SERIES 6A

SMART POSITIONER

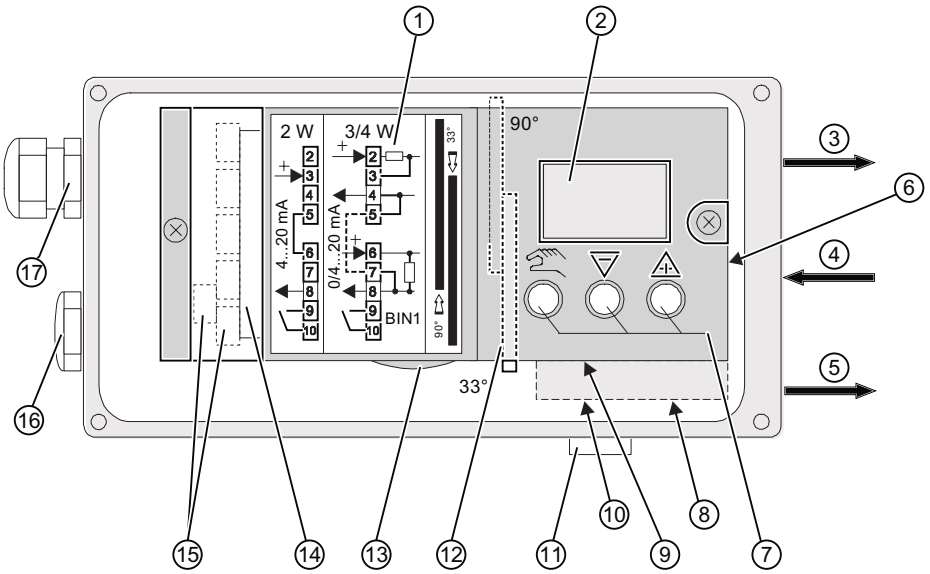
ADVANCED SETUP GUIDE

This document is not comprehensive, and is intended to help users become familiar with the Bray S6A Electro-Pneumatic Positioner Advanced Setup & Diagnostics. For more detailed information please reference the Installation, Operation and Maintenance Manual available on the Bray website.

CONTENTS

1.0 Device Components

Overview of device components



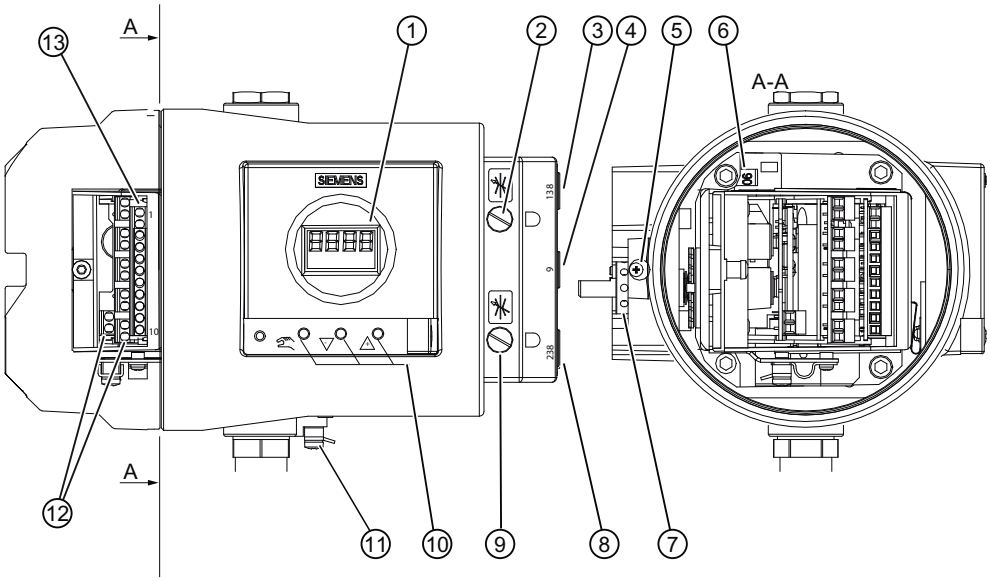
→ Arrowhead means: Turn the device to see the corresponding view

① Wiring diagram on module cover
② Display
③ Output: Actuating pressure Y1
④ Input: Supply pressure PZ
⑤ Output: Actuating pressure Y2[1)]
⑥ Purging air selector
⑦ Buttons
⑧ Restrictor Y2 for double-acting actuators[1)]
⑨ Restrictor Y1 for single-acting actuators
⑩ Restrictor Y1 for double-acting actuators
⑪ Exhaust air outlet with a sound absorber
⑫ Transmission ratio selector[2)]
⑬ Friction clutch adjustment wheel
⑭ Basic electronics
⑮ Connecting terminals of option modules
⑯ Blanking plug
⑰ Cable gland

1) for double-acting actuators

2) visible when the positioner is open

Figure 1 View of positioner with cover open



①	Display	⑧	Output: Actuating pressure Y2[1]
②	Restrictor Y1	⑨	Restrictor Y2[1]
③	Output: Actuating pressure Y1	⑩	Buttons
④	Input: Supply pressure PZ	⑪	Ground terminal
⑤	Safety catch	⑫	Connecting terminals of option modules
⑥	Transmission ratio selector[2]	⑬	Connecting terminals of basic electronics
⑦	Friction clutch adjustment wheel		

1) for double-acting actuators

2) visible when the positioner is open

Figure 2 View of positioner in f ameproof enclosure, cover opened

Basic electronics

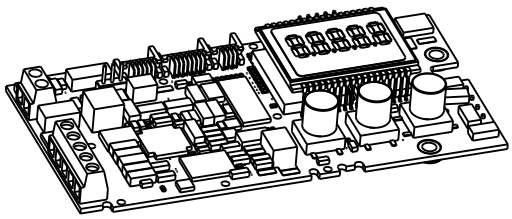
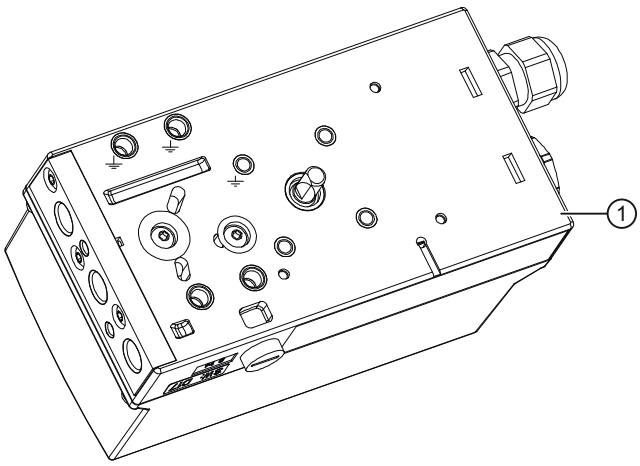


Figure 3 Basic electronics, schematic representation

The basic electronics contains:

- CPU
- Memory
- Analog-to-digital converter
- Display

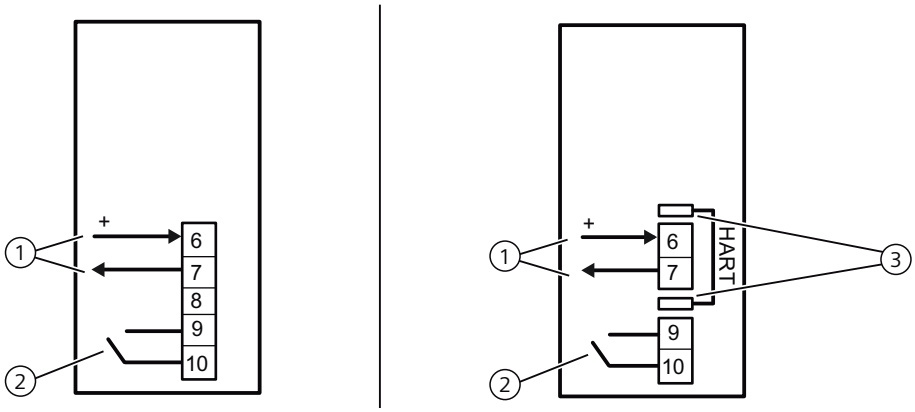


⏚ Shield

Figure 4 Base plate ①

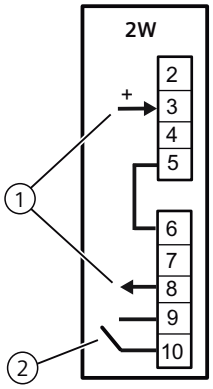
2.0 Electrical Wiring

Electronics



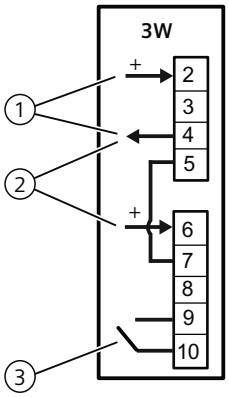
① Setpoint 4 ... 20 mA, terminals 6 and 7
② Digital input DI1, terminals 9 and 10
③ HART connection

Figure 5 Connection diagram for electronics 2-wire



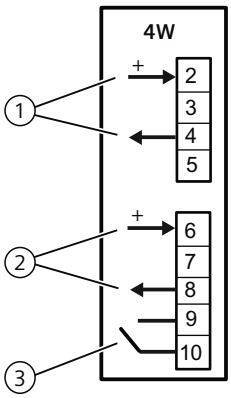
① Setpoint 4 ... 20 mA, terminals 3 and 8
② Digital input DI1, terminals 9 and 10

Figure 6 Connection diagram for electronics, 2/3/4-wire, with wiring con iguration 2-wire



① Power source 18 ... 30 V, terminals 2 and 4
② Setpoint 0/4 ... 20 mA, terminals 6 and 4
③ Digital input DI1, terminals 9 and 10

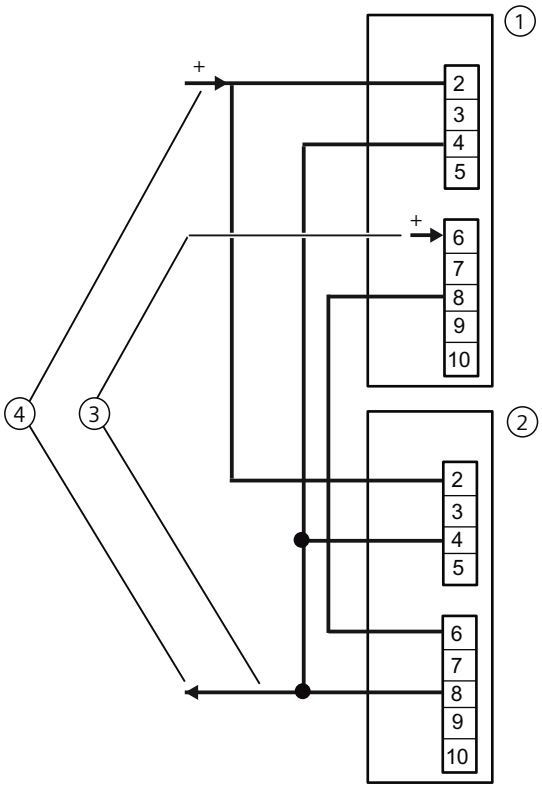
Figure 7 Connection diagram for electronics, 2/3/4-wire, with wiring con iguration 3-wire



