	INSTRUCTION MANUAL DigitalTrak™	
STI		PT

Instruction, installation and
maintenance manual

DT *DigitalTrak*
POSITIONER

SUMMARY

	INSTRUCTION MANUAL **DigitalTrak™**	

1. GENERAL INFORMATION

1.1 General warnings

> This Instruction Manual is an integral part of the device, it should be carefully read before carrying out any operation and it should be kept for future references.
> This Instruction Manual covers only the DT positioner.
> This Instruction Manual is realized in accordance with the Directive 2006/42/CE.

1.2 Generalities

STI S.r.l positioners are conceived, manufactured and controlled according to the Quality Control System in compliance with EN-ISO 9001 international regulation.

1.2.1 Applicable regulation

UNI EN ISO 12100-1: 2005: Safety of machinery – *Basic notions, general design principles. Part 1-Basic terminology, method.*
UNI EN ISO 12100-2: 2005: Safety of machinery – *Basic notions, general design principles. Part 2-Technical principles and specification.*
2006/42/EC: Machine directive.
2006/95/EC: Directive for low voltage equipment.
2004/108/EC: Directive for the electromagnetic compatibility.

1.2.2 Terms and conditions

STI S.r.l. guarantees that all the items produced, if installed, used and subject to maintenance, are without material and manufacturing defects, and comply with specifications in force. The period of warranty is of one year, starting from the date of installation by the first user of the product, or of eighteen months as of the date of shipment to the first user, depending on which event occurs first.
The warranty does not cover special products or components not covered by warranty in their turn by subcontractors, or materials that were used or installed inappropriately, which were modified or repaired by unauthorized staff.
If the failure was caused by inappropriate installation, maintenance or use, or by irregular working conditions, the repairs will be charged according to the applicable fees.

1.3 Manufacturer

With respect to Machinery Directive 2006/42/EC the Manufacturer of the described product, is STI S.r.l. as specified on nameplate.
Address: **STI S.r.l.**
Via Dei Caravaggi 15
24040 Levate (Bergamo) – ITALY

1.4 Safety precautions

  1) Throughout the operation of the positioner, including auto setup, do not touch it.
  2) Make sure to disconnect air supply before make any maintenance work on the positioner
  3) The products must be correctly installed, operated and maintained.

1.5 Packing list

  1) DT Intelligent Electropneumatic valve Positioner.
  2) Mounting kit.
  3) User Manual.
  4) Ordered kits as option.

1.6 Safety notices

In order to make you better use this manual and ensure your safety, when debugging, running ,repairing this equipment, please pay attention to the use of following symbols:

Symbol	Slogan	Explanation
	Warning	Refers to the potential dangers, if can't avoid, it may damage the product itself or the surrounding objects. (Hazardous materials).
	Caution	Refers to the things which are useful or special neglected affecting the operating conditions or production function (Not contain dangerous or harmful situations).

Please read this manual careful before installation and debugging.

1.7 Positioner and manufacturer's identification

It is forbidden to modify the information and the marks without previous written authorization by STI S.r.l.
The following plate is fastened on the positioner housing:

1.8 Declaration of incorporation

ATTESTATO DI CONFORMITÀ C.E.

EC DECLARATION OF CONFORMITY

CE

La Sottoscritta STI S.r.l. con sede in Via Dei Caravaggi, 15 – 24040 Levate BG – ITALIA dichiara, in qualità di costruttore sotto la propria responsabilità, che il prodotto:

We, STI S.r.l. based in Via Dei Caravaggi, 15 – 24040 Levate BG – ITALY, hereby declares, as the manufacturer of the product named below on its sole responsibility, that the product called:

Denominazione e Modello	**Posizionatore serie DT – DIGITAL TRAK**
Trade and Model Name:	*Positioner series DT – DIGITAL TRAK*

- soddisfa i requisiti delle seguenti Direttive Europee
- *meets the requirements of the following European Directives*
  - **2004/108/CE Direttiva Compatibilità Elettromagnetica**
  - *2004/108/EC Electromagnetic Compatibility Directive*

- La conformità ai requisiti della presente Direttiva è dimostrata dal completo rispetto delle seguenti norme
- *Conformity with the requirements of this Directive is proven by complete adherence to the following standards:*
-
  - **EN 61000-6-2 / EN 61000-6-3**
    Ex: EN 50 014 / EN 50 284 / EN 50 018 / EN 50 020

La Documentazione tecnica pertinente è custodita presso:
The Technical Construction File required by this Directive is maintained at:

STI S.r.l. via Dei Caravaggi 15 24040 Levate (BG) Italia

L'Amministratore Delegato
Ernestino Bertoli

Levate, 15 settembre 2014

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2.   DESCRIPTION

DT Intelligent Electro pneumatic Positioner is a loop powered instrument produced by STI s.r.l. As a control part of the pneumatic valve set, DT Intelligent Electro pneumatic valve Positioner is widely used in petroleum, chemical, electric power, metallurgy, light industry and other fields of automation systems.

DT Intelligent Electro pneumatic valve Positioner accepts the 4÷20mA valve setting signal from the control system; at the same time, it gets the actual valve signal through the location sensors; the two signals are compared by control software in order to control the feeding and exhaust of the gas to actuator, drive the valve to reach set point (as Figure 1).

DT Intelligent Electro pneumatic valve Positioner is based on microprocessor technology. It can overcome friction and the imbalance power on the control valve well, and improve the response speed of control valve, which makes the position set rapidly and accurately.
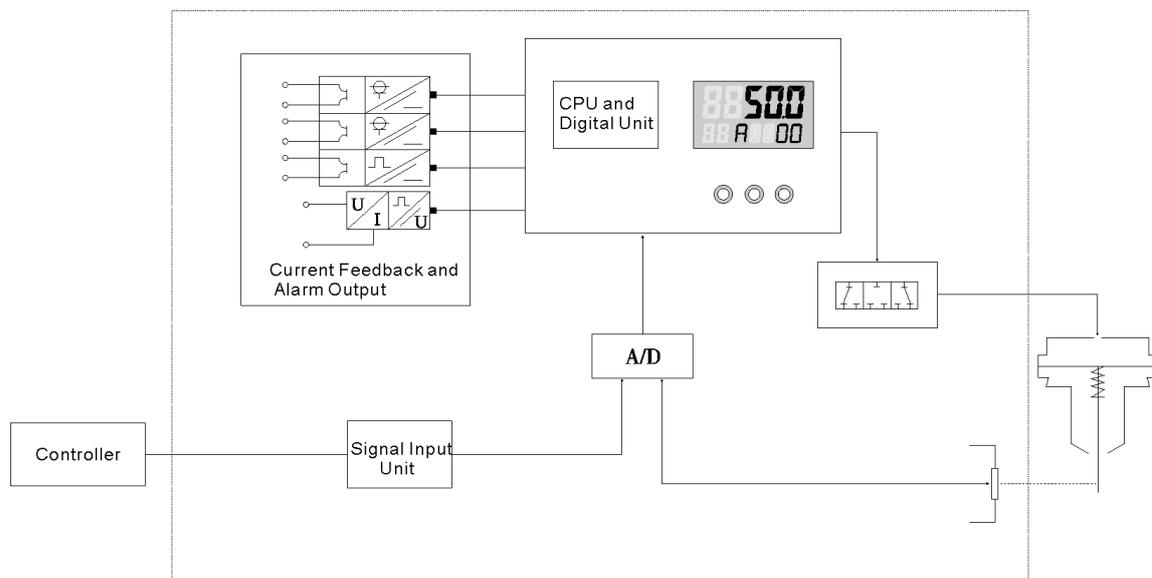
Figure 1: DT Intelligent Electropneumatic valve Positioner Principle

2.1   Description of Function instruction

- Self-adaptive function: automatic search the Zero and Span of valve, optimize the valve's control parameters and improve the control precision.
- Configuration function: valve characteristics, action mode, dead band, stroke range, alarm events.
- Self-diagnosis function: show the value of input current, up / down running time, the dead band.
- Fault Mode: Fail safe or fail freeze.
- Valve position feedback function: 4~20mA DC current signal.

