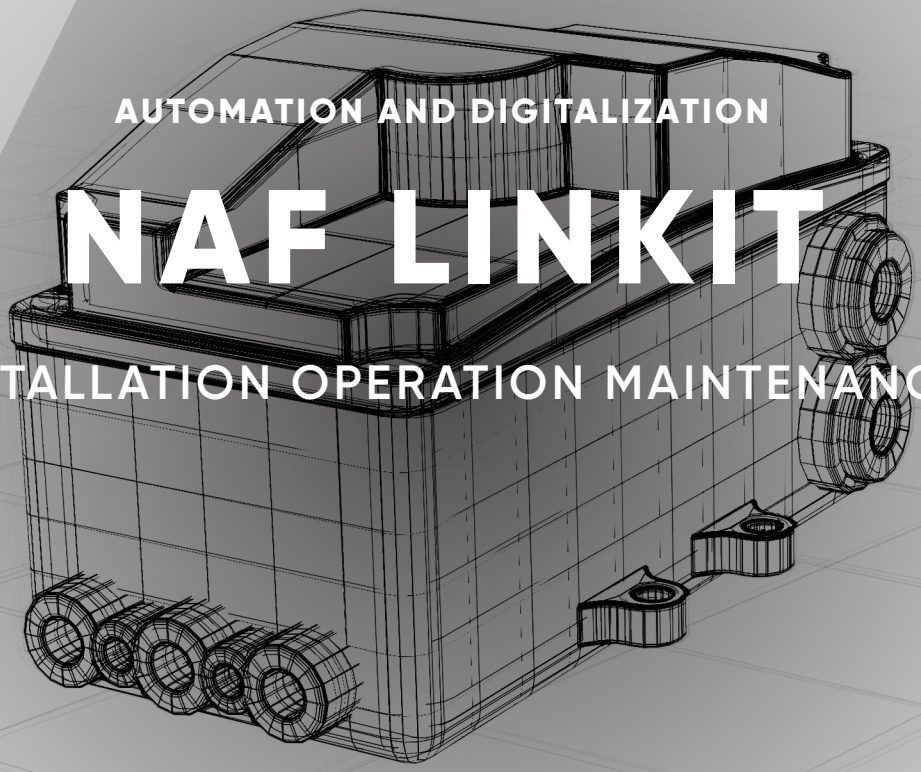
AUTOMATION AND DIGITALIZATION

NAF LINKIT

INSTALLATION OPERATION MAINTENANCE



ANDRITZ

ENGINEERED SUCCESS

Specification

TYPE

NAF LinkIT, is a digital positioner to operate pneumatic valve actuators, product code no. 370991-

DEVICE FEATURES

Intelligent:

- Auto start with self-calibration
- Self-diagnostic, status and diagnostic messages.
- Easy confi guration with three key pads.
- Multi lingual full text grafi cal LCD.

Control parameters and alarm limits can be configured by means of local keys, or on versions with communication (HART, FOXCOM, Profi bus, or Fieldbus Foundation) remote, with hand-held terminal, PC, or DCS system.

With applicable software, NAF-LinkIT can also provide diagnostics of valve condition.

Application:
NAF-LinkIT is mounted directly on a NAF actuator, or with a mounting kit on other pneumatic rotary actuators.

The NAF actuator has a slot to receive the positioner spindle. A driver pin then transfers the rotary motion from the actuator to the valve positioner.

Design:
NAF-LinkIT has a very robust and rugged design made for severe applications in the process industry. The valve controller has a very high air output capacity to fit on large size actuators and valves.

The NAF-LinkIT is equipped with an integrated beacon indicator visible through the transparent cover. The beacon has red indicator markings for 90° rotation angle.

CONTENTS

CONTENTS

1. Method of operation

1.1 GENERAL

The intelligent positioner NAF-LinkIT 1 and the pneumatic actuator 2 form a control loop with the setpoint value w (from master controller or controll system), the output pressure y and the position x of the actuator on valve 3

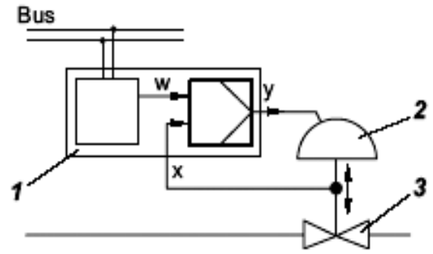


Fig.: Fieldbus version
For the supply air, we recommend a fi lter regulator

The positioner can be attached to both linear actuators and rotary actuators.
Actuators with spring force are controlled by a single acting positioner. Actuators without spring force are controlled by a double acting positioner.

HART or FoxCom version:
The positioner can be operated locally by means of local keys or Hand Held Terminal, remotely via PC-based confi guration or a corresponding control system as, e.g. I/A Series System.

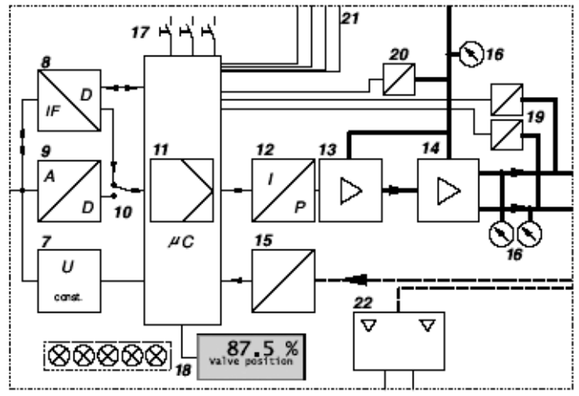
PROFIBUS-PA or FOUNDATION Fieldbus version:
The positioner can be operated locally by means of local keys, remotely via a corresponding control system or can be operated via PC-based confi guration and operating tools as, e.g. PC20 / IFDC.

1.2 BLOCK DIAGRAM

s Air supply 1.4 ... 7 bar (20 ... 90 psig)

Input (w) each acc. to version:

. Analog operation 4...20 mA (+FSK)
. Digital operation FSK 13...36 V DC
. Bus input



I Output pressure

II to actuator

x Position of actuator

1.3 OPERATION

With the intelligent positioner with input signal 4-20 mA or superimposed HART signal, the supply takes place via the power signal adjacent to the input.
By means of voltage converter 7, derivation of the internal supply of the electronic takes place. The power value is measured, in A/D transformer 9 converted, and directed via switch 10 to digital controller 11.

With PROFIBUS-PA or FOUNDATION Fieldbus, the NAFLinkIT is powered by means of the bus cable. The positioner is operated from a control system by sending a setpoint (set-point value) to the positioner. The digital signal is directed via the interface component 8 to the digital controller 11.
By means of the voltage converter 7 the internal supply of the electronic is established, fed via the bus cable.

With FoxCom digital operation a DC voltage is provided at input w. On this voltage a FSK-signal is modulated. The modulation contains information (eg setpoint value), sent digitally to the control unit 11 across the FSK-unit 8.

The output of controller 11 drives the electro-pneumatic converter (IP-module) 12, controlling a pre-amplifier , controlling a pre-amplifier 13,
the single acting (or double acting) pneumatic power amplifier 14. The output of the amplifier. The output of the amplifi er 14 is the output
pressurey to the actuator.

The pneumatic amplifi ers are supplied with supply air s 1.4 to 7 bar (20 to 90 psig). The position x of the actuator is sent to the control unit 11 by the position sensor (conductive plastic potentiometer) 15.

Optional gauges 16, pressure sensors 19, 20, inputs / outputs 21 (two binary outputs; a 4-20 mA output and alarm; control inputs for 'Open/Close' and 'Hold last value*) enable additional diagnostic indications and possible intervention. The mechanical limit switch 22 (optional) enables independent alarm signals.

Adjusting, start-up of the positioner as well as the demand for internal information can be made using the local keys 17 with indication given by LCDs 18 or LEDs.

2. Operating modes

Operation of the positioner is divided into individual 'operating modes'. Operating modes may change depending on, for example, key commands or internal calculations. The different operating modes are described in abbreviated form below.

INITIALIZE

Upon power-up or Reset (pressing of the 3 keys simultaneously), several self-tests are conducted. Individual steps in the self-test process are indicated by the LCD or green LEDs.

If no error occurs the device moves to OUT OF SERVICE, if it is still in a delivery condition; AUTOSTART has to be performed. If AUTOSTART was done already, the device will go to IN OPERATION.

If faults are detected, the code of the faulty self-test will remain (see page 40). If error reoccurs after reset, the device is probably defect and should be sent in for repair.

DEVICE FAULT

In the event that the LCD shows a message (or red LED lights up constantly and all green LEDs are off), a device fault is signaled. These faults are detected during cyclical self-test.

The device can no longer be operated. This could be caused a. o. by a jammed menu key, defect program memory, etc. (see chapter "trouble-shooting").
This condition disappears through new resetting until the same error is detected again. If a device error occurs repeatedly, the device should be sent in for repair.

IN OPERATION

After performing an AUTOSTART, the device moves to IN OPERATION and will always, even after restarting or resetting, move back to the safety position (de-energized valve position) or FAILSAFE. If setpoint values are fed via communication, the NAF-LinkIT will go to IN OPERATION.

FAILSAFE

Positioner carries out actions as confi gured in menu "failure handling". Additionally, the cyclical self-diagnosis takes place.

If the instrument is IN OPERATION, but no setpoint values arrive via communication, the NAF-LinkIT will go to FAILSAFE mode, after a defi ned time period; either with:

- maintaining last value
- output pressureless, or
- with predetermined position.

As soon as setpoint values arrive via communication again, the instrument is immediately back IN OPERATION.

OUT OF SERVICE

The NAF-LinkIT in its delivery condition is confi gured in such a way that it will remain OUT OF SERVICE after power-up until moving to IN OPERATION via the manually initiated function AUTOSTART.

In the device state OUT OF SERVICE the menu entering mode remains active at all times. If a device has been IN OPERATION already and is removed from an actuator and mounted to another, it is recommended to take the device out of operation via RESET CONFIG (Menu 9.1) prior to disconnecting the device from the fi rst actuator. This enables the next actuator to be started in the delivery condition.

CALIBRATE

During an AUTOSTART function the device is in condition CALIBRATION. Tha actuator is moved between 0-90° several times, and the device could be busy for a longer period of time. Subsequently, the device moves to IN OPERATION.

MESSAGE

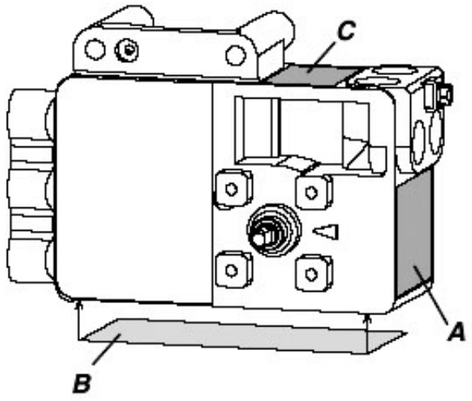
The NAF-LinkIT continuously supervises its important device functions. In the event that limit values are exceeded or operational problems occur, messages are signaled via the LCD or the special LED blinking mode: red LED with long, green LEDs with short fl uorescent time.
The message with the highest priority will be indicated fi rst. With key DOWN additional messages can ba called up, with key UP the measuring values can be retrieved. It is possible at all times to reach the menu by pressing the menu keys to possibly eliminate the problem by performing suitable menu functions. Further references may be found in chapter "Trouble-shooting"

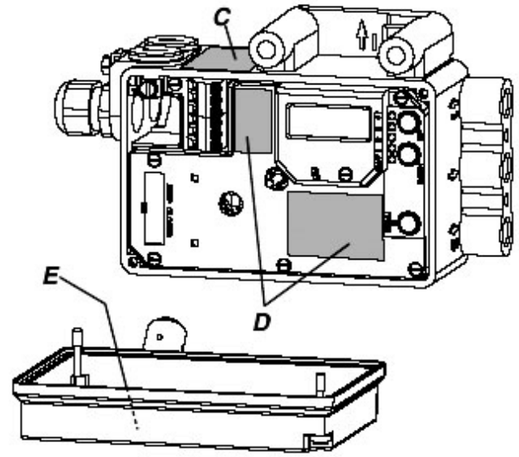
SIMULATE

(FOUNDATION FIELDBUS version only)
During function IN OPERATION, the valve position queried via the communication, can be simulated with a value that has been entered via communication into the instrument during position SIMULATION. Thereby the positioner continues with normal operation and regulates to the "accurate" set value.
For the NAF-LinkIT, this function has to be additionally released or blocked via menu 10.

LCD description, defi nition of the LEDs and possible operator interventions are described in chapter: START-UP.

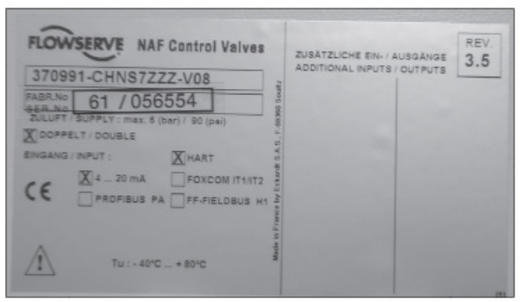
LABELS



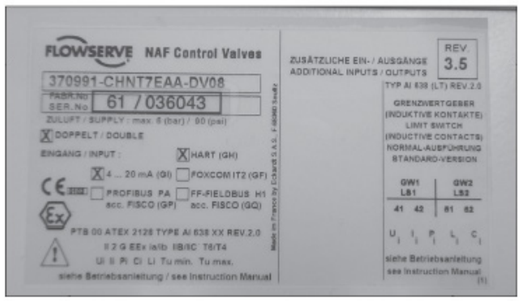


A Nameplate
B Nameplate
C Additional label
D Warning labels, terminal wiring, key and LED-designation
E Brief description inside cover

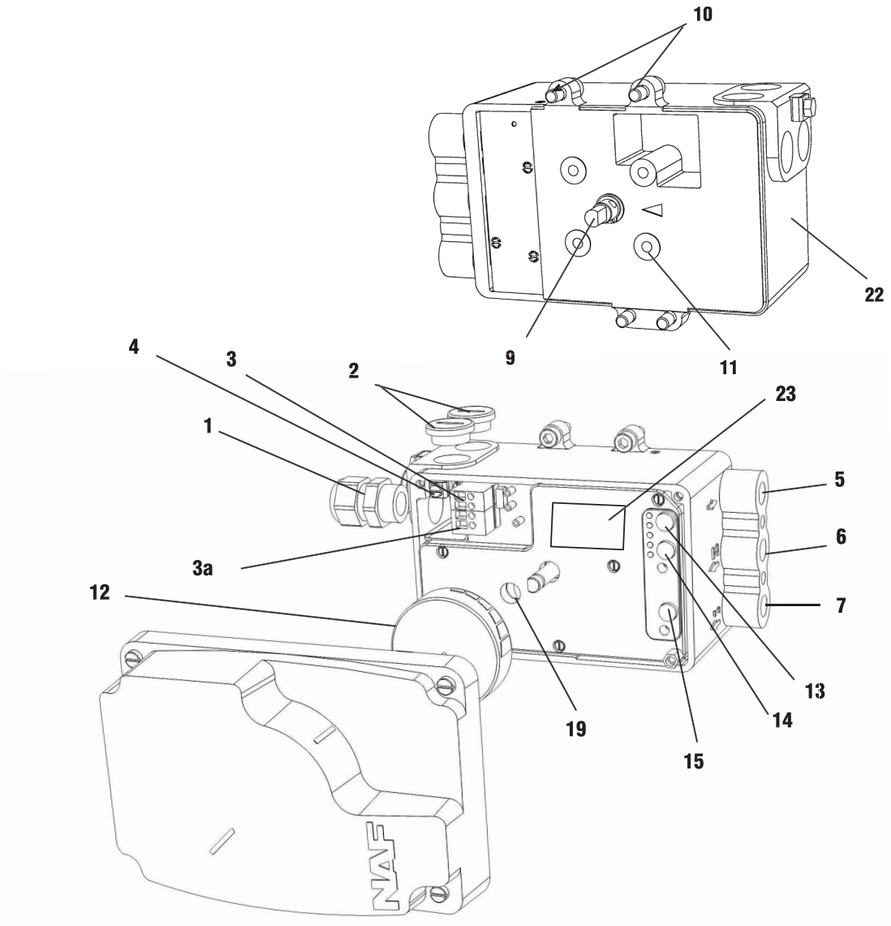
Nameplate B (Example)
Without Ex protection, with options



