USER MANUAL

Intelligent Valve Controller

IVC24

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Table of contents

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1 General

This manual covers software version:

Software ID: DVC-SW-001
Software Version: 2.12

This manual covers hardware revision:

IVC24-F	Rev. 2
IVC24-A	Rev. 3
IVC24-AF	Rev. 2

1.1 Safety instructions

For a safe installation of an IVC24 the following must be observed. The module must only be installed by qualified personnel who are familiar with the national and international laws, directives and standards that apply to this product as well as all instructions in this manual.

The information in this user manual is subject to changes without notice.

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2 Application

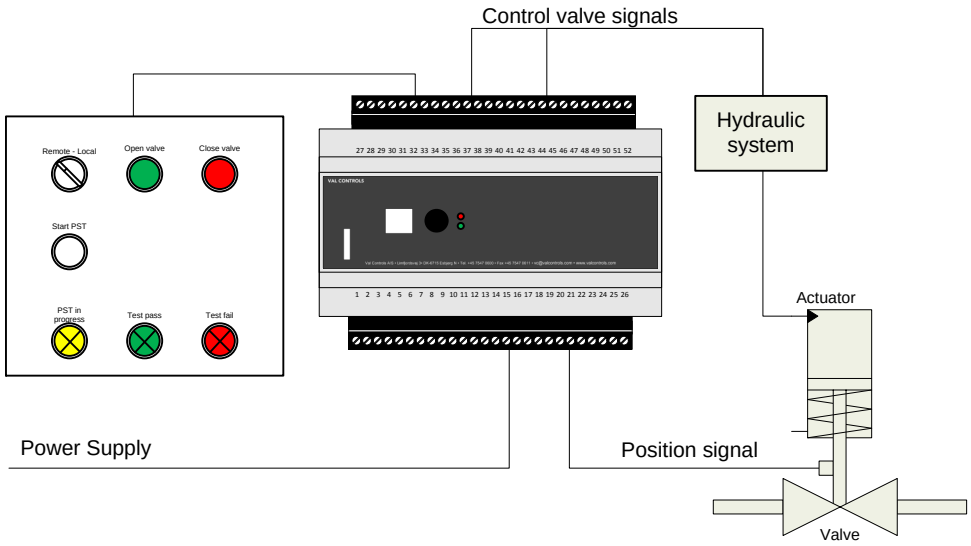
The IVC is a simple partial stroke unit developed by Val Controls.

The system is very easy to install and adjust and it offers a very simple but efficient test of the ESD system. It can be installed on new and old installation.

The IVC24 can control an ON/OFF valve with a hydraulic or pneumatic system.
24 VDC power supply must be connected to the IVC24 which then powers the control valves.

A local control panel can be connected to provide the ability to start the test at the location and get a pass/fail signal to indicate the result of the test.

The unit is configured over a communication bus.



3 Installation guide

1. Connect all wires and make sure that all is connected correctly according to the hardware manual/installation drawings.

2. Configure the unit using ValConnect
    a. Configure the valve setup, see 5.4 Configuration
    b. Configure the test settings, see 5.4 Configuration

3. Auto calibrate the unit by pushing the button for 3sec..

4. After a successful calibration the green indicator will light. If the red is light, there was an error during calibration. Connect ValConnect and see what the error message is and go to the manual to get an explanation on the error no. and how to solve it, see 9 System errors.

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4 Specifications

4.1 Environment

Operating temperature: -40 to 85˚C
Storage temperature: -55 to 100˚C

Relative Humidity: < 95% (No condensation)

The hardware is coated for tropical climate conditions on exposed areas.

4.2 Terminals

Screw torque: 0.4Nm (3.6Lb. in)
Wire diameter: 28-12 AWG 2.5mm^2

4.3 Dimension and mounting

Dimensional drawings can be found on www.valcontrols.com.

Mounting: 35mm DIN rail according to EN50022.

Connect the IVC24 to ground to avoid electromagnetic interference.

After installation the lid has to be closed properly to maintain the IP rating.
The O-ring is as standard treated with Molykote 55 O-ring grease. To maintain the IP rating the O-ring has to be treated every 2nd year with Molykote 55 O-ring grease or similar.

4.4 Electrical specifications

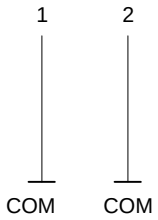
Power supply / ESD in	
Power supply	20.4 – 27.6VDC
Power dissipation, no position sensor/loop or valves are connected.	< 2W
Power dissipation, with maximum load on all inputs and outputs	< 5W
Digital output – DO	
Max load per digital output	up to 48W @24VDC only if powered through terminal 5 and 6
Max load total	up to 192W @24VDC if powered through terminal 5 and 6. If powered through terminal 21 and 22 the max load is 2W @24VDC
ESD out	
Max load per digital output	up to 48W @24VDC
Digital input - DI	
Type	Normally open / normally close
Cable length (unknown resistance)	20 meters
Maximum cable resistance	100 ohm
AO0	
Impedance	< 470 ohm @20mA and 9,4VDC
Linearity	< 0.1%
Temperature coefficient	0.025% / 1°C
HART	FSK, 1200Hz / 2200Hz 400-800mVpp
Galvanic isolated	
AI0	
Impedance	< 470 ohm @20mA and 9,4VDC
Linearity	< 0.1%
Temperature coefficient	0.01% / 1°C
HART	FSK, 1200Hz / 2200Hz 400-800mVpp
Galvanic isolated	
Analogue input – AI	
External position loop max Rload	585 ohm @20mA and 11.5VDC
Operating area	4 – 20mA
Minimum span	12mA
Cable length	1000 meters
Linearity	< 0.1%
Temperature coefficient	0.01% / 1°C
Position sensor	
Potentiometer size	5 Kohm to 20 Kohm
Minimum use operating area	40%
Cable length	1.5 meters
Linearity	< 0.1%
Temperature coefficient	0.01% / 1°C
Internal Watch	

Time deviation	Δf/fo = +/- 20ppm
Aging	Δf/fo = +/- 3ppm / Year
Temperature Coefficient	β = -0.034 +/- 0.006ppm/°C²

Important:
All external components must have specifications that fit the desired performance and requirements of the valve/actuator system.

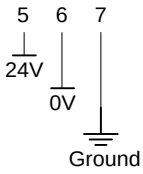
4.4.1 Communication

Communication interface. See separate manual.



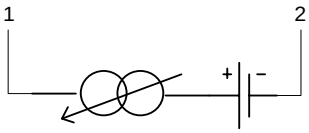
4.4.2 Power supply

Connection for an external power supply. Consult separate SIL manual for correct use.

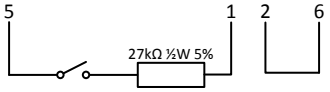


4.4.3 AI0

4-20mA analogue input signal. The input is passive.



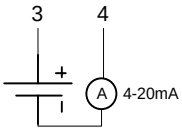
Passive loop



Digital input

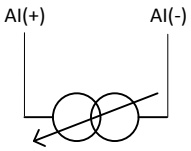
4.4.4 AO0

4-20mA analogue output signal. The output is passive.

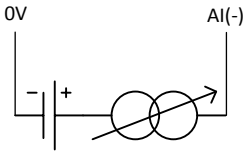


4.4.5 Analogue input

The position feedback is a 4-20mA loop powered transmitter.

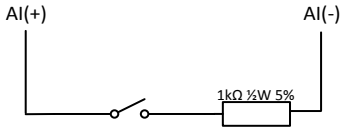


Passive transmitter



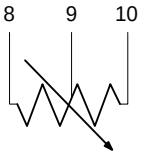
Active transmitter

To use the analogue input as a digital input use the following schematic.

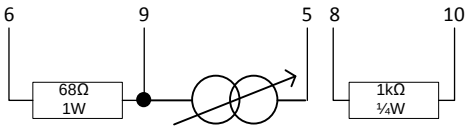


4.4.6 Position sensor

The position feedback can be delivered from a 3-wire potentiometer. The Sensor input can as an alternative also be used as a loop input.



Potentiometer



Passiv loop

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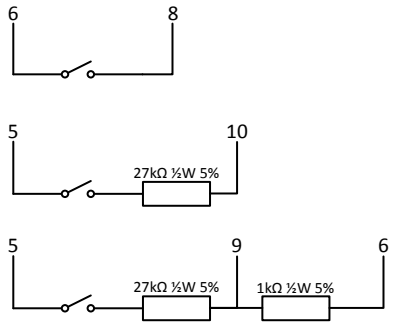
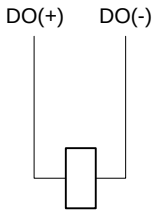


Digital input

4.4.7 Digital output

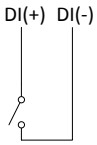
The unit has 3 digital outputs to control 24VDC devices.



Each output port can be configured with a "Turn Off Period" from 1 – 240 minutes.

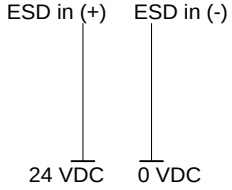
4.4.8 Digital input

The digital inputs can be used for connecting digital input signals.