① Power source 18 ... 30 V, terminals 2 and 4
② Setpoint 0/4 ... 20 mA, terminals 6 and 8
③ Digital input DI1

Figure 8 Connection diagram for electronics, 2/3/4-wire, with wiring con iguration 4-wire

Split range

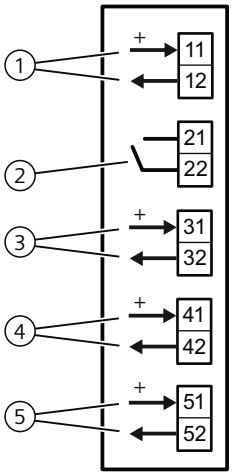


① Positioner 1
② Positioner 2
③ Signal source 0/4 ... 20 mA, terminals 6 and 8
④ Power source 18 ... 30 V, terminals 2 and 8

Figure 9 Series connection of 2 positioners, e.g. split range

Option modules

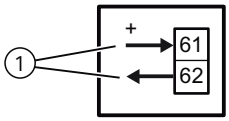
Digital I/O Module (DIO) 6DR4004-6A / -8A



① Digital input DI2, electrically isolated
② Digital input DI2, dry contact
③ Fault message output
④ Digital output DO1
⑤ Digital output DO2

Figure 10 Digital I/O Module (DIO)

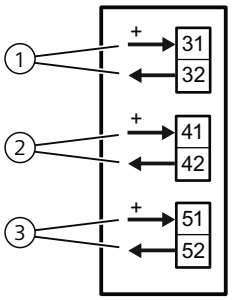
Analog Output Module (AOM) 6DR4004-6J / -8J



① Analog output AO

Figure 11 Analog Output Module (AOM)

Inductive Limit Switches (ILS) 6DR4004-6G / -8G



① Fault message output, has no function in combination with 6DR4004-3ES
② Digital output (limit monitor) A1
③ Digital output (limit monitor) A2

Figure 12 Inductive Limit Switches (ILS)

Mechanical Limit Switches (MLS) 6DR4004-6K / -8K

DANGER

Supply with hazardous voltage

If you connect the switching contacts of the 6DR4004-8K module to a hazardous voltage, observe the following safety rules:

1. Isolate the device from power. Use a circuit breaker positioned near the device to do this.
2. Make sure that the device cannot be switched back on inadvertently.
3. Make sure the device is truly isolated from power.

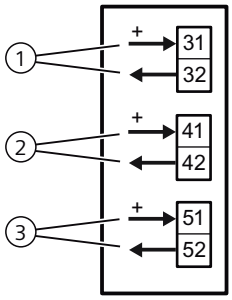
CAUTION

Maximum AC/DC switching voltage with UL approval E344532

Mechanic Limit Switches (MLS) 6DR4004-**6K**/-**8K** are approved for use with positioners with UL approval. The maximum switching voltage in this case is ≤ 30 V AC/DC.

If switching voltages greater than 30 V are connected, the UL approval for the positioner becomes invalid.

Connection diagram Mechanic Limit Switches (MLS) 6DR4004-6K and -8K



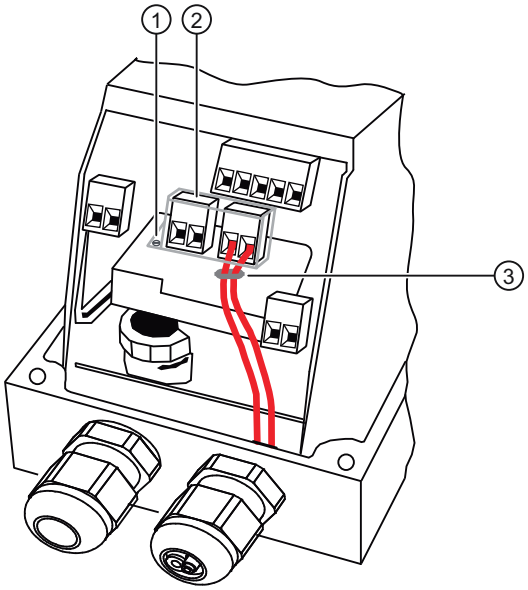
① Fault message output, has no function in combination with 6DR4004-4ES
② Digital output (limit monitor) A1
③ Digital output (limit monitor) A2

Figure 13 Mechanic Limit Switches (MLS)

Procedure

1. Loosen the screw ① on the transparent cover ②.
2. Pull the transparent cover ② up to the front end stop.
3. Tighten every cable in the corresponding terminal.

4. Slide the transparent cover ② up to the end stop of the basic electronics.
5. Tighten the screw ① of the transparent cover ②.
6. Connect the cables of each switch to the lug of the printed circuit board in pairs. Use the provided cable ties ③ for this purpose.



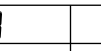
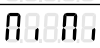
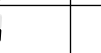
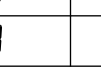
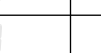
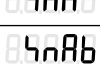
① Screw
② Cover
③ Cable tie

Figure 14 Connecting the cables

3.0 Setup Parameter Overview

Parameter	Function	Parameter values		Unit
1.YFCT	Type of actuator	Normal	Inverted	
	Part-turn actuator	turn	-turn	
	Linear actuator	**WAY**	-WAY	
	Linear actuator - carrier pin on actuator spindle	FWAY	-FWAY	
	Linear actuator - external linear potentiometer (e.g. with cylinder drives)	LWAY	-LWAY	
	Part-turn actuator with NCS/iNCS	ncSt	-ncSt	
	Linear actuator with NCS	ncSL	-ncSL	
	Linear actuator with NCS/iNCS and lever	ncSLL	-ncLL	
2.YAGL	Rated angle of rotation of positioner shaft[1)]			
		33°		Degrees
		90°		
3.YWAY[2)]	Range of stroke (optional setting)[3)]			
		OFF		mm
		5 | 10 | 15 | 20 (Short lever 33°, range of stroke 5 to 20 mm)		
		25 | 30 | 35 (Short lever 90°, range of stroke 25 to 35 mm)		
		40 | 50 | 60 | 70 | 90 | 110 | 130 (Long lever 90°, range of stroke 40 to 130 mm)		
4.INITA	Initialization (automatic)	**NOINI** | no / ###.# | Strt		
5.INITM	Initialization (manual)	**NOINI** | no / ###.# | Strt		
6.SCUR	Current range of setpoint			
	0 ... 20 mA	0 mA		
	4 ... 20 mA	**4 mA**		
7.SDIR	Setpoint direction			
	Rising	**riSE**		
	Falling	FALL		
8.SPRA	Setpoint split range start	**0.0** ... 100.0		%
9.SPRE	Setpoint split range end	0.0 ... **100.0**		%
10.TSUP	Setpoint ramp up	Auto / **0** ... 400		s
11.TSDO	Setpoint ramp down	**0** ... 400		s

Parameter	Function		Parameter values	Unit
12.SFCT	Setpoint function			
	Linear		**LIN**	
	Equal percentage	1 : 25	1 - 25	
		1 : 33	1 - 13	
		1 : 50	1 - 50	
	Inverse equal percentage	25 : 1	n1 - 25	
		33 : 1	n1 - 33	
		50 : 1	n1 - 50	
	Freely adjustable		FrEE	
13.SLO ... 33.SL20 [4)]	Setpoint turning point at			
13.SL0	0 %		0.0 ... 100.0	%
14.SL1 ...	5 %			
32.SL19	95 %			
33.SL20	100 %			
34.DEBA	Deadband of closed-loop controller		**Auto** / 0.1 ... 10.0	%
35.YA	Start of the manipulated variable limit		**0.0** ... 100.0	%
36.YE	End of the manipulated variable limit		0.0 ... **100.0**	%
37.YNRM	Standardization of manipulated variable			
	To mechanical travel		**MPOS**	
	To flow		FLoW	
38.YDIR	Direction of action of manipulated variable for display and position feedback			
	Rising		**riSE**	
	Falling		FALL	
39.YCLS	Tight closing / fast closing with manipulated variable			
	None		**no**	
	Tight closing Up		uP	
	Tight closing Down		do	
	Tight closing Up and Down		up do	
	Fast closing Up		Fu	
	Fast closing Down		Fd	
	Fast closing Up and Down		Fu Fd	
	Tight closing Up and fast closing Down		uP Fd	
	Fast closing Up and tight closing Down		Fu do	
40.YCDO	Lower value for fast closing / tight closing		0.0 ... **0.5** ... 100.0	%
41.YCUP	Upper value for fast closing / tight closing		0.0 ... **99.5** ... 100.0	%

Parameter	Function	Parameter values		Unit
42.DI1 [5)]	Function digital input DI1	NO contact	NC contact	
	None	**OFF**		
	Message only	on	-on	
	Block configuration	bLoc1		
	Block configuring and manual operation	bLoc2		
	Move process valve to position YE	uP	-uP	
	Move process valve to position YA	doWn	-doWn	
	Block movement	StoP	-StoP	
	Partial Stroke Test	PSt	-PSt	
43.DI2 [5)]	Function digital input DI2	NO contact	NC contact	
	None	**OFF**		
	Message only	on	-on	
	Move process valve to position YE	uP	-uP	
	Move process valve to position YA	doWn	-doWn	
	Block movement	StoP	-StoP	
	Partial Stroke Test	PSt	-PSt	
44.AFCT [6)]	Alarm function	Normal	Inverted	
	None	**OFF**		
	A1 = Min, A2 = Max			
	A1 = Min, A2 = Min			
	A1 = Max, A2 = Max			
45.A1	Response threshold, alarm 1	0.0 ... **10.0** ... 100.0		%
46.A2	Response threshold, alarm 2	0.0 ... **90.0** ... 100.0		%
47. ↳FCT [6)]	Function of fault message output	Normal	Inverted	
	Fault			
	Fault + not automatic [7)]			
	Fault + not automatic + DI [7)]			
48. ↳TIM	Monitoring period for setting of fault message 'Control deviation'	**Auto** / 0 ... 100		s
49. ↳LIM	Response threshold for fault message 'Control deviation'	**Auto** / 0 ... 100		%
50.PRST	Preset			
	Reset all parameters which can be reset by "Init", "PArA" and "diAg".	**ALL**		
	Reset parameters 'YFCT' to 'INITM'.	Init		
	Reset parameters 'SCUR' to 'LIM'.	PArA		
	Reset parameters A to U of the extended diagnostics function as well as parameter 'XDIAG'.	diAg		
51.PNEUM	Pneumatics type			
	Standard pneumatic block	**Std**		
	Fail in Place pneumatic block	FIP		
	Operation with boosters	booSt		

Parameter	Function	Parameter values	Unit
52.XDIAG	Activation of extended diagnostics		
	Off	**OFF**	
	Single stage message	On1	
	Two stage message	On2	
	Three stage message	On3	

1) Set transmission ratio selector accordingly.

2) Parameter only appears with "WAY", "-WAY", "ncSLL" and "-NCLL"

3) If used, the value on the actuator must correspond to the set range of stroke on the lever arm. Carrier must be set to the value of the actuator travel or, if this value is not scaled, to the next higher scaled value.

4) Setpoint turning points only appear when '12.SFCT = FrEE' is selected.