Nameplate B (Example)
With Ex protection acc to ATEX, T4 / T6 , with options



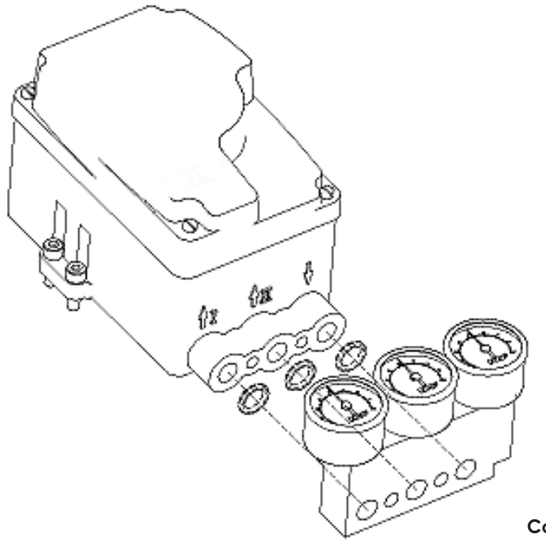
3. Design



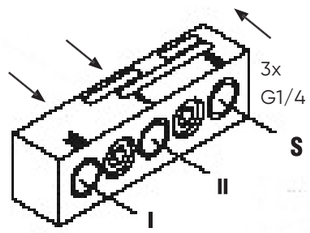
1	Cable gland PG 13.5	12	Travel indicator
2	Plug interchangeable by pos 1	13	Key UP
3	Screw terminals 11+ 12- for input (w)	14	Key DOWN
3a	Screw terminals for options	15	Key M
4	Ground connection	19	Shaft for limit switch connection
5	Female thread 1/4-18 NPT for air supply	20	Cover
6	Female thread 1/4-18 NPT for air output II (y2)	22	Name plate
7	Female thread 1/4-18 NPT for air output I (y1)	23	LCD
8	Direct connection hole for output I (y1)		
9	Feedback shaft		
10	Connection manifold for mounting to linear actuator		
11	Connection base for mounting to rotary actuators		

3.1 PNEUMATIC ACCESSORIES

When mounting, check the proper seating of the O-rings and bolt on the accessories with the two M8 bolts. Unused outputs are closed by means of plastic plugs.



Code LEXG -M:
Connection manifold



L x B x H =
83 x 20 x25 mm

Code LEXG -K:
Connection manifold
with G 1/4 threads

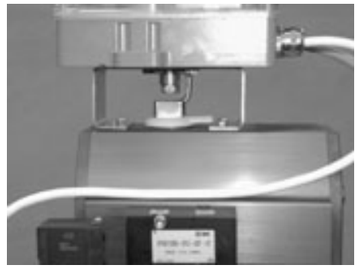
4. Mounting on linear actuators

Not applicable for this unit.

5. Mounting on rotating actuators

5.1 TYPE OF MONTAGE

Applicable to rotary actuators that meet the VDI/ VDE 3845 standard for mounting or NAF manufactured actuators. Installation position of positioner: Mount the positioner so that the pneumatic connections are in the same direction as the longitudinal drive axis of the actuator as shown in the photograph below.



ATTENTION

The feedback shaft 9 of the NAF-LinkIT has no mechanical stop, therefore may spin round. The permissible rotation angle range is between +47,5 and –47,5 degrees around the arrow at the housing concerning the fl at area of the feedback shaft. Since a rotary actuator has a rotary angle of about 90 degrees the mounting as described as follows must be carried out very precise.

Attachment of the positioner to actuators not manufactured by NAF is made by using the rotary adaptor kit EBZG -R.

Pneumatic connections: Do not use Tefl on tape for sealant. The fi ne fi bres could disturb the function of the NAF-LinkIT. Use only Loctite® #243 for sealant[1]). Screw-type glands for electrical connections are used as needed. Any unused threaded holes are closed by plugs.

CAUTION!

Prevent accumulation of water in the instrument in this mounting position by sealing cable entry against water. Provide a continuous supply of dry instrument air.

1) Apply only to male thread.

5.1.1 PREPARATION OF POSITIONER

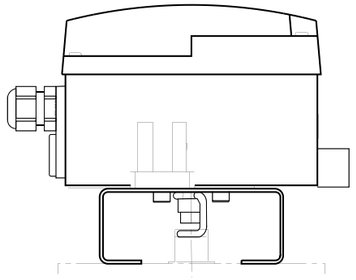
Valve must be in failsafe position and the direction of rotation of the actuator drive shaft must be known. These items are extremely important for proper functioning. These items can be checked as follows in case they are not clear:

In the single-acting actuator the force of the installed springs closes. The pressure-less actuator is in failsafe position. Through manually feeding compressed air it can be seen whether the actuator drive shaft rotates to the left or to the right. In the powerless NAF-LinkIT is y1 pressureless.

In the double-acting actuator without spring reset both air chambers are basically equal. Failsafe position can be either „open" or „close". Therefore, indication of the failsafe position has to be determined by engineering. Then the direction of rotation may be determined by manual feeding of compressed air. In the powerless NAF-LinkIT y1 pressureless and y2 under pressure.

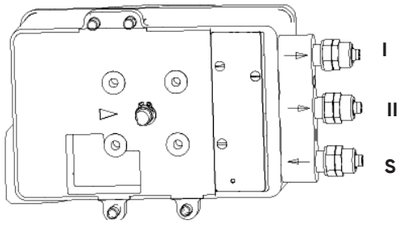
Bolt 2 is screwed into actuator drive shaft 1 for subsequent centering of the rotary adaptor 3 . The attachment console is mounted to the stroke actuator (see photo).

Attachment diagram for bracket



Rotary adaptor

6. Pneumatic connection



Following alignment and mounting of the positioner to the valve, pneumatic tubing has to be provided.

Explanation of abbreviatons:
s Supply air
I Output 1, depressurized at currentless electronics.
II Output 2, full pressure at currentless electronics.

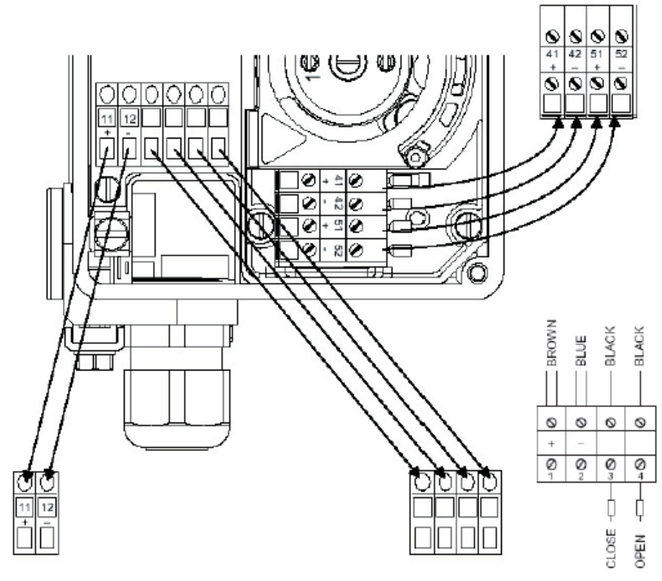
7. Electrical connection

The safety requirements on page 45 must be observed! Unused cable glands should be closed.
Feed in the cable through the gland 1. The gland is suitable for cable diameters of 6 to 12 mm. Observe the tightness of the cable entry. Make the electrical connection of the input line at the screw terminals 3 marked with 11+ and 12-. The terminals are suitable for wire cross-sections of 0.3 to 2.5 mm (22-14 AWG). Connection of options (see terminals below item 3):

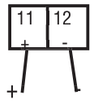
Option -N (wo options)		Option -P 2 binary outputs		Option -B 2 binary inputs		Option -Q 1 pos. feedb. 1 Alarm	
Mark	Signal	Mark	Signal	Mark	Signal	Mark	Signal
11+	Setp.	11+	Setp.	11+	Setp.	11+	Setp.
12-	Setp.	12-	Setp.	12-	Setp.	12-	Setp.
		81+	AB1	13+	EB1	81+	AB1
		82-	AB1	14-	EB1	82-	AB1
		83+	AB2	15+	EB2	83+	AI
		84-	AB2	16-	EB2	84-	AI

Note:
When connecting shielded cable connect the cable shield only to the system! Do not connect the cable shield to the NAF-LinkIT!
For selection of cable, see recommendation for cable types acc to IEC 1158-2. For connection to a local ground the internal and external ground terminal 4 can be used.

ELECTRICAL CONNECTION

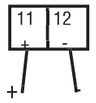


Target value
For 370991-xH (HART), -xD (Digital)



Input 4 - 20 mA

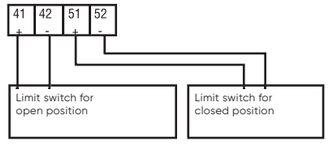
For 370991-xP (Profi bus PA) and 370991-xQ (Foundation F.H1)



Bus connection according to IEC 1158-2
Supply voltage DC 9 - 32 V

INDUCTIVE LIMIT SWITCHES

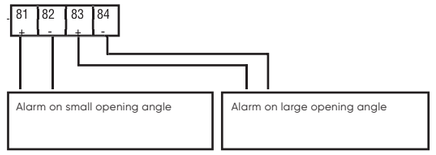
370991-xxxT
2-wire inductive transmitter according to DIN 19234 or NAMUR
Supply voltage:
T = 8V



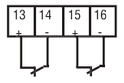
370991-xxxW
3-wire inductive transmitter according to DIN 19234 or NAMUR
Supply voltage:
W = 10-30V

"Option Board" (Accessory)

Two binary output (370991-xxP)
2-wire inductive transmitter according to DIN 19234
Supply voltage: DC 8 - 48 V

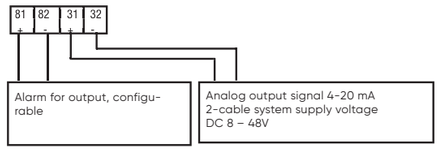


Two binary output (370991-xxP)



Binary inputs with internal feed for connection of transmitter or switches (Switch closed for normal operating condition)

Position feedback 4 - 20 mA and 1 Alarm-370991-xxQ)



8. Options

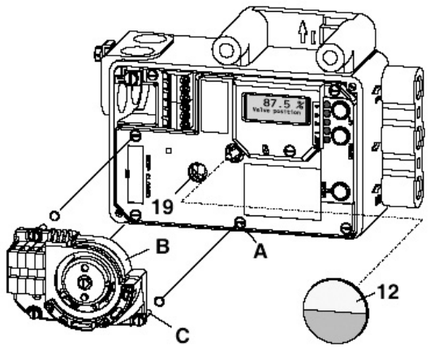
8.1 "LIMIT SWITCH"

Rebuild to this option resp. exchange.
Remove three screws A including tooth lock washer from plastic cover.

Attach a limit indicator B so that the fl attened shaft end so that the fl attened shaft end 19 contacts the groove of the limit indicator shaft in the positioner.

Attach limit indicator by means of three longer screws C and washers.
Test: the coupling shaft at the back of the positioner should easily be turnable, thereby also moving the vanes of the limit indicator. If this is not the case, loosen screws C and fl ushalign the shafts of positioner and limit switch (turn coupling shaft several times).

Replace short travel indicator 12 by long travel indicator.



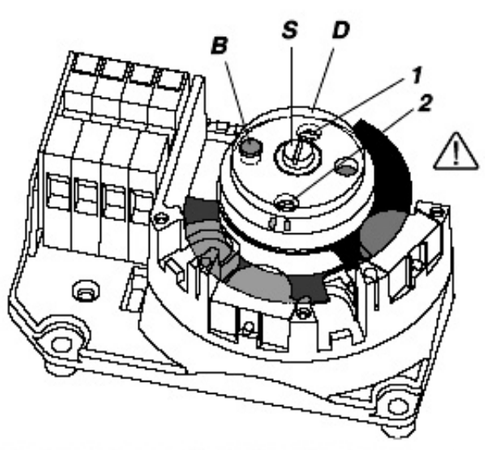
SETTING LIMIT SWITCH TRIGGER POINTS

First loosen screw S until disc D is no longer blocked by bolt B. Then turn disc by 90°, until set screws 1 and 2 are accessible.

Set trigger point switch GW1:
Turn screw 1 at mark (•), until desired switch behavior is reached.
Set trigger point switch GW2:
Turn screw 2 at mark (• •), until desired switch behavior is reached.

To fix switch points turn disc again by 90°, until the bolt catches, then fasten tight the center screw S.

Do not touch control vanes during operation, danger of injuries!



Levels of control vanes (illustration without cover)

8.2 ADDITIONAL INPUTS / OUTPUTS GENERAL

All versions of the NAF-LinkIT are prepared to retrofi t to this option.

Take current off NAF-LinkIT and turn-off supply air. Unscrew cover and remove electronics unit 40 (see page 36).

Attach option board 8 to connection ledge (observe orien- to connection ledge (observe orientation, see illustration). Refasten electronics unit 40.

After initialization acknowledge message 10 by simultaneous pressing of keys UP + DOWN.

OPTION "POSITION FEEDBACK AND ALARM"

The analog output for position feedback indicates the valve position 0 to 100% as current signal 4 to 20 mA [1]). Signal range is 3.8 to 20.5 mA, at fault approx. 0.5 mA.

The binary output for Alarm will be activated in the following cases (see Messages, page 42).
- Calibration error (for example due to break-up of calibration) Message 3
- Output outside of limits determined during Autostart (Check mounting of feedback lever) Message 5
- Circuit to potentiometer is disturbed (cable plugged?) Message 5
Circuit to IP module is disturbed (Cable plugged?) Message 6
- No actuator movement; Message 7
- Remaining control deviation (packing is too tight?) Message 11

Signal range: 1 mA resp. 4...6 mA, at fault ‹ 50 µA.
In the event of disturbances in the electronics of the NAFLinkIT the Watchdog circuit is activated. The binary output for alarm signalizes this as "cable failure"

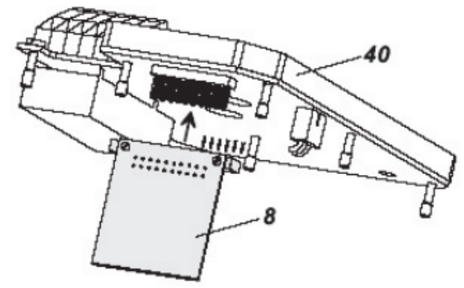
8.3 "BUILT-IN PRESSURE SENSORS"

The pressure sensors 50 are part of the electronics 40, therefore, the electronics has to be exchanged for conversion to this option.

Disconnect electric power and air supply. Remove cover and electronic unit 40 .

Remove, if present, the M3 bolts with sealing washers from both chimneys 52. Press in a sealing plug 51 Part No. 534 346 013 into the top of each chimney 52 until the collar makes contact. DO NOT GREASE!

To install an electronic unit with pressure sensors, c a r e f u l l y guide the tubes 50 of the pressure sensors vertically into the sealing plugs 51. Do not twist or tilt the unit. Fasten screws on the electronic unit.