4.4.9 ESD input

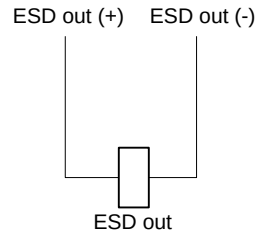
Power to the ESD solenoid valve. Consult separate SIL manual for correct use.



4.4.10 ESD out

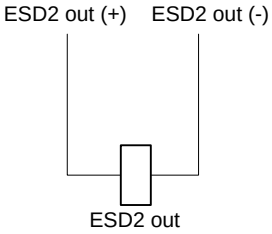
The ESD line is continued through the IVC24. The output requires power on the ESD in line to be active.

ESD out is active to open the valve.



4.4.11 ESD2 out

The ESD line is continued through the IVC24. The output is inverted, that is when ESD out is power the ESD2 out is power off. The output requires power on the ESD in line to be active.



4.5 Terminals for IVC24-F

See the chart below to see how to connect to the terminals on the IVC24-F.

Passive analogue input (optional)	**Digital output**
1. AI0 (+) 2. AI0 (-)	27. DO 1 (+) 28. DO 1 (-) 30. DO 2 (+) 31. DO 2 (-) 33. DO 3 (+) 34. DO 3 (-)
Passive analogue output (optional)	
3. AO0 (+) 4. AO0 (-)	
Power supply	
5. External 24 VDC power supply (+) 6. External 24 VDC power supply (-) 7. Ground	**ESD in / ESD power supply**
Active analogue input	21. ESD in (+) 22. ESD in (-)
11. AI1 (+) 12. AI1 (-) 13. AI2 (+) 14. AI2 (-)	**ESD out** 23. ESD out (+) 24. ESD out (-)
Digital input	**Alternative digital inputs**
39. DI 1 (+) 40. DI 1 (-) 41. DI 2 (+) 42. DI 2 (-) 43. DI 3 (+) 44. DI 3 (-)	1. DI12 – AI0 (+) 2. DI12 – AI0 (-) 11. DI13 – AI1 (+) 12. DI13 – AI1 (-) 13. DI14 – AI2 (+) 14. DI14 – AI2 (-)

Note: Terminal 7 must be connected to Ground. All grounds are connected internally.

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4.6 Terminals for IVC24-A and IVC24-AF

See the chart below to see how to connect to the terminals on the IVC24-A and IVC24-AF.

Passive analogue input (optional)	**Digital output**
1. AI0 (+)	27. DO 1 (+)
2. AI0 (-)	28. DO 1 (-)
Passive analogue output (optional)	29. Ground
3. AO0 (+)	30. DO 2 (+)
4. AO0 (-)	31. DO 2 (-)
Power supply	32. Ground
5. External 24 VDC power supply (+)	33. DO 3 (+)
6. External 24 VDC power supply (-)	34. DO 3 (-)
7. Ground	35. Ground
Position sensor	36. DO 4 (+)
8. Position sensor – High	37. DO 4 (-)
9. Position sensor – Wiper	38. Ground
10. Position sensor – Low	47. DO 5 (+)
Active analogue input	48. DO 5 (-)
11. AI1 (+)	49. DO 6 (+)
12. AI1 (-)	50. DO 6 (-)
13. AI2 (+)	**Digital input**
14. AI2 (-)	39. DI 1 (+)
15. AI3 (+)	40. DI 1 (-)
16. AI3 (-)	41. DI 2 (+)
17. AI4 (+)	42. DI 2 (-)
18. AI4 (-)	43. DI 3 (+)
19. AI5 (+)	44. DI 3 (-)
20. AI5 (-)	45. DI 4 (+)
Alternative digital inputs	46. DI 4 (-)
8. DI9 – Position sensor – High	
9. DI10 – Position sensor – Wiper	
10. DI11 – Position sensor – Low	
1. DI12 – AI0 (+)	
2. DI12 – AI0 (-)	
11. DI13 – AI1 (+)	
12. DI13 – AI1 (-)	
13. DI14 – AI2 (+)	
14. DI14 – AI2 (-)	
15. DI15 – AI3 (+)	
16. DI15 – AI3 (-)	
17. DI16 – AI4 (+)	
18. DI16 – AI4 (-)	
19. DI17 – AI5 (+)	
20. DI17 – AI5 (-)	

Note: Terminal 7 must be connected to Ground. All grounds are connected internally.

4.7 Terminals for expansion board 3:2 for IVC24-A and IVC24-AF

Extra digital inputs.

4.7.1 Terminals

Digital input	
21. DI 8 (+) 22. DI 8 (-) 23. DI 7 (+) 24. DI 7 (-)	25. DI 6 (-) 26. DI 6 (+) 51. DI 5 (+) 52. DI 5 (-)

4.8 Terminals for expansion board 3:3 for IVC24-A and IVC24-AF

When using the Emergency Shutdown Controller (SIL) to power the IVC must terminal 5 and 6 no be connected.

4.8.1 Terminals

Power supply	Digital output
21. Power supply (+) 22. Power supply (-)	23. ESD out (+) 24. ESD out (-) 25. ESD2 out (+) 26. ESD2 out (-)

4.9 Terminals for expansion board 3:4 for IVC24-A and IVC24-AF

When using the Emergency Shutdown Controller (SIL) + extra 24VDC power supply.

The IVC24 must be connected to an external power supply on terminal 5 and 6.

4.9.1 Terminals

Digital input	Digital output
21. ESD in (+) 22. ESD in (-)	23. ESD out (+) 24. ESD out (-) 25. ESD2 out (+) 26. ESD2 out (-)

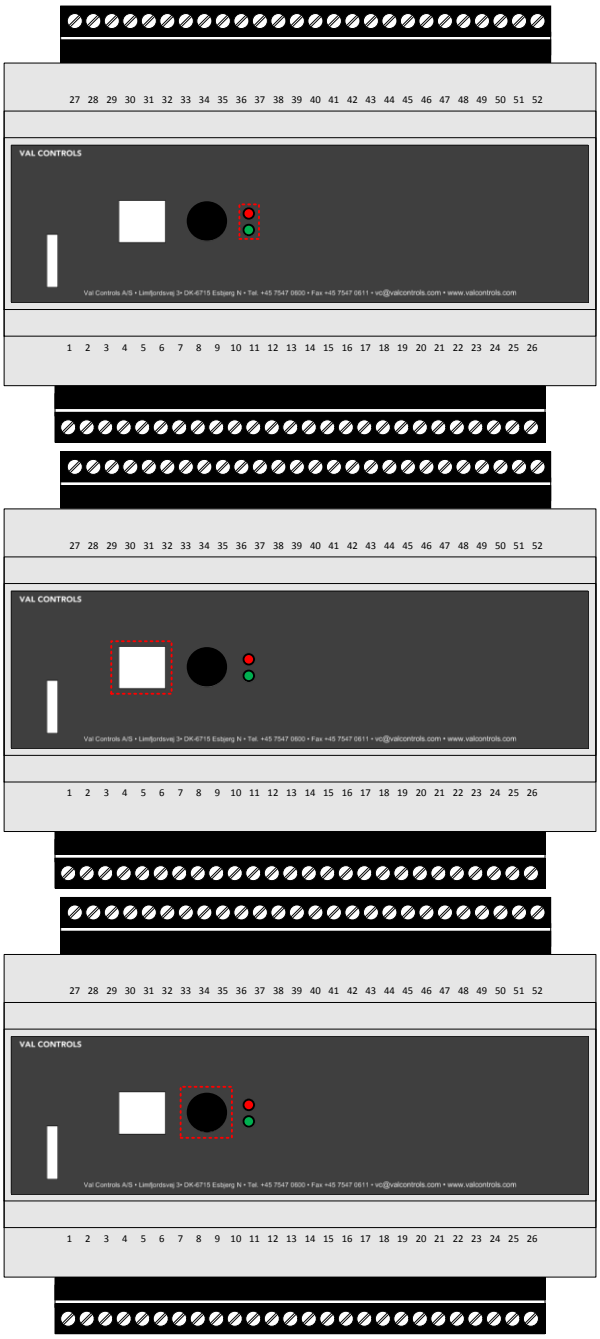
4.10 User interface

The IVC24 is fitted with two indicators.

Indicators

USB connector

Button



4.10.1 Indicator

The indicator lights will work as follow:

	Green LED	Red LED
Loading data from Eeprom	Blink	Off
System error	Off	On
System ok	On	Off

4.10.2 USB connector

The USB port is used to connect the IVC24 to a computer with ValConnect.

4.10.3 Button

The button is used to start the auto calibration. Push for 3 sec.