5) NO contact: Action when signal state is 1; NC contact: Action when signal state is 0

6) Normal: conductive, no fault; Inverted: deactivated, fault

7) '+' means: OR logic operation

4.0 Overview of Diagnostic Values

No.	Short designation	Meaning	Representable diagnostics values	Unit	Properties
1	STRKS	Number of total strokes	**0** ... 4.29E9	-	①
2	CHDIR	Number of changes in direction	**0** ... 4.29E9	-	①
3	↳CNT	Number of fault messages	**0** ... 4.29E9	-	①
4	A1CNT	Number of alarms 1	**0** ... 4.29E9	-	①
5	A2CNT	Number of alarms 2	**0** ... 4.29E9	-	①
6	HOURS	Number of operating hours	**0** ... 4.29E9	Hours	②
7	HOURR	Resettable operating hours counter	**0** ... 4.29E9		①
8	WAY	Determined travel	**0** ... 130	mm or °	②
9	TUP	Travel time up	**0.0** / 0 ... 1000	s	②
10	TDOWN	Travel time down	**0.0** / 0 ... 1000	s	②
11	LEAK	Leakage test	- / 0.0 ... 100.0	%/minute	③
12	PST	Monitoring of Partial Stroke Test	**OFF** / ###.#, FdIni, notSt, SdtSt, fdtSt, notoL, Strt, StoP	s for ###.#	③
13	PRPST	Time since last Partial Stroke Test	###, **notSt**, Sdtst, fdtSt	Days	②
14	NXPST	Time until next Partial Stroke Test	**OFF** / ###	Days	②
15	DEVI	Dynamic control valve behavior	0.0 ... 100.0	%	②
16	ONLK	Pneumatic leakage	0.0 ... 100.0	-	②
17	STIC	Stiction (slipstick)	0.0 ... 100.0	%	②
18	ZERO	Lower endstop	0.0 ... 100.0	%	②
19	OPEN	Upper endstop	0.0 ... 100.0	%	②
20	PAVG	Average value of position	**OFF**, IdLE, rEF, COMP 0.0 ... 100.0	%	②
21	P0	Potentiometer value of lower endstop (0%)	**0.0** ... 100.0	%	③
22	P100	Potentiometer value of upper endstop (100%)	**0.0** ... 100.0	%	③
23	IMPUP	Pulse length up	**6** ... 160	ms	④
24	IMPDN	Pulse length down	**6** ... 160	ms	④
25	PAUTP	Pulse pause	2 ... **28** ... 320	ms	④
26	DBUP	Deadband up	**0.1** ... 10.0	%	②
27	DBDN	Deadband down	**0.1** ... 10.0	%	②
28	SSUP	Slow step zone up	0.1 ... **10.0** ... 100.0	%	④
29	SSDN	Slow step zone down	0.1 ... **10.0** ... 100.0	%	④
30	TEMP	Current temperature	-50 ... 100 -58 ... 212	°C °F	②
31	TMIN	Minimum temperature (min/max pointer)	-50 ... 100 -58 ... 212	°C °F	②
32	TMAX	Maximum temperature (min/max pointer)	-50 ... 100 -58 ... 212	°C °F	②

No.	Short designation	Meaning	Representable diagnostics values	Unit	Properties
33	T1	Number of operating hours in temperature range 1	**0** ... 4.29E9	Hours	②
34	T2	Number of operating hours in temperature range 2	**0** ... 4.29E9	Hours	②
35	T3	Number of operating hours in temperature range 3	**0** ... 4.29E9	Hours	②
36	T4	Number of operating hours in temperature range 4	**0** ... 4.29E9	Hours	②
37	T5	Number of operating hours in temperature range 5	**0** ... 4.29E9	Hours	②
38	T6	Number of operating hours in temperature range 6	**0** ... 4.29E9	Hours	②
39	T7	Number of operating hours in temperature range 7	**0** ... 4.29E9	Hours	②
40	T8	Number of operating hours in temperature range 8	**0** ... 4.29E9	Hours	②
41	T9	Number of operating hours in temperature range 9	**0** ... 4.29E9	Hours	②
42	VENT1	Number of switching cycles of pneumatic block, valve 1	**0** ... 4.29E9	-	②
43	VENT2	Number of switching cycles of pneumatic block, valve 2	**0** ... 4.29E9	-	②
44	VEN1R	Number of switching cycles of pneumatic block, valve 1, resettable	**0** ... 4.29E9	-	①
45	VEN2R	Number of switching cycles of pneumatic block, valve 2, resettable	**0** ... 4.29E9	-	①
46	STORE	Save the current values as 'last maintenance' (press ⚠ button for 5 seconds)	-	-	③
47	PRUP	Prediction up	**1** ... 40	-	④
48	PRDN	Prediction down	**1** ... 40	-	④
49	WT00	Number of operating hours in the travel range WT00	**0** ... 4.29E9	Hours	①
50	WT05	Number of operating hours in the travel range WT05	**0** ... 4.29E9	Hours	①
51	WT10	Number of operating hours in the travel range WT10	**0** ... 4.29E9	Hours	①
52	WT30	Number of operating hours in the travel range WT30	**0** ... 4.29E9	Hours	①
53	WT50	Number of operating hours in the travel range WT50	**0** ... 4.29E9	Hours	①
54	WT70	Number of operating hours in the travel range WT70	**0** ... 4.29E9	Hours	①
55	WT90	Number of operating hours in the travel range WT90	**0** ... 4.29E9	Hours	①
56	WT95	Number of operating hours in the travel range WT95	**0** ... 4.29E9	Hours	①
57	LKPUL	Length of the leakage compensation pulse	-256 ... **0** ... 254	ms	②
58	LKPER	Period of the leakage compensation pulse	**0.00** ... 600.00	s	②
59	mA	Setpoint current	0.0 ... 20.0	mA	②
60	PZ	Supply pressure PZ	9.999 999.99 9.999	bar psi MPa	③
61	P1	Actuating pressure Y1			③
62	P2	Actuating pressure Y2			③
63	PZMAX	Maximum supply pressure PZ			①
64	N_MIN	Event counter violations of lower limit PZ	0 ... 99999	-	①
65	N_MAX	Event counter violations of upper limit PZ			
66	N1MAX	Event counter violations limit Y1			

67	LMY1	+/- Leakage at Y1	±0.000 ... 9.999	bar / min	②
68	LMY2	+/- Leakage at Y2	±0.000 ... 0.999	MPa / min	
			±0.00 ... 99.99	psi / min	
69	LMUY1	Maximum positive leakage at Y1	+0.000 ... 9.999	bar / min	①
70	LMUY2	Maximum positive leakage at Y2	+0.000 ... 0.999	MPa / min	
			+0.00 ... 99.99	psi / min	
71	LMDY1	Maximum negative leakage at Y1	-9.999 ... -0.000	bar / min	①
72	LMDY2	Maximum negative leakage at Y2	-0.999 ... -0.000	MPa / min	
			-99.99 ... -0.000	psi / min	

Meaning of the diagnostics values

Diagnostic value '1.STRKS - Number of total strokes'

Display range: 0 ... 4.29E9

Purpose: In operation, the movements of the actuator are summed up and displayed in this diagnostics parameter as the number of strokes. Unit: 100% strokes, i.e. the path between 0% and 100% and back.

Diagnostic value '2.CHDIR - Number of changes in direction'

Display range: 0 ... 4.29E9

Purpose: Every change in direction of the actuator is noted in the controller and added to the number of changes in direction.

Diagnostic value '3.\\CNT - Number of fault messages'

Display range: 0 ... 4.29E9

Purpose: Every fault is noted in the closed-loop controller with '3.ЧCNT' and added to the number of fault messages.

Diagnostic value '4.A1CNT - Number of alarms 1' / '5.A2CNT - Number of alarms 2'

Requirement: '44.AFCT' Alarm function (Page 154) parameter is activated.

Display range: 0 ... 4.29E9

Purpose: This value indicates how often the alarm has been triggered.

Diagnostic value '6.HOURS - Number of operating hours'

Display range:	0 ... 4.29E9
Purpose:	The runtime meter is incremented every hour as soon as electric auxiliary power is supplied to the positioner.

Diagnostic value '7.HOURR - Resettable operating hours counter'

Display range:	0 ... 4.29E9
Purpose:	The runtime meter is incremented every hour as soon as electric auxiliary power is supplied to the positioner. In contrast to Diagnos-tic value '6.HOURS - Number of operating hours', this value can be reset.
Description:	In order to minimize the control valve wear resulting from a poor control quality, it makes sense to optimize the positioner's parameters. You can recognize optimum parameter settings when the values of the Diagnostic value '44.VEN1R' / '45.VEN2R' are low. Low values mean that the switching frequency of the positioner pneumatics is also low. In order to carry out a comparison with various parameter settings, determine the number of switching cycles per hour. To do this, use the values of the Diagnostic value '44.VEN1R' / '45.VEN2R' and '7.HOURR'. These three parameters can be reset to enable simpler determination of the values.

Diagnostic value '8.WAY - Determined travel'

Condition for linear actuator:	The travel is set in the '3.YWAY' Range of stroke parameter.
Display range:	0 ... 130
Purpose:	This value in mm or ° speci ies the travel determined during the initialization.

Diagnostic value '9.TUP - Travel time up' / '10.TDOWN - Travel time down'

Display range:	0 ... 1000
Purpose:	This value indicates the current UP or DOWN travel time in seconds determined during the initialization.

Diagnostic value '11.LEAK - Leakage test'

Condition	The positioner is initialized and in manual mode (MAN).
Display range:	• - • 0.0 ... 100.0
Purpose:	You can use this diagnostics parameter to read the last test result or start an offline leakage test with which you can detect leakages in the actuator or in the pipe installation. Display is percent stroke per minute referred to the total stroke. A test result originates from one of the following options: • Function '11.LEAK' has already been carried out. • Leakage test was already carried out during initialization. • 'Offline leakage test' function was already executed by a HOST system. "-" in the display can have the following causes: • A leakage test has not yet been carried out. • Resetting to the factory settings was carried out using the '50.PRST' Preset > ALL parameter. • Positioner is not initialized. How to start the test 1. Move the actuator to the position at which you wish to start the test. 2. In 'Diagnostics' mode, go to the '11.LEAK' diagnostic value as described in section Display of diagnostics values. 3. Start the function by pressing the ⚠ button for at least 5 seconds.
Description:	'Strt' is output in the display. The function is started after 5 seconds. 'tESt' and the current position of the actuator (actual value) are then displayed alternately for one minute. After one minute, the display shows the difference in the actuator position before and after the test. This means: the actuator position has changed by the displayed value in one minute.