2.2   Performance

- Position precision: 0.5% F.S.
- Manual setting operation allowed directly on the positioner.
- Small and compact design, modular construction.
- Automatic initialization, automatic diagnosis, valve characteristic.
- Reduced number of mechanical parts, good vibration resistance performance.
- Local parameter setting.
- Low power, low air consumption, low running cost.
- Using 4~20mA standard signal.

3. TECHNICAL PARAMETERS

PNEUMATIC	*Air supply pressure*	0.14 ÷ 0.7Mpa
	Air consumption in stable state	< 36 L / H
	Air quality	According to GB/T 13277.1 Size and density of particulates: Class 2 Oil concentration: Class 2 Dew point: Class 2 or at least 10K below surrounding environment
	Valve leakage	< 0.6 L / H
INPUT / OUTPUT	*Actuator*	Single acting, double acting
	Input signal	4 ÷ 20mA, Loop Power Supply system
	Output specialty	Linear, equal percentage, quick open or freely adjustable
	Electrical connection	M20x1.5 or NPT1/2
	Pneumatic connection	G ¼ or NPT1/4
	Stroke	Linear actuator 10 ÷ 100mm Rotary actuator 30 ÷ 105°
DISPLAY	*LCD*	2x7 digitals, dimension: 22x38 mm
OPERATE	*Manual*	3 keys on the front panel
	Self tuning	Automatic calibrate the zero and span, dead band
	Self diagnose	Show value of input current, travel time, dead band, etc.
PRECISION	*Accuracy*	0.5% F.S.
	Hysteresis	0.2% F.S.
	Linearity	0.5% F.S.
	Sensitivity	0.1% F.S.
	Repeatability	0.2% F.S.
	Dead band	0,1 ÷ 10% adjustable
	Input impedance	375 Ω/20mA
ENVIRONMENT	*Environmental temperature*	-20 ÷ +70°C
	Environmental humidity	5 ÷ 95% RH
	Atmospheric pressure	86 ÷ 106KPa
	Enclosure degree of protection	IP65
APPEARANCE	*Weight*	2 kg
	Dimension	170×96×96mm
	Shell material	Aluminum alloy
Specification of Remote Sensor		
Working temperature		-40 ÷ 100°C
Bearable vibration condition		27 ÷ 200Hz @ 6g (gravity)
Length of the cable		5m, 10m

4. ASSEMBLY

4.1 Dimensional drawings
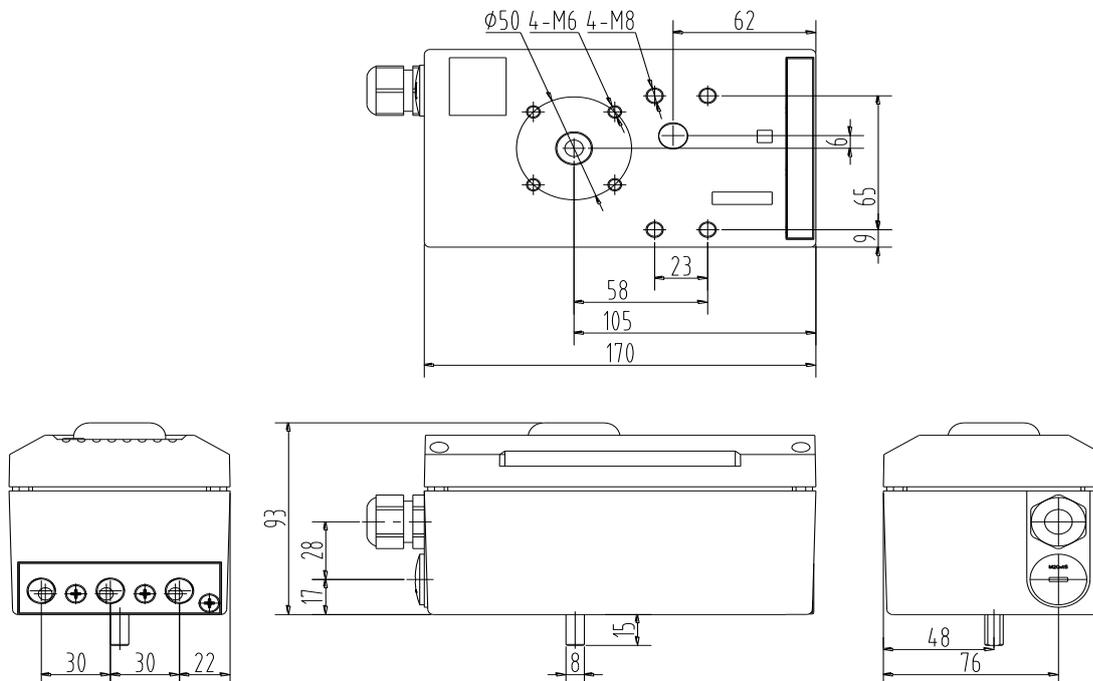
Figure 2: Dimensional drawing

4.2 Installation

To install correctly the rotate angle of the positioner stem should comply to the required reading angle range. Figure 3-a shows the positioner feedback indicator and the arrow marking indicator's rotating range. Solid line shows the middle position of the indicator (when uninitialized, the LCD feedback value should be around 50.0 and the bottom row displays NOINIT). The two dotted line show the limit position of the feedback node rotate angle in normal use.
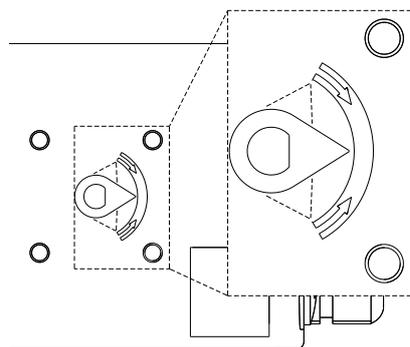
Figure 3