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5 Parameter Lists

5.1 Identification

Identification	Default value	Description
Identification		
Software version		Software version number, e.g. 10203 = 1.02.03
Software ID		Software identification number
Manufacture name		Product manufacturer name
Type name		Product type name
Serial number		Serial number
Part number		Part number
Tag number		User configurable tag number

5.2 Logs

Log	Default value	Description
System error log		
Number of errors		Number of entries in the log
System error 1		Value of newest system error
System error 2		Value of error
System error 3		Value of error
System error 4		Value of error
System error 5		Value of error
System error 6		Value of error
System error 7		Value of error
System error 8		Value of error
System error 9		Value of error
System error 10		Value of oldest error, if a new error occurs this value will be removed.
Test log		
Number of errors		Number of entries in the log
Test error 1		Value of newest test logging
Test error 2		Value of test logging
Test error 3		Value of test logging
Test error 4		Value of test logging
Test error 5		Value of test logging
Test error 6		Value of test logging
Test error 7		Value of test logging
Test error 8		Value of test logging
Test error 9		Value of test logging
Test error 10		Value of oldest test logging, if a new error occurs this value will be removed
Event log		**Event log**
Number of events		Number of events in the event log in the memory
Event 1 Type		Type of event
Event 1 Date		Date when the event occured
Event 1 Time		Time when the event occured
Event 1 Argument		Argument for the event. Only applicable for some event types
Event 2 Type		Type of event
Event 2 Date		Date when the event occured
Event 2 Time		Time when the event occured
Event 2 Argument		Argument for the event. Only applicable for some event types

Event 3 Type		Type of event
Event 3 Date		Date when the event occured
Event 3 Time		Time when the event occured
Event 3 Argument		Argument for the event. Only applicable for some event types
Event 4 Type		Type of event
Event 4 Date		Date when the event occured
Event 4 Time		Time when the event occured
Event 4 Argument		Argument for the event. Only applicable for some event types
Event 5 Type		Type of event
Event 5 Date		Date when the event occured
Event 5 Time		Time when the event occured
Event 5 Argument		Argument for the event. Only applicable for some event types
Event 6 Type		Type of event
Event 6 Date		Date when the event occured
Event 6 Time		Time when the event occured
Event 6 Argument		Argument for the event. Only applicable for some event types
Event 7 Type		Type of event
Event 7 Date		Date when the event occured
Event 7 Time		Time when the event occured
Event 7 Argument		Argument for the event. Only applicable for some event types
Event 8 Type		Type of event
Event 8 Date		Date when the event occured
Event 8 Time		Time when the event occured
Event 8 Argument		Argument for the event. Only applicable for some event types
Event 9 Type		Type of event
Event 9 Date		Date when the event occured
Event 9 Time		Time when the event occured
Event 9 Argument		Argument for the event. Only applicable for some event types
Event 10 Type		Type of event
Event 10 Date		Date when the event occured
Event 10 Time		Time when the event occured
Event 10 Argument		Argument for the event. Only applicable for some event types

5.3 Live Status

Live status	Default value	Description	Val
Position			
Position - travel	0	Position in %. For switches 0% and 100% are shown	
End position - 100%			
End position - 0%			
Device state			
Valve test service		Shows what test service the device is running, e.g. partial stroke test or auto calibration	
Digital Inputs			
DI1	Off	Current status of the input	
DI2	Off	Current status of the input	
DI3	Off	Current status of the input	
DI4	Off	Current status of the input	
DI5	Off	Current status of the input	
DI6	Off	Current status of the input	
DI7	Off	Current status of the input	

DI8	Off	Current status of the input	
DI9	Off	Current status of the input	
DI10	Off	Current status of the input	
DI11	Off	Current status of the input	
DI12	Off	Current status of the input	
DI13	Off	Current status of the input	
DI14	Off	Current status of the input	
DI15	Off	Current status of the input	
DI16	Off	Current status of the input	
DI17	Off	Current status of the input	
Digital Outputs			
DO1	Off	Current status of DO1	
DO2	Off	Current status of DO2	
DO3	Off	Current status of DO3	
DO4	Off	Current status of DO4	
DO5	Off	Current status of DO5	
DO6	Off	Current status of DO6	
Analogue Inputs			
Analogue Input 0			
AI0 - unit	0	Value measured in a given unit	
AI0	0	mA value of the input	
Analogue Input 1			
AI1 - unit	0	Value Measured at the input	
AI1	0	mA value of the input	
Analogue Input 2			
AI2 - unit	0	Value measured in a given unit	
AI2	0	mA value of the input	
Analogue Input 3			
AI3 - unit	0	Value measured in a given unit	
AI3	0	mA value of the input	
Analogue Input 4			
AI4 - unit	0	Value measured in a given unit	
AI4	0	mA value of the input	
Analogue Input 5			
AI5 - unit	0	Value measured in a given unit	
AI5	0	mA value of the input	
Scheduler			
Action required?	0	A flag used in semi auto to indicate that an action must be performed	
Advanced			
Digital inputs			
DI1	0	Raw ADC value of the input	
DI2	0	Raw ADC value of the input	
DI3	0	Raw ADC value of the input	
DI4	0	Raw ADC value of the input	
DI5	0	Raw ADC value of the input	
DI6	0	Raw ADC value of the input	
DI7	0	Raw ADC value of the input	
DI8	0	Raw ADC value of the input	
Analogue inputs			

AI0 (DI12)	0	Raw ADC value of the input	
AI1 (DI13)	0	Raw ADC value of the input	
AI2 (DI14)	0	Raw ADC value of the input	
AI3 (DI15)	0	Raw ADC value of the input	
AI4 (DI16)	0	Raw ADC value of the input	
AI5 (DI17)	0	Raw ADC value of the input	
Analogue outputs			
AO0		Raw ADC value of the output	
Potentiometer Input			
Pot high (DI9)	0	Potentiometer high pin ADC value	
Pot wiper (DI10)	0	Potentiometer wiper pin ADC value	
Pot low (DI11)	0	Potentiometer low pin ADC value	
Power supply			
Power supply	0	Voltage on the Power supply	
Power supply	0	Raw ADC value	
ESD signal status			
ESD power line status		ESD Line Status	
SIL relay energized		Is the Internal SIL Relay energized	
ESD power - adc		raw ADC value for ESD line sensor	
Is in ESD mode		0: Unknown; 1: Yes; 2: No	
SIL SOV1		Raw ADC value	
SIL SOV1 Current	0	Current drawn by SOV1	
SIL SOV2		Raw ADC value	
SIL SOV2 Current	0	Current drawn by SOV2	
Expansion boards			
Is Bluetooth module installed		Tells if Bluetooth module is available	
Is fieldbus module installed		Tells if fieldbus module is available	
File numbers			
PST		Number of the latest file	
FST		Number of the latest file	
SOT		Number of the latest file	
PST reference		Number of the latest file	
FST reference		Number of the latest file	
SOT reference		Number of the latest file	
EST		Number of the latest file for all the test	
Test order		**The order the tests were performed.**	
Test 1	None	The type of the latest test	
Test 2	None	The type of the second last test	
Test 3	None	The type of the third last test	
Valve test status	**Default value**	**Description**	**Val**
Latest tests			
Last PST result	No Test	Result of the last Partial Stroke Test	
Last FST result	No Test	Result of the last Full Stroke Test	
Last SOT result	No Test	Result of the last Solenoid Valve Test	
Partial stroke test			

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Last test		**Last partial stroke test measurements**	
Time		Time for last partial stroke	
Date		Date for last partial stroke	
Breakaway time	0	Breakaway time	
Closing time	0	Closing time	
Opening time	0	Opening time	
Total time	0	Total time	
Max travel	0	Maximum travel distance	
Reference test		**Partial stroke reference measurements**	
Time		Time for last reference partial stroke	
Date		Date for last reference partial stroke	
Breakaway time	0	Breakaway time	
Closing time	0	Closing time	
Opening time	0	Opening time	
Total time	0	Total time	
Max travel	0	Maximum travel distance	
Full stroke test			
Last test		**Last full stroke test measurements**	
Time		Time for last full stroke	
Date		Date for last full stroke	
Breakaway time	0	Breakaway time	
Closing time	0	Closing time	
Opening time	0	Opening time	
Total time	0	Total time	
Reference test		**Full stroke reference measurements**	
Time		Time for last reference full stroke	
Date		Date for last reference full stroke	
Breakaway time	0	Breakaway time	
Closing time	0	Closing time	
Opening time	0	Opening time	
Total time	0	Total time	
Solenoid test			
Last test		**Last solenoid test measurements**	
Time		Time for last solenoid test	
Date		Date for last solenoid test	
Start pressure	0	Start pressure	
Reaction time	0	SOV reaction time	
Breakaway time	0	SOV breakaway time	
Breakaway pressure	0	SOV breakaway pressure	
Total time	0	Total time	
Reference test		**Solenoid reference measurements**	
Time		Time for last reference solenoid test	
Date		Date for last reference solenoid test	
Start pressure	0	Start pressure	
Reaction time	0	SOV reaction time	
Breakaway time	0	SOV breakaway time	
Breakaway pressure	0	SOV breakaway pressure	
Total time	0	Total time	

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Emergency shutdown			
Last ESD			
Time			
Date			
Breakaway time	0	Breakaway time	
Closing time	0	Closing time	
Total time	0	Total time	