Diagnostic value '12.PST - Monitoring of Partial Stroke Test'

Indication on the display:	• OFF • C-ERR • FdIni • notSt • ###.# • SdtSt • FdtSt
Purpose:	This diagnostics parameter indicates the measured stroke time of the last Partial Stroke Test. A Partial Stroke Test can be initiated manually or an active Partial Stroke Test can be interrupted by pressing the ⚠ button.
Description of indications on the display:	• OFF: The Partial Stroke Test function is deactivated. • C-ERR: Configuration error. Partial Stroke Test cannot be started. Settings in the 'A1.STPOS start position', 'A3.STRKH stroke height' and 'A4.STRKD stroke direction' are not plausible. • FdIni - Failed PST Initialization: The reference stroke time measurement of the Partial Stroke Test has failed. • notSt - No Test: A Partial Stroke Test has not yet been executed. • ###.#: Corresponds to the measured stroke time in seconds. The last Partial Stroke Test was successfully executed. • SdtSt - Stopped Test: The last Partial Stroke Test was interrupted. • FdtSt - Failed Test: The last Partial Stroke Test failed.
Status messages:	The following status messages appear when you hold the ⚠ button pressed: • notoL - No Tolerance: The valve is outside the tolerance range for start of the Partial Stroke Test. No manual Partial Stroke Test will be started. • Strt - Start: A manual Partial Stroke Test is started after the button is pressed for five seconds. • WAIt - Wait: The Partial Stroke Test is being executed.
Factory setting:	OFF

Diagnostic value '12.PST - Monitoring of Partial Stroke Test' with option -Z P02

The monitoring of the Partial Stroke Test for positioners with pressure sensor module is described below.

Indication on the display:
- OFF
- C-ERR
- FdIni
- notSt
- norEF
- oCAY
- SdtSt
- FdtSt

Purpose:
This diagnostics parameter indicates the status of the last Partial Stroke Test.

A Partial Stroke Test can be initiated manually or an active Partial Stroke Test can be interrupted by pressing the ⚠ button.

Description of indications on the display:
- OFF: The function of the Partial Stroke Test is disabled.
- C-ERR: Configuration error. Partial Stroke Test cannot be started. Settings in the "A1.STPOS start position" and "Ad.ENPOS end position" parameters are not plausible.
- FdIni - Failed PST Initialization: A reference abort pressure is determined with the parameter "AF.PSTRF". This test failed.
- notSt - No Test: A Partial Stroke Test has not yet been executed.
- norEF: A reference Partial Stroke Test has not yet been executed.
- oCAY: The last Partial Stroke Test was successfully executed.
- SdtSt - Stopped Test: The last Partial Stroke Test was interrupted.
- FdtSt - Failed Test: The last Partial Stroke Test failed.

Status messages:
The following status messages appear when you hold the ⚠ button pressed:
- notoL - No Tolerance: The valve is outside the tolerance range for start of the Partial Stroke Test. No manual Partial Stroke Test will be started.
- Strt - Start: A manual Partial Stroke Test is started after the button is pressed for 5 seconds. 'WAIt' is indicated in the display.
- StoP - Stop: The current Partial Stroke Test was interrupted.
- WAIt - Wait: The Partial Stroke Test is being executed.

Factory setting:
OFF

Diagnostic value '13.PRPST' - Time since last Partial Stroke Test'

Indication on the display:
- ###
- notSt
- Sdtst
- FdtSt

Purpose: This diagnostics parameter shows the elapsed time in days since the last Partial Stroke Test.

Status messages:
- notSt - No Test: A Partial Stroke Test has not yet been executed.
- SdtSt - Stopped Test: The last Partial Stroke Test was interrupted.
- FdtSt - Failed Test: The last Partial Stroke Test failed

Diagnostic value '13.PRPST' - Time since last Partial Stroke Test' with option -Z P02

Indication on the display:
- ###
- notSt
- norEF
- Sdtst
- FdtSt

Purpose: This diagnostics parameter shows the elapsed time in days since the last Partial Stroke Test.

Status messages:
- notSt - No Test: A Partial Stroke Test has not yet been executed.
- norEF: A reference PST has not yet been executed.
- SdtSt - Stopped Test: The last Partial Stroke Test was interrupted.
- FdtSt - Failed Test: The last Partial Stroke Test failed

Diagnostic value '14.NXPST - Time until next Partial Stroke Test'

Requirement:
- The Partial Stroke Test is activated in 'Configuration' mode.
- The test interval is set in the 'A8.INTRV' parameter.

Indication on the display:
- OFF
- ###

Purpose: This diagnostics parameter shows the time in days until the next Partial Stroke Test. If one of the above-mentioned conditions is not met, 'OFF' is shown on the display.

Diagnostics value '15.DEVI - Dynamic control valve behavior'

Requirement:	Monitoring of dynamic control valve behavior 'b.\\DEVI' parameter is activated.
Display range:	0.0 ... 100.0
Purpose:	This value in percent provides information about the current dynamically determined deviation from the model response.

Diagnostic value '16.ONLK - Pneumatic leakage'

Requirement:	Monitoring/compensation of pneumatic leakage 'C.\\LEAK' parameter is activated.
Display range:	0 ... 100
Purpose:	This diagnostics parameter shows the current leakage indicator.

Diagnostic value '17.STIC - Stiction (slipstick)'

Requirement:	Monitoring of stiction (slipstick) 'd.\\STIC' parameter is activated.
Display range:	0.0 ... 100.0
Purpose:	This diagnostics parameter shows the filtered value of the slip jumps in percent resulting from the stiction.

Diagnostic value '18.ZERO - Lower endstop'

Requirement:	Monitoring of lower endstop 'F.\\ZERO' parameter is activated. '39.YCLS' Tight closing/fast closing with manipulated variable (Page 151) Parameter is set to one of the following values: 'do', 'uP do', 'Fd', 'Fu Fd', 'uP Fd', 'Fu do'
Display range:	0.0 ... 100.0
Purpose:	Indication of how many percent the lower endstop has changed compared to its value during initialization.

Diagnostic value '19.OPEN - Upper endstop'

Requirement:	Monitoring the upper endstop 'G.\\OPEN' parameter is activated. '39.YCLS' Tight closing/fast closing with manipulated variable (Page 151) parameter is set to one of the following values: 'uP', 'uP do', 'Fu', 'Fu Fd', 'uP Fd', 'Fu do'
Display range:	0.0 ... 100.0
Purpose:	An indication of the current shift of the upper endstop compared to its initialization value.

Diagnostic value '20.PAVG - Average value of position'

Indication on the display:

- OFF
- IdLE
- rEF
- COMP

Purpose:

This value shows the last calculated comparison average. Meaning of the displays:

- OFF: The underlying function is deactivated in the configuration menu.
- IdLE : Inactive. The function has not been started yet.
- rEF: The reference average is calculated. The function was started, and the reference interval is in progress at the moment.
- COMP: The comparison average is calculated. The function was started, and the comparison interval is in progress at the moment.

Diagnostic value '21.P0 - Potentiometer value of lower endstop (0%)' / '22.P100 - Potentiometer value of upper endstop (100%)'

Display range:

- NO
- 0.0 ... 100.0

'NO': Changing the low or upper endstop is not possible in the current state of the control valve. Initialize the positioner again.

Condition 1 - read values: The positioner is initialized.

Purpose 1

Read values

You can use the P0 and P100 parameters to read the values for the lower endstop (0%) and the upper endstop (100%) of the position measurement as determined during the automatic initialization. The values of manually approached end positions are applicable for manual initialization.

Condition 2 - change values

- The positioner is initialized and in manual mode (MAN) or automatic mode (AUT).
- The current position of the actuator is within the range -10% to +10% of the lower endstop (P0).
- The current position of the actuator is within the range 90% to 110% of the upper endstop (P100).

Purpose 2:

Change values

You can use these two parameters to change the lower endstop (P0) and the upper endstop (P100).

Since initialization is not usually carried out under process conditions, the values for the lower endstop (P0) and the upper endstop (P100) can change when the process is started. These changes can result from temperature changes with the associated thermal expansion of the material. If the Monitoring of lower endstop 'F.\\ZERO' (Page 177) and Monitoring the upper endstop 'G.\\OPEN' (Page 178) parameters are active, the thresholds set in these two parameters can be exceeded as a result of thermal expansion. An error message is output in the display.

The process-dependent thermal expansion might represent the normal state in your application. You do not wish to receive an error message as a result of this thermal expansion. Therefore reset the 'P0' and/or 'P100' parameters after the process-dependent thermal expansion has had its complete effect on the control valve. The procedure is described in the following.

Description:

Procedure for manual mode (MAN)

1. Move the actuator to the desired position of the lower endstop (upper endstop) using the ⚠ and ▽ buttons.
2. Switch to diagnostics mode.
3. Go to diagnostic value 21.P0 (22.P100).
4. Apply the setting by pressing the ⚠ button for at least 5 seconds. After 5 seconds, '0.0' (with 22.P100: '100.0') is displayed. Result: The lower endstop (upper endstop) now corresponds to the current position of the actuator.
5. Switch to manual mode (MAN). Result: Values for the upper endstop (lower endstop) have changed.

Procedure for automatic mode (AUT)

1. Check in the display whether the current position of the actuator is at the desired position of the lower endstop (upper endstop).
2. Switch to diagnostics mode.
3. Go to diagnostic value 21.P0 (22.P100).
4. Apply the setting by pressing the ⚠ button for at least 5 seconds. After 5 seconds, '0.0' (with 22.P100: '100.0') is displayed. Result: The lower endstop (upper endstop) now corresponds to the current position of the actuator.
5. Switch to automatic mode (AUT).

Diagnostic value '23.IMPUP - Pulse length up' / '24.IMPDN - Pulse length down'

Display range:	6 ... 160
Purpose:	The smallest impulse lengths that can be used to move the actuator are determined during the initialization process. They are separately determined for the 'Up' and 'Down' directions and displayed here. Display in ms. In the case of special applications you can additionally set the smallest impulse lengths in these two parameters.
Factory setting:	6

Diagnostic value '25.PAUTP - Pulse interval'

Display range:	2 ... 320
Purpose:	This value is not changed during an initialization process. Display in ms. For applications with high stiction (slipstick), adjusting this parameter improves the control quality. This parameter can be set for special applications.
Factory setting:	28

Diagnostic value '26.DBUP - Deadband up' / '27.DBDN - Deadband down'

Display range:	0.1 ... 10.0
Purpose:	In this parameter, you can read the deadbands of the controller in the 'Up' and 'Down' directions. Display in percent. The values correspond either to the manually configured value of the '34.DEBA' Deadband of closed-loop controller (Page 148) parameter or to the value automatically adapted by the device if 'DEBA' was set to 'Auto'.

Diagnostic value '28.SSUP - Slow step zone up' / '29.SSDN - Slow step zone down'

Display range:	0.1 ... 100.0
Purpose:	The slow step zone is the zone of the closed-loop controller in which control signals are issued in a pulsed manner. Display is in percent. The impulse length is thus proportional to the control deviation. If the control deviation is beyond the slow step zone, the valves are controlled using permanent contact. This parameter can be set for special applications.
Factory setting:	10.0

Diagnostic value '30.TEMP - Current temperature'

Display range:	°C: -50 ... 100 °F: -58 ... 212
Purpose:	Current temperature in the positioner enclosure. The sensor is present on the basic electronics. In order to switch over the temperature display between °C and °F, press the ⏃ button.

Diagnostic value '31.TMIN - Minimum temperature' / '32.TMAX - Maximum temperature'

Display range:	°C: -50 ... 100 °F: -58 ... 212
Purpose:	The minimum and maximum temperatures within the enclosure are constantly determined and saved as with a min/max pointer. This value can only be reset in the factory. In order to switch over the temperature display between °C and °F, press the ⏃ button.