OPTION "TWO BINARY OUTPUTS"

Both binary outputs AB1 resp. AB2 switch to high current as soon as the valve position is below resp. exceeds the associated limit value. If the binary outputs AB1 resp. AB2 are to be inverted (higher current no alarm, lower current alarm), the association upper / lower alarm has to be exchanged. Signal range 1 mA resp. 5 mA, at fault ‹ 50 µA.

[1] The direction of action of the position response message is set:
valve position 0% = 4 mA; valve position 100% = 20 mA
[2] Factory setting. Via communication actions may be turned off or used otherwise. EB1 and EB2 can thus also be used as diagnostics inputs.

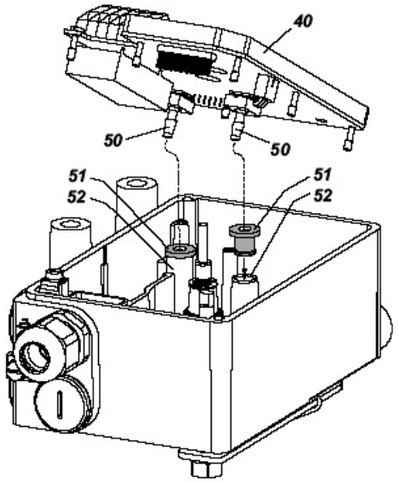
OPTION "BINARY INPUTS"

The binary inputs EB1 and EB2 for two external switches resp. sensors initiate the following actions: [2]

EB1	EB2	Action [2]
closed	closed	IN SERVICE
open	closed	Position to be operated full power to 0%
closed	open	Position to be operated full power to 100%
open	open	Hold last value

An input not used is to be short-circuited (wire bridge between + and -).

Attention: Even if opening limit or closing limit are set: these actions are superimposed, and the actuator actually moves to 0% resp. 100%.



9. Start-up

GENERAL

First of all, the nameplate should be checked, especially with respect to indications referring to Ex / non- Ex, input signal, communication, output signal, single / double acting, additional inputs / outputs. Before starting the positioner the NAF-LinkIT has to be mounted to the actuator; power and air supply must be connected.

The supply air connection must have suffi cient capacity and pressure of 1.4 - 7 bar (20...100 psig) and should not exceed the maximum operating pressure of the actuator.

9.1 SETTING BY MEANS OF LOCAL KEYS

The NAF-LinkIT can be adjusted by means of a local key-pad when the cover is off.

M (Menu) start menu / end menu
UP / **DOWN** counting up/down of menu numbers resp. parameter numbers
UP + DOWN simultaneously: confi rm at start, or when entering, storing, or verifying
M + UP + DOWN simultaneously: Reset = new start of NAF-LinkIT, thereafter initialization [1]

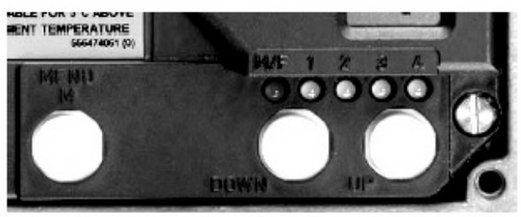
INDICATION WITH LCDPOINTS

In true text:

```
NAF-LinkIT Main Menu
1  Mounting
2  Autostart
3  Valve Action
```

Attention: Configuration using local keys or the communication interface may interfere with operation of the actual process! During configuration it is recommended that there is no fl ow through the valve.

For Initial Start-up see next page.



If there is no response using the local key-pad (message 1 appears, see page 42) make sure that the Write Protection is not set ! Remove the write protection using the confi guration software (PC20 / IFDC or NAF-eValvate (FDT) software)

Attention: Do not touch behind the positioner housing while operating the keys!
D A N G E R O F I N J U R I E S !

INDICATION WITH LEDS

The LEDs serve as indication in the following different methods:

M	1	2	3	4	
½	½	-	-	-	M and LED 1 flash

1 constant light, ON
¼ fl ashing: short ON, long OFF
¾ fl ashing: long ON, short OFF
½ fl ashing: ON and OFF same duration
- OFF

9.2 OPERATION

After Power ON
INIT: After power on if input signal or after reset, the NAF-LinkIT initialises, thus the various components of the electronic are checked and started. (The stored data of the positioner is of course not affected and remains unchanged). The current status is stated on the LCD in clear text or indicated as LED code (see page 40).
Initialisation after positioner start-up takes approx. 3 sec, then the NAF-LinkIT goes

- Into operation (Autostart has already been done) or
- To configuration, Menu 9.8 (with LCD the text language is selected before (changing e.g. to Swedish language) ...

```
9.8    Menu Lang
9.8.1  English
9.8.2  Deutsch
9.9.3  Swedish
```

... and the display orientation is selected ...

```
9.9    LCD Orient
9.9.1  Normal
9.9.2  Flipped
```

... then automatically continued to confi guration:

```
NAF-LinkIT Main Menu
1   Mounting
2   Autostart
3   Valve Action
```

CONFIGURATION

MENU: The various specifications for configuration are arranged in menus:

LEDs flash					Menu	Description
red	green					
M	1	2	3	4		
½	½				1	Actuator system, mounting side
½		½			2	Autostart, short Autos
½			½		3	Valve function
½				½	4	Characteristic of setpoint
½	½	½			5	Limits and Alarms[1]
½	½		½		6	Parameter for position controller
½	½			½	7	Manual setting of pneumatic position
½		½	½		8	Manual setting for valve position
½		½		½	9	Calibration functions for workshop
½			½	½	10	PROFIBUS-PA:Bus Address FOUNDATION F.: Simulate

½ = ON and OFF flashing same duration

IN OPERATION

After accomplished autostart, the NAF-LinkIT goes automatically IN OPERATION. (Additional parameters can of course be confi gured through pressing of menu key M). On the LCD display the process variable is indicated.

```
87.5 %
Valve position
```

Through pressing of keys UP or DOWN additional information can be retrieved from the NAF-LinkIT:

Travel position
Input current
Digital setpoint
Stem setpoint
Output pressure1
Output pressure2
Input pressure
Temperature
Travel sum
Valve cycles
NAF-LinkIT Version

(Certain data is available only with the corresponding options).

MANUAL OPERATION

Through twice pressing of keys UP+DOWN (together), the NAF-LinkIT goes into manual operation mode, where the valve position can be set manually. Exit of menu by pressing twice of key M.

DIAGNOSTICS DURING OPERATION

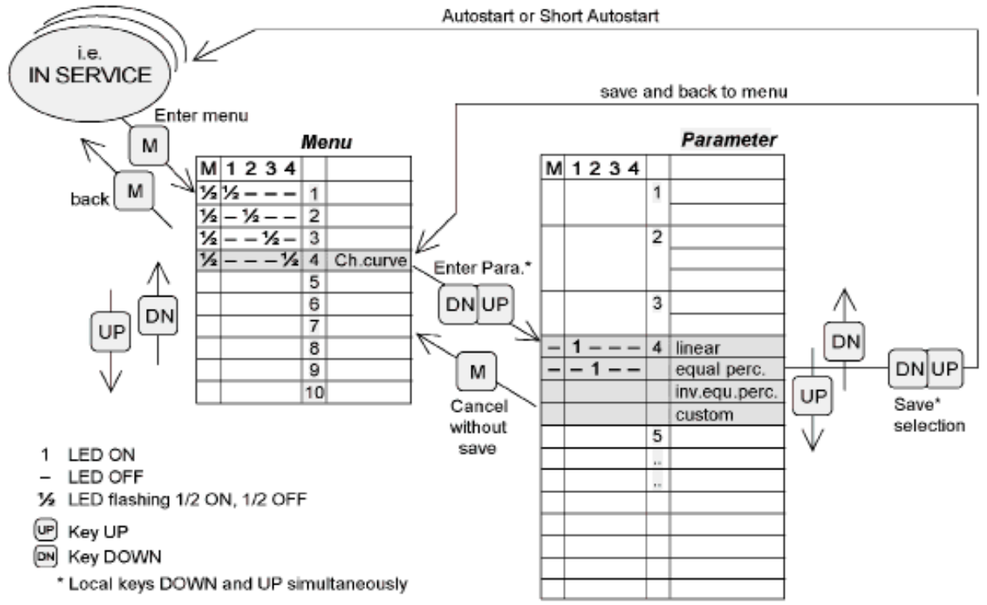
If the diagnostics determines an occurrence, this is indicated in the bottom line: (resp. blinking code with LEDs).

87.5 %
Valve position
Ctrl diff error

MESSAGE: The NAF-LinkIT recognises an occurrence which the user must eliminate by taking suitable steps (see page 42) in order to continue with operation. This can be e.g. a wrong confi guration or missing supply air.

ERROR: During self-testing the NAF-LinkIT has recognised an error and is no longer operable, see page 40.

OPERATION WITH LOCAL KEYS



... WITH LCD

- Enter the Menu mode by pressing the M key, and Menu 1 appears (see also page 18).
- Select the desired Menu item by pressing the UP or DOWN key, see table. Each press of the key moves one menu item forward (or back).
- Pressing the UP+DOWN (together) key confi rms the selected menu item and enters the Parameter change mode for the selected menu item. To set a parameter see table Parameter on next page.
- Leave Menu mode by pressing M key again. If device remains in menu mode it still is OUT OFSERVICE and AUTOSTART has to be initiated.If the instrument is IN OPERATION, the display with the valve position appears. If a menu was selected and no further keys are pressed thereafter, the NAF-LinkIT switches automatically back to operation after some minutes.

[1] Exception in Menu 6 (and at PROFIBUS Menu 10). No parameter indicated at fi rst, but fl ashing rhythm with long green and short red phases. This points to a sub-menu. Then entry into parameter selection as described.

... WITH LED

- Enter the Menu mode by pressing the M key. The red LED fl ashes alternately with the green LED1, which indicates the Menu item 1.
- Select the desired Menu item by pressing the UP or DOWN key, see table. Each press of the key moves one menu item forward (or back). The flashing green LEDs indicate the selected menu item. LED test before confi guration: Move form menu item 1 to 4 and inspect that each LED lights.
- Pressing the UP+DOWN key (together) confi rms the selected menu item and enters the Parameter change mode for the selected menu item. The red LED goes off and the remaining green LED indicate the parameter or state to be set[1]. To set a parameter see table Parameter on next page.
- Leave Menu mode by pressing M key again. Red and green LEDs extinguish when device is INSERVICE. If device remains in menu mode it still is OUT OF SERVICE and AUTOSTART has to be initiated. If a menu was selected and no further keys are pressed thereafter, the NAF-LinkIT switches automatically back to operation after some minutes.

MENU STRUCTURE FOR NAF-LINKIT WITH LCD

Menu	Factory configuration	Description
NAF-LinkIT Main Menu		
1 Mounting		
1.1 Lin left		Linear actuator, left-hand or direct mounting
1.2 Lin right		Linear actuator, right-hand mounting
1.3 Rot cclockw	✓	Rotary actuator, opening counter-clockwise
1.4 Rot clockw		Rotary actuator, opening clockwise
2 Autostart		
2.1 Endpoinds		Adaption to the mechanical stops only
2.2 Standard		Autostart rtecommendedfor standard application
2.3 Enhanced		Optimized control behaviour compared to Standard Autostart
2.4 Smooth Resp.		Extended Autostart, dampenend control behaviour for e.g. smaller actuators
2.5 Fast Resp.		Extended Autostart, undampenend control behaviour for e.g. larger actuators
3 Valve Action		
3.1 Direct	✓	Valve opens with increasing setpoint value
3.2 Reverse		Valve closes with increasing setpoint value
4 Character		
4.1 Linear	✓	Linear characteristic
4.2 Eq Perc 1:50		Equal percentage characteristic 1:50
4.3 Quick open		Inverse equal percentage characteristic 1:50 (quick opening)
4.4 Customer		Custom characteristic
5 Limits/alarms		Not locally available with communication FF and Profibus
5.1 Lower limit	0%	Closing limit
5.2 Cutoff low	0%	0%-tight sealing point
5.3 Cutoff high	100%	100%-tight sealing point
5.4 Upper limit	100%	Opening limit
5.5 Splitr 0 %	4mA	Split range 0 %: input value corresponds to 0 %
5.6 Splitr 100 %	20mA	Split range 100 %: input value corresponds to 100 %
5.7 Lower Alarm	-10%	Lower position alarm on output 1
5.8 Upper Alarm	110%	Upper position alarm on output 2
5.9 Valve 0%	0%	Configuration of rated-stroke of 0% at 4 mA
5.10 Valve 100%	100%	Configuration of rated-stroke of 100% at 20 mA
5.11 Stroke range	90.8°	Configuration of nominal travel (rotary shows range from autostart, not config)
5.12 Temp Unit	°C	Configuration of the temperature unit °C or °F
5.12.1 °C		Temperature in °C
5.12.2 °F		Temperature in °F
6 Parameters		
6.1 Gain closing	3,5	P: Proportional amplification for 'close valve'
6.2 Gain opening	3,5	p: Proportional amplification for 'open valve'
6.3 Res time cl	15	I: Integration time for 'close valve'
6.4 Res time op	15	I: Integration time for 'open valve'
6.5 Rate lim cl	0	T63: Setting time for 'close valve'
6.6 Rate lim op	0	T63: Setting time for 'open valve'
6.7 Control gap	0	Permitted neutral zone for control difference

MENU STRUCTURE FOR NAF-LINKIT WITH LCD

7 Output		Manual setting of IP-Module for testing of pneumatic output
8 Setpoint		Manual setting of valve position
8.1 12.5% Steps		Setpoint changes of 12.5% steps by pushing buttons Up or Down
8.2 1% Steps		Setpoint changes of 1% steps by pushing buttons Up or Down
9 Workbench		
9.1 Reset Config		Resetting of configuration to setting "ex factory"
9.2 Calib. 4 mA		Calibrate input current to 4 mA
9.3 Calib. 20 mA		Calibrate input current to 20 mA
9.4 Calib. -45°		Calibrate position measuring value to –45°
9.5 Calib. +45°		Calibrate position measuring value to +45°
9.6 Reset all 1		Resetting of configuration and Calibration (!) to "ex factory" setting for single-acting output
9.7 Reset all 2		Resetting of configuration and Calibration (!) to "ex factory" setting for double-acting output
9.8 Menu Lang		
9.8.1 English	✓	Standard
9.8.2 Deutsch		Standard
9.8.3 Français		Preselected / Freely Defiable
9.9 LCD orient		
9.9.1 Normal	✓	Normal orientation of writing on LCD
9.9.2 Flipped		Reverse orientation of writing on LCD
9.10 Cal. Feedback		
9.10.1 Cal 4 mA		Calibration of 0% at 4 mA
9.10.2 Cal 20 mA		Calibration of 100% at 20 mA
10 - not available - for HART		
10 Bus adresse - Profibus PA		
10.1 Address LSB		Ratio from Dec. 0 / Hex 00 to Dec. 15 / Hex 0F
10.2 Address MSB		Ration from Dec. 0 / Hex 00 to Dec. 112 / Hex 70
10.3 Address	126	Display of Bus Address from Dec. 1 to 127 (Hex 00 to 7F)
10 FF Config		
10.1 Simulate	✓	
Disabled		Simulate disabled
Enabled		Simulate enabled
10.2 Profile		
Linkmaster	✓	Link Master active
Basic device		Link Master de-active

ADDITIONAL PARAMETERS

The following parameters are accessible via communication only:

Parameter	ex factory
Control difference limit value	5 %
Control difference response time	1 min
Sealing hysteresis	0.5 %
Failsafe-Action	OFF
Power-up action	IN SERVICE
Parameter write protection	OFF
Alarm limit for total strokes	90 Mio.

Parameter	ex factory
Alarm limit for total cycles	90 Mio.
Dead band for valve cycles	1 %
Set value source: Model Code xFxx	digital
Set value source: all others	analog
Upper pre-alarm	100 %
Lower pre-alarm	0 %
Hysteresis for position alarms	0.5 %

Complete parameter list see PC20 / NAF-eValuate (FDT Software).