5.4 Configuration

Configuration	Default value	Description
Valve configuration		
Valve open		
DO1	Not Used	Open valve DO1
DO2	Not Used	Open valve DO2
DO3	Not Used	Open valve DO3
DO4	Not Used	Open valve DO4
DO5	Not Used	Open valve DO5
DO6	Not Used	Open valve DO6
SIL	On	Open valve SIL relay
Valve close		
DO1	Not Used	Close valve DO1
DO2	Not Used	Close valve DO2
DO3	Not Used	Close valve DO3
DO4	Not Used	Close valve DO4
DO5	Not Used	Close valve DO5
DO6	Not Used	Close valve DO6
SIL	Off	Close valve SIL relay
Valve stay put		
DO1	Not Used	Close valve DO1
DO2	Not Used	Close valve DO2
DO3	Not Used	Close valve DO3
DO4	Not Used	Close valve DO4
DO5	Not Used	Close valve DO5
DO6	Not Used	Close valve DO6
SIL	Off	Close valve SIL relay
Power on state		
Local power on state	Open	Valve state on power on when in local mode
Remote power on state	Open	Valve state on power on when in remote mode
End settings		
Stay put at open status	Off	Enable the Stay put function at the open end
Stay put at open time		Set the time after reaching open when the Stay put function is activated
Stay put at close status	Off	Enable the Stay put function at the close end
Stay put at close time		Set the time after reaching close when the Stay put function is activated
Deadband	1	End settings deadband, used to determine open and close
Position signal		
Position input signal		
Position input	AI1 (position	Position input signal

	input)	
Position input switches		
Position switch 100%	None	Set the 100% switch, only if position input is switches
Position switch 0%	None	Set the 0% switch, only if position input is switches
Transmitter - AO0		
Fail position	None	Set the transmitter output to this value if there is an system error
Signal configuration	**Default value**	**Description**
Digital input - Type		
DI1	Normally open	Digital Input type
DI2	Normally open	Digital Input type
DI3	Normally open	Digital Input type
DI4	Normally open	Digital Input type
DI5	Normally open	Digital Input type
DI6	Normally open	Digital Input type
DI7	Normally open	Digital Input type
DI8	Normally open	Digital Input type
DI9	Normally open	Digital Input type
DI10	Normally open	Digital Input type
DI11	Normally open	Digital Input type
DI12	Normally open	Digital Input type
DI13	Normally open	Digital Input type
DI14	Normally open	Digital Input type
DI15	Normally open	Digital Input type
DI16	Normally open	Digital Input type
DI17	Normally open	Digital Input type
Digital output - Turn off time		
DO1	0	0 = Disable; 1-240 Turn off time in minutes
DO2	0	0 = Disable; 1-240 Turn off time in minutes
DO3	0	0 = Disable; 1-240 Turn off time in minutes
DO4	0	0 = Disable; 1-240 Turn off time in minutes
DO5	0	0 = Disable; 1-240 Turn off time in minutes
DO6	0	0 = Disable; 1-240 Turn off time in minutes
Analogue input		
Analogue Input 0		
4 mA unit value	0	Unit value a 4mA, e.g. 0 for 0.0 bar
20 mA unit value	100	Unit value a 20mA, e.g. 25000 for 250.0 bar
Analogue Input 1 (Position input)		
0% unit value	0	Unit value at 0% position, e.g. 0 for 0.0 degree
100% unit value	100	Unit value at 100% position, e.g. 9000 for 90.0 degree
Analogue Input 2		
4 mA unit value	0	Unit value a 4mA, e.g. 0 for 0.0 bar
20 mA unit value	100	Unit value a 20mA, e.g. 25000 for 250.0 bar
Analogue Input 3		
4 mA unit value	0	Unit value a 4mA, e.g. 0 for 0.0 bar
20 mA unit value	100	Unit value a 20mA, e.g. 25000 for 250.0 bar

Analogue Input 4		
4 mA unit value	0	Unit value a 4mA, e.g. 0 for 0.0 bar
20 mA unit value	100	Unit value a 20mA, e.g. 25000 for 250.0 bar
Analogue Input 5		
4 mA unit value	0	Unit value a 4mA, e.g. 0 for 0.0 bar
20 mA unit value	100	Unit value a 20mA, e.g. 25000 for 250.0 bar
Analogue output Configuration		
Analogue Output 0		**Calibration and setup of Analogue Output 0**
Direction	Direct	
4-20 mA calibration		
Analogue input		
Analogue input 0		
1 value adc		Value to change the endpoint of the unit value
2 value adc		Value to change the endpoint of the unit value
4mA adc		4 mA signal calibration value
20mA adc		20 mA signal calibration value
Analogue input 1 (Position input)		
0% value adc		ADC value for 0% position
100% value adc		ADC value for 100% position
4mA adc		4 mA signal calibration value
20mA adc		20 mA signal calibration value
Analogue input 2		
1 value adc		Value to change the endpoint of the unit value
2 value adc		Value to change the endpoint of the unit value
4mA adc		4 mA signal calibration value
20mA adc		20 mA signal calibration value
Analogue input 3		
1 value adc		Value to change the endpoint of the unit value
2 value adc		Value to change the endpoint of the unit value
4mA adc		4 mA signal calibration value
20mA adc		20 mA signal calibration value
Analogue input 4		
1 value adc		Value to change the endpoint of the unit value
2 value adc		Value to change the endpoint of the unit value
4mA adc		4 mA signal calibration value
20mA adc		20 mA signal calibration value
Analogue input 5		
1 value adc		Value to change the endpoint of the unit value
2 value adc		Value to change the endpoint of the unit value
4mA adc		4 mA signal calibration value
20mA adc		20 mA signal calibration value
Analogue outputs		
Analogue output 0		

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4mA dac		Signal calibration for 4mA output value
20mA dac		Signal calibration for 20mA output value
Local control panel	**Default value**	**Description**
Local/remote		
Local mode input signal	None	Set the controller in local mode with this digital input, Remote is the default
Local open input signal	None	Push button to open the valve when in local mode
Local close signal input	None	Push button to close the valve when in local mode
Local continuously open input signal	None	Digital input which must be connected to open the valve when in local mode
Remote open input signal	DI2 long push	Push button to open the valve when in remote mode
Remote close input signal	DI3 long push	Push button to close the valve when in remote mode
Remote continuously open input signal	None	Digital input which must be connected to open the valve when in remote mode
End position deadband	1	The deadband used to determine if the valve is at 0% or 100%
0% output signal	None	Output to indicate that the valve is at 0%
100% output signal	None	Output to indicate that the valve is at 100%
ESD Reset Configuration		
Reset on power up	Off	Go to ESD directly after power up
Reset input signal	None	Push button to reset device after an ESD
Ready to reset output signal	None	Ready to reset output
ESD input	None	ESD input signal. Not a SIL input
Close after ESD	No	Require an open command after an ESD
Pump controller		
Manual mode input signal	None	Digital input to set the pump controller in manual mode
Manual mode pump start input signal	None	Digital input to start the pump when the pump controller is in manual mode
Valve test		
Partial stroke test		
Local start input signal	DI1 long push	Input to start a partial stroke from local
Local abort input signal	DI1 short push	Input to abort a partial stroke from local
Remote start input signal	DI1 long push	Input to start a partial stroke from remote
Remote abort input signal	DI1 short push	Input to abort a partial stroke from remote
Test in progress output signal	DO3	Digital output to show that a partial stroke is in progress
Pass output signal	DO1	Digital output to show that the latest partial stroke was successful
Fail output signal	DO2	Digital output to show that the latest partial stroke failed
Warning output signal	None	Digital output to show that the latest partial stroke ended with a warning
Full stroke test		
Start input signal	None	Push button to start a full stroke
Local abort input signal	None	Input to abort a full stroke from local
Remote start input signal	None	Input to start a full stroke from remote
Remote abort input signal	None	Input to abort a full stroke from remote
Test in progress output signal	None	Digital output to show that a full stroke is in progress
Pass output signal	None	Digital output to show that the latest full stroke was successful
Fail output signal	None	Digital output to show that the latest full stroke failed
Warning output signal	None	Digital output to show that the latest full stroke ended with a warning
Solenoid test		

Start input signal	None	Push button to start a solenoid test
Local abort input signal	None	Input to abort a solenoid test from local
Remote start input signal	None	Input to start a solenoid test from remote
Remote abort input signal	None	Input to abort a solenoid test from remote
Test in progress output signal	None	Digital output to show that a solenoid test is in progress
Pass output signal	None	Digital output to show that the latest solenoid test was successful
Fail output signal	None	Digital output to show that the latest solenoid test failed
Warning output signal	None	Digital output to show that the latest solenoid test ended with a warning
Lamp test		
Input signal		Turn on the selected digital output when this input is activated
Test DO1		Test DO1 in the lamp test
Test DO2		Test DO2 in the lamp test
Test DO3		Test DO3 in the lamp test
Test DO4		Test DO4 in the lamp test
Test DO5		Test DO5 in the lamp test
Test DO6		Test DO6 in the lamp test
Pump controller	**Default value**	**Description**
Pump		
Pump control active	Always off	Activate the pump controller
Pump output signal	None	Output to activate the pump
Stop pump on ESD	No	Stop the pump when an ESD is detected
Motor safety relay		
Input signal	None	Input for the motor safety relay
Output signal	None	Output to show that there is an error on the safety relay
Max running time		
Status	Off	Turn on the max running time function
Time		The maximum running time limit in sec
Output signal	None	Output which is activated when the maximum running time is reached
Pressure		
Analogue input signal	None	The pressure input sensor
Low digital input signal	None	Pressure low input switch
High digital input signal	None	Pressure high input switch
Low limit	80	Start the pump below this value
High limit	120	Stop the pump above this value
Low output signal	None	Output which is active when the pressure is low
High output signal	None	Output which is active when the pressure is high
Temperature		
Analogue input signal	None	The temperature input sensor
Low digital input signal	None	Temperature low input switch
High digital input signal	None	Temperature high input switch
Low limit	353	Temperature error below this limit
High limit	373	Temperature error above this limit
Low output signal	None	Output which is active when the temperature is low
High output signal	None	Output which is active when the temperature is high
Stop on error	Yes	Stop the pump on a temperature error
Level		
Analogue input signal	None	The level input sensor