Diagnostic value '33.T1' ... '41.T9' - Number of operating hours in the temperature range 1 to 9

Display range: 0 ... 4.29E9

Purpose: Statistics about the duration of operation in different temperature ranges is maintained in the device. An average of the measured temperature is taken every hour and the counter assigned to the corresponding temperature range is incremented. This helps in drawing conclusions about the past operating conditions of the device and the entire control valve.

The temperature ranges are classified as follows:

	T1	T2	T3	T4	T5	T6	T7	T8	T9
Temperature range [°C]	-	≥ -30	≥ -15	≥ 0	≥ 15	≥ 30	≥ 45	≥ 60	≥ 75
	≤ -30	< -15	< 0	< 15	< 30	< 45	< 60	< 75	-

Operating hours in temperature ranges T1 to T2

Diagnostic value '42.VENT1' / '43.VENT2'

'42.VENT1' number of switching cycles pneumatic block, valve 1

'43.VENT2' number of switching cycles pneumatic block, valve 2

Display range: 0 ... 4.29E9

Purpose: Control procedures of the pneumatic block are summarized and displayed in this parameter.

Description: The pneumatic block of the positioner pressurizes and depressurizes the actuator. The characteristic service life of the pneumatic block depends on the load. The average service life is approx. 200 million switching cycles. The number of control procedures for the switching cycles serves to assess the switching frequency of the pneumatic block.

Counting procedure for single-acting actuators:

- Pressurize => 42.VENT1
- Depressurize => 43.VENT2

Counting procedure for double-acting actuators:

- Pressurize (Y2) / Depressurize (Y1) => 42.VENT1
- Depressurize (Y1) / Pressurize (Y2) => 43.VENT2

The value is written hourly into a nonvolatile memory.

Diagnostic value '44.VEN1R' / '45.VEN2R'

'44.VEN1R' number of switching cycles pneumatic block, valve 1, resettable

'45.VEN2R' number of switching cycles pneumatic block, valve 2, resettable

Display range: 0 ... 4.29E9

Purpose:	Control procedures of the pneumatic block are counted since the last time this parameter was reset, and displayed here.
Description:	Corresponds to the description for Diagnostic value '42.VENT1' / '43.VENT2' (Page 229) referred to the diagnostics parameters 'VEN1R' and 'VEN2R' described here.

Diagnostic value '46.STORE - Save maintenance data'

Purpose:	The minimum and maximum temperatures within the enclosure are constantly determined and saved as with a min/max pointer. This value can only be reset in the factory. In order to switch over the temperature display between °C and °F, press the ⚠ button for at least 5 seconds in order to initiate a save function. The values of the diagnostics parameters Diagnostic value '8.WAY - Determined travel' to Diagnostic value '11.LEAK - Leakage test' and Diagnostic value '21.P0 - Potentiometer value of lower endstop (0%)' / '22.P100 - Potentiometer value of upper endstop (100%)' to Diagnostic value '28.SSUP - Slow step zone up' / '29.SSDN - Slow step zone down' are saved in the non-volatile memory as 'data of last maintenance'. This diagnostics data contains selected values whose changes can give information about mechanical wear and tear of the valve. This function is normally operated through the PDM, menu command 'Diagnostics-> Save maintenance information'. The data of the last maintenance operation can be compared with the current data using SIMATIC PDM.

Diagnostic value '47.PRUP - Prediction up' / '48.PRDN - Prediction down'

Display range:	1 ... 40
Purpose:	This value specifies the prediction of the controller for the up (PRUP) and down (PRDN) movements. For more information, refer also to the section Optimization of con-troller data.
Factory setting:	1

Diagnostic value '49.WT00' ... '56.WT95' - Number of operating hours in the travel range WT00 to WT95

Display range: 0 ... 4.29E9

Purpose: When the positioner is in "Automatic" mode, statistics are continuously maintained regarding the duration for which a process valve is operated in a particular section of the travel range. The entire travel range is divided into 8 sections from 0 to 100 %. The positioner records the current position continuously and increments the runtime meter assigned to the corresponding travel range every hour. This helps in drawing conclusions about the past operating conditions and especially in assessing the control properties of the control loop and the entire control valve.

Travel range	WT00	WT05	WT10	WT30	WT50	WT70	WT90	WT95
Travel range section [%]	-	≥ 5	≥ 10	≥ 30	≥ 50	≥ 70	≥ 90	≥ 95
	< 5	< 10	< 30	< 50	< 70	< 90	< 95	-

Division of travel ranges

You can simultaneously set the eight operating hours counters to zero.

TIP: Since the travel ranges are provided at the end of the diagnostics parameters, press the ▽ button several times along with the ↵ button. This will help you to access the desired diagnostics parameters faster.

Diagnostic value '57.LKPUL - Length of the leakage compensation pulse'

Display range: -256 ... **0** ... 254

Purpose: This value in milliseconds indicates the length of a compensation pulse when Monitoring/compensation of pneumatic leakage 'C.\\LEAK' is active. The sign indicates the control direction of the pulse.

Factory setting: 0

Diagnostic value '58.LKPER - Period of the leakage compensation pulse'

Display range: **0.00** ... 600.00

Purpose: This value in seconds indicates the period of the leakage compensation pulses when Monitoring/compensation of pneumatic leakage 'C.\\LEAK' is active.

Factory setting: 0.00

Diagnostic value '59.mA - Setpoint current'

Here you can display the current setpoint in mA.

Diagnostic value '60.PZ Supply pressure PZ'

Indication on the display: #.### (bar)
###.## (psi)
#.### (MPa)

Purpose: Shows the current supply pressure PZ. The value refers to the pres-sure unit assigned in "U1.PUNIT".

If the supply pressure is the same as the pressure level of the environment, the pressure value shown in the display is 0. Depending on the height at which you use the positioner, the displayed pressure value is ≠0. Press the ⚠ button for at least 5 seconds to set the value to 0. "rESEt" is shown in the display for as long as you press the ⚠ button. This calibration is only possible if the displayed pressure value is in the following pressure range:

- -0.500 ... 0.500 (bar)
- -72.51 ... 72.51 (psi)
- -0.050 ... 0.050 (MPa)

If the pressure value displayed is outside of the pressure range, "no-toL" is shown in the display when you attempt to set the value to 0.

Diagnostic value '61.P1 - Actuating pressure Y1'

Indication on the display: #.### (bar)
###.## (psi)
#.### (MPa)

Purpose: Shows the current actuating pressure Y1. The value refers to the pressure unit assigned in "U1.PUNIT".

If the actuating pressure is the same as the pressure level of the environment, the pressure value shown in the display is 0.

Depending on the height at which you use the positioner, the displayed pressure value is ≠0. Press the ⚠ button for at least 5 seconds to set the value to 0. "rESEt" is shown in the display for as long as you press the ⚠ button. This calibration is only possible if the displayed pressure value is in the following pressure range:

- -0.500 ... 0.500 (bar)
- -72.51 ... 72.51 (psi)
- -0.050 ... 0.050 (MPa)

If the pressure value displayed is outside of the pressure range, "no-toL" is shown in the display when you attempt to set the value to 0.

Diagnostic value '62.P2 - Actuating pressure Y2'

Indication on the display: #.### (bar)
###.## (psi)
#.### (MPa)

Purpose: Shows the current actuating pressure Y2. The value refers to the pressure unit assigned in "U1.PUNIT".

If the actuating pressure is the same as the pressure level of the environment, the pressure value shown in the display is 0.

Depending on the height at which you use the positioner, the displayed pressure value is ≠0. Press the ⚠ button for at least 5 seconds to set the value to 0. "rESEt" is shown in the display for as long as you press the ⚠ button. This calibration is only possible if the displayed pressure value is in the following pressure range:

- -0.500 ... 0.500 (bar)
- -72.51 ... 72.51 (psi)
- -0.050 ... 0.050 (MPa)

If the pressure value displayed is outside of the pressure range, "notoL" is shown in the display when you attempt to set the value to 0.

Diagnostic value '63.PZMAX Maximum supply pressure PZ

Indication on the display: #.### (bar)
###.## (psi)
#.### (MPa)

Purpose: The supply pressure PZ is continuously monitored and the maximum value (min/max pointer) is displayed.

The min/max pointer can be reset via HART communication.

Diagnostic value '64.N_MIN - Event counter violations of lower limit PZ'

Display range: 0 ... #####

Purpose: Each new measured value of the supply pressure PZ is compared with the value set in "U5.PZMLL". The counter increases when the supply pressure falls below the configured limit.

The counter can be reset via HART communication at the same time as the "65.N_MAX" counter.

Diagnostic value '65.N_MAX - Event counter violations of upper limit PZ'

Display range:	0 ... #####
Purpose:	Each new measured value of the supply pressure PZ is compared with the value set in "U6.PZMUL". The counter increases when the supply pressure exceeds the configured limit. The counter can be reset via HART communication at the same time as the "64.N_MIN" counter.

Diagnostic value '66.N1MAX - Event counter violations limit Y1'

Display range:	0 ... #####
Purpose:	Each new measured value of the actuating pressure Y1 is compared with the value set in "U7.PCL". The counter increases when the actuating pressure Y1 exceeds the configured limit. The counter can be reset via HART communication.

Diagnostics value '67.LMY1 +/-Leakage at Y1'

Display range:	±0.000 ... #.### (bar/min) ±0.000 ... #.### (psi/min) ±0.00 ... ##.## (MPa/min)
Purpose:	Shows the pressure increase/leakage per minute on actuating pressure Y1. The value is determined in the controlled state. Negative values (leakage) can indicate a leak in the pneumatic system. Positive values (pressure increases) can indicate a pneumatic short circuit between supply pressure PZ and actuating pressure Y1.

Diagnostics value '68.LMY2 +/-Leakage at Y2'

Display range:	±0.000 ... #.### (bar/min) ±0.000 ... #.### (psi/min) ±0.00 ... ##.## (MPa/min)
Purpose:	Shows the pressure increase/leakage per minute on actuating pressure Y2. The value is determined in the controlled state. Negative values (leakage) can indicate a leak in the pneumatic system. Positive values (pressure increases) can indicate a pneumatic short circuit between supply pressure PZ and actuating pressure Y2.

Diagnostics value '69.LMY1 - Maximum positive leakage at Y1'

Display range:	+0.000 ... #.### (bar/min) +0.000 ... #.### (psi/min) +0.00 ... ##.## (MPa/min)
Purpose:	The pressure change at Y1 is continuously monitored in the controlled state. The maximum pressure increase is displayed. If a limit defined in "U8.LRL" is exceeded, the error code "22" is shown in the display. A message is entered in the logbook. To reset the error code, eliminate the leakage. The parameter can also be reset via HART communication. If you cannot eliminate the leakage, increase the "U8.LRL" parameter or set the parameter to 0.

Diagnostics value '70.LMY2 - Maximum positive leakage at Y2'

Display range:	+0.000 ... #.### (bar/min) +0.000 ... #.### (psi/min) +0.00 ... ##.## (MPa/min)
Purpose:	The pressure change at Y2 is continuously monitored in the controlled state. The maximum pressure increase is displayed. If a limit defined in "U8.LRL" is exceeded, the error code "22" is shown in the display. A message is entered in the logbook. To reset the error code, eliminate the leakage. The parameter can also be reset via HART communication. If you cannot eliminate the leakage, increase the "U8.LRL" parameter or set the parameter to 0.

