article 501-4 when barriers are not used.	T4 T_{amb} <85 °C (185 °F)	NEMA 4 X
CSA®	-02	Intrinsically Safe Class I Division 1 Groups A,B,C,D	Ui = 30V Ii = 100mA Pi = 800mW Ci = 0 Li = 0	T4 T_{amb} <85 °C (185 °F)	NEMA 4 X
	-08	Nonincendive Class I Division 2 Goups A,B,C,D	Install per NEC Article 501-4 when barriers are not used.	T4 T_{amb} <85 °C (185 °F)	NEMA 4 X
Ex ATEX	-15	II1G Ex ia IIC T4 - T6	Ui = 30V Ii = 100mA Pi = 800mW Ci = 0 Li = 0	T4 T_{amb} < 85 °C (185 °F) T5 T_{amb} < 55 °C (131 °F) T6 T_{amb} < 40 °C (104 °F)	IP65
	-32	II3G Ex ic IIC T4 - T6	Ui = 30V Ii = 100mA Pi = 800mW Ci = 40nF Li = 0	T4 T_{amb} < 85 °C (185 °F) T5 T_{amb} < 55 °C (131 °F) T6 T_{amb} < 40 °C (104 °F)	IP65

Dimensions

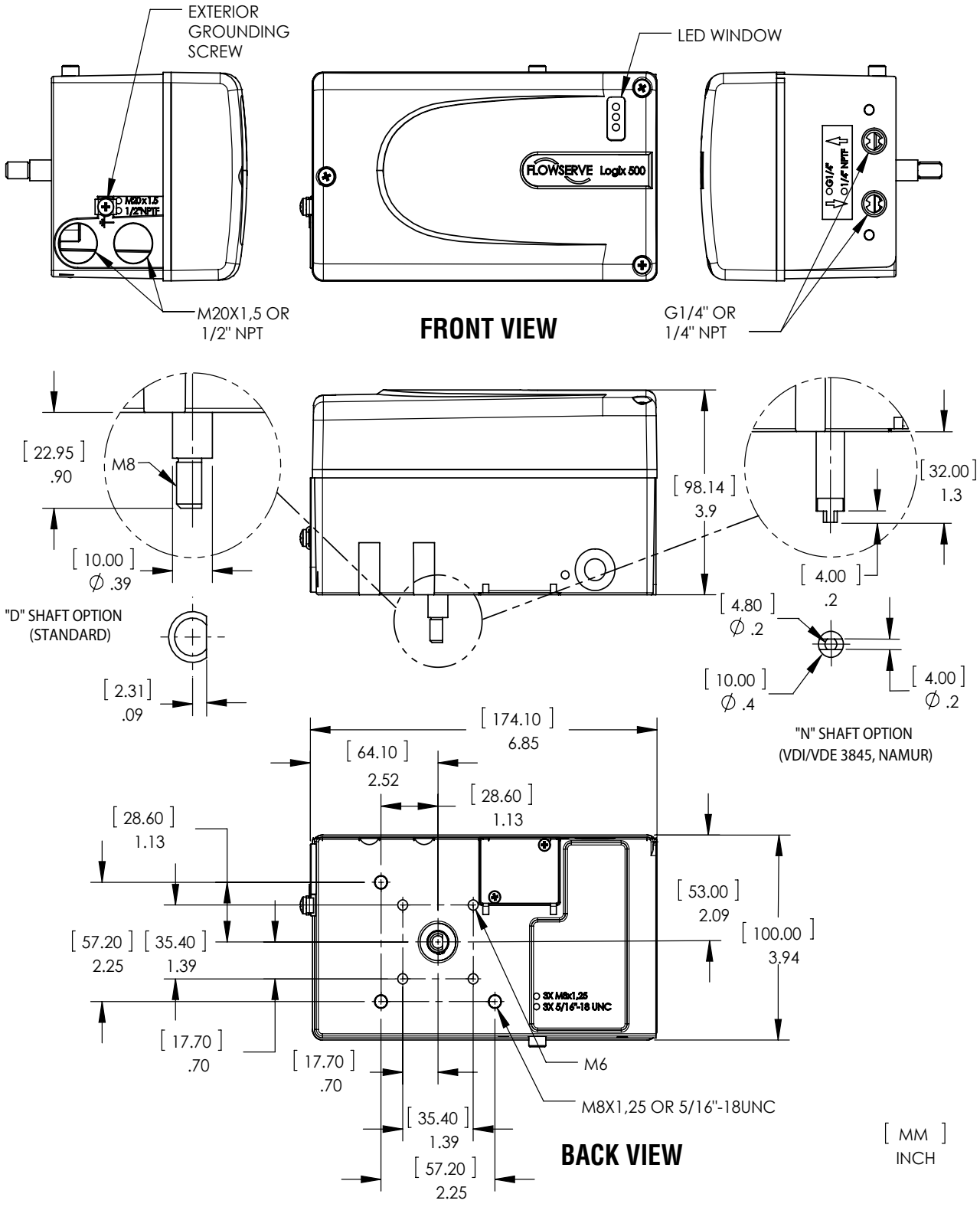

Figure 2: Dimensional Drawing of the Logix 510si Series Digital Positioner