Low digital input signal	None	Level low input switch
Low limit	1	Level high input switch
Limit output signal	None	Output which is active when the level is low
Stop on error	Yes	Stop the pump on a level error
PST configuration	**Default value**	**Description**
Valve configuration		
DO1	Not Used	PST close valve DO1
DO2	Not Used	PST close valve DO2
DO3	Not Used	PST close valve DO3
DO4	Not Used	PST close valve DO4
DO5	Not Used	PST close valve DO5
DO6	Not Used	PST close valve DO6
SIL	Off	PST close valve SIL relay
PST configuration		
SP switch signal input	None	Set the PST switch, only if position input is switches
Position deadband	1	Set the partial stroke deadband, only if position input is AI1
PST travel	20	The partial stroke travel, only if position input is AI1
PST signature sample time	100	Sample time for the PST signatures
PST error parameters		
Disable all errors	No	Disable all PST errors
Breakaway timeout	0	Breakaway timeout for the partial stroke test
Closing timeout	0	Closing time out for the partial stroke
Total timeout	0	Total timeout for the partial stroke
PST warning parameters		
Disable all warnings	Yes	Disable all PST warnings
Breakaway time low	0	Low limit for breakaway time warning
Breakaway time high	0	High limit for breakaway time warning
Closing time low	0	Low limit for closing time warning
Closing time high	0	High limit for closing time warning
Total time low	0	Low limit for total time warning
Total time high	0	High limit for total time warning
Max travel	0	Limit for stroke warning
FST configuration	**Default value**	**Description**
Valve configuration		
DO1	Not Used	FST close valve DO1
DO2	Not Used	FST close valve DO2
DO3	Not Used	FST close valve DO3
DO4	Not Used	FST close valve DO4
DO5	Not Used	FST close valve DO5
DO6	Not Used	FST close valve DO6
SIL	Off	FST close valve SIL relay
FST configuration		
Wait at fail position during reference		Wait for pressure to drop during calibration
SOV activate time	0	Auto set during calibration based on FST closing time and wait at fail position
Position deadband	1	The position deadband which is used to determine if the valve has moved
FST signature sample time	100	Sample time for the FST signatures

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FST error parameters		
Disable all errors	No	Ignore all FST errors
Breakaway timeout	0	Breakaway timeout for the full stroke test
Closing timeout	0	Closing time out for the partial stroke
Total timeout	0	Total timeout for the full stroke
FST warning parameters		
Disable all warnings	Yes	Disable all FST warnings
Breakaway time low	0	Low limit for breakaway time warning
Breakaway time high	0	High limit for breakaway time warning
Closing time low	0	Low limit for closing time warning
Closing time high	0	High limit for closing time warning
Total time low	0	Low limit for total time warning
Total time high	0	High limit for total time warning
SOT configuration	**Default value**	**Description**
Valve configuration		
DO1	Not Used	SOT close valve DO1
DO2	Not Used	SOT close valve DO2
DO3	Not Used	SOT close valve DO3
DO4	Not Used	SOT close valve DO4
DO5	Not Used	SOT close valve DO5
DO6	Not Used	SOT close valve DO6
SIL	Off	SOT close valve SIL
SOT configuration		
SOT pressure input	None	The input for the pressure sensor. To perform SOT without pressure sensor set to None
Pressure deadband	0	The pressure deadband which is used to determine if the SOV has reacted
Position deadband	1	The position deadband which is used to determine if the valve has moved
SOT error parameters		
Disable all errors	No	Disable all SOT errors
Timeout	0	The timeout, before which a pressure drop must occur
Start pressure high	0	High limit for the start pressure
Start pressure low	0	Low limit for the start pressure
Total timeout	0	Total timeout for the solenoid test
Automatic cal. configuration	**Default value**	**Description**
Wait before test	10	Time to wait before the test is performed

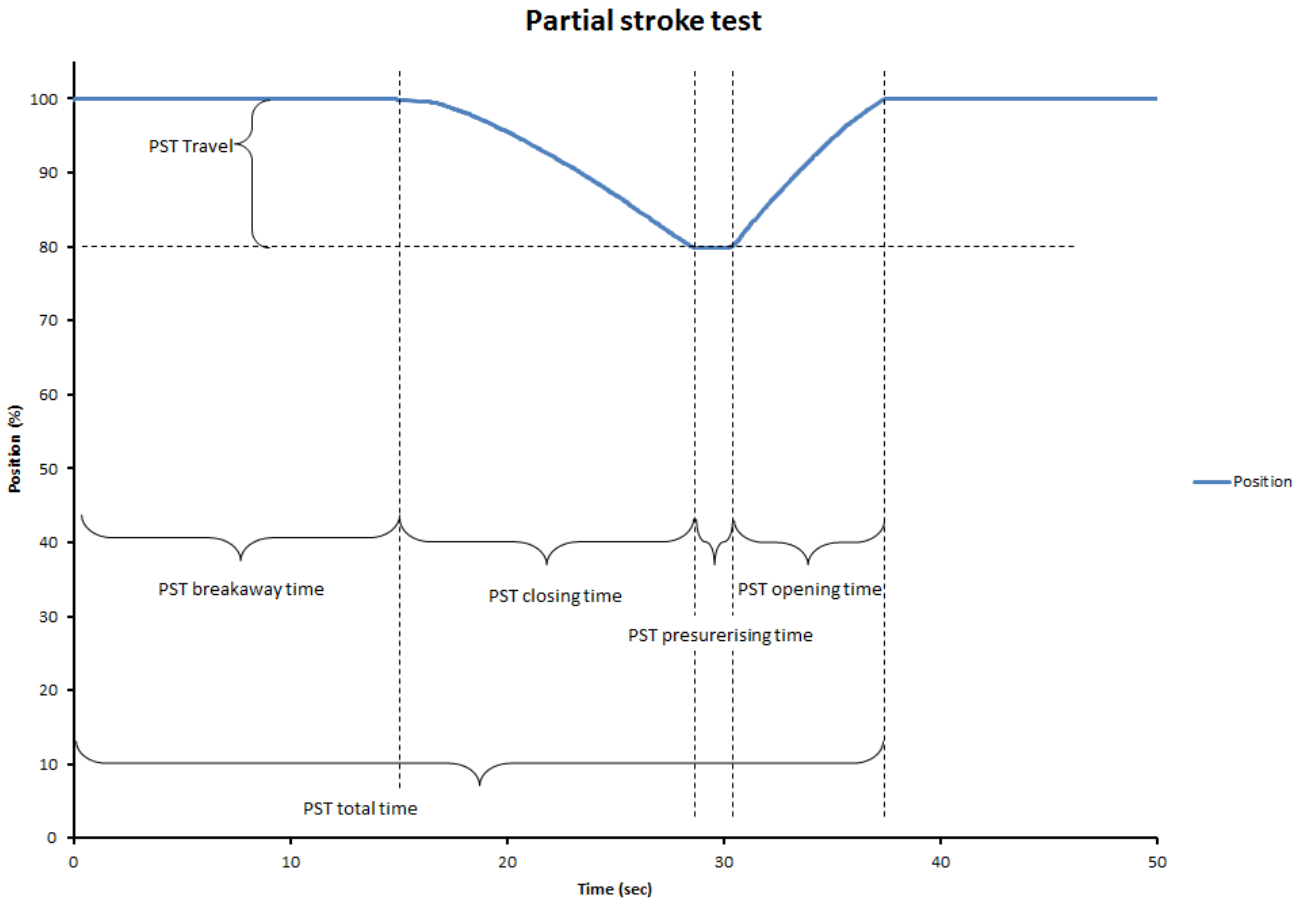
6 Valve test

6.1 Partial stroke test

The partial stroke exercises the actuator and the valve and confirms that the actuator can move the valve.

The actuator will move the distance specified by the PST and then go back to its operating position.. A short travel will only impact the flow in the valve insignificantly and therefore can the test be performed while the system is in production.

Below is a signature from typical partial stroke shown, including definitions on the different terms further used in this manual.



When a partial stroke is started the position is evaluated. The valve must be full open before the partial stroke can start.

The IVC24 monitors the position during the partial stroke. The IVC24 aborts the partial stroke and report an error if the limits in the error parameters are reached.

If a partial stroke does not reach the limits it will be carried out in full and then the warning parameters are evaluated.

6.1.1 Errors

PST start condition: Not full open (Error: 401)
The valve must be full open to perform a partial stroke. All measured times depends on that the valve is full open.