9.3 DESCRIPTION OF MENUS

Because of optimised local operation, for configuration neither PC or control system is required.

MENU 1: ACTUATOR SYSTEM, MOUNTING SIDE

NAF-LinkIT Main menu
1 Mounting
2 Autostart
3 Valve action

Confirm with keys UP+DOWN

1 Mounting
1.1 Lin left
1.2 Lin right
1.3 Rot cclockw

(Further with UP key)

1 Mounting
1.1 Lin left
1.2 Lin right
1.3 Rot cclockw

1 Mounting
1.1 Lin left
1.2 Lin right
1.3 Rot cclockw

1 Mounting
1.2 Lin right
1.3 Rot cclockw
1.4 Rot clockw

In case operation via local keys is not possible check if write protection is set. Change via PC20 / IFDC or NAF-eValuate (FDT) software.

M	1	2	3	4	
½	½	-	-	-	M and LED 1 flash

For an optimal actuator adaption the NAF-LinkIT has to be configured whether it is a rotary or a stroke actuator. The positioner of the rotary actuator can work directly with the linear position sensor value. In case of a stroke actuator an error tan arises due to the angle of the resulting in 1% non-linearity at travel of 30. The NAF-LinkIT is able to correct the travel via the tan function and thus avoid bigger linearity errors. The rotation direction of the adapter shaft for the tap changes depending on the mounting side of the stroke actuator. "Valve closed" in one case means "Valve open" in another one. There are rotary actuator types opening in the counter clockwise direction and others opening in the clockwise direction. This also has to be signaled to the NAF-LinkIT so that 0% "Valve closed" and 100% "Valve open" are correctly assigned.

-	1	-	-	-	LED 1 lights up

For stroke actuators mounted left of the spindle resp. directly mounted.

-	-	1	-	-	LED 2 lights up

For stroke actuators mounted left of the spindle resp. directly mounted.

-	-	-	1	-	LED 3 lights up

For rotary actuators opening the valve during counter clockwise (left) rotation.

-	-	-	-	1	LED 4 lights up

For rotary actuators opening the valve during clockwise (right) rotation.

MENU 2: AUTOSTART

NAF-LinkIT Main Menu
1 Mounting
2 Autostart
3 Valve Action

2 Autostart
2.1 Endpoints
2.2 Standard
2.3 Enhanced

2 Autostart
2.3 Enhanced
2.4 Smooth resp.
2.5 Fast resp.

M	1	2	3	4	
½	-	½	-	-	M and LED 2 flash

Selection between different Autostart modes (change with key UP or DOWN):
Autostart:
To automatically adapt the positioner to the valve. Geometric data of the actuator is determined and optimally assigned to control parameters. If the "Standard" Autostart does not result in stable regulation, another Autostart mode - depending upon actuator - should be selected. At Initial start-up, an Autostart should always be performed.

Attention: Autostart overwrites previous control parameters!

2.2 READY FOR "STANDARD" AUTOSTART:

-	1	-	-	-	LED 1 and LED 4 lights up

With key UP or DOWN to other Autostart modes:

2.1 READY FOR "END POINTS" AUTOSTART:

Serves for automatic adjustment of the NAF-LinkIT to the mechanical end points.

-	-	1	1	-	LED 2 and LED 3 lights up

2.3 READY FOR "ENHANCED" AUTOSTART:

To the optimization of the controller parameters in relation to standard mode:

-	-	1	-	1	LED 2 and LED 4 lights up

2.4 READY FOR "SMOOTH RESPONSE" AUTOSTART:

Extended, damped controller parameters for e.g. smaller drives

-	1	-	1	-	LED 1 and LED 3 lights up

2.5 READY FOR "FAST RESPONSE" AUTOSTART:

Extended, undamped controller parameters for e.g. larger drives

-	1	1	-	-	LED 1 and LED 2 lights up

2 Autostart
NAF-LinkIT Vers.xx

Get end points

2 Autostart
NAF-LinkIT Vers.xx

Get motor again

2 Autostart
NAF-LinkIT Vers.xx

Control params

2 Autostart
NAF-LinkIT Vers.xx

Get valve speed

After selection and start (by pressing the UP+DOWN keys) the function taking several minutes can be followed at LCD or tha green LEDs. Duration on a valve position can take some time depending on actuator volume, air supply, pressure, etc.

-	1	-	-	-	LED 1 lights up

Moving direction, mechanical starting and ending positions are determined by one or several passages of valve position range.

-	-	1	-	-	LED 2 lights up

Ramps are entered and control system parameter is determined (ratio position/valve size).

-	-	-	1	-	LED 3 lights up

Jumps are entered for determination of control parameters.

-	-	-	-	1	LED 4 lights up

Determination of positioning speeds.

-	-	-	-	-	All LEDs are off

Determined values are saved; previous values are superscribed.
The NAF-LinkIT is IN SERVICE again with the detected new parameters.

MENU 3: VALVE ACTION

NAF-LinkIT Main Menu
1 Mounting
2 Autostart
3 Valve Action

3 Valve Action
3.1 Direct
3.2 Reverse

M	1	2	3	4	
½	-	-	½	-	M and LED 3 flash

Function of the positioner is set at:

-	1	-	-	-	LED 1 lights up

"Direct" if increasing input signal is to initiate increasing output signal.

-	-	-	-	1	LED 4 lights up

"Reverse" if increasing input signal is to initiate decreasing output signal.

MENU 4: CHARACTERISTIC OF SETPOINT

NAF-LinkIT Main Menu
2 Autostart
3 Valve Action
4 Valve Char.

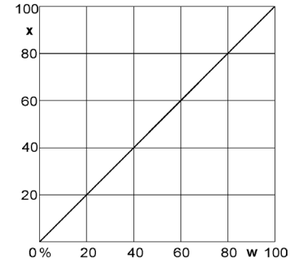
M	1	2	3	4	
½	-	-	-	½	M and LED 4 flash

A relationship between the input signal and valve position is set.

4 Valve Char.
4.1 Linear
4.2 Eq Perc 1:50
4.3 Quick open

-	1	-	-	-	LED 1 lights up

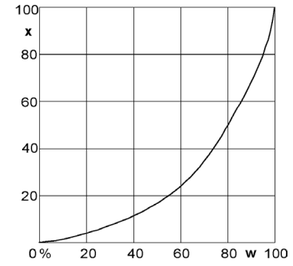
"Linear"



4 Valve Char.
4.1 Linear
4.2 Eq Perc 1:50
4.3 Quick open

-	-	1	-	-	LED 2 lights up

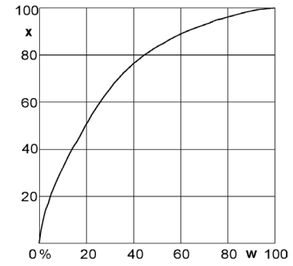
"Equal percentage":
Results in an equal percentage characteristic line with a position ratio of 1:50 for a valve of linear characteristic.



4 Valve Char.
4.1 Linear
4.2 Eq Perc 1:50
4.3 Quick open

-	-	-	1	-	LED 3 lights up

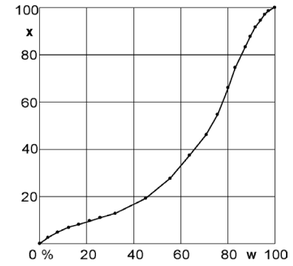
"Inverse equal perc.":
Results in an inversely equal percentage characteristic line with a position ratio of 50:1 for a valve of linear characteristic.



4 Valve Char.
4.2 Eq Perc 1:50
4.3 Quick open
4.4 Customer

-	-	-	-	1	LED 4 lights up

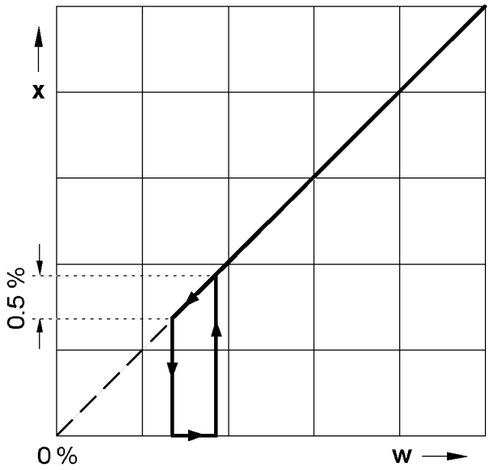
"User defi ned characteristic":
A characteristic line entered via communication (not via local keys) communication (not via local keys) with 2 to 22 supporting points is activated. A linear characteristic is factory set.



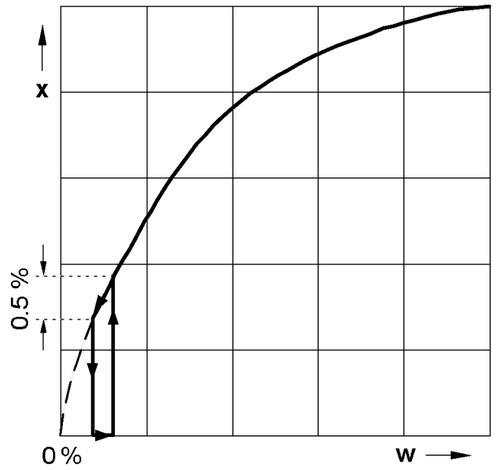
MENU 5: LIMIT AND ALARMS OF VALVE

NAF-LinkIT Main Menu
3 Valve Action
4 Valve Char.
5 Limits/Alarms

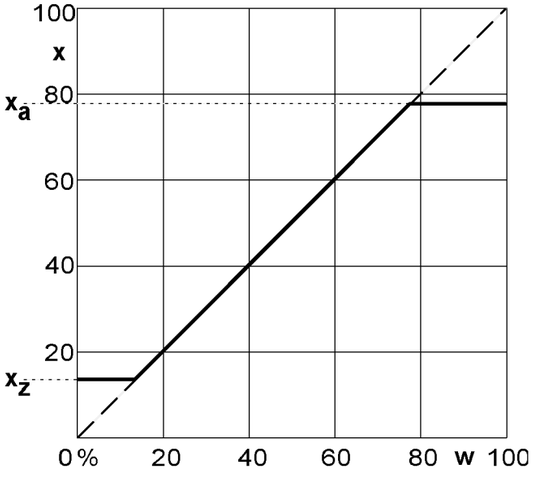
NOTICE: With versions with LCD, the values can be adjusted stepwise locally in "clear text" with keys UP or DOWN. With versions with LED and HART or "without communication", the corresponding current of the valve is rated via analog output and entered with keys UP+DOWN. With versions LED and fi eldbus, the values can be entered only via communication. With versions with communication, the values can be configured also with corresponding software.



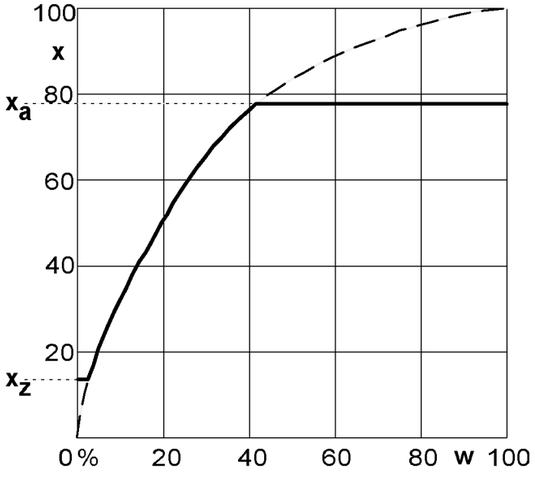
Sealing tightly, linear characteristic line



ling tightly, inversely equal percentage



Opening limit x_a, Closing limit x_z, linear characteristic



Opening limit x_a, Closing limit x_z, inversely equal percentage characteristic

5 Limits/Alarms
5.1 Lower limit
5.2 Cutoff low
5.3 Cutoff high

5.1 Lower limit

2.0%

5.1 SETTING LOWER LIMIT ("CLOSING LIMIT")

-	1	-	-	-	LED 1 lights up

The positioner provides that IN SERVICE the valve position does not close any further than defi ned by the closing limit. If the setpoint value is lower than this limit, message 12 (see page 44) is produced.
By pressing of UP or DOWN keys, the value is adjusted and confi rmed with keys UP+DOWN. The keys have Autorepeat: By pressing and holding of a key UP or DOWN, the value is counted upward, after some time in larger steps.

Example: Lower limit is set to 2%.

5 Limits/Alarms
5.1 Lower limit
5.2 Cutoff Low
4.3 Quick open

5.2 Cutoff low

3.0%

5.2 SETTING CUTOFF LOW ("0% SEAL-TIGHT POINT")

-	-	1	-	-	LED 2 lights up

If a 0% seal.tight point is given, in case the setpoint is deviated lower (e.g. 3%), the NAF-LinkIT provides the pneumatic output to press the valve into its seat with full force in order to tightly seal valve.
As soon as the command value is 1%• higher than this seal-tight value, the position again follows the command value.

• This is the "Seal-tight hysteresis" factory set at 1%. The value may be changed via communication.

5 Limits/Alarms
5.1 Lower limit
5.2 Cutoff low
5.3 Cutoff high

5.3 Cutoff high

97.0%

5.3 SETTING CUTOFF HIGH ("100% SEAL-TIGHT POINT")

-	-	-	1	-	LED 3 lights up

If a 100% seal-tight point is pre-set and in case a certain set value is exceeded (e.g. 97%), the NAF-LinkIT provides that the pneumatic output presses the valve 100% into its seat with full force. This function makes sense for 3-way valves.
Also both seal.tight points can be used in order to tightly close the respective shut-off path during partial operation.
By pressing of UP or DOWN keys, the value is adjusted and confi rmed with keys UP+DOWN. The keys have Autorepeat: By preessing and holding of a key UP or DOWN, the value is counted upward, after some time in larger steps.

Example: Cutoff high is set to 97%.

5 Limits/Alarms
5.2 Cutoff low
5.3 Cutoff High
5.4 Upper limit

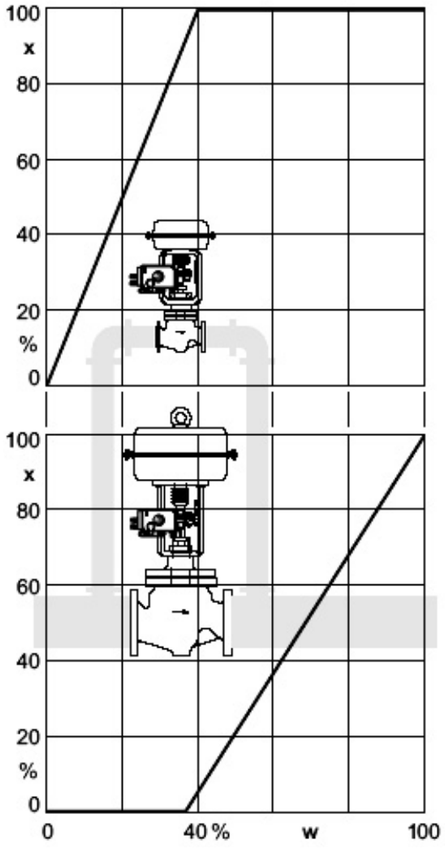
5.4 SETTING UPPER LIMIT ("OPENING LIMIT")

-	-	-	-	1	LED 4 lights up

The NAF-LinkIT provides that IN SERVICE the valve position does not open any further than defi ned by the opening limit. If the set value is exceeded, message 13 (see page 44) is produced.