Diagnostics value '71.LMDY1 - Maximum negative leakage at Y1'

Display range:	+0.000 ... #.### (bar/min) +0.000 ... #.### (psi/min) +0.00 ... ##.## (MPa/min)
Purpose:	The pressure change at Y1 is continuously monitored in the controlled state. The maximum pressure decrease (leakage) is displayed. If a limit de ined in "U8.LRL" is exceeded, the error code 22 is shown in the display. A message is entered in the logbook. To reset the error code, eliminate the leakage. The parameter can also be reset via HART communication. If you cannot eliminate the leakage, increase the "U8.LRL" parameter or set the parameter to 0.

Diagnostics value '72.LMDY2 - Maximum negative leakage at Y2'

Display range:	+0.000 ... #.### (bar/min) +0.000 ... #.### (psi/min) +0.00 ... ##.## (MPa/min)
Purpose:	The pressure change at Y2 is continuously monitored in the controlled state. The maximum pressure decrease (leakage) is displayed. If a limit de ined in "U8.LRL" is exceeded, the error code 22 is shown in the display. A message is entered in the logbook. To reset the error code, eliminate the leakage. The parameter can also be reset via HART communication. If you cannot eliminate the leakage, increase the "U8.LRL" parameter or set the parameter to 0.

5.0 Overview of Diagnostic Parameters

Parameter		Function	Parameter values	Unit
A.┗PST		Partial Stroke Test (PST) with the following parameters:		
	A1.STPOS	Start position	0.0 ... **100.0**	%
	A2.STTOL	Start tolerance	0.1 ... **2.0** ... 10.0	%
	A3.STRKH	Stroke height	0.1 ... **10.0** ... 100.0	%
	A4.STRKD	Stroke direction	uP / **do** / uP do	
	A5.RPMD	Ramp mode	**OFF** / On	%/s
	A6.RPRT	Ramp rate	0.1 ... **1.0** ... 100.0	
	A7.FLBH	Behavior after failed PST	**Auto** / HoLd / AirIn / AirOu	
	A8.INTRV	Test interval	**OFF** / 1 ... 365	Days
	A9.PSTIN	Reference stroke time for PST	NOINI/(C)##.#/FdIni/rEAL	s
	AA.FACT1	Factor 1	0.1 ... **1.5** ... 100.0	
	Ab.FACT2	Factor 2	0.1 ... **3.0** ... 100.0	
	AC.FACT3	Factor 3	0.1 ... **5.0** ... 100.0	
A.┗PST		Partial Stroke Test (PST) with option -Z P02 with the following parameters:		
	A1.STPOS	Start position	0.0 ... **100.0**	%
	A2.STTOL	Start tolerance	0.1 ... **2.0** ... 10.0	%
	A8.INTRV	Test interval	**OFF** / 1 ... 365	Days
	Ad.ENPOS	End position	0.0 ... **90.0** ... 100.0	%
	AE.ENTOL	End tolerance	1.0 ... **5.0** ... 20.0	%
	AF.BOLIM	Breakout pressure limit	0.1 ... **7.0**	bar
	AG.BOTOL	Breakout pressure tolerance	**0.1** ... 6.0	bar
	AH.PSTDO	Time to end position	1 ... **80** ... 300	s
	AJ.PSTUP	Time back to start position	**0** ... 300	s
	AL.PSTRP	Test repetitions	**0** ... 3	s
	AY.PSTIN	Start PST reference	**"leer"** / C-Err / oCAY / noINI / FdIni / SdrEF	
b.┗DEVI		Monitoring of dynamic control valve behavior with the following parameters:		
	b1.TIM	Time constant	**Auto** / 1 ... 400	s
	b2.LIMIT	Limit	0.1 ... **1.0** ... 100.0	%
	b3.FACT1	Factor 1	0.1 ... **5.0** ... 100.0	
	b4.FACT2	Factor 2	0.1 ... **10.0** ... 100.0	
	b5.FACT3	Factor 3	0.1 ... **15.0** ... 100.0	
C.┗LEAK		Monitoring/compensation of pneumatic leakage with the following parameters:		
	C1.LIMIT	Limit	0.1 ... **30.0** ... 100.0	%
	C2.FACT1	Factor 1	0.1 ... **1.0** ... 100.0	
	C3.FACT2	Factor 2	0.1 ... **1.5** ... 100.0	
	C4.FACT3	Factor 3	0.1 ... **2.0** ... 100.0	

Parameter		Function	Parameter values		Unit
d.ϟSTIC		Monitoring of stiction (slipstick) with the following parameters:			
	d1.LIMIT	Limit	0.1 ... **1.0** ... 100.0		%
	d2.FACT1	Factor 1	0.1 ... **2.0** ... 100.0		
	d3.FACT2	Factor 2	0.1 ... **5.0** ... 100.0		
	d4.FACT3	Factor 3	0.1 ... **10.0** ... 100.0		
E.ϟDEBA		Monitoring of deadband with the following parameters:			
	E1.LEVL3 *)	Threshold	0.1 ... **2.0** ... 10.0		%
	*) The values are monitored in the range of '0.1' to '2.9'. Values between '3.0' and '10.0' are not monitored.				
F.ϟZERO		Monitoring of lower endstop with the following parameters:			
	F1.LEVL1	Threshold 1	0.1 ... **1.0** ... 10.0		%
	F2.LEVL2	Threshold 2	0.1 ... **2.0** ... 10.0		
	F3.LEVL3	Threshold 3	0.1 ... **4.0** ... 10.0		
G.ϟOPEN		Monitoring of upper endstop with the following parameters:			
	G1.LEVL1	Threshold 1	0.1 ... **1.0** ... 10.0		%
	G2.LEVL2	Threshold 2	0.1 ... **2.0** ... 10.0		
	G3.LEVL3	Threshold 3	0.1 ... **4.0** ... 10.0		
H.ϟTMIN		Monitoring of lower limit temperature with the following parameters:			
	H1.TUNIT	Temperature unit	**°C**	°F	°C / °F
	H2.LEVL1	Threshold 1	-40 ... **-25** ... 90	-40 ... **-13** ... 194	
	H3.LEVL2	Threshold 2	-40 ... **-30** ... 90	-40 ... **-22** ... 194	
	H4.LEVL3	Threshold 3	**-40** ... 90	**-40** ... 194	
J.ϟTMAX		Monitoring of upper limit temperature with the following parameters:			
	J1.TUNIT	Temperature unit	**°C** / °F	°F	°C / °F
	J2.LEVL1	Threshold 1	-40 ... **75** ... 90	-40 ... **167** ... 194	
	J3.LEVL2	Threshold 2	-40 ... **80** ... 90	-40 ... **176** ... 194	
	J4.LEVL3	Threshold 3	-40 ... **90**	-40 ... **194**	
L.ϟSTRK		Monitoring of number of total strokes with the following parameters:			
	L1. LIMIT	Limit	1 ... **1E6** ... 1E8		
	L2.FACT1	Factor 1	0.1 ... **1.0** ... 40.0		
	L3.FACT2	Factor 2	0.1 ... **2.0** ... 40.0		
	L4.FACT3	Factor 3	0.1 ... **5.0** ... 40.0		
O.ϟDCHG		Monitoring of number of changes in direction with the following parameters:			
	O1.LIMIT	Limit	1 ... **1E6** ... 1E8		
	O2.FACT1	Factor 1	0.1 ... **1.0** ... 40.0		
	O3.FACT2	Factor 2	0.1 ... **2.0** ... 40.0		
	O4.FACT3	Factor 3	0.1 ... **5.0** ... 40.0		
P.ϟPAVG		Monitoring the position average value with the following parameters:			
	P1.TBASE	Time basis of average value generation	**0.5h** / 8h / 5d / 60d / 2.5y		
	P2.STATE	Status of monitoring of position average value	**IdLE** / rEF / ###.# / Strt		
	P3.LEVL1	Threshold 1	0.1 ... **2.0** ... 100.0		%
	P4.LEVL2	Threshold 2	0.1 ... **5.0** ... 100.0		%
	P5.LEVL3	Threshold 3	0.1 ... **10.0** ... 100.0		%

Parameter		Function	Parameter values	Unit
U.┗PRES		Pressure monitoring		
	U1.PUNIT	Pressure unit	**bAr** / PSI / MPA	
	U2.P_HYS	Hysteresis for limits	**0.200** ... 1.000	bar
			2.90 ... 14.50	psi
			0.020 ... 0.100	MPa
	U3.PFRLL	Behavior lower limit PZ	**Cont** / HoLd	
	U4.PFRUL	Behavior upper limit PZ	**Cont** / HoLd	
	U5.PZMLL	Lower limit PZ	**1.400** ... 7.000	bar
			20.30 ... 101.52	psi
			0.140 ... 0.700	MPa
	U6.PZMUL	Upper limit PZ	1.400 ... **7.000**	bar
			20.30 ... 101.52	psi
			0.140 ... 0.700	MPa
	U7.PCL	Limit actuating pressure Y1	0.000 ... **7.000**	bar
			0.00 ... 101.52	psi
			0.000 ... 0.700	MPa
	U8.LRL	Limit +/- Leakage	**0.000** ... 7.000	bar
			0.00 ... 101.52	psi
			0.000 ... 0.700	MPa
	U9.TPMT	Time pressure measurement Y1	**1** ... 100	s

6.0 Diagnostics and Troubleshooting

Output of system messages in the display

System messages before initialization

Remarks about the tables:

nn	Stands for variable numeric values
↳	Error symbol
/	(slash): the texts on the left and right of the slash flash alternately

Messages before initialization (first commissioning)

Message	Line		Meaning / cause	Measure
	Up	Down		
CPU Start	X	X	Message after application of electrical auxiliary power	• Maintenance
Pnnn.n	X		Potentiometer voltage of a non-initialized positioner (P-manual mode) (actual position value in % of the measuring range).	• Check whether the complete travel can be covered using the ▲ and ▽ buttons and that "P---" is never displayed. • Execute the initialization process.
P---	X		Measuring range was exceeded, the potentiometer is in the inactive zone, the transmission ratio selector or the effective lever arm are not adjusted as per the actuator travel.	• Switch the transmission ratio selector to 90°, especially in the case of part-turn actuators. • Adjust the effective lever length of linear actuators as per the measuring range.
NOINI		X	Positioner is not initialized.	• Start initialization.