PST error: No breakaway (Error: 411)
This arises if the position signal has not changed within the breakaway timeout.

This can occur if the solenoid valve is not reacting or the output of the solenoid valve is blocked.

PST error: Timeout while closing (Error: 415)
This arises if the position has not moved the PST travel with in the closing timeout.

PST error: Timeout while opening. Position (Error: 416)
This arises if the valve is unable to open again.

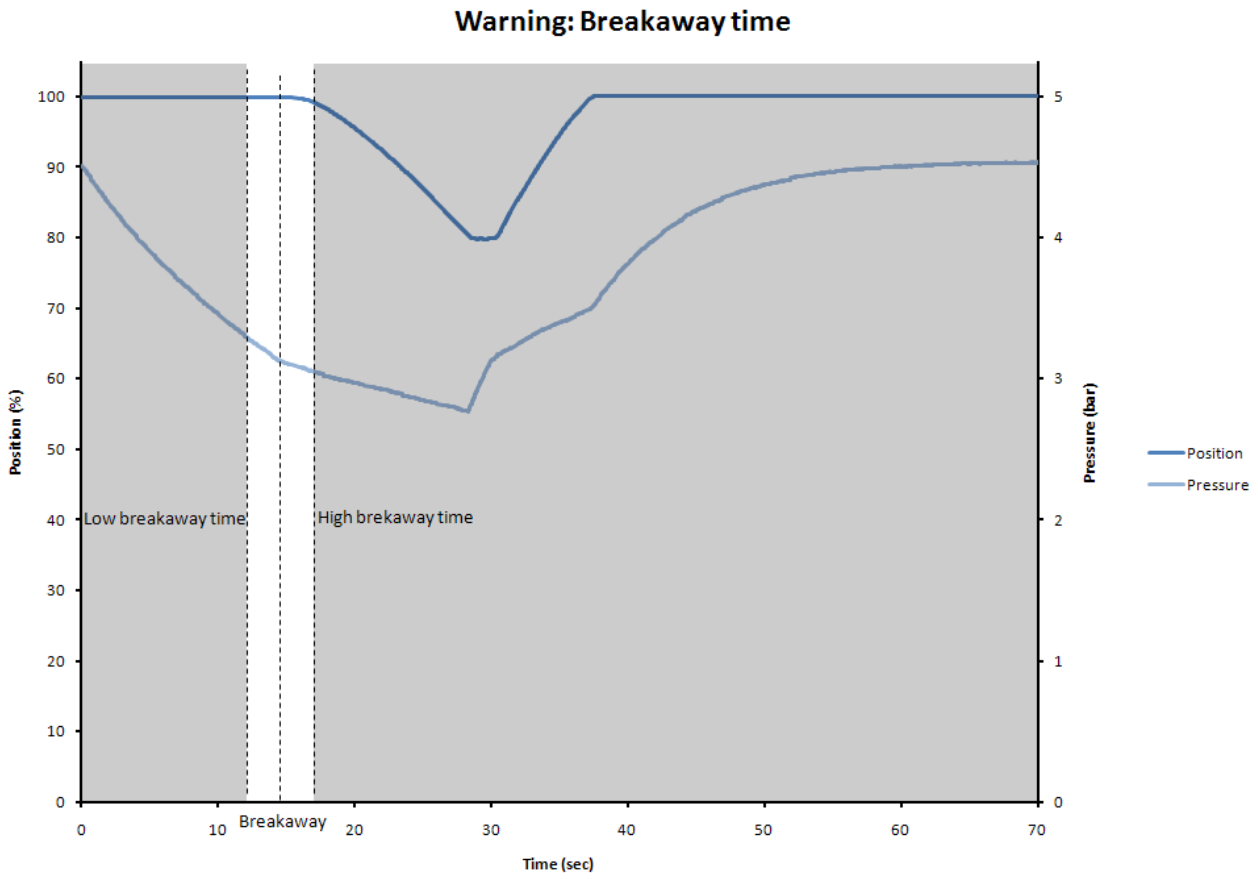
The cause of this problem may be no supply pressure or that the solenoid valve cannot be energized.

6.1.2 Warnings

Warnings can be used to notify the operator that the actuator or valve has changed characteristics. For both breakaway time and travel time it is possible to set a high and low error level in the basic setup menu (3). It requires knowledge of the physical system to determine reasonable error and warning limits as they depends on several factors, e.g. variation in pressure in the hydraulic/pneumatic system. If the measured times exceed the alarm limits is an error raised. The error can only be removed by performing a successful partial stroke.

PST warning: Breakaway time (Error: 433 and 434)
The breakaway time is measured from the test is initiated to the valve position has moved the amount specified as deadband in the advanced setup menu (2.5).

A long breakaway time may indicate that the valve is stuck in the operational position and then when it breaks away moves fast as there is build up pressure in the hydraulic/pneumatic system.



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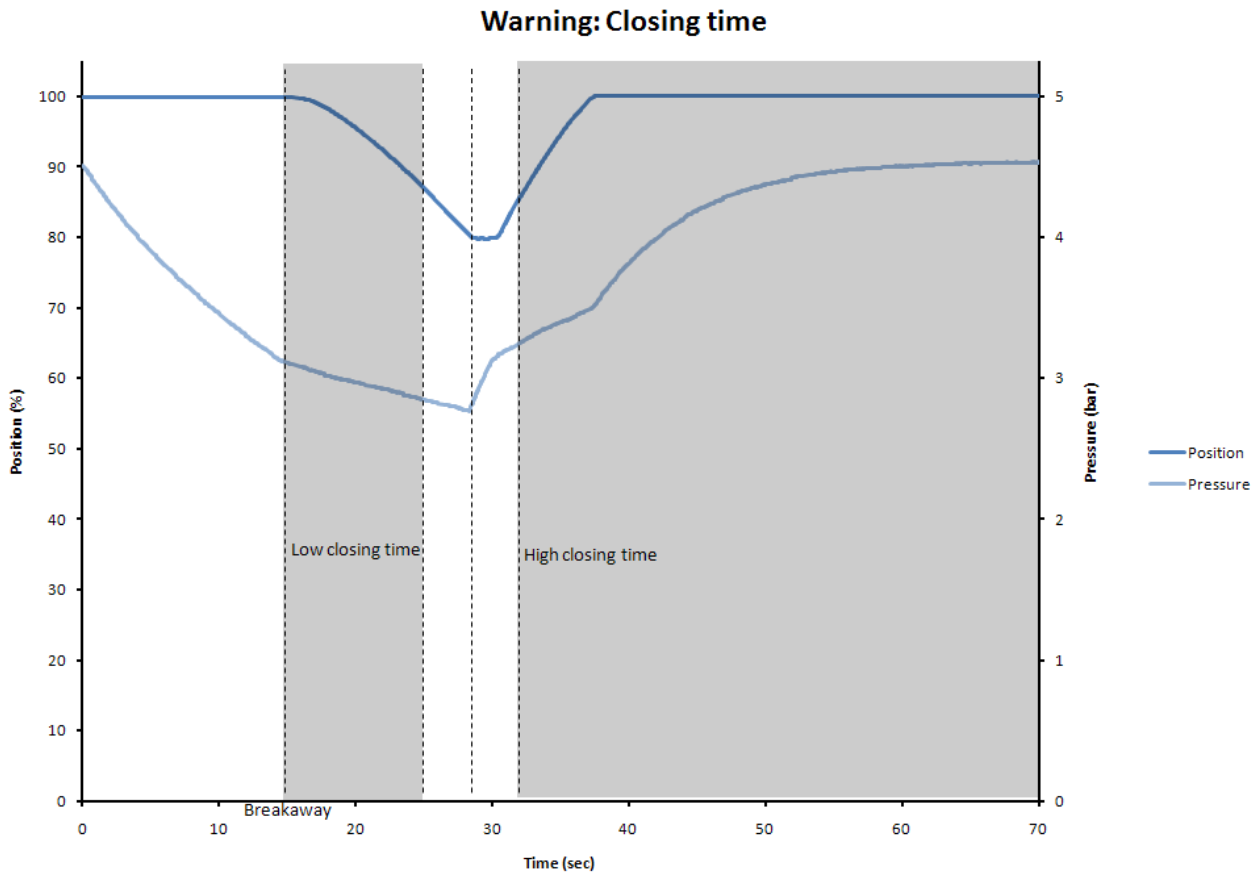
PST warning: Closing time (Error: 435 and 436)
The closing time is defined as the time it takes to move from full open to the PST set point.

If the partial stroke closing time has changed it indicates that the full stoke closing time may also have changed.