4.3 Assembly for linear actuator

For linear actuator SC63 with lever feedback:
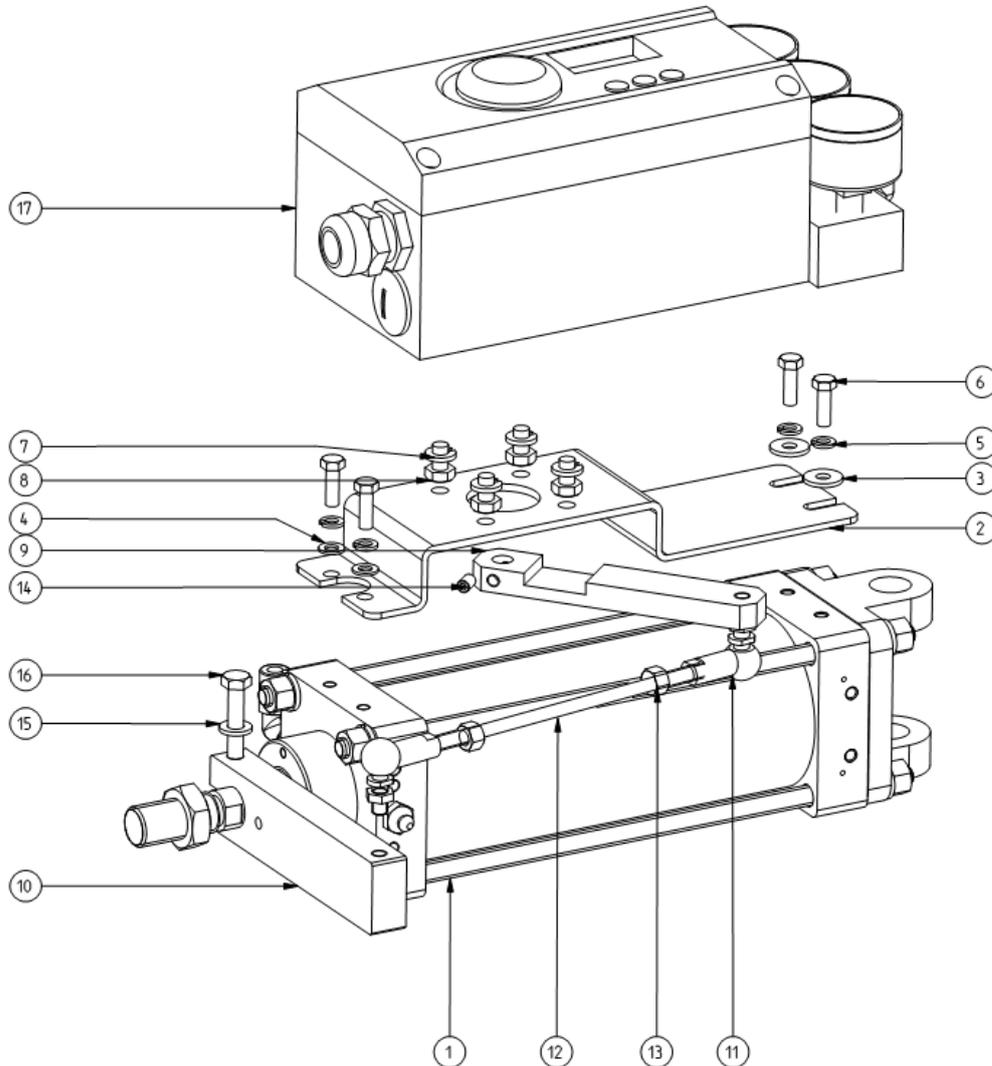
Figure 4-a

The positioner is installed on the side of the actuator. Through the adjustable feedback lever actuator connected with actuator's putting lever (as Figure 4-a), the installation steps as follows:
- Fix the support plate [# 2] on the actuator through the four screws [# 6+4+3].
- Fix the positioner [# 17] on the plate through the four screws [# 7+8].
- Connect the lever [#9] to the positioner shaft and insert the screw [#14] into the lever on the side of the lever.
- Move the actuator shaft to 50% to the stroke, rotate the lever [#9] perpendicular to the support plate, if necessary adjust the length of the treaded rod [#12] unloosing the nuts [#13], rotating the bar and fixing again the nuts.
- Adjust the rotate angle of the feedback lever so that it comply to the requirement in 4.2.1.and fix tight the screw [#14].
- Move the actuator shaft from 0% of the stroke to 100% checking that there are not mechanical interference of the linkage components.

For actuators with motion converter feedback linkage:
Positioner installed on the side of the actuator. Through the motion converter STI model MC, connected with actuator's shaft with rod and cam; the installation steps are the following
- Fix the support [# 1] on the motion converter with the four screws [# 3+455]
- Fix the positioner on the support [# 1] the four screws [# 6+7]

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- Connect the upper lever to the positioner shaft and the lower [# 2] to the motion converter shaft.
- For motion converter adjustment please see Instruction manual 2051
- Adjust the rotate angle of the feedback lever so that it comply to the requirement in 4.2.1.and fix tight the screw [#13]
- Move the actuator shaft from 0% of the stroke to 100% checking that there are not mechanical interference of the linkage components.
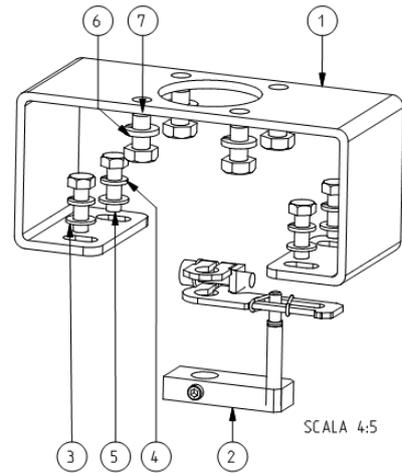
Figure 4-b
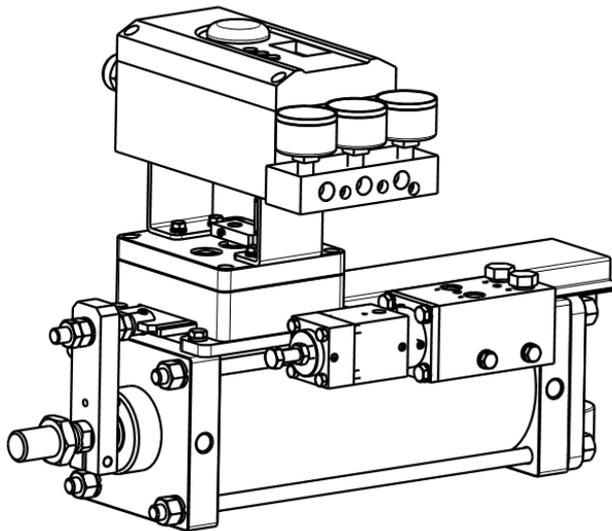
4.4   Assembly for rotary actuator
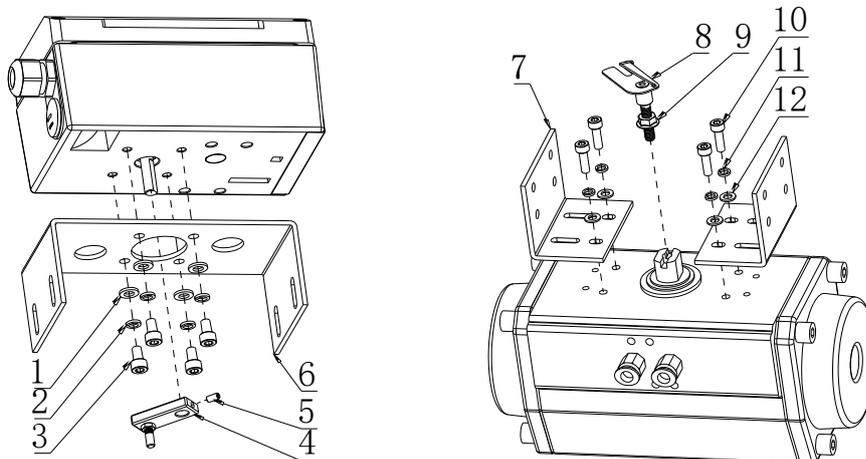
Figure 5-a