System messages during initialization

Remarks about the tables:

nn	Stands for variable numeric values
↳	Error symbol
/	(slash): the texts on the left and right of the slash flash alternately

Messages during initialization

Message	Line		Meaning/cause	Measure
	Top	Bottom		
P---	X		Measuring range was exceeded, the potentiometer is in the inactive zone, the transmission ratio selectors or the effective lever arm are not adjusted as per the actuator travel	• Switch the transmission ratio selector to 90°, especially in the case of part-turn actuators. • Adjust the effective lever length of linear actuators as per the measuring range.
RUN 1		X	Initialization was started, part 1 is active (the direction of action is determined)	• Wait.
RUN 2		X	Initialization part 2 is active (actuator travel check and determination of stops)	• Wait.
RUN 3		X	Initialization part 3 is active (determination and display of travel times)	• Wait.
RUN 4		X	Initialization part 4 is active (determination of the minimum controller increment length)	• Wait.
RUN 5		X	Initialization part 5 is active (optimization of the transient response)	• Wait until "FINSH" is displayed. Initialization was completed successfully. • For option -Z P02: Wait.
RUN 6		X	Initialization part 6 is active (determination of Valve Signature)	• Wait until "FINSH" is displayed. Initialization was completed successfully.
YEND1		X	The first position of the stop can be approached only in case of a manual initialization	1. Approach first position of the stop with the button ⏃ or ▽. 2. Acknowledge using ⏎ button.
YEND2		X	The second position of the stop can be approached only in case of a manual initialization	1. Approach second position of the stop with the button ⏃ or ▽. 2. Acknowledge using ⏎ button.
RANGE		X	The position of the stop or the measuring span is beyond the permissible measuring range only in case of a manual initialization	• Approach a different position of the stop using ⏃ or ▽ button and acknowledge using ⏎ button. • Move the friction clutch until "ok" is displayed, and then acknowledge with the ⏎ button. • Terminate the initialization process using the ⏎ button, switch to the P-manual mode, and correct the actuator travel and the position displacement sensor.
ok		X	The permissible measuring range of end positions is achieved only in case of a manual initialization	• Use the ⏎ button to acknowledge; the remaining steps ("RUN 1" to "FINSH") run automatically.

Message	Line		Meaning/cause	Measure
	Top	Bot-tom		
RUN 1 / ERROR		X	Error in "RUN 1", no movement e.g. due to the lack of compressed air	Possible causes: • Insufficient supply of compressed air. • Restrictor(s) blocked. • Actuator does not move freely. Measures: 1. Eliminate possible causes. 2. Restart initialization.
VS-ER		X	Error in "RUN 6". Valve Signature (VS) could not be recorded successfully. Start/end position or return position not reached. Pressure sensor module defective.	• Check supply pressure. • Check whether application ranges are adhered to. • Check the pressure sensor module. Pressure values in the Diagnostics menu Parameter 60, 61, and 62 are plausible.
┗d___U		X	Bar graph display of the zero point is outside the tolerance range	1. Set between "P 4.0" and "P 9.9" (>0<) using friction clutch. 2. Continue using ⊿ or ▽ button.
SEt	X		Friction clutch was moved; "P 50.0" not displayed when the lever is horizontal	1. In the case of linear actuators, use the ⊿ or ▽ button to bring the lever perpendicular to the spindle. 2. Briefly acknowledge using ⏎ button (initialization is continued).
MIDDL		X		
┗UP >		X	"UP" tolerance range was exceeded or the inactive zone of the potentiometer was covered.	1. Increase the effective lever length of the linear actuators or switch the transmission ratio selector to 90°. 2. Briefly acknowledge using ⏎ button. 3. Restart initialization.
┗90_95		X	Possible only in case of part-turn actuators: actuator travel is not in the range between 90 and 95%	1. Use the ⊿ or ▽ button to move it in the range between 90 and 95%. 2. Briefly acknowledge using ⏎ button.
┗U-d>		X	"Up-Down" measuring span was undershot	1. Decrease the effective lever length of the linear actuators or switch the transmission ratio selector to 33°. 2. Briefly acknowledge using ⏎ button. 3. Restart initialization.
U nn.n	X		Display of the "Up" travel time	• Wait until initialization continues in RUN 4. • To change the travel time, interrupt the initialization process using the ▽ button. • Activate the leakage test using the ⊿ button.
D->U		X		

Message	Line		Meaning/cause	Measure
	Top	Bot-tom		
D nn.n	X		Display of the "Down" travel time	• Wait until initialization continues in RUN 4. • To change the travel time, interrupt the initialization process using the ▽ button. • Activate the leakage test using the ⚠ button.
U->d		X		
NOZZL		X	Actuator stops (the initialization process was interrupted using the "-" button when the actuation speed display was active)	1. The travel time can be changed by adjusting the restrictor(s). 2. Redetermine the positioning speed using the ▽ button. 3. Continue using ⚠ button.
TESt	X		Leakage test active (the "+" button was pressed when the actuation speed display was active)	• Wait for one minute.
LEAKG		X		
nn.n	X		Value and unit of the result after the leakage test	• Rectify the leakage if the value is too large. • Continue using ⚠ button.
%/MIN		X		
nn.n	X		Initialization completed successfully with the display of actuator travel or the actuator angle	1. Briefly acknowledge using ⏎ button. 2. Leave configuration level with a long press on the ⏎ button.
FINISH		X		

System messages when exiting the Configuration mode

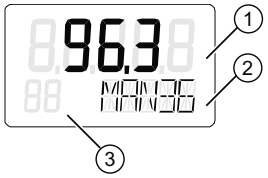
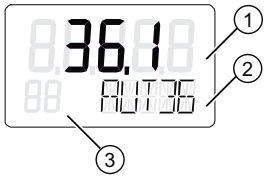
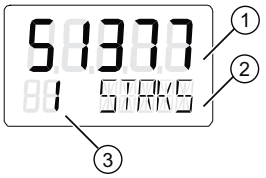
Remarks about the tables:

nn	Stands for variable numeric values
ϟ	Error symbol
/	(slash): the texts on the left and right of the slash flash alternately

Overview of error codes

Overview of error codes that activate the fault message output

The error codes are output in the fault message display shown below.

Operating mode	Representation in the display	Pos.	Legend
Manual mode (MAN)		①	Position [%]
		②	Setpoint [%]
		③	Fault message
Automatic (AUT)		①	Position [%]
		②	Setpoint [%]
		③	Fault message
Diagnostics		①	Diagnostics value
		②	Diagnostics name
		③	Diagnostics number

Error code	Number of thresholds	Event	Parameter setting	Error message disappears when	Possible causes
↳1	1	Control deviation: Actual value response has exceeded values for TIM and LIM	Always active	... the actual value response falls below the value for LIM	Supply pressure PZ missing, actuator fault, process valve fault (e.g. blockage).
↳2	1	Device not in "Automatic" mode	**.↳FCT[1)] =↳nA or = ↳nAB	... the device is changed to "Automatic" mode.	The device has been configured or is in the manual mode
↳3	1	Digital input DI1 or DI2 active	**.↳ FCT[1)] =↳nAB and digital function DI1 or DI2 set to "On"	... the digital input is no longer activated.	The contact connected to the digital input was active (e.g. packing gland monitoring, overpressure, temperature switch).
↳4	3	Limit for number of total strokes exceeded	L.↳STRK≠OFF	... the stroke counter is reset or the thresholds are increased	The total path covered by the actuator exceeds one of the configured thresholds.
↳5	3	Limit for number of changes in direction exceeded	O.↳DCHG≠OFF	... the counter for changes of direction is reset or the thresholds are increased.	The number of changes of direction exceeds one of the configured thresholds.
↳6	3	Lower endstop limit exceeded	F.↳ZERO≠OFF **.YCLS = do or up do	... the deviation of the endstop disappears or the device is re-initialized.	Wear and tear of the process valve, deposits or foreign bodies in the process valve, mechanical misalignment, friction clutch moved.

Error code	Number of thresholds	Event	Parameter setting	Error message disappears when	Possible causes
↳7	3	Upper endstop limit exceeded	G.↳OPEN≠OFF **.YCLS[1] = do or up do	... the deviation of the endstop disappears or the device is re-initialized.	Wear and tear of the process valve, deposits or foreign bodies in the process valve, mechanical misalignment, friction clutch moved.
↳8	1	Deadband limit exceeded	E.↳DEBA≠OFF **.DEBA[1] = Auto	... the limit is undershot again	Increased packing gland friction, mechanical gap in the position feedback.
↳9	3	Case 1: Partial Stroke Test exceeds reference stroke time.	A.↳PST≠OFF	Case 1: ... a Partial Stroke Test is successfully executed within the reference stroke time or the function is deactivated.	Case 1: Process valve is stuck or rusted. Increased stiction.
		Case 2: Start position outside the start tolerance		Case 2: ... the actuator is moved into the range of the PST start tolerance. Or: ... the PST start tolerance is increased until the actuator (PST start position) is within the PST start tolerance. Restart the Partial Stroke Test.	Case 2: Valve is present in the safety position.
	For Partial Stroke Test with option -Z P02:				
	1	Partial Stroke Test failed	A.↳PST≠OFF	... the next execution of the Partial Stroke Test is successful.	• Unexpectedly large step height detected during execution. • Lower limit of the internal breakout pressure violated • Lower limit of the internal rupture pressure violated • End position not reached • Return position not reached.
10	3	Deviation from expected dynamic control valve behavior	b.↳DEVI≠OFF	... the position is again in a narrow corridor between the set-point and the model, or the function is deactivated.	Actuator fault, process valve fault, process valve jams, increased stiction, decreased supply pressure PZ
11	3	Valve leakage	C.↳LEAK≠OFF	... the valve leakage has been remedied or the function is deactivated.	Pneumatic leakage
12	3	Stiction limit (slip-stick) exceeded	d.↳STIC≠OFF	... Slipjumps can no longer be detected, or the function is deactivated.	Increased stiction, process valve no longer moves smoothly but in jerky motion.
13	3	Temperature undershot	H.↳TMIN≠OFF	... the low temperature thresholds are no longer undershot.	Ambient temperature too low

Error code	Number of thresholds	Event	Parameter setting	Error message disappears when	Possible causes
14	3	Temperature overshot	J.┗TMAX≠OFF	... the high thresholds are no longer overshot.	Ambient temperature too high
15	3	Position average deviates from the reference value	P.┗PAVG≠OFF	... the average position value calculated after a comparison interval is again within the thresholds for the reference value, or the function is deactivated.	In the last comparison interval, the process valve characteristic was changed so significantly that a deviating average value of position was calculated.

[1)] You can find additional information on the parameter in the corresponding parameter descriptions

The following table shows error codes that are displayed when pressure monitoring is activated:

Error code	Number of thresholds	Event	Parameter setting	Error message disappears when	Possible causes
16[1)]	1	Partial Stroke Test (PST) is performed with non-plausible parameter values	A.┗PST≠OFF and U.┗PRES≠OFF	...the parameter values entered in A1.STPOS, A3.STRKH and A4.STRKD are plausible. **For** Partial Stroke Test **with option -Z P02:** • ... the parameter values entered in A1.STPOS, A2.STTOL and Ad.ENPOS are plausible. • ... a higher pressure level exists for A1.STPOS than for Ad.ENPOS. For double-acting actuators, the pressure difference P2 minus P1 is decisive.	Parameters for Partial Stroke Test are not plausible Extended diagnostics parameters were reset.
17	1	Pressure sensor module defective	U.┗PRES≠OFF	... the device is restarted with functioning pressure sensor module. ... the pressure monitoring U.┗PRES is set to OFF and the device is restarted.	Pressure sensor module was overloaded. Electrical connection was terminated.
18	1	Lower limit of supply pressure fallen below	U.┗PRES≠OFF	... the supply pressure PZ is higher than the limit value in U2.PRMLL plus the hysteresis in U2.P_HYS.	Supply pressure PZ is too low
19	1	Supply pressure PZ out of specification	U.┗PRES≠OFF	... the supply pressure PZ is within the positioner specification of 1.4 to 7.0 bar plus the hysteresis in U2.P_HYS.	Supply pressure PZ too high or too low

Error code	Number of thresholds	Event	Parameter setting	Error message disappears when	Possible causes
20	1	Upper limit of supply pressure PZ exceeded	U.↳PRES≠OFF	... the supply pressure PZ is lower than the limit value in U6.PRMUL minus the hysteresis in U2.P_HYS.	Supply pressure PZ too high
21	1	Limit of actuating pressure at Y1	U.↳PRES≠OFF	... the actuating pressure at Y1 is lower than the limit value in U7.PCL minus the hysteresis in U2.P_HYS.	Actuating pressure at Y1 too high
22	1	Limit +/- Leakage exceeded	U.↳PRES≠OFF	... when the cause has been eliminated and the relevant diagnostics values LMUY1, LMUY2, LMDY1 and LMDY2 are reset. ... or when LRL = 0 is set.	Pneumatic system is leaky.