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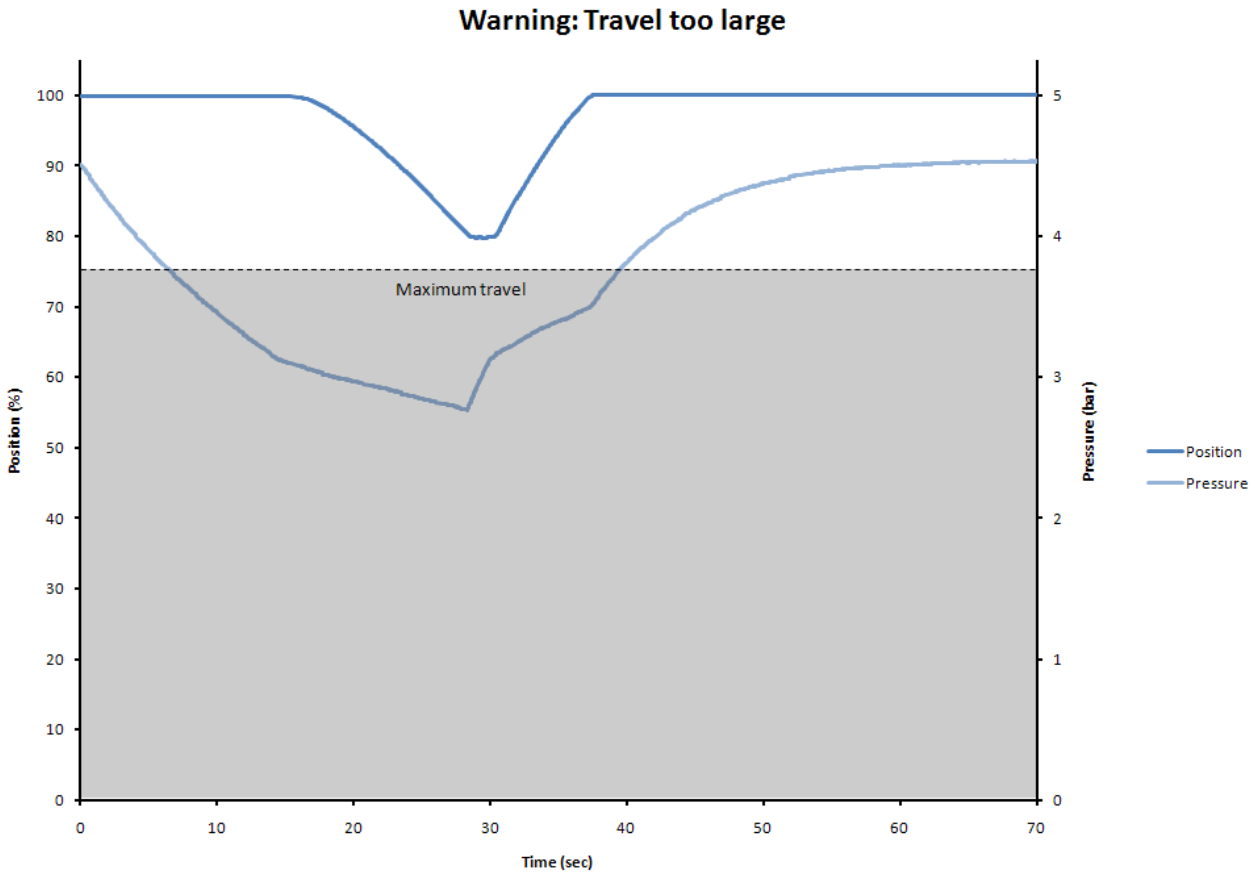
PST warning: Travel too large (Error: 437)

During the partial stroke the IVC24 monitors the maximum travel from full open. The alarm on the travel can be used to ensure that the partial stroke does not interrupt the production by moving the valve too much.



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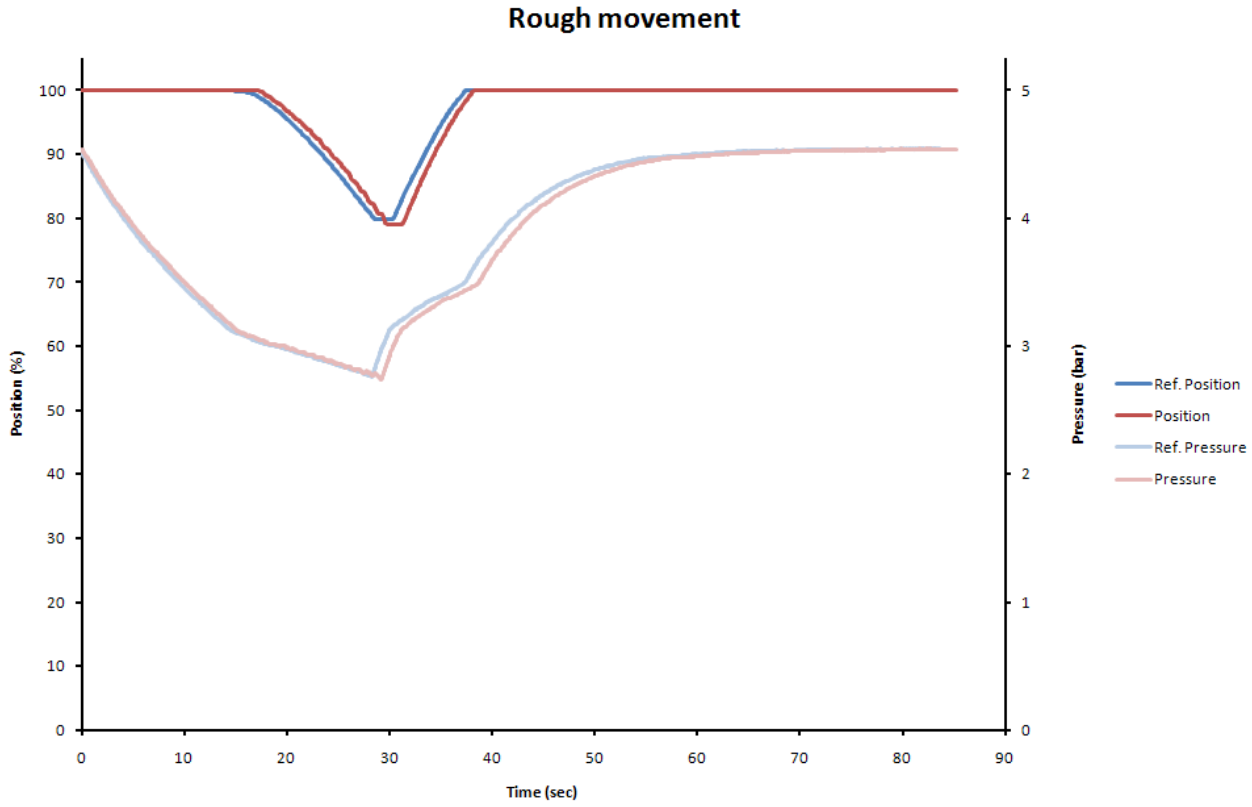
Rough movement



The IVC24 will not report errors if the deviations from the reference curve are small. In cases like this the signatures must be extracted and analysed visually.

The above example shows a curve from a valve with increased torque which leads to uneven movement. The measured times and pressures does not give an error but in time the performance will be so bad that it will give errors.

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6.2 Calibration

6.2.1 Automatic

The automatic calibration performs a reference partial stroke. The reference stroke is used to set the error and warning parameters. These parameters are used further on to determine the state of the actuator and valve during a later test.

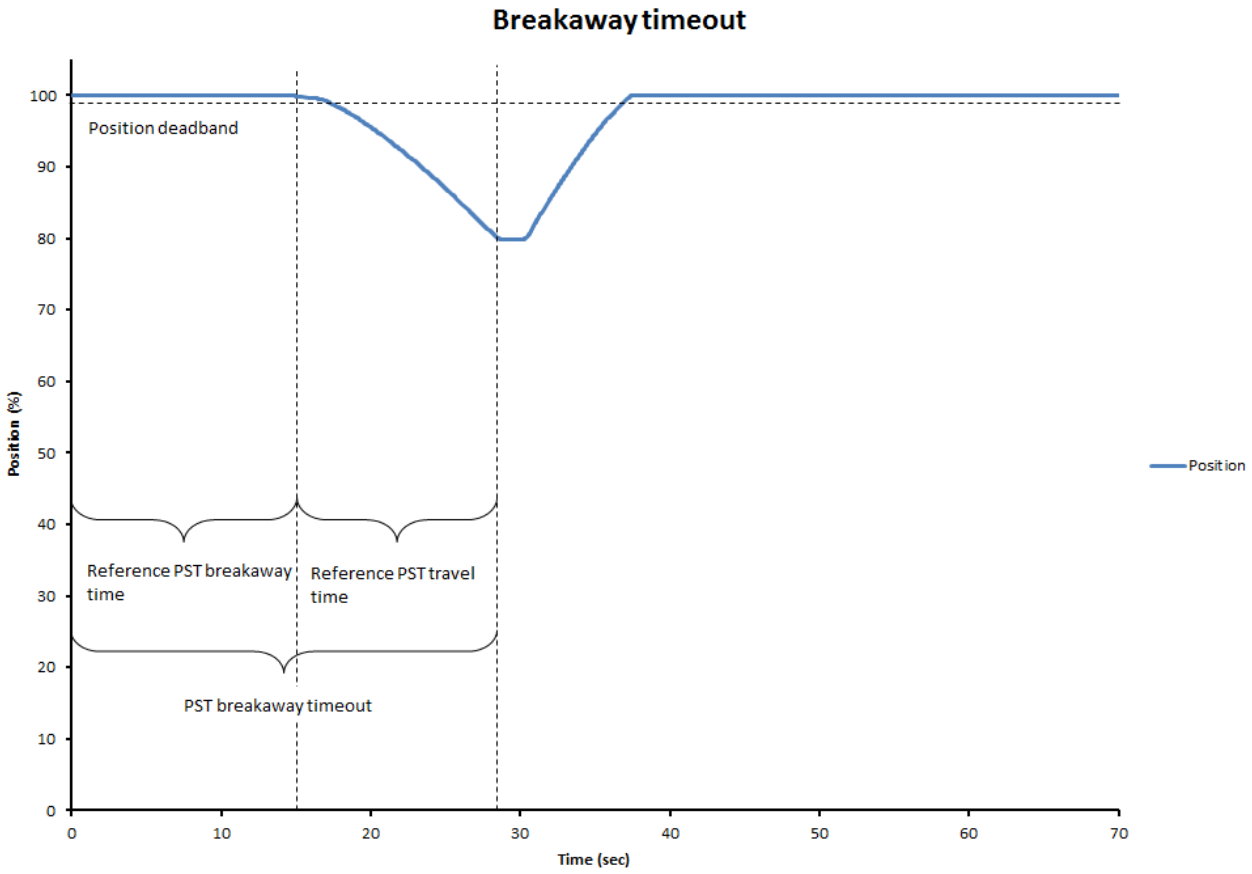
The automatic calibration is started by pushing the button on the front panel for 3 sec.