No.	Amount	Name	Spec.
1	8	Washer	D6
2	8	Elastic washer	D6
3	8	socket cap screw	M6×12
4	1	set screw	M5×5
5	1	Feedback lever	
6	1	Bracket 2	
7	2	Bracket 1	
8	1	U shape feedback lever	

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9	1	socket cap screw	M6
10	4	Socket cap screw	M5×12
11	4	Elastic washer	D5
12	4	Washer	D5
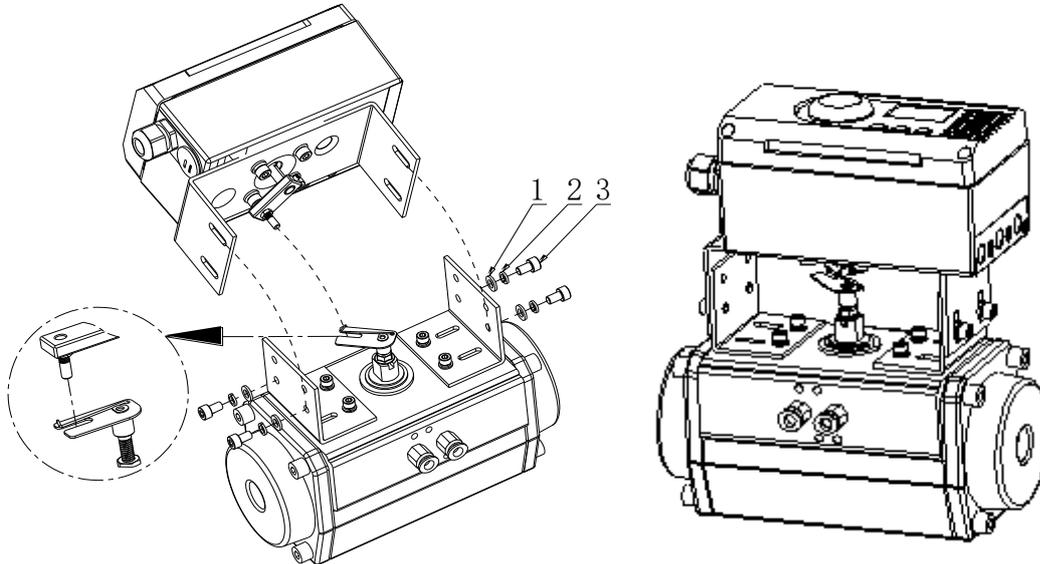
Figure 5-b

The installation steps as follow:
- Attach the Bracket 2 (6) to the positioner with socket cap screws (3), elastic washers (2) and washers (1).
- Attach the feedback lever (4) to the shaft and fix with the set screw (5).
- Attach the Bracket 1 (7) to the actuator with socket cap screws (10), elastic washers (11) and washers (12).
- Attach socket cap screws (9) to the U shape feedback lever (8) and attach the U shape feedback lever (8) to the actuator.
- Put the positioner carefully on the actuator. The pin of the feedback lever (4) should be in the through of the U shape feedback lever (8). Adjust the height of the positioner, lock screw on the pin of the feedback lever (4) and fix the positioner with socket cap screws (3), elastic washers (2) and washers (1). Adjust the rotate angle of the feedback lever so that it comply to the requirement in 4.2.1

4.5 Installation of the Remote Sensor

The installation design of the remote sensor is the same as the positioner. Please fully refer to the installation of the positioner.

4.6 Pneumatic connection

Pneumatic Connections is on the right of positioner, positioner provides two kind of connection types: G1 / 4 and NPT 1/4 (refer to ordering data), the specific type is marked on the shell, users can choose the type according to pipe to be connected.
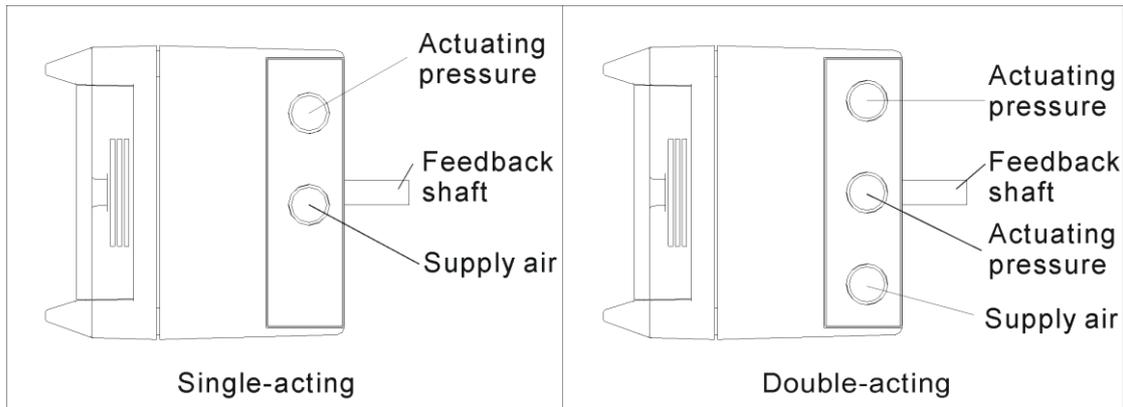
Figure 6: Pneumatic Connection

Installation Step:
1. Connect to the output of the DigitalTrak smart positioner to the input of the actuator.

⚠	**WARNING**: Any fitting leakage is harmful to the good operation, use soapy water inspection air tightness of joint connection.

2. Connect the positioner's input with the air supply. The compressed air through the positioner must be filtered and regulated.

Air requirements:
a) Air pressure must be 0.14 ~ 0.7 MPa, depending on the specific value of the actuator.
b) Air supply must clean dry air with no, oil or other liquid / vapor.
c) Air supply must be no corrosive.
d) The number of solid particles contained in Gas source should be less than 0.1 g/m^3, and particle diameter should be less than 60um, oil content should be less than 10m g/m^3.
e) The air dew point under work pressure should be at least 10 ℃ lower than its work positioner environment temperature.

4.7   Electrical connections

Electrical connections should be strictly in accordance with the connection diagram, should be firmly secured, and not be loose.
Cable connector has to be a standard waterproof connector. Diameter of the signal cable diameter should be at least 8mm and tighten the cover so that the IP protect level will not reduce.

4.7.1   Input electrical connection (Figure 6)

Type: Loop Power Supply system
Input signal: 4-20mA
The min. working current: 3.6mA DC
Input impedance: 350Ω
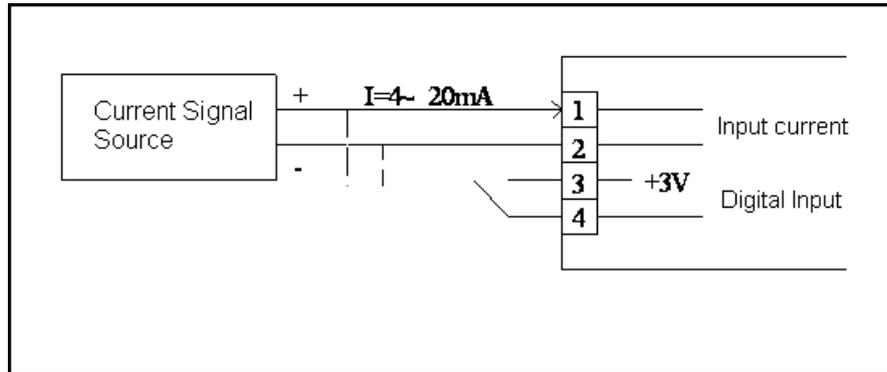
Figure 7: Electrical input connection