Definitions

Stroke, stroke range	of the membrane actuator is defi ned for rotary actuator as angle, angle range.
0 % position	is the mechanical impact at actually closed valve (caution if using handwheel and mechanically adjustable stroke limitation!)
100 % position	is the mechanical impact at actually open valve.
Closing limit	is a lower limit set via software. In normal operation the valve will not close more than set here. Attention: In the event of failure of the auxiliary energy no controlling is possible, therefore the springs in the actuator will move the valve into safety position (for single-acting actuator).
Opening limit	is a upper limit set via software. In normal operation the valve will not close more than set here. Attention: In the event of failure of the auxiliary energy no controlling is possible, therefore the springs in the actuator will move the valve into safety position (for single-acting actuator).
Normal operation	(= IN SERVICE) means that the position is controlled to the 4–20 mA input signal.



SPLIT-RANGE, PV_SCALE SPLITTING

Split Range is useful if an additional control range is demanded which cannot be covered by one valve only. A valve of smaller nominal size can be applied overtaking the smallest quantities; a parallel mounted valve of bigger nominal size takes on the larger quantities.

With conventional positioners, this function is realised through serial conection of the instruments and allocation of individual regulating ranges (see drawing). With NAF-LinkIT with analogue setpoint value (version HART or "without communication"), this can be adjusted with menus 5.5 and 5.6.

The other versions of the NAF-LinkIT receive the set value via digital means; the input data signal cannot be splitted. The function can be realised either in the primary control system, in which own setpoint values are calculated for input setpoint value can be assigned to the valve span.

Example: At low current, only the smaller valve positions; from approx. 40% the large valve is added.

/With the other versions of the NAF-LnikIT, these menus cannot be selected.)

NAF-LINKIT WITH HART OR "WITHOUT COMMUNICATION"

5 Limits/Alarms
5.4 Upper limit
5.5 Splitr 0%
5.6 Splitr 100%

5.5 SPLIT RANGE 0%

-	1	-	1	-	LED 1 and LED 3 lights up

LED: The value that was adjusted e.g. with a loop calibrator at the input of the NAF-LinkIT, is entered with confi rmation of keys UP+DOWN as 0% value.
LCD: By pressing of keys UP or DOWN the value is adjusted and confi rmed with keys UP+DOWN.

5 Limits/Alarms
5.4 Upper limit
5.5 Splitr 0%
5.6 splitr 100%

5.6 SPLIT RANGE 100%

-	-	1	-	-	LED 2 lights up

LED: The value that was adjusted e.g. with an loop calibrator at the input of tha NAF-LinkIT, is entered with confi rmation of keys UP+DOWN as 0% value.
LCD: By pressing of keys UP or DOWN the value is adjusted and confi rmed with keys UP+DOWN.
The keys have Autorepeat: By pressing and holding of a key UP or DOWN, the value is counted upward, after some time in larger steps.

5.6 Splitr 100%

10.4 mA

Example: An input current of 10.4 mA has to correspond to a valve position of 100%

5 Limits/Alarms
5.6 Splitr 100%
5.7 Lower Alarm
5.8 Upper Alarm

5.7 SETTING LOWER ALARM

-	1	1	-	-	LED 1 and LED 2 lights up

When falling below the set value underneath the entered alarm limit, an alarm is activated. Message 12 (see page 44) is generated.
To switch off the alarm setting, enter the value -10%.

5 Limits/Alarms
5.6 Splitr 100%
5.7 Lower Alarm
5.8 Upper Alarm

5.8 SETTING UPPER ALARM

-	-	1	-	1	LED 2 and LED 4 lights up

IWhen surpassing the set value above the entered alarm limit, an alarm is activated. Message 13 is generated.
To switch off the alarm setting, enter the value +110%

5.8 Upper Alarm

91.3%

By pressing of keys UP or DOWN, the value is adjusted and with keys UP+DOWN confirmed. The keys have Autorepeat: By pressing and holding of a key UP or DOWN, the value is counted upward, after some time in larger steps.

Example: Upper Alarm set to 91.3%

5.9 VALVE LIMITS (NOT WITH VERSIONS FF/PB/FOXCOM WITH LED DISPLAY).

At Autostart the NAF-LinkIT determines the real limits of the actuator (which generally are a little larger then specifi ed on the specifi cation sheet). An actuator with 30 mm stroke, could display a real stroke of 33 mm. In order to produce a precise relationship between the input signal and the stroke, the tolerances of the actuator can be compensated with menus 5.9 and 5.10. At unchanged 0%, the actuator could be moved until exactly 30 mm are reached. Through execution of function 5.10, the current position can be declared as 100% and at setpoint value of 50%, the actuator will run on exactly 15 mm.
For new confi guration of the strokes at 0% or 100%, the valve must be run in the corresponding position and then must be confi rmed.

5 Limits/Alarms
5.9 Valve 0%
5.10 Valve 100%
5.11 Stroke

5.9 SETTING VALVE 0%

-	1	1	-	-	LED 1, LED 2 and LED 4 lights up

The actual position of the actuator is declared as 0%.

5 Limits/Alarms
5.9 Valve 0%
5.10 Valve 100%
5.11 Stroke

5.10 SETTING VALVE 100%

-	-	1	1	1	LED 2, LED 3 and LED 4 lights up

The actual position of the actuator is declared as 100%.

By pressing of keys UP or DOWN, the value is adjusted and with keys UP+DOWN confi rmed.
The keys have Autorepeat: By pressing and holding of a key UP or DOWN, the value is counted upward, after some time in larger steps.

5.10 Valve 100%

98.4%
Confirm

Example: The actual valve position 98.4% is to be counted as 100%.

5 Limits/Alarms
5.10 Valve 100%
5.11 Stroke
5.12 Temp unit

5.11 Stroke

90⁰

5.11 SETTING STROKE WITH STROKE ACTUATORS (ONLY WITH LCD)

-	-	1	1	-	LED 2 and LED 3 lights up

Rotary valves:
Shows the range from autostart (not confi g.).

The NAF-LinkIT measures with its feedback lever always only an angle and by means of its tangent function, a linear stroke of 0 to 100% is calculated therefrom. In order to indicate as well a real stroke in mm, the full stroke at 100% can be entered in this menu. The LCD display will then indicate the actual position in mm (or inch).
(Changing of display to "inch" via communication.)
By pressing of keys UP or DOWN, the value is adjusted and with keys UP+DOWN confi rmed. The keys have Autorepeat: By pressing and holding of a key UP or DOWN, the value is counted upward, after some time in larger steps.

Example: Stroke range of valve is to be 30 mm.

5 Limits/Alarms
5.10 Valve 100%
5.11 Stroke
5.12 Temp unit

5.12 TEMPERATURE UNIT (ONLY WITH LCD)

Selection of temperature indication in ⁰C or ⁰F.

MENU 6: PARAMETER FOR POSITION CONTROLLER

Along with the determination of the actuator geometry and control parameters the suitable setting parameters for the position controller are determined via function AUTO- START in Menu 2. Assessment of a control behavior generally is very subjective. Partially a quick response is requested without consideration of the overshoot width, partially a very smooth swinging is requested with minor overshoot.

We basically recommend to fi rst perform the execution of the automatic setting via AUTOSTART in Menu 2 in order to achieve a stable control behavior. Corrections may then be made from the optimal setting for the respective application. See "Remarks for controller optimization" following table 4.

For small actuators an improvement of the control behavior can be achieved also by increasing damping at the pneumatic output (see page 37). A further optimization may follow by repeating AUTOSTART.

NAF-LinkIT Main Menu
4 Valve Char.
5 Limits/Alarms
6 Parameters

M	1	2	3	4	
½	½	-	½	-	M, LED 1 and LED 3 flash

Seven control parameters are combined in Menu 6 each availing of a submenu. 15 different values may be selected in each of these and pressing of UP+DOWN be entered in the position controller as constant. Controller type is a PI controller.

Parameter-Designation	Valve is opening	Valve is closing	Unit
Proportionate amplifi cation KP	P ↑	P ↓	-
Integration time constant	Tn ↑	Tn ↓	sec
Positioning time	T63 ↑	T63 ↓	sec
Dead band for control diff.	GAP	GAP	% of span

The dead band prevents (at the expense of accuracy) that the valve in the controlled condition constantly moves around the setpoint. This less harms the mechanical parts of the actuator and in particular the valve packing.

6 Parameters
6.1 Gain closing
6.2 Gain opening
6.3 Res time cl

etc.

6 Parameters
6.4 Res time op
6.5 Rate lim cl
6.6 Rate lim op

6 Parameters
6.5 Rate lim cl
6.6 Rate lim op
6.7 Control gap

SELECTION OF SUB-MENUS:

M	1	2	3	4		
¼	-	¾	-	-	M, LED 1 and LED 3 flash	P ↓
¼	¾	¾	-	-	M, LED 1 and LED 2 flash:	P ↑
¼	-	-	¾	-	M, LED 3 flash:	Tn ↓
¼	¾	-	¾	-	M, LED 1 and LED 3 flash:	Tn ↑
¼	-	-	-	¾	M, LED 4 flash:	T63 ↓
¼	¾	-	-	¾	M, LED 1 and LED 4 flash:	T63 ↑
¼	-	¾	¾	-	M, LED 1 and LED 4 flash:	GAP

Follow selection of the sub-menu the codes for the parameter values (table 4) can be selected by pressing UP+DOWN:

TABLE 4: ALLOCATION OF THE PARAMETER VALUES TO CODING:

Code	LEDs 1 2 3 4	In LCD shown values: [in Menu Nr.]			
		P↑ [6.2] P↓[6.1]	Tn↑ [6.4] Tn↓ [6.3] (sec)	T63↑ [6.6] T63↓ [6.5] (sec)	Dead band [6.7] (%)
1	1 0 0 0	2	1	0.1	0
2	0 1 0 0	2.66	1.33	0.15	0.12
3	1 1 0 0	3.50	1.75	0.25	0.16
4	0 0 1 0	4.7	2.4	0.35	0.22
5	1 0 1 0	6.3	3.2	0.5	0.3
6	0 1 1 0	8.4	4.2	0.75	0.4
7	1 1 1 0	11.2	5.6	1.15	0.53
8	0 0 0 1	15	7.5	1.75	0.7
9	1 0 0 1	20	10	2.6	0.94
10	0 1 0 1	26.6	13.3	3.9	1.25
11	1 1 0 1	35.5	17.8	5.9	1.67
12	0 0 1 1	47.3	23.7	8.85	2.22
13	1 0 1 1	63.1	31.6	13.3	2.96
14	0 1 1 1	84.2	42.1	20	3.95
15	1 1 1 1	112.2	- off -	30	5.3

REMARKS TO CONTROLLER TUNING

If AUTOSTART does not fi nd the optimum setting the following may be theresult:
A) slow response to setpoint, long positioning time or long neutral time
B) continuous, oscillation following setpoint jump
C) wide and high overshoot

For the assessement of the control 12.5% jumps in both directions may be performed in Menu 8, The valve dynamics may be observed at LCD or the mechanical indicator.

Prior to changing parameters for valve dynamics a number of items are to be checked, see below. The pneumatic output can be operated directly without controller via Menu 7 and the valve movement may be assessed.

In case of behavior A) check:
1. Is the Proportionate gain P↑ (Menu 6.1) or P↓ (Menu 6.2) too small?
Remedy: Increase parameters according to chart 4.

2. Is the air pressure high enough too possibly overcome trouble-free the actuator spring force and friction (dimensioning)?
Remedy: through increasing air pressure.

3. Is the actuator volume high, possibly requiring an increased air capacity for fast valve movement?
Remedy: through booster, see accessories.

4. Was AUTOSTART performed in Menu 2 and did messages 8 resp. 9 occur (messages, see table page 43).
Remedy: "AUTOSTART" in Menu 2 resp. observe information in table, page 43.

5. Has the parameter for the positioning time been set at a value too high?
Remedy: decrease both parameters "T63" in Menu 6.5 or 6.6 .

6. Is valve packing too tight resulting in a very high friction?

7. Is the supply air fi lter blocked?
Remedy - see page 36.

8. Has the supply air been contaminated by small oil drops resp. particles or are pneumatic parts possibly blocked?
Remedy: exchange of pneumatic parts; possibly use a suiteable air supply station.

Behaviors B) and C) check:
1. Is the air capacity possibly too high, e.g. through spool valve or booster?
Remedy: Work, if necessary, without booster resp. use version without spool valve.

2. Is the air achievement throttle too far open with a small drive, with high supply air pressure?
Remedy: see text right, damping screw, to more strongly throttling.

3. Has to air supply pressure been set too high?
Remedy: reduce pressure resp. install pressure reducer.

Changing valve dynamics during behavior A):
If valve has a high friction (for example, often the case in small rotary actuators due to low air supply pressure or due to a valve seat packing which is too tight) then the valve position gets stuck after a setpoint jump and possibly is recontrolled via the resetting time Tn, possibly after quite some time has elapsed.

Basically, the following is possible:
a) to accept a remaining deviation
b) to accept some response procedures (such as remaining in over-response for a short time, and remaining below setpoint and trailing).

When deciding a), "Tn" should become ineffective, table value (15). Compensating "P(kp)" should be increased until the setpoint jumps reach the setpoint within a short period of time and without signifi cation over-response (adapt to both movement directions).

When deciding b) start as in a) above. Therafter "Tn" is reswitched and decreased until the setpoint deviation has been re-controlled within a short period of time and without long after-response (adapt in both movement directions).
It is recommended to maintain the Tn's for both directions about the same. If a post oscillation occurs after a setpoint jump. "Tn" is selected too small, possibly "P(kp)" was selected too large.

The positioning time "T63", also called valve damping, does not have an effect during AUTOSTART in Menu 2, however, setpoint jumps in Menu 8 reach the position controller in a damped condition which then is not easily stimulated to ascillation. This behavior is also true for the setpoint input. This enables setting the controller to higher "P(kp)" values without producing oscillations in the process. On one side this helps the position control to level disturbances due to friction, changes in load or air supply pressure changes faster. On the other hand it helps the superimposed valve control circuit that neutral times in the valve control route do no have such a big effect (stability in valve control circuit).

Changing valve dynamics during behaior B):
Increase "Tn" for both movement directions, possibly turnoff and proceed as described in behavior A) alternative b).

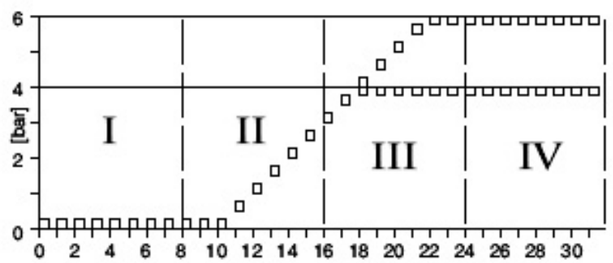
NAF-LinkIT Main Menu
5 Limits/Alarms
6 Parameters
7 Output

7 Output
□□□_____]

M	1	2	3	4	
½	½	-	-	½	M, LED 1 and LED 4 fl ash

Serves to check the pneumatic parts of the positioner by directly applying current to the IP module (no control; software limit values such as "stoke limits" or "tight closing" are ignored).

The current of the IP module is increased by about 3% in 32 steps. By measuring the output pressure generally the following characteristic line of the IP module is achieved.
The ramp also may be more steep or fl at depending on theThe ramp also may be more steep or flat depending on the air supply pressure.



The pneumatic works precisely, if the actuator begins movement in section II and runs latest in section IV into the end position.

If no reaction is shown, check:
- does air supply exist? - is plug connected to IP module? If these items are okay, possibly the electronics or a pneumatic part is defect. See also page 36 and 37. After leaving this menu (by pressing the M key or UP+DOWN) the actual setpoint is automatically restarted.

MENU 8: MANUAL SETTING OF VALVE POSITION

NAF-LinkIT Main Menu
6 Parameters
7 Output
8 Setpoint

8 Setpoint
8.1 12.5% Steps
8.2 1% Steps

8 Setpoint
□_____] 12.5 %
Pos. 12.5 %

M	1	2	3	4	
½	½	-	-	½	M, LED 1 and LED 4 fl ash

For the purpose of checking the control reaction of the actuator to a setpoint jump can be observed via the indicator. As far as the device is IN SERVICE the UP/DOWN keys can initiate jumps of 12.5% (or 1%) each. The starting value for Menu 8 is always the current setpoint value.