[1] The fault message is displayed but not reported via the fault message output.

Fault and remedy

Fault profile (symptoms)	Possible cause(s)	Remedy
Positioner remains in "RUN 1".	• Initialization started from the end position • The response time of a maximum of 1 minute was not observed • Supply pressure PZ not connected or supply pressure PZ too low. • Compressed air line blocked, e.g. solenoid valve	• A waiting time of up to 1 minute is required • Do not start initialization from the end position. • Ensure supply pressure PZ. • Free up blocked lines
Positioner remains in "RUN 2".	• Transmission ratio selector and parameter 2 • "YAGL" and the real stroke do not match. • Incorrectly set stroke on the lever • Pneumatic block does not switch.	• Check settings: Parameters 2 and 3 • Check the stroke setting on the lever
Positioner remains in "RUN 3".	• Actuator travel time is too high	• Open the restrictor completely and/or set supply pressure PZ to the highest permissible value. • Use a booster if required.
Positioner remains in "RUN 5", does not go to "FINISH" (waiting time > 5 min.).	• "Gap" (play) in the positioner - actuator - control valve system	• Part-turn actuator: Check for firm seating of set screw on coupling wheel • Linear actuator: Check for firm seating of lever on positioner shaft. • Correct any other play between the actuator and the control valve.
	• Diagnostic value "9.TUP" or "10.TDOWN" < 1.5 s	• Adjust the travel speed to > 1.5 s with the internal restrictors.

Fault profile (symptoms)	Possible cause(s)	Remedy
"CPU test" flashes on the local display approximately every 2 seconds.	• Water in the pneumatic block (due to wet compressed air)	• At an early stage, this fault can be rectified with subsequent operation using dry air, in a temperature cabinet at 50 to 70 °C if required. • Otherwise: Repair
Pneumatic block does not switch.		
In the manual and automatic modes, the actuator cannot be moved or can be moved only in one direction.	• Moisture in the pneumatic block	
Pneumatic block does not switch. A gentle click sound is also not audible when the ▲ or ▽ buttons are pressed in manual mode.	• The screw between the cover and the pneumatic block has not been tightened firmly or the cover is jammed.	• Tighten the screw; correct jam, if required.
	• Dirt (swarf, particles) in the pneumatic block	• Repair or a new device; built-in fine screen, can also be replaced and cleaned.
	• Deposits on contacts between the electronics board and the pneumatic block can develop due to abrasion resulting from continuous strong vibration loads.	• Clean all contact surfaces with spirit; bend the pneumatic block contact springs slightly if required.
Actuator does not move.	Compressed air < 1.4 bar	Set supply pressure PZ to > 1.4 bar.
Pneumatic block does not switch (however, a gentle clicking sound can be heard when the ▲ or ▽ button is pressed in "Manual" mode.)	• Restrictors on the pneumatic block are closed (screw at the right end-stop)	• Open the restrictor screw by turning it to the left.
	• Dirt in the pneumatic block	• Repair or a new device; built-in fine screen, can also be replaced and cleaned.
The pneumatic block continually switches in stationary automatic mode (constant setpoint) and in "Manual" mode.	• Pneumatic leakage in the positioner - actuator system; start the leakage test in "RUN 3" (initialization).	• Rectify leakage in the actuator and/or feed line. • In case of an intact actuator and tight feed line: Repair or new device
	• Dirt in the pneumatic block	• Repair or a new device; built-in fine screen, can also be replaced and cleaned.
The pneumatic block continually switches and the actuator oscillates around a mean value in stationary automatic mode (constant setpoint) and in "Manual" mode.	• Stiction of the packing gland from the control valve or actuator too large	• Reduce stiction or increase deadband of positioner (parameter "dEbA") until the oscillation stops.
	• Looseness (play) in the positioner/ actuator/control valve system	• Part-turn actuator: Check for firm seating of set screw on coupling wheel. • Linear actuator: Check for firm seating of lever on positioner shaft. • Correct any other play between the actuator and the control valve.
	• Actuator too fast	• Increase travel times using restrictor screws. • If a quick travel time is needed, increase the deadband (parameter "dEbA") until the oscillation stops.

Fault profile (symptoms)	Possible cause(s)	Remedy
Positioner does not move control valve to the endstop (at 20 mA).	Supply pressure is too low. Load on the feeding controller or system output is too low.	• Increase supply pressure, insert ballast converter • Select 3-/4-wire operation.
Zero point displaces sporadically (> 3%).	Impact or shock loads result in accelerations so high that the friction clutch moves, e.g. due to "vapor shocks" in vapor lines.	• Rectify the causes for shock loads. • Re-initialize the positioner.
The device function has completely failed: No representation on the display either.	Electrical auxiliary power is not adequate.	Check the electrical auxiliary power.
	In case of very high continuous loads due to vibrations (oscillations): • Screws of the electrical connecting terminals may be loosened. • Electrical connecting terminals and/or electronic components may be knocked out.	• Tighten the screws firmly and secure using sealing wax. • Repair • For prevention: Install the positioner on damping pads.
Pressure sensor module		
Display shows "VS-ERR".	Valve Signature could not be recorded successfully. Possible causes: • Pressure sensor module defective • Actuator does not move or no pressure change is detected	• Check whether the pressure sensor module supplies plausible pressure values; diagnostics values 60, 61 and 62. • Restart the initialization. • Contact Support. • Check actuator and supply pressure PZ.
Display shows fault message "16".	The Partial Stroke Test is not configured correctly.	• Execute stroke direction from high pressure level to lower pressure level. For double-acting actuators, the pressure difference P2 minus P1 is decisive. • The "A1.STPOS". "Ad.ENPOS" and "A2.STTOL" parameters must be selected in such a way that the following condition is true: A1.STPOS - A2.STTOL > Ad.ENPOS +5 % (higher pressure level at 100%) A1.STPOS + A2.STTOL < Ad.ENPOS - 5 % (higher pressure level at 0%)
Display shows "99999" for diagnostics value "60.PZ", "61.P1" and "62.P2".	Pressure sensor module defective	Replace pressure sensor module
Display shows fault message "17".		
Display shows fault message "18".	Supply pressure PZ falls below the lower limit (U5.PZMLL).	Increase supply pressure PZ until the limit (U5.PZMLL) plus hysteresis (U2.P_HYS) is exceeded.

Fault profile (symptoms)	Possible cause(s)	Remedy
Display shows fault message "19".	Supply pressure PZ is out of specification	Adjust supply pressure PZ until the device-specific limits of 1.4 to 7 bar +/- hysteresis (U2.P_HYS) are adhered to.
Display shows fault message "20".	Supply pressure exceeds the upper limit (U6.PZMUL)	Reduce supply pressure PZ until the limit (U6.PZMUL) minus hysteresis (U2.P_HYS) is fallen below.
Display shows fault message "21".	Chamber pressure at Y1 exceeds the lim-it (U7.PCL)	• Check to determine why the chamber pressure was exceeded. • Reduce the chamber pressure by moving the positioner in the opposite direction.
Display shows fault message "HoLd".	• Device is at "Hold position", when "HoLd" is assigned as the response (U3.PFRLL or U4.PFRUL).	• Increase or reduce supply pressure according to fault message "18" or "20".
	• The actuating pressure at Y1 exceeds the limit (U7.PCL)	• Check to determine why the actuating pressure was exceeded. • Reduce the actuating pressure by moving the positioner in the opposite direction.
Display shows fault message "22".	• Pressure increase / leakage (pressure decrease) exceeds the limit (U8.LRL)	• Find and eliminate the cause of the pressure increase / leakage. Also reset diagnostics values 69, 70, 71 and 72. • Reset the "U8.LRL" limit to 0.

7.0 Fail States

Behavior in case of failure of the electrical auxiliary power and/or the supply pressure PZ

Overview

CAUTION

Note the following before working on the control valve

Note that, before working on the control valve, you must first move it to the safety position. Make sure that the process valve has reached the safety position. If you only interrupt the supply pressure PZ to the positioner, the safety position may in some cases only be attained after a certain delay period.

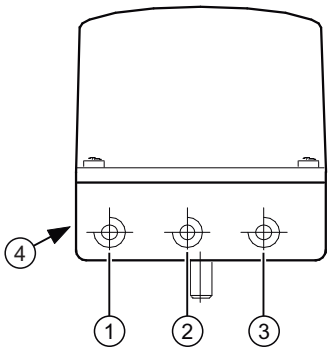
The difference between a failure of supply pressure PZ and a failure of electrical auxiliary power:

- Failure of **electrical auxiliary power** means:
  - Device version 2-wire: Failure of signal source 4 to 20 mA
  - Device version 3/4-wire: Failure of power source 18 to 30 V
- Failure of the **supply pressure PZ**

With 3-wire/4-wire device version, the 0% position is approached if the 4 to 20 mA signal source fails. The following table shows the pneumatic connection versions for different actuator types, regulating action and safety position after failure.

Actuator type	Behavior in case of failure: The actuator moves into safety position		Fail in place, order suffix F01	
	Failure of electrical auxiliary power	Failure of supply pressure PZ	Failure of electrical auxiliary power	Failure of supply pressure PZ
Single-acting	Y1 = depressurized	Y1 = depressurized	Y1 = closed	Y1 = closed
Double-acting	Y1 = pressurized Y2 = depressurized	Y1 = closed Y2 = closed	Y1 = closed Y2 = closed	Y1 = closed Y2 = closed

Structure of pneumatic connection



① Output: Actuating pressure Y2 *)
② Input: Supply pressure PZ
③ Output: Actuating pressure Y1
④ Exhaust air outlet with sound absorber, thread G¼

*) for double-acting actuators

SINCE 1986, BRAY HAS PROVIDED FLOW CONTROL SOLUTIONS
FOR A VARIETY OF INDUSTRIES AROUND THE WORLD.

VISIT **BRAY.COM** TO LEARN MORE ABOUT
BRAY PRODUCTS AND LOCATIONS NEAR YOU.

HEADQUARTERS

Bray International, Inc.
13333 Westland East Blvd.
Houston, Texas 77041
Tel: +1.281.894.5454

EN_TSM-2004-6A Advanced_Set-Up_20211012

Bray®

THE HIGH PERFORMANCE COMPANY

BRAY.COM