4.7.2 Feedback output module electrical connections (Figure 8):

Feedback signal type: Loop Power Supply 4÷20mA
Drift: ≤100ppm
Scope of working: 3.6 ÷ 20.5 mA
Precision: ≤1%F.S
Working voltage: 12÷30V DC
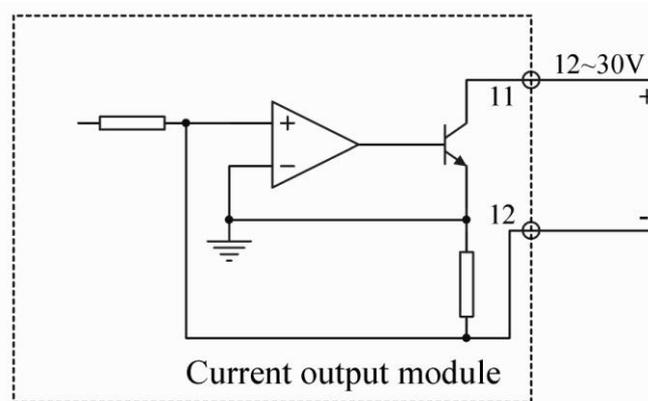
Figure 8: feedback output model electronic connection

4.7.3 Limit switch (option if present) electrical connections (Figure 9):

Input voltage: Ui≤24V DC
Input current: Ii≤2A
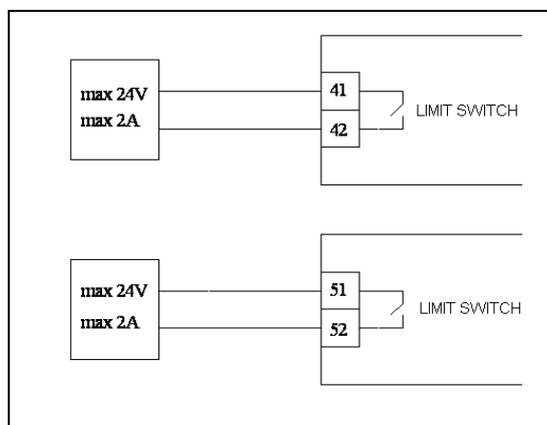
Figure 9: Limit switch electronic connection

4.7.4 Connection of the remote sensor:
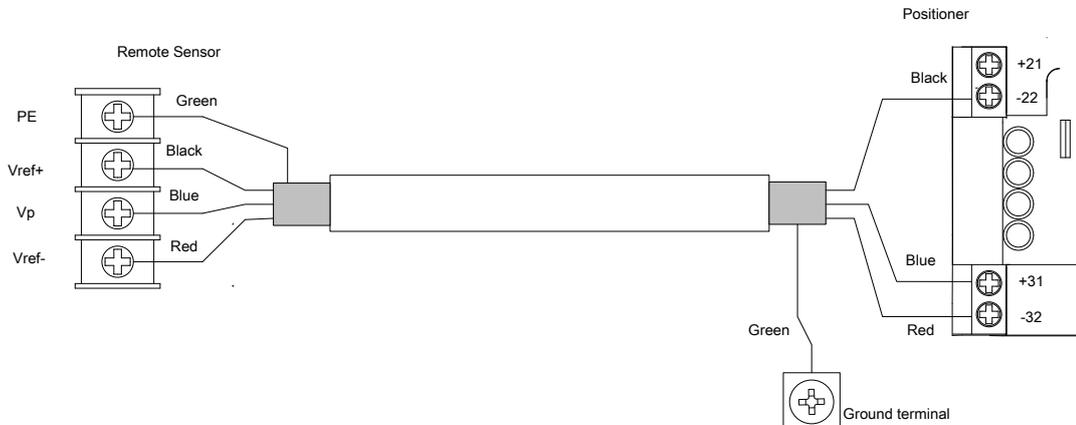
5.   OPERATING REGULATION

5.1 Interface description

Display: The LC display has two lines:
- in the normal mode the first line shows the position, the second line from left to right shows direction of the valve-action, the state of running and the setpoint;
- in the Configuration menu mode, the first line shows the parameter value, the second line from left to right shows parameter number, the parameter name.

| ⚠️	**NOTE:** If the positioner is operated in ranges with temperatures below -10°C the liquid crystal display becomes sluggish and the display refresh rate is reduced obviously.

The positioner has three keys.

As Figure:
operation mode key A/M [ENTER]
decrease ▼[DOWN]
increase ▲[UP]
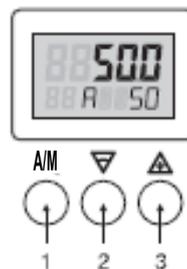
Figure10: Operation Interface

❗	**NOTE:** 1) <u>Manual / automatic switch</u> Automatic to manual: Click the button **A/M**, the second line of LCD shows "A". Manual to Automatic: click button A/M, the second line of LCD shows"M".

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	2) <u>Manual control</u> In manual mode, hold down the button ▲, valve position increase; at the same time hold down the ▼, valve position fast increase. In manual mode, holding down a button▼, valve position decrease; at the same time hold down the ▲, valve position fast decrease.

5.2 User menu

1) Enter user menu

In the normal mode, to go to the Configuration menu, press the operation mode button "A/M"for at least 3 seconds.

2) Choose user menu

In user menu state, the user can choose 4 different kind of menu: P1, P2, P3 and P4.

Conversion of four kind of menu: when showing any of P1, P2, P3 and P4, press A/M, to choose parameters circularly (as Figure 11).
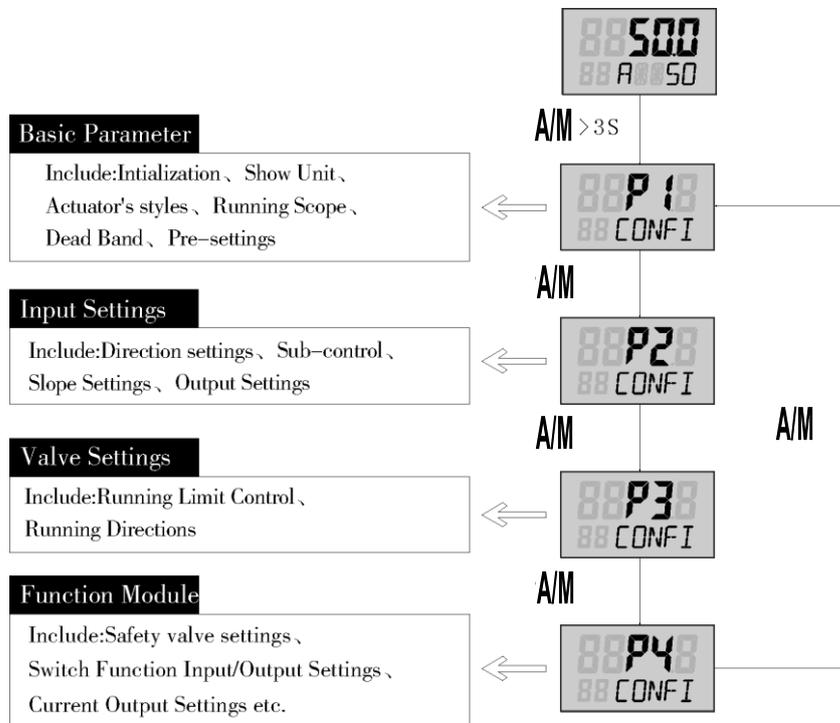
Figure 11: Choose User Menu parameter

Choosing the parameter of any kind of menu:

Press the increase button ▲, the menu turns forward circularly.