If the control behavior is to be improved, this can be reached by performing a complete Autostart (see Menu 2) or through manual tuning (see Menu 6).

After leaving this menu the existing setpoint value at the input is automatically restarted.

This menu point can also be called up under normal operating conditions, by twice pressing of key M.

MENU 9: CALIBRATION FUNCTIONS (FOR WORKSHOP)

NAF-LinkIT Main Menu
7 Output
8 Setpoint
9 Workbench

M	1	2	3	4	
½	-	½	-	½	M, LED 2 and LED 4 fl ash

Factory calibrations are carried out with suffi cient accuracy and remain unchanged during lifetime. However, an alignment may become necessary in some cases after servicing hardware components.

9 Workbench
9.1 Reset Config
9.2 Calib 4 mA
9.3 Calib 20 mA

9.1 RESET CONFI GURATION TO "EX FACTORY" SETTINGS

-	1	-	-	-	
					LED 1 lights up

It is possible to restore the confi guration existing at time of delivery via this function. This may become necessary if it is unclear what had been changed per menu or in the event that a positioner was taken from one actuator and mounted to another actuator.
Following this function the device is turned to condition OUT OF SERVICE. This has to be followed by Autostart for the purpose of adapting the calibration to the actuator and to start IN SERVICE.
The parameters of the factory setting are listed in table Menu Structure (page 16)

The following calibration functions must only be performed by trained personnel.

NAF-LINKIT WITH HART OR "WITHOUT COMMUNICATION

9 Workbench
9.1 Reset Config
9.2 Calib 4 mA
9.3 Calib 20 mA

9.2 CALIBRATION OF INPUT CURRENT TO 4 MA

-	-	1	-	-	
					LED 2 lights up

The present input current value is taken over as "4 mA" when pressing keys UP+DOWN.

9 Workbench
9.1 Reset Config
9.2 Calib 4 mA
9.3 Calib 20 mA

9.3 CALIBRATION OF INPUT CURRENT TO 20 MA

-	1	1	-	-	
					LED 1 and LED 2 lights up

The present input current value is taken over as "20 mA" when pressing keys UP+DOWN.

Calibration of position sensor (angle calibration)
The angle pertaining to the vertical tap position (arrow mark) is factory calibrated for the position tap. If the position sensor or the electronics board is exchanged the mechanical and electric tolerances have to be aligned through recalibration. See page 42.

9 Workbench
9.4 Calib -45°
9.5 Calib +45°
9.6 Reset all 1

9.4 CALIBRATION OF POSITION SENSOR VALUE TO - 45°

-	-	-	1	-	
					Led 3 lights up

The present position value is taken over as angle -45° when pressing keys UP+DOWN

9 Workbench
9.4 Calib -45°
9.5 Calib +45°
9.6 Reset all 1

9.5 CALIBRATION OF POSITION SENSOR VALUE TO +45°

-	1	-	1	-	
					LED 1 and LED 3 lights up

The present position value is taken over as angle -45° when pressing keys UP+DOWN

9 Workbench
9.6 Reset all 1
9.7 Reset all 2
9.8 Menu Lang

9 Workbench
9.6 Reset all 1
9.7 Reset all 2
9.8 Menu Lang

CONFI GURATION FUNCTIONS FOR ALL NAF-LINKIT VERSIONS WITH LCD

9 Workbench
9.6 Reset all 1
9.7 Reset all 2
9.8 Menu Lang

9.8 Menu Lang
9.8.1 English
9.8.2 Deutsch
9.8.3 Swedish

9 Workbench
9.7 Reset all 2
9.8 Menu Lang
9.9 LCD Orient

9.9 LCD Orient
9.9.1 Normal
9.9.2 Flipped

9.9 LCD Orient
9.9.1 Normal
9.9.2 Flipped

9.6 RESETTING OF CONFI GURATION AND CALIBRATION TO "EX FACTORY" SETTINGS

For the exchange of the electronics the device must be configured whether the pneumatic output is single-acting or double-acting so that the controller shows the correct behavior during the next start-up.

Caution: The current calibration for inputs and outputs, the angle calibration and all other calibrations are reset to their factory defined condition!

9.6 RESETTING OF CONFI GURATION AND CALIBRATION TO "EX-FACTORY" SETTINGS - FOR SINGLE-ACTING PNEUMATIC OUTPUT

-	-	-	-	1	LED 4 lights up

The factory calibration for single-acting pneumatic output is restored when pressing UP+DOWN keys.

9.7 RESETTING OF CONFI GURATION AND CALIBRATION TO "EX-FACTORY" SETTINGS - FOR DOUBLE-ACTING OUTPUT

-	1	-	-	1	LED 1 and LED 4 lights up

The factory calibration for double-acting pneumatic output is restored when pressing UP+DOWN keys.

9.8 SELECTION OF MENU LANGUAGE [1)]

One of three of the programmed languages can be selected (only in version with LCD display).

Ex-factory the active language is always English. Changing to one of the other two languages, can also take place during operation.

The third menu language can be selected and was already programmed in the factory according to customer order. If a different third menu language is desired, then the language fi le can be downloaded from website: http://www.foxboro-eckardt.com/download/PLFselector.html
Thereafter download the fi le from the PC via PC20 / NAF eValuate (FDT-software) onto the NAF-LinkIT. See also references on the internet page. (PC20: EDIT / Change Text Language / Select: File . PLF)

9.9 LCD ORIENTATION [1)]

Display normal or turned by 180.

[1)] The menus 9.8 and 9.9 appear automatically at initial start-up, i.e. if the NAF-LinkIT is connected the first time to the electrical supply.

9 Workbench
9.8 Menu Lang
9.9 LCD Orient
9.10 Cal. Feedbk

9.10 Cal. Feedbk
9.10.1 Cal. 4mA
9.10.2 Cal. 20mA

9.10 CALIBRATION OF OPTION "POSITION FEEDBACK 4-20 MA"

Connect 24 V DC to the terminals of this option (see page 10) and insert a precise ampmeter into this loop.

Selecting "Cal. 4 mA" should result in a current of 4 mA Calibrate with keys UP or DOWN. Confi rm with keys UP+DOWN.

Selecting "Cal. 20 mA" should result in a current of 20 mA.
Calibrate with keys UP or DOWN. Confi rm with keys UP+DOWN.

NAF-LINKIT WITH PROFIBUS PA: MENU 10: BUS ADDRESS

NAF-LinkIT Main Menu
8 Setpoint
9 Workbench
10 Bus address

10 Bus address
10.1 Address LSB
10.2 Address MSB
10.3 Address

10 Bus Address
10.1 Address LSB
10.2 Address MSB
10.3 Address

10.2 Address MSB
Dec: 48 Hex: 30

Upper 3 bits ±1

M	1	2	3	4	
½	-	-	½	½	M, LED 3 and LED 4 flash

Here the bus address of the NAF-LinkIT can be indicated and changed. The bus address is in the value range of 0 to 127; for the display 7 bits are required.
Each bit has a specifi c value (bit 1=1, bit 2=2, bit 3=4, bit 4=8, bit 5=16, bit 6=32, bit 7=64). The bus address is then the total of the individual values.

To display this with 4 LEDs, selection must be made between the lower and upper 4 bits (whereby the highest bit 8 has no usage and is always 0).

10.1 SELECTION OF LOWER 4 BITS:

¼	¾	-	-	-	M short flash, LED 1 long flash

With UP or DOWN key to selection of upper 4 bits:

10.2 SELECTION OF UPPER 4 BITS:

¼	-	-	-	¾	M short flash, LED 4 long flash

Upon selection, the bits are displayed. When pressing UP or DOWN keys, the value is always changed by 1. Pressing keys UP+DOWN, the newly entered address will be activated.

The bus address is the total of the individual values:

Values of the lower 4 bits and the upper 4 bits:

-	[1]	[2]	[4]	[8]	Value of the bits	-	[16]	[32]	[64]	-	Value of the bits
-	-	-	-	-	0	-	-	-	-	-	0
-	1	-	-	-	1	-	1	-	-	-	16
-	-	1	-	-	2	-	-	1	-	-	32
-	1	1	-	-	3	-	1	1	-	-	48
-	-	-	1	-	4	-	-	-	1	-	64
-	1	-	1	-	5	-	1	-	1	-	80
-	-	1	1	-	6	-	-	1	1	-	96
-	1	1	1	-	7	-	1	1	1	-	112
-	-	-	-	1	8						
-	1	-	-	1	9						
-	-	1	-	1	10						
-	1	1	-	1	11						
-	-	-	1	1	12						
-	1	-	1	1	13						
-	-	1	1	1	14						
-	1	1	1	1	15						

Note: Addresses 0 and 127 should not be used. Address 126 (delivery condition) is not permitted for cyclical operation.
For further information see TI EVE0105 P.

In the version with LCD indicator, the address is displayed in decimal and hexademical number system.

10 Bus address
10.1 Address LSB
10.2 Address MSB
10.3 Address

10.3 Address
Dec:126 Hex: 7E

10.3 ADDRESS

With LCD indicator, this function is recommended, whereby the address can be completely entered, without separation in LSB and MSB. The keys have Autorepeat: By pressing and holding of a key UP or DOWN, the value is counted upward, after some time in larger steps.

NAF-LINKIT WITH FOUNDATION FIELDBUS: MENU 10: SIMULATE TO RELEASE / BLOCK

NAF-LinkIT Main Menu
8 Setpoint
9 Workbench
10 Simulation

10 Simulation
10.1 Disabled
10.2 Enabled

M	1	2	3	4	
½	-	-	½	½	M, LED 3 and LED 4 flash

The NAF-LinkIT sends during normal operation its actual Position-Actual-Value1) back to the control system.
If, however, "Simulate" is released in the NAF-LinkIT and in addition via communication Simulate is activated, then a simulation value coming from the control system is sent back as an actual value to the control system. In this way within the control system, e.g. the reaction to specifi c valve adjustments can be tested without having to adjust the valve - the NAF-LinkIT regulates toward the "accurate" setpoint value.
For further information about the Simulate see TI EVE0105 Q.

10.1 SIMULATE DISABLED

-	1	-	-	-	LED 1 lights up

Disable simulate. The real valve position will be indicated.

10.2 SIMULATE ENABLED

-	-	-	-	1	LED 4 lights up

Release simulate.

By using the UP or DOWN keys the desired condition can be selected and entered through pressing keys UP+DOWN.

1) With the option "Position Feedback", the position-actual-value will be displayed, as before, as analog value 4 to 20 mA

10. Decommissioning

Before decommissioning the unit, disconnect the supply air and the electrical input signal.
After disconnecting the electrical input signal the last confirmed confi guration of the positioner is preserved in the memory.

11. Maintenance

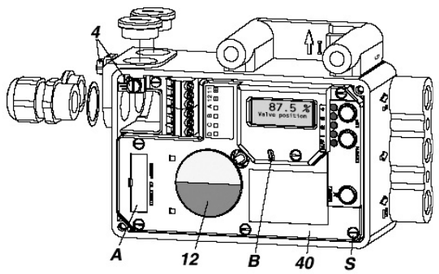
GENERAL

The NAF-LinkIT requires no periodical maintenance. When replacing components during repair work, the safety requirements on page 45 must be observed!

11.1 SERVICE PLUG AND IRCOM

All basic instruments of the NAF-LinkIT are equipped with a service plug. There via RS232 a PC with PC20 / NAF-eValuate (FDT-Software) can be connected via modem EDC82 (galv. separated, not Ex).
This universal interface, together with the PC software, allows the confi guration of all NAF-LinkIT versions independent of the protocol - thus versions HART, FOUNDATION Fieldbus, PROFIBUS PA, FoxCom and also the version "without communication" can be confi gured from the PC, without having to acquire expensive modems. For details see TI to EDC82.

The service plug (IDC connector) is accessible, if the cover ***A*** is pushed to the side.
The connector links EDC82 modem with NAF-LinkIT, and from EDC82 a 9 pole subD cable links to RS232 interface of PC.



If the NAF-LinkIT is equipped with option "IrCom" B, communication can take place contactless via infrared with the positioner (even with closed cover!). Modem "IR Interface" (not Ex) is connected via RS232 to a PC (for practical reasons a notebook) with software NAF-eValuate and makes possible a range of approx. 1 m.
(If the notebook has an IrDa interface, this cannot be used, despite similar technique. The IrDa instruction set has no communication instructions for positioners.)

11.2 SUPPLY FI LTER REPLACEMENT

An obstructed supply fi lter can be replaced. Unscrew the air supply fi tting, remove the fi lter and exchange the fi lter with a new one.

11.3 REMOVAL OF THE ELECTRONICS UNIT•

Pull off the travel indicator ***12***. To remove the electronics unit ***40***, loosen the 7 screws on the front.

Lift the electronic vertically upward.
Disconnect the plugs ***41*** and ***42*** (see next page) from the board.
Do not use tools to remove plugs, because components could be damaged. Tight-fitting plugs can be easily removed by tilting them diagonally inward before pulling them off.

Connect the plugs ***41*** and ***42*** to the new electronics unit 40 and attach the new unit by using the 7 screws on the front (attention with the cables).

After replacing the electronics unit an angle calibration should be carried out (see page 38)

* On NAF-LinkIT with 'pressure sensors' option, see page 12 Pressure sensors.

11.4 REPLACEMENT OF MECHANICAL AND PNEUMATIC UNITS

First remove the electronics unit **40**. After the exchange autostart always has to follow.

11.4.1 AMPLIFIER REPLACEMENT

Unscrew the pneumatic amplifi er **43** from the base plate and replace the O-rings between the amplifier and base plate*.
Use three O-rings for a single-acting amplifier and five O-rings for a double-acting amplifier. If replacing a singleacting amplifi er with a double acting, remove the sealing screw **44** before installation. During start-up confifi guration has to be performed in Menu 9 to „double-acting output".

In the installation of a new amplifi er, make sure the screws are tightened for proper sealing.
The damper screws have to be loosened until the screw head is even with the amplifier surface (= no damping).

11.4.2 PREAMPLIFIER REPLACEMENT

Unscrew the preamplifi er 45 from the base plate by removing screws **46** and **47** .
Replace the four O-rings between preamplifier **45** and the base plate* and install the new preamplifier.

11.4.3 IP MODULE REPLACEMENT

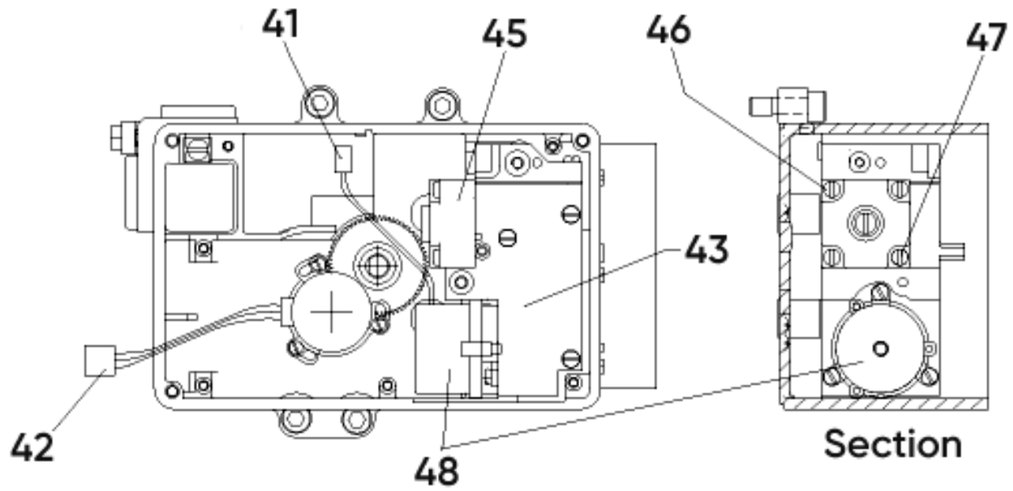
Unscrew the IP module **48** from the base plate and replace with a new IP module. Replace the O-ring between the IP module and the base plate and install the new IP module.