Press the decrease button ▼the menu turns backward circularly.

Here display the contents of parameters:

Two digit in the front of the below line show parameters number, letters in the back display the name of parameter.

3) Change user menu

Press the button A/M to enter the parameter configure mode, the parameters on the screen will be blinking; such as

For numerical parameters:

Press the button ▲ parameter value will increase. Press the button for longer time, the parameter value increases quickly.

Press the button ▼, parameter value will decrease. Press the button for longer time, the parameter value quickly.

For character parameters:

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Press the button ▲, parameter value move forward.
Press the button ▼, parameter value move reverse.
For reset PRST, automatic initialization INIA and manual initialization parameters INIM:
Press the ▲ button, LCD shows "STRT" on the first line, after 3 seconds it enter the state of their own.

> **NOTE:** In the menu state, if there is no operation 2 minutes, the valve positioner will return to normal state.

4) Exit user menu

In user menu state:
Press the button A/M for 3 seconds to exit the user menu and return to normal mode.

5.3   Calibration

When smart electro-pneumatic valve Positioner installation is completed, it must be initialized. When initializing, the valve will open and close automatically, please check the working conditions and take measures to ensure that the valve movement does not affect the process and personal safety.
There are two ways to initialize: automatic tuning and manual tuning.

5.3.1   Ready to initialize

Check the positioner installation and electrical connection is in line with the requirement of chapter 4 of the manual. Connect the gas source and the power/ signal. Control the valve manually to run it from fully open to fully close and confirm the installation is correct.

5.3.2   Auto-tuning

1)   After electrical and pneumatic positioner connection, press and hold A/M more than 3 seconds to enter the user menu state.

Displaying: `P1 CONFI`

2)   Press ▲, up shows "N0", down shows "INIA",

Displaying: `no 01 INIA`

3)   Press function key A/M, the down showing will be blinking , enter the parameter configure state.

4)   Press ▲ for more than 3 seconds, up shows "STRT", enter the auto-tuning.

Displaying: `no 01 INIA`

5)   The whole procedure goes from "STEP1" to "STEP5", and shows the current steps on the down line

Displaying: `500 STEP1` `500 STEP2` `500 STEP3` `500 STEP4` `500 STEP5`

6)   After tuning, up show the values of parameters, the down shows the "ED XXXX", XXXX means the relevant parameters of tuning.
Displaying:

`05 Ed DbUP` → `-05 Ed DbDW` → `02 Ed PUP` → `-02 Ed PdW` → `15 Ed IMUP` → `-15 Ed IMdW` → `10 Ed SSUP` → `-10 Ed SSdW`
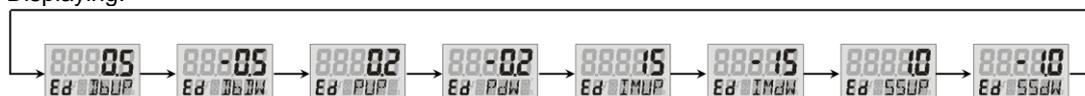
press and hold A/M 3 seconds to return to normal state.

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> **NOTE**: In the process of tuning, press the function button A/M more than 3 seconds, can exit tuning state and enter automatically state

5.3.3 Manual tuning

1) Positioner is in normal state after power-on. Press and hold **A/M** for more than 3 seconds to enter the user menu state.

Displaying:

2) Press ▲ to choose the parameter, till the second row shows "INIM".

Displaying:

3) Press the button **A/M**, the down line will be blinking , enter the parameter amending state.

Displaying:

4) Press ▲ for more than 3 seconds, up shows "STRT", then it enter the manual tuning. Down shows "ZERO",

Displaying:

5) Press ▲ or ▼ to choose the start point.

Displaying:

6) Press **A/M** to confirm, At this time the down line shows "SPAN"

Displaying:

7) Press ▲ or ▼ to choose the end point

Displaying:

8) Press **A/M** to confirm, At this time the down line shows "500"

Displaying:

9) Press ▲ or ▼,and then release it when the feedback value is between zero and span.

Displaying:

10) Press **A/M** to continue the procedure. The whole procedure is according to the "STEP1" to "STEP5", and shows the current steps on the down line.

In the process of tuning, press the function key **A/M** for more than 3 seconds to exit tuning state and enter automatic state.

11) After tuning, up shows parameters value; the down shows the "ED XXXX", XXXX means the relevant tuned parameters.
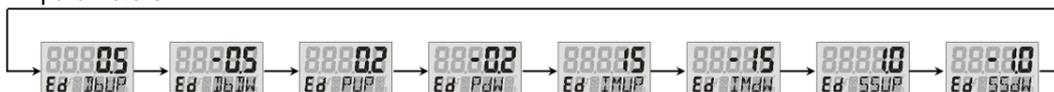
12) Press **A/M** for 3 seconds to return the normal state.

5.4   Diagnosis

5.4.1 Enter the state of diagnosis

In normal state, press the button **A/M** and ▲ 3 seconds to enter the diagnosis state. Upper line displays the value of parameter; lower line displays the name of the parameter.
Press the button ▲, the parameter moves forward circularly
Press the button ▼, the parameter moves revise circularly

5.4.2 Exit the state of diagnosis

In the state of diagnosis: Press the button **A/M** for 3 seconds to exit the diagnosis state and return to automatic state.

5.4.3 The auto-diagnostic parameter list of valve Positioner

No	Parameters	Display	Meaning	Value/Range	Default	Unit
01	CURR	CURR	Input current	4.00~20.00		mA
02	STRK	STRK	Stroke range	0~100	100	mm/d
03	TUP	TUP	Travel time up	0~200	10	S
04	TDW	TDW	Travel time down	0~200	10	S
05	DBUP	DbUP	Dead band up	0.1~10.0	0.5	%
06	DBDW	DbDW	Dead band down	-0.1~-10.0	-0.5	%
07	PUP	PUP	Prediction up	0.1~100.0	0.2	%
08	PDW	PDW	Prediction down	-0.1~-100.0	-0.2	%
09	IMUP	IMUP	Pulse length up	0.1~200.0	10	ms
10	IMDW	IMDW	Pulse length down	-0.1~-200.0	-10	ms
11	SSUP	SSUP	Step zone up	0.1~100.0	30.0	%
12	SSDW	SSDW	Step zone down	-0.1~-100.0	-30.0	%
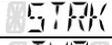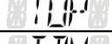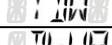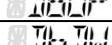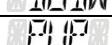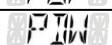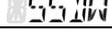
5.5   Alarm

5.5.1   Position sensor out of range

In uninitialized state, if the position sensor goes out of the working range, it will display the error code "ADER":
Display:
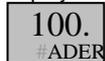
Solution:
Check whether installation of feedback components is accordance with 4.2.2 or 4.2.3 in this manual.
Fine-tune the installation bracket position.

5.5.2   Zero point of position sensor too low

In uninitialized state, if the feedback position value is less the 5.0, it will display the error code "DOWN":
Display:

Solution:
Check whether installation of feedback components is accordance with 4.2.2 or 4.2.3 in this manual.
Fine-tune the installation bracket position.

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5.5.3 Span point of position sensor too high

In uninitialized state, if the feedback position value is less the 5.0, it will display the error code "DOWN":
Display:

Solution:
Check whether installation of feedback components is accordance with 4.2.2 or 4.2.3 in this manual.
Fine-tune the installation bracket position.

5.5.4 Initialization error

When the positioner Initialization, the parameters setting or the actuator acting error.
Display:

Solution:
Start manual initialization
Re-set parameters

5.5.5 Measurement span is insufficient

When the positioner Initialization, the feedback range is less than 25.0.
Display:
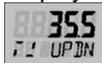
Solution:
Adjust the slider on the control rod components, making the feedback value range greater than 25.0.

5.5.6 Valve position out of limit

When the valve is running, valve position goes out of limit position.
Display:

Solution:
Check the feedback lever of the positioner installation.
Check the connection of positioner and actuator.
Check the connection of the bracket and actuator.
Adjust the valve position limit values.
Re-initialize the positioner.

5.5.7 User characteristics setting error

When the user defines the characteristics profile of the valve, the characteristics is non-monotonic up / down.
Display:
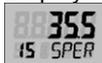
Solution:
Re-set the parameters.

5.5.8 Position limit setting error

When the value of 36 YA is greater than or equal to the value of 37 YE will display the error code "LIMSE":
Display:
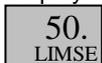
Solution:
Set the value of 36 YA smaller than the value of 37 YE.

5.5.9 Feedback over limits

Feedback value is> 110% or <-10%.
Display:

Solution:
Check feedback sensor and, if necessary, replace the sensor.
Re-initialize the positioner.

5.5.10 Input current out of work range

If the input current value is greater than 21mA(>110%) or less than 3.8mA (<-10%).
Display:

Solution:
Check the input signal.

5.5.11 Actuator error

For some reason, the positioner cannot drive the valve to a specific position.
Display:

Solution:
Cleaning valve.
Check the valve connected institutions.

5.5.12 Memory error

When the memory of the positioner has error, display:
Display:

Solution:
Disconnect the signal line and reconnect the signal line.

5.5.13 Abnormal error

When there is hardware error internal hardware of positioner,
Display:

Solution:
Inform supplier to solve the problem.

5.6 Parameter list

Parameter		Show code	Function	Content / Scope	Factory Settings	UM
P1						
01	INIA	INIA	Initialize (automatic): Not start /Start	NO/STRT	NO	
02	INIM	INIM	Initialize(Manual): Not start /Start	NO/STRT	NO	
03						
04	TYPE	TYPE	The executive body types: linear actuator	LINE/TURN	LINE	

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			/ rotary actuator			
05						
06	DEBA		controller dead	AUTO 0.1÷10.0	AUTO	%
07	PRED		Predict value	AUTO 0.1 ÷100.0	AUTO	%
08	PRST		restore the factory settings: not start / factory set to start	NO/STRT	NO	
P2						
09	SDIR		Control input signal and valve-relations	RISE/FALL	RISE	
010	SPRA		Sub-control point	0.0 ÷100.0	0.0	%
011	SPRE		At the end of the sub- control	0.0 ÷100.0	100.0	%
012	TSUP		Valve to increase the value of a given damping	AOTU 0÷400	AUTO	s
013	TSDO		Valve to reduce the value of a given damping	AOTU 0÷400	AUTO	s
014	SFCT		Valve Special Linearity -equal percentage open soon User define	LINE 1:30 30:1 FrEE	LINE	
015÷035	SP00÷SP10		User define valve special profile	0.0 ÷100.0		%
P3						
036	YA		Working under the valve-limits	0.0 ÷100.0	0.0	%
037	YE		Place limits on the work of the valve	0.0 ÷100.0	100.0	%
038	YDIR		Valve-positive and negative feedback effect	RISE/FALL	RISE	
039	YCDW		"Compactness close " values down	OFF 0.0 ÷49.9	OFF	%
040	YCUP		"Compactness close " values up	OFF 50.1 ÷100.0	OFF	%
P4						
041	SAFE		Safe valve: Holding / wide clearance / Settings / wide-open	OFF / KEEP / CLOSE / 0.1÷99..9 / OPEN	OFF	%
042	BIN		Input switching functions: start-safety valve	ON/OFF	OFF	
043	DO1		Switch output function: Fault alarm Fault + Non-auto Fault + Non-auto+BIN Under setting value Higher than the setting value	FAULT NA NAB LMVPT HMVPT	FAULT	
044	SW1		setting value	0.0 ÷100.0	0.0	%
045	DO2		Switch output function: Auto/ Manual Under setting value Higher than the setting value	A/M LSET HSET	A/M	
046	SW2		setting value	0.0 ÷100.0	0.0	%
047	AMIN		Min output current	4.0÷20.0	4.0	mA
048	AMAX		Max output current	4.0÷20.0	20.0	mA
049	ADIR		Current output aspect	RISE/FALL	RISE	

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6.   PARAMETERS

01. INIA
Automatic calibration (see chapter 5.3.2)

02. INIM
Manual calibration（see chapter 5.3.3）

04. TYPE
Type of actuator.
The actuator is a linear actuator (LINE) or rotary actuator (TURN).

06. DEBA
Dead band of the controller
If dEbA = AUto,the value of dead zone will change according to the operation status during operation．If there is oscillation, the dead zone will gradually increase, and gradually decrease after the oscillation disappears.
In the other discrete settings the fixed value is used for the dead zone.

07. PRED
Predict value
When control-loop gives a signal to the actuator, it judge the direct running value of actuator, when PRED=AUTO, generally predict value confirm with the request of control-loop under auto-mode

08. PRST
Preset (factory setting)
Establishing the default value and resetting the initialization

> ⚠ **NOTE:** The positioner must be re--initialized after "Preset". All previously determined maintenance parameters are cleared.

09.SDIR
Setpoint direction(see figure 12)
When SDIR is "rise" , 4mA Correspond to 0%-valve, 20mA is Correspond to 100%-valve,
when SDIR is set "fall", 4mA is correspond to 100%-valve, 20mA is correspond to 0%-valve.

010.SPRA
Split range start (see figure 12)