11.4.4 FEEDBACK UNIT REPLACEMENT

First, remove the feedback lever or rotary adapter from the feedback shaft. Now remove the retaining ring from the feedback shaft **9** (see page 6). Remove screws and pull out the complete unit **49** consisting of feedback shaft, gears and position sensor.

Insert the new feedback unit **49** and secure with screws. Remember to replace the retaining ring on the feedback shaft

After replacing the feedback unit an angle calibration must be completed (see chapter 11.5)..



* The base plate consists of a manifold and air ducts. O-rings are required to guarantee sealing of the mounted elements.

11.5 ANGLE CALIBRATION

When the electronic unit or the position feedback unit is replaced, the position sensor requires calibration. To accomplish the calibration, an angle calibration tool 'ACT' (WKX 425 014 038) is required.

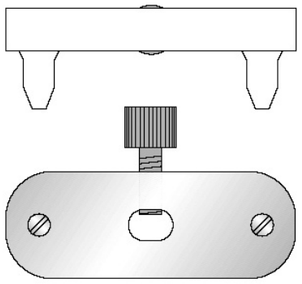


Fig.: Angle calibration tool ('ACT')

Rotate the feedback shaft **9** so that the flat side on the shaft is perpendicular to the arrow **26** on the housing.
Attach the ACT to the top of the feedback shaft.
Rotate the feedback shaft counter-clockwise until the two pins line up with the mounting holes AA on the back of the positioner, as shown below.

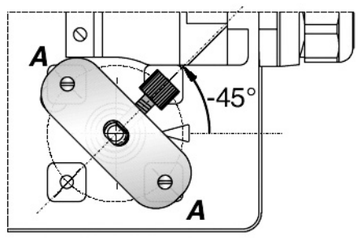


Fig.: Position "-45°"

Push down the ACT until the pins are centered in the mounting holes AA and fasten screws to secure the ACTto the feedback shaft. The position is now locked at "-45°".

Now the measurement value of the position sensor must be stored in the NAF-LinkIT. This can be done locally or via software. For operation with local keys, the menu item 9.4 "Calibrate position measuring value to -45°" is used.
Confirm with pressing the keys UP+DOWN.
For calibration with software via PC20 / NAF-eValuate (FDT-Software) follow the directions in the appropriate workshop function. Enter value "-45°" and confirm.
Now loosen the ACT and turn it with feedback shaft clockwise 90 degrees to the second set of mounting holes BB.
See illustration.

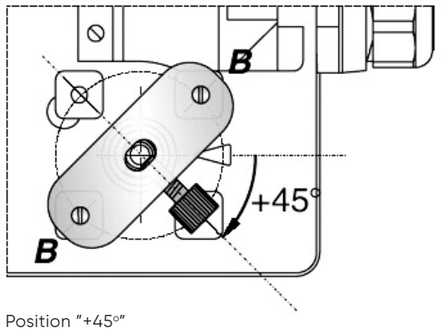


Fig.: Position "+45°"

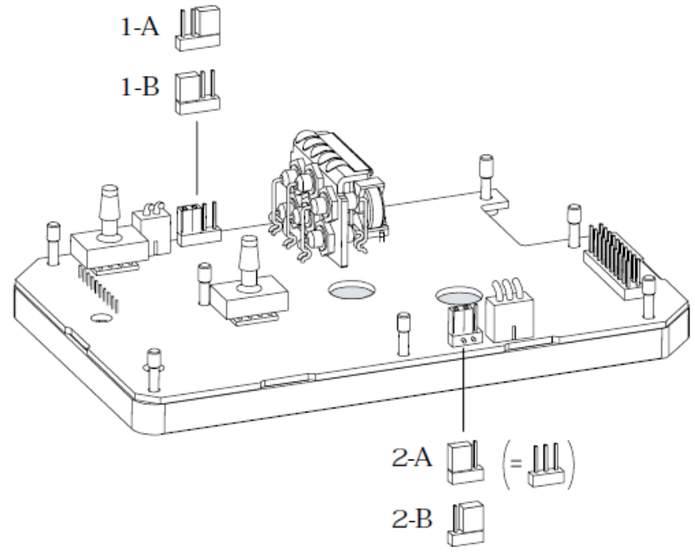
Push down the ACT until the pins are centered in the mounting holes BB and screws on to secure the ACT to the feedback shaft. The position is now locked at "+45°".

Now the measurement value of the position sensor must be stored in the NAF-LinkIT. This can be done locally or via software.
For operation with local keys, the menu item 9.5 "Calibrate position measuring value to "+45°" is used.
Confi rm with pressing the keys UP+DOWN.
For calibration with software via PC20 / NAF-eValuate (FDTSoftware) follow the directions in the appropriate workshop function. Enter the value "+45°" and confi rm.

Remove angle calibrator.
Re-connect NAF-LinkIT at actuator and carry out AUTOSTART, if necessary perform confifi guration.

11.6 JUMPER SETTINGS

Depending on the version of NAF-LinkIT, the following jumpers are located on the electronics unit (Electronics unit removed, see chapter 11.3). Conversion to analog set value input is feasible without communication. Jumper 1 into position 1- B, connect a current source 10 ... 20 mA, wait for initialization and acknowledge message 4 via keys UP+DOWN (simultaneously).



Jumper 1
(only for FOXCOM version)
Hardware dependent conversion between FOXCOM analog and FOXCOM digital

Position 1-A Model Code NAF-LinkIT-xExx
Input 11+ 12– is a current input 4-20 mA for analog setpoint value (FOXCOM 4-20 mA)

Position 1-B Model Code NAF-LinkIT-xFxx
Input 11+ 12– is a voltage input 13 - 48 V for digital setpoint value (FOXCOM)

(Other positions of the jumper are inadmissible and can lead to damage of the device).

Attention: Changes to the jumper 1 must be carried out by trained personnel only since otherwise damage of the electronics cannot be ruled out. In position 1-A only a current signal, in case 1-B only a respective voltage signal can be connected.

Additionally, conversion to the digital input signal requires reconf guration by means of PC20 or IFDC software as per FOXCOM communication. The impedences for communication are to be considered in any case, see chapter 14.

Jumper 2
Defi nes behavior of pneumatic output in case the watchdog recognized an error in the electronics:

Position 2-A (fundamentally)
Output y1 becomes depressurized

Position 2-B
Not permitted; an error message is issued.

This restriction to „Output y1 becomes depressurized" increases the reliability: this assures that a defined value (failsafe position of the valve) is initiated during failure of the electronics.

12. Trouble-shooting guide

The components of the positioner are under constant surveillance by the installed micro controller. Errors detected are displayed in LCD or indicated by the LEDs.

Certain conditions (suh as "Stroke limitation active") are displayed in LCD or indicated by the LEDs as message.

12.1 ERRORS DETECTED DURING INITIALIZATION

After start-up or reset several initialization phases are passed through which are shown in LCD or in the green LEDs.
If this phase stops an error was detected.
If after renewed reset1) the indicator stops at error code the device is probably defect and should be sent to the manufacturer for repair. Stating the error code will be of help to the Repair and Service Dept.

LED Error Codes (with LCD in true text)

LEDs					Description
red	green				
M	1	2	3	4	
-	1	1	1	1	Micro controller functional testside
-	1	1	1	-	Micro controller RAM test
-	1	1	-	1	Micro controller ROM test
-	1	1	-	-	initialize operating system
-	1	-	1	1	initialize monitor
-	1	-	1	-	initialize interfaces
-	1	-	-	1	initialize timer
-	1	-	-	-	initialize EEPROM
-	-	1	1	1	initialize data
-	-	1	1	-	initialize ADC
-	-	1	-	1	initialize communication
-	-	-	1	1	start background process
-	-	-	1	-	check options and start
-	-	-	-	1	start operating system

1 = LED constant light

LED indication for diagnosis, errors.
The following combinations are possible:
After start/reset: (X X X X = error code)
M 1 2 3 4
- X X X X Error detected during Init.

Device in normal operation:
M 1 2 3 4
1 - - - - Cyclical self-test
- - - - - diagnosis without LED inform
¾ x x x x flashing: message

12.2 ERRORS DETECTED DURING SELF-TEST

During cyclical self-test certain components of the NAFLinkIT are under constant surveillance. At trouble detection in the electronics LCD or the red LED is initiated; output I becomes pressureless ('fail safe position').
If after reset1) the display shows the error again the device is probably defect and should be sent to manufacturer for repair.

LEDs					Description
red	green				
M	1	2	3	4	
-	1	1	1	1	⇒ Red LED lights up const. RAM / EPROM fault √ Actuate "Reset"; send device to manufacturer if error reappears

1 = LED constant light

12.3 DIAGNOSIS WITHOUT LED OR LCD INFORM

Fault	Possible cause	Solution
Positioner not operational using key pads	No input signal at 11, 12	Connect input signal
	Local operation blocked (write protection)	Remove blockage via communication
	No automatic power up (Reset)	Reset NAF-LinkIT with keys
	A key got jammed	Release cover screws, check menu functions, retighten cover
	Failure in the positioner	Send device to manufacturer
Autostart not completed (>45 min)	Actuator volume too large	stop Autostart and carry out extended Au-tostart, see chapter 9.3, Menu 2 or apply booster
	Failure in the positioner, otherwise Mes-sage 8, 9.	carry out Autostart again, see chapter 9.1 and 9.3, Menu 2 carry out Reset confi guration
	Autostart remains stagnant for a longer time (>10 min) in step 1 or 2 (LED 1 or 2 lights up), otherwise message 8.	Feedback lever (at stroke actuator) incorrect-ly mounted. Verify installa-tion of feedback lever; fl at part points to arrow on housing
		Coupling piece (at rotary actuator) incorrectly turned (R and L mixed up): Verify direction of rotation; fl at part points to arrow on housing
	Autostart remains stagnant for a longer time (>10 min) in step 3 (LCD: shows"Control params") (LED: #3 lights up)	At large volume actuators the Autostart can possibly remain stagnant for a longer time (>10 min) in step 3, prior to continuing in step 4.
Actuator does not react to a change in the input signal	No Autostart performed	Perform Autostart
	Positioner is not IN OPERATION	Switch positioner IN OPERATION, see chap.9.2 resp. Autostart or via Configurator
	Setpoint source is confi gured wrong	Correct confi guration via confi gurator
Actuator does not attain the closed or opened position	Autostart not carried out	carry out Autostart
	Supply pressure too low	check supply air pressure
	Travel limit is set, message 12, 13	check settings, see chapter 9.3 Menu 5
	Angle position linearization, positioner action or characteristic curve is set incorrectly (e.g. 'Custom', but values are missing).	check settings, see chapter 9.3 Menus 1, 3, 4
Unstable behaviour, position control circuit oscillates	Autostart incomplete, therefore, control parameters not suitable	carry out complete Autostart, see chapter 9.3 Menu 2
	Small actuator volume but high air capacity	increase damping at pneumatic output, see chapter 9.3 Menu 8
	Friction on valve packing too great.	loosen packing gland slightly or replace
	IP module or Pneumatic amplifi er defective	change module, see page 38
Actuator reacts too sluggish	air capacity insuffi cient	attach booster
	damping set too high	reduce damping at pneumatic output, see chapter 9.3 Menu 8
	positioning time T63 set too high	reduce positioning time, see chapter 9.3 Menu 6
No communication possible	Input voltage too low	Eliminate voltage drop
	Faulty protocol, communicator and device type do not match.	Check confi guration of devices
	Wrong electronics unit	change device

For tuning controller parameters see remarks on page 27.

12.4 MESSAGES IN THE NAF-LINKIT WITH OPTION "BUILT-IN PRESSURE SENSORS" FLASHING IS SUPERIMPOSED BY A FLICKERING.

LEDs					Description of message / LCD text	Remedy
M	1	2	3	4		
¾	¼	-	-	-	Write pw	
Message 1: write protection					Parameter and functions are write-protected	Can be changed via Confi guratior, PC20 / IFDC or PC50 (FDT Software) or Profi le 3.0 (PROFIBUS)
M	1	2	3	4		
¾	-	¼	-	-	Bad confi g CRC	
Message 2: Parameter					Invalid, undefi ned parameter values	Reset of confi guration to factory setting in Menu 9.1
M	1	2	3	4		
¾	¼	¼	-	-	Calib invalid	
Message 3: Calibration					Incomplete calibration or entering value resp. calibration value outside of permissible tolerance range.	Repeat calibrations in Menus 9.2 ... 9.5
M	1	2	3	4		
¾	-	-	¼	-	Ill loop current	
Message 4: Input current outside of operating range					Check nameplate (INPUT) for correct version Message appears at: Analog HART: Input current under approx. 3.8 mA or above approx. 22 mA Fieldbus or FoxCom: Input current under approx. 9 mA or above approx. 12 mA	check supply voltage (Analog) or check Bus voltage (Fieldbus), exchange NAF-LinkIT if necessary
M	1	2	3	4		
¾	¼	-	¼	-	Pot problem	
Message 5: Position sensor					Position sensor input recognizes error	check 3-pole plug at electronic board
						check cable to sensor
						check sensor (Potentiometer: 5k +20% -0%)
					Position not within permissible rotation angle range. Lower devia- tion of the original 0% and exceeding of the original 100%, which have been determined by Autostart	check feedback lever mounting (fl at area points to arrow on housing).
					During Autostart a change of the direction of movement was found	Acknowledge with UP+DOWN keys, then o.k.
						Check further possible reasons: valve seat worn-out; spindle lock out-of-line; carrier unit on spindle lock is damaged (for determination of valve position).
M	1	2	3	4		
¾	-	¼	¼	-	IP motor problem	
Message 6: I/P-converter output					Connection I/P converter to electronic board faulty	check 2-pole plug at electronic board
						check cable to the I/P converter
						check I/P converter to detect short circuit or interruption

LEDs					Description of message / LCD text	Remedy
M	1	2	3	4		
¾	¼	¼	¼	-	No supply press	
Message 7: Air supply / pneumatic error					Detection: spring closes: w > 2%, but position > 1% spring opens: w < 98%, but position < 99% no actuator change in direction of position signal	check air supply pressure
						lead cable separated
						possibly poor control parameters are set
						pneumatic parts blocked
M	1	2	3	4		
¾	-	-	-	¼	Autostart err 1	
Message 8: AUTOSTART defective					Air supply too low	Check air supply
					Feedback lever (linear actuator) or Coupling (rotary actuator) incorrectly linked. Potentiometer moves out of operating range of ± 47 % of 0° position	Check mounting. Flat area points to arrow on housing
					Coupling (rotary actuator) incorrectly linked (R and L interchanged)	Check mounting
					Mechanical stops not determinable	Check spring movement of actuator / check air supply / check mounting
					When using a booster or spool valve, no control parameters can be determined, since air capacity is too high.	Device version is not suitable for this actuator; select version with smaller air capacity or remove booster.
					Control parameter too high since air capaci- ty is too high (in general, oscillation in valve movement)	Use a booster or the version with spool valve. Reduce control parameter prop.-gain (Menu 6.1 and 6.2) to Code 10 = value 26.6.
					Possibly incomprehensible confi guration data.	Reset confi guration, see Menu 9.1
M	1	2	3	4		
¾	¼	-	-	¼	Autostart err 2	
Message 9: AUTOSTART defective					Confi guration to single-acting instead of double-acting actuator	Initialize factory calibration for double-acting in Menu 9.7
M	1	2	3	4		
¾	-	¼	-	¼	Optionboard err	
Message 10: Disturbances at Option board					Confi gured status of the NAF-LinkIT deviates from existing version (e.g. Option board has been inserted subsequently.	Check if correct option board has been connec- ted Confi rm message and thereby new instrument version.
					Bad contact	Connections to terminals interchanged
						Check connections
						Tighten electronics
					Defective	Exchange option board
M	1	2	3	4		
¾	¼	¼	-	¼	Ctrl diff error	
Message 11: Remaining control deviation					Actuator problems (high friction or blocked)	Check actuator
					Insufficient air supply	Check air supply / air filter
					Insufficient parameters for position controls, for example, amplifi cation too small	Check control parameter, check pneumatic components
					IP module or pneumatic amplifier defect	Check in Menu 7; replace if necessary

LEDs					Description of message / LCD text	Remedy
M	1	2	3	4		
¾	-	-	¼	¼	Lower stroke lim	
Message 12: confi gurated closing limit has been reached					If this is desired, the message may be igno-red, of course.	If not, the setting has to be checked in Menu 5.1 or via communication.
M	1	2	3	4		
¾	¼	-	¼	¼	Upper stroke lim	
Message 13: confi gurated opening limit has been reached					If this is desired, the message may be igno-red, of course.	If not, the setting has to be checked in Menu 5.4 or via communication.
M	1	2	3	4		
¾	-	¼	¼	¼	Maintenance	
Message 14: Maintenance required					Operating point of controller is outside of permissible tolerance.	Pneumatic components have to be checked and if necessary readjusted. Filters are possibly blocked and have to be replaced.
M	1	2	3	4		
¾	¼	¼	¼	¼	Unforeseen	
Message 15:					Not defi ned	

13. Safety requirements

13.1 EMC AND CE

For notes regarding Electromagnetic compatibility EMC and CE labels see Product Specifi cations Sheet PSS EVE0105 A.