011.SPRE
Split range end (see figure 12)
The parameters "10.SPRA" and "11.SPRE" in connection with the parameter "9.SDIR" are used to restrict the active setpoint range. In this way split range tasks can be solved with the following characteristics.
- rising / falling
- falling / rising
- falling / falling
- rising / rising
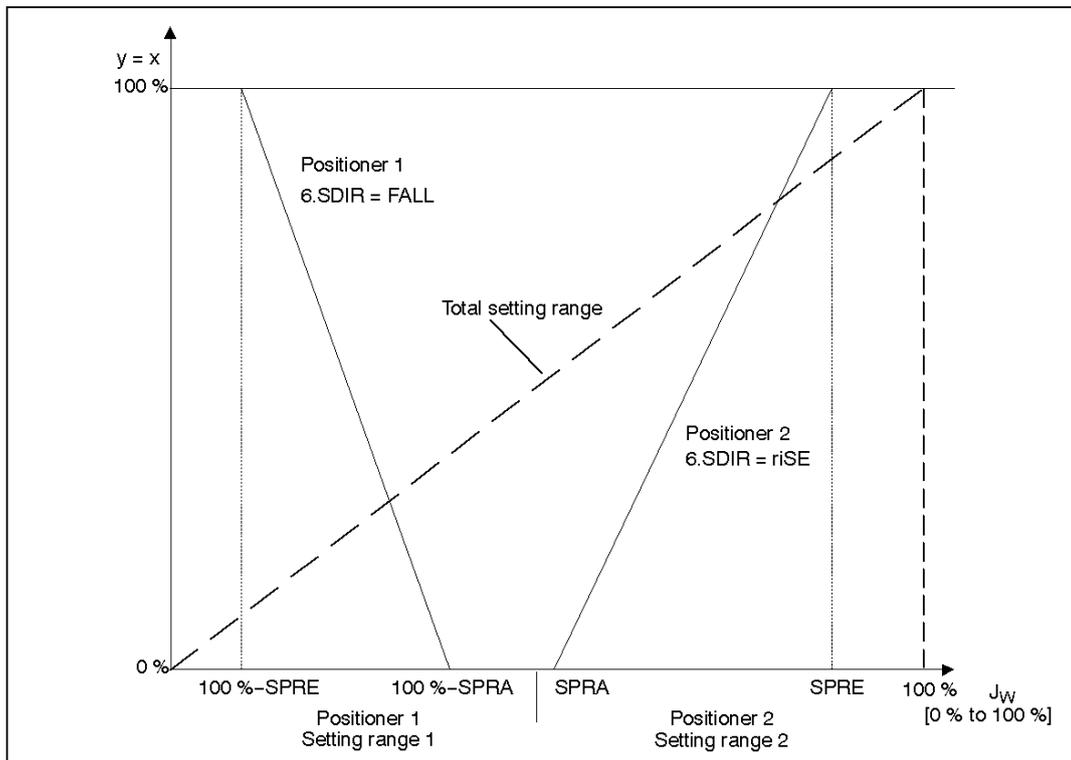
Figure 12: Split range-operation with two positioners

012. TSUP
Set point ramp UP
When switch from manual to automatic, bumpless switch is accomplish by set point ramp. Factory setting is AUTO.

013. TSDO
Set point ramp DOWN
The same as 12.TSUP. Factory setting is AUTO.

014. SFCT
Set point function
Non--linear valve characteristics can be linearized with this function and any flow characteristics simulated in linear valve characteristics.
Four valve characteristics are stored in the positioner
- Linear (14.SFCT = LINE, factory setting)
- equal percentage 1:30   (14.SFCT=1:30)
- quick open 30:1   (14.SFCT=30:1)
- custom   (14.SFCT=FREE)

015. SP00 to SP20
Set point turning points
A flow parameter can be assigned to the respective set point turning value at an interval of 10 %. These points lead to a polygon chain with 10 straight lines which therefore represents a projection of the valve characteristic.
The set point vertex values can only be input at 14.SFCT=FrEE. You may only enter a strictly monotonous characteristic.

036. YA
Valve position limiting start

037. YE
Valve position limiting end
Valve travel range can be limited by setting YA and YE.
YE must always be set greater than YA.

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038. YDIR
Valve position feedback direction
When YDIR = RISE, the valve-potentiometers' resistance value is increased, which means increasing the valve-opening,
When YDIR = FALL, the valve-potentiometers' resistance value is reduced, which means increasing the valve-opening.

039. YCDW
Value for tight closing
When the set point is smaller than YCDW value, position will drive the valve to position 0%.
This function can reduce the erosion of high speed medium on spool head.

040. YCUP
Value for tight closing
When the set point is smaller than YCDW value, position will drive the valve to position 100%.
This function can reduce the erosion of high speed medium on spool head.
YCDO must always be set to be smaller than YCUP.

041. SAFE
Only when 31.BIN is set to be ON, Safety valve is effective
If binary input is 0, valve will be drive to the position specified by this value.

042. BIN
Binary input functions: enable/disable safe position function.

043. DO1
Digit output function 1
When positioner detected set fault, channel 1(DO1) of binary output module state is "high".

044 SW1
DO1 set value
When DO1 = LSET, valve position is smaller than the SW1, channel 1(DO1) of binary output module state is "high".
When DO1 = HSET, valve position is greater than the SW1, channel 1(DO1) of binary output module state is "high".

045 DO2
Digit output function 2
When positioner detected set fault, channel 2(DO2) of binary output module state is "high".

046 SW2
DO2 set value
When DO2 = LSET, valve position is smaller than the SW1, channel 2(DO2) of binary output module state is "high".
When DO2 = HSET, valve position is greater than the SW1, channel 2(DO2) of binary output module state is "high".

047 AMIN
Min output current.
Min output current for the 0% position.

048 AMAX
Max output current.
Max output current for the 100% position.

049 ADIR
Relation between the output current of position feedback module and valve position. There are two choices: rise and fall. When choosing rise, output current will be 4mA when valve position is 0%; output current will be 20mA when valve position is 100%. When choosing fall, the result will be opposite.

7. FAULT AND MAINTENANCE

7.1 Trouble shooting

When positioner failed, follow these steps to eliminate fault,
If you cannot solve the fault according to steps as bellow, please contact STI.

Fault	Reason	Action to be taken
Actuator no action in manual /auto state	Air pressure too low	Air pressure adjustment > 0.14MPa
	Actuator jammed	Solve problem of actuator jammed
Actuator does not move or moves slowly	Air pressure low	Regulate the air pressure to above 0.14MP
	Exit initialization before finish	Re-initialize
Move frequently(not oscillation)	Leakage in air loop	Check the air pipes
Oscillation	User configuration incorrect	Contact manufacturer if positioner leak
		Set larger dead band, larger prediction
	Volume of actuator is too small	Set larger dead band, larger prediction
	Hysteresis is large, feedback device is not connected correctly, gap between the feedback pole slider and the U-shaped feedback lever is too large	Adjust installation of bracket or bracket position and re-initialize
Valve cannot be fully opened or closed	Air pressure too low	Increase air pressure
	Initialization data incorrect (physical limit during initialization or not initialized	Re-initialize
	Position limit is set	Check user configuration
	Tighten close not set	Active tighten close function in user menu
No display	Signal too small(<2mA)	Check input signal
	Electrical connection terminal screws loose	Tighten the terminal screws
	Main board failed	Change the main board
Exhaust not smooth	Bracket covers the exhaust	Drill a hole on the bracket over the exhaust
No position feedback current	Position feedback module failed	Change the module
	No external power, position feedback module not work	Provide 24V power to the module
	External wiring polarity	Rewire
Feedback current mismatch actual position	Position feedback module failed	Change the module
	Calibration of module drift	Tune the module potentiometer
Position display on LCD mismatch actual position	Actuator travel range mismatch the scale	Manual initialize

7.2 Maintainance

1) Positioner is a instrument which should be regularly maintained. The air supply of positioner should be kept dry and clean. Regularly exhaust water and pollution of the regulator connecting the positioner in order to keep the positioner normally.

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2) Feedback connection may be loose due to long term work. Check the feedback connection regularly. If loose, tighten at once and decide whether to initialize or not according error of zero and span.
3) In order to see whether the positioner is normal, keep the pressure gauge clear.

8.   Transport and storage

1) Check whether all kinds of sign are integrality, fully, and the package is firm before storage. Finally, check the reliability and safety of enswathement.
2) The transport should be light disposal, prohibit impacting, compression, and damp.
3) Stored at -20 ÷ 80°C, relative humidity should be no more than 90% of the room, the air should not contain harmful and corrosion impurities instrument.
4) Place according to the box's surface marker, do not reverse.

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