In order to ensure EMC protection, the black electronic cover made of conductive plastic has to be screwed to the housing, see page 36.

13.2 EXPLOSION PROTECTION

(Only if ordered)
Technical data for explosion protection see Product Specifications Sheet PSS EVE0105 A or Certifi cates of Conformity EX EVE0105 A.
For installations located in explosive atmospheres, all relevant national regulations and installation conditions must be observed, e.g. in the Federal Republic of Germany ElexV and DIN VDE 0165.

Attention:
When repairing explosion-protected equipment, observe the national regulations.

Repairs involving parts must be manufacturer's original parts.

The following applies to the Federal Republic of Germany:
Repairs involving parts required for explosion protection must either be carried out by the manufacturer or by authorized personnel and confirmed by certificate.

14. System configuration

The safety requirements (see above) must be observed!

14.1 HART COMMUNICATION

When using the 'communication' (an alternating current signal, which is modulated onto the 4-20 mA signal), it must be observed that the connected outputs are suitable for the used frequency ranges. Apart from the load, also the alternating current impedances have to be observed.
It is recommended therefore, to use only suitable instruments.

To eliminate crosstalk between leads and to reduce disturbances through electromagnetic infl uences, it is recommended to use twisted paired shielded leads (0.3 ... 2.5 mm², max. 100pF/m).

The capacities of the leads and the connected instruments must not exceed the maximum values for HART.

All components which are connected to the NAF-LinkIT in an explosion hazardous area, require an Ex-Approval. The therein applicable limit values must not be exceeded in any case. These limit values also have to be adhered to when connecting additional capacitances, inductances, voltages and currents.

Measuring HART Communication Signal
If a reliable communication signal can not be received. it is advisable to check the level with an oscilloscope. The first data block always comes from the configurator and the second block is the reply from the NAF-LinkIT.

14.2 FOXCOM COMMUNICATION

HART	measured at confi gurator	Measured at NAF-LinkIT:
Confi gurator transmits	at least 350 mVpp	at least 120 mVpp
NAF-LinkIT transmits	at least 120 mVpp	at least 400 mVpp

When using the 'communication' (a rectangular signal which is modulated onto the constant current signal), it must be observed that the connected outputs are suitable for the used frequency ranges. The supply instrument must be a voltage source with an impedance of 250 ... 500 Ohm. The total of all instrument and lead capacities must be <60 nF.
It is therefore recommended, to use only suitable instruments.

To eliminate crosstalk between leads and to reduce disturbances through electromagnetic infl uences, it is recommended to use twisted paired shielded leads (0.3 ... 2.5 mm², max. 100 pF/m).

The capacities of the leads and the connected instruments must not exceed the maximum values for FoxCom.

All components which are connected to the NAF-LinkIT in an explosion hazardous area, require an Ex-Approval. The therein applicable limit values must not be exceeded in any case. These limit values also have to be adhered to when connecting additional capacitances, inductances, voltages and currents.

Measuring FoxCom Communication Signal
If a reliable communication signal can not be received, it is advisable to check the level with an oscilloscope. The first data block always comes from the confi gurator and the second block is the reply from the NAF-LinkIT.

FOXCOM	measured at confi gurator:	Measured at NAF-LinkIT:
Confi gurator transmits (Request)	at least 350 mVpp	at least 75 mVpp
NAF-LinkIT transmits (Acknowledge)	at least 75 mVpp	at least 350 mVpp

14.3 WITH COMMUNICATION PROFIBUS-PA

The operation of the positioner takes place digital, as per PROFIBUS-PA Profi le Class B acc. to EN 50170 and DIN 19245 part 4. Data transmission via bit synchronous current modulation with a speed of 31250 bits via twisted and shielded two-wire connections acc. to IEC 1158-2, with cable shields on both sides and bus terminators according to recommendation IEC 1158-2.

The positioner has to be connected to a segment coupler, which has to be conforming to IEC 1158-2. For operation in explosion hazardous areas, a segment coupler in explosion proof version has to be used. Supply as well as communication takes place via the bus.

All components which are connected to the NAF LinkIT in an explosion hazardous area, require an Ex-Approval. The therein applicable limit values must not be exceeded in any event.
These limit values also have to be afhered to when connecting additional capacitances, inductances, voltages and currents. The FISCO model is thereby used as a basis.

Further information for observance: "Technical Guide for PROFIBUS-Connection Technique" PROFIBUS-User Organisation, Order no. 2.141.

14.4 WITH COMMUNICATION FOUNDATION FIELDBUS

The operation of the positioner takes place digital, as per FOUNDATION Fieldbus Specifi cation Rev. 1.4. Data transmission via bit synchronous current modulation with a speed of 31250 bits of via twisted and shielded two-wire connections acc. to IEC 1158-2, with cable shields on both sides and bus terminators according to recommendation IEC 1158-2.

The positioner has to be connected to components which are conforming to IEC 1158-2. For operation in explosion hazardous areas, an Ex-separator has to be used. Supply as well as communication takes place via the bus.

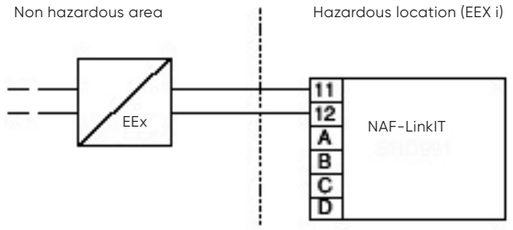
All components which are connected to the NAF-LinkIT in an explosion hazardous area, require an Ex-Approval.
The therein applicable limit values must not be exceeded in any event. These limit values also have to be adhered to when connecting additional capacitances, inductances, voltages and currents. The FISCO model is thereby used as a basis.

Further information for observance:
"Wiring and installation 31.25 kBit/s, Voltage Mode, Wire Medium Application Guide" by FOUNDATION fieldbus.

14.5 SYSTEM CONFI GURATION

ELECTRICAL CONNECTION

Connection compartment see page 10.
Electrical connection for NAF-LinkIT in intrinsic safe (EEx i)in intrinsic safe (EEx i) version.version.



	Input		Options			
	11	12	A	B	C	D
Input signal / Setpoint value						
HART/FoxCom/ 4-20 mA	11+	12-				
Fieldbus acc to IEC 1158-2	11••	12••				
Options / Additional In-/Outputs						
Position feedback			81+	82-	31+	32-
Binary output			81+	82-	83+	84-
Binary input			13+	14-	15+	16-
Limit signal switch			41+	42-	51+	52-
Potentiometer						
Sensor						

•• any Polarity

CONNECTION VALUES

HART / 4-20 mA
Terminals . . . . . 11+ / 12-
Signal range . . . . . 4 ... 20 mA
Input voltage . . . . . DC 12 ... 36 V (non loaded)

FOUNDATION Fieldbus
Terminals . . . . . 11 / 12
Bus connections . . . . . Fieldbus interface acc. to IEC 1158-2
Supply voltage . . . . . DC 9 ... 32 V [2)]
Max. Supply voltage . . . . . DC 36 V
Operating current . . . . . 10.5 mA ± 0.5 mA

PROFIBUS-PA
Terminals . . . . . 11 / 12
Bus connection . . . . . Fieldbus interface acc. to IEC 1158-2
Supply voltage . . . . . DC 9 ... 32 V [2)]
Max. Supply voltage . . . . . DC 36 V
Operating current . . . . . 10.5 mA ± 0.5 mA

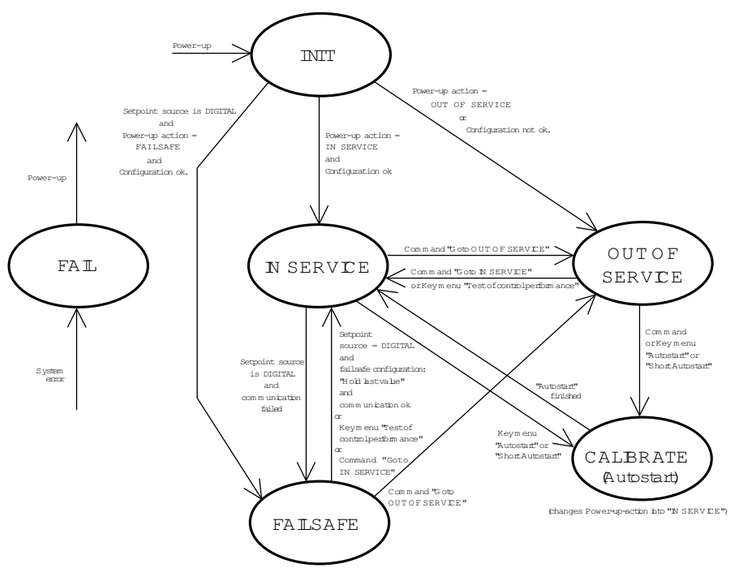
FoxCom - digital (IT2)
Terminals . . . . . 11+ / 12-
Supply voltage . . . . . DC 13 ... 36 V [2)]
Max. Supply voltage . . . . . DC 36 V
Operating current . . . . . ~ 9 mA at DC 24 V

FoxCom - analog (IT1)
Terminals . . . . . 11+ / 12-
Signal range . . . . . 4 ... 20 mA
Supply voltage . . . . . DC 13 ... 36 V [2)]

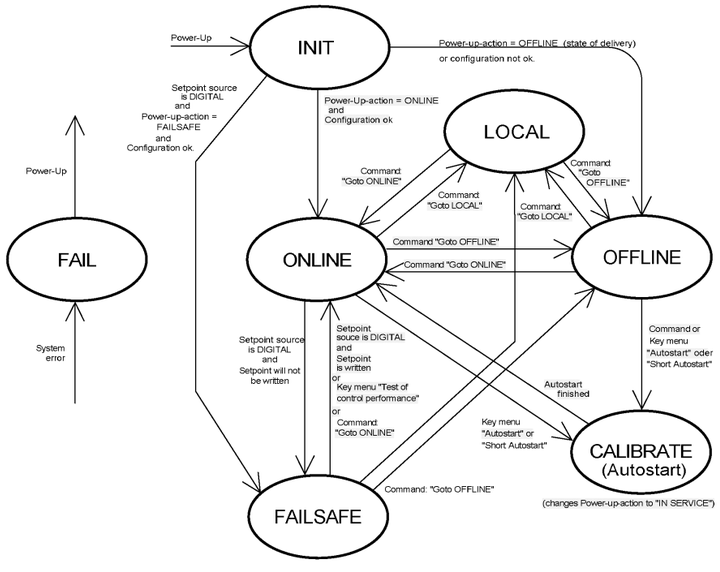
2) When used in Ex-hazardous areas, the max, supply voltages, etc. on nameplate resp. certifi cate of conformity, have to be observed!

15. Phase Diagrams Modes of Operation

15.1 NAF-LINKIT WITH COMMUNICATION HART



15.2 NAF-LINKIT WITH COMMUNICATION FOXCOM



EXPLANATIONS OF PHASE DIAGRAMS

The respective oval shape indicates the mode. Mode of operation changes in direction of arrow if described conditions are met.

Key / menu „xxx“ : Operation via local keys

Command „yyy“ : Command via Communication

Power-Up: Return of the supply voltage or RESET

Power-up-action: A confi gurable 'switch' determining what is to happen at power-up.

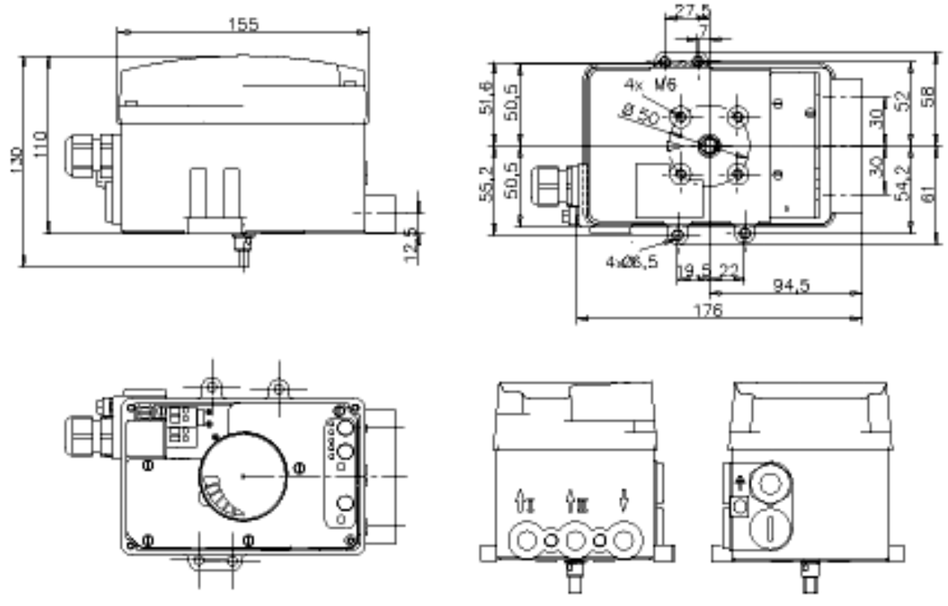
Example HART: In delivery condition the switch is 'OUT OF SERVICE' since Autostart has not yet been executed and, therefore, no useful operation is possible. After the execution of Autostart the switch changes automatically to 'IN SERVICE'. If the power should be down and returns again, the power-up action will bring NAF-LinkIT into mode 'IN SERVICE'.

Writing permission in FOXCOM
Even without write protection there are certain limitations dependent on the respective mode:

Mode	Who is allowed to write?
ONLINE FAILSAFE	I/A system - setpoint value IFDC - no setpoint value Neither one - confi guration data
OFFLINE	Neither one - setpoint value All - confi guration data
CALIBRATE	Neither one - setpoint value Neither one - confi guration data
LOCAL	I/A system - no setpoint value IFDC - setpoint value All - confi guration data
Key menu (Keyboard mode	Neither one - setpoint value Neither one - confi guration data

16. Dimensions

All measures in mm



CONTACT US!

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