6.2.2 PST reference

Perform a partial stroke reference curve and set the partial stroke error and warning parameters.

For the partial stroke the error parameters are set to the following values:

- Breakaway timeout = Reference breakaway time + reference closing time
- Closing timeout = Reference total time
- Total timeout = 2 * Reference total time



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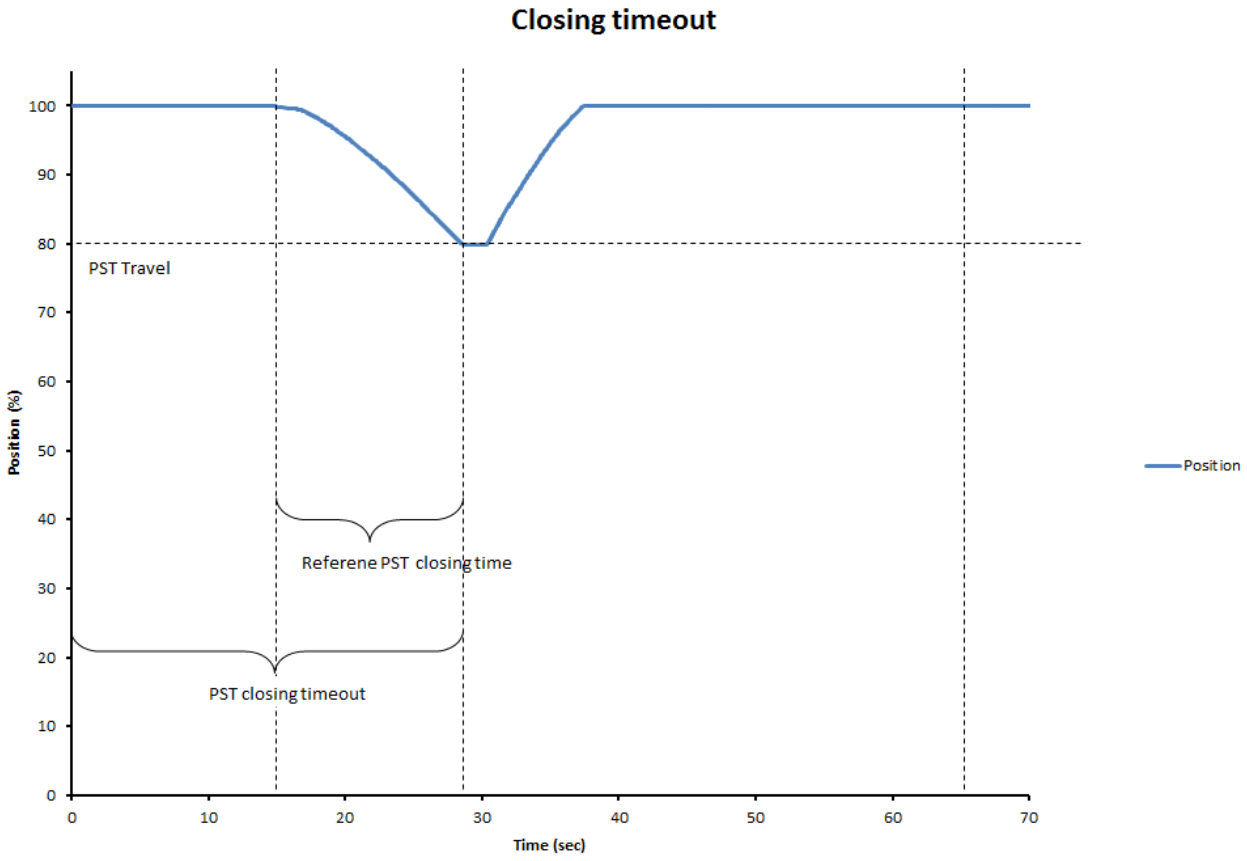

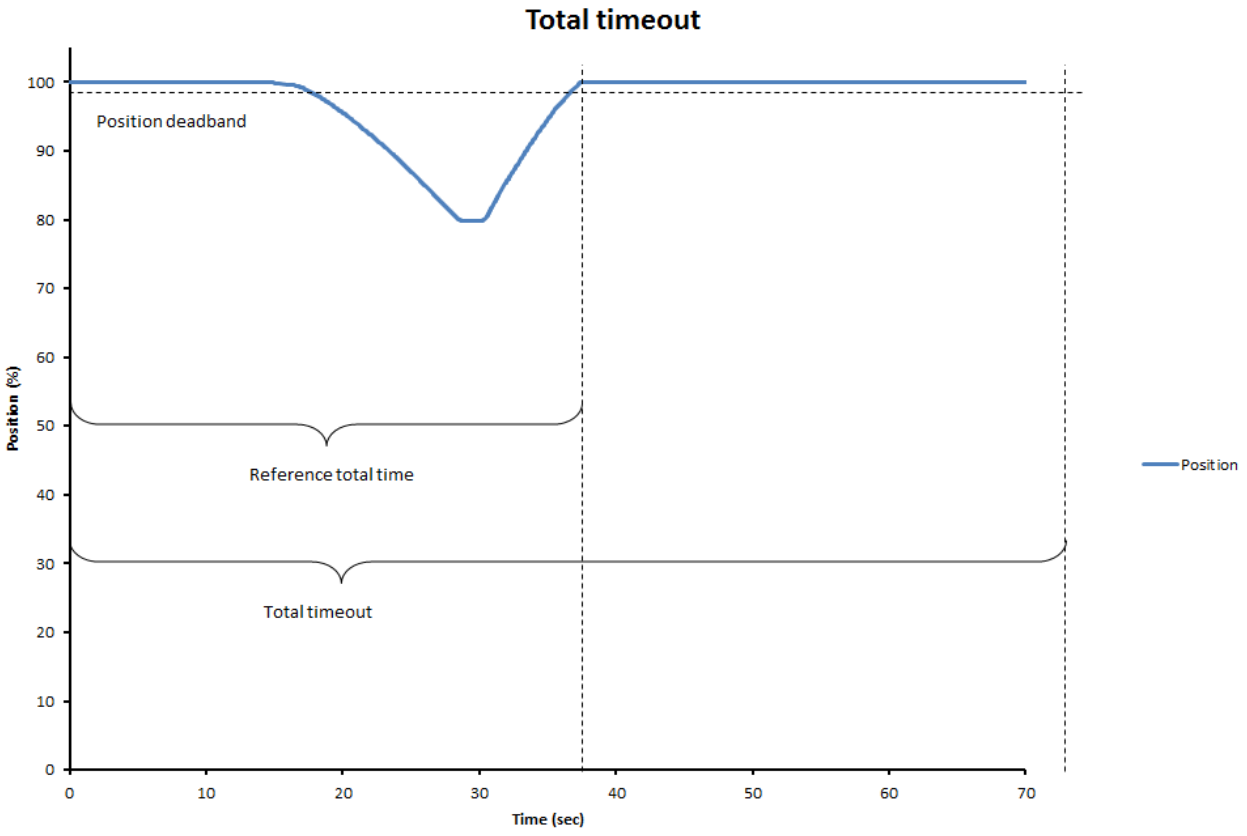

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The partial stroke warning parameters are set to the following values:

- Low breakaway time = Reference breakaway time – 50%
- High breakaway time = Reference breakaway time + 50%
- Low closing time = Reference closing time – 50%
- High closing time = Reference closing time + 50%

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7 Power unit controller

7.1 Pump

Output: Configure which output is used to control the pump. Note that when an output is selected it will not be available to control a solenoid valve.

Controller: The pump controller can be set to different modes.

- Always off: No power to the pump output
- Always on: Always power to the pump (except if motor safety relay is on or ESD is active)
- Auto: The pump is regulating depending on the hydraulic pressure, level and temperature.

A sensor is not used if "None" is selected as the input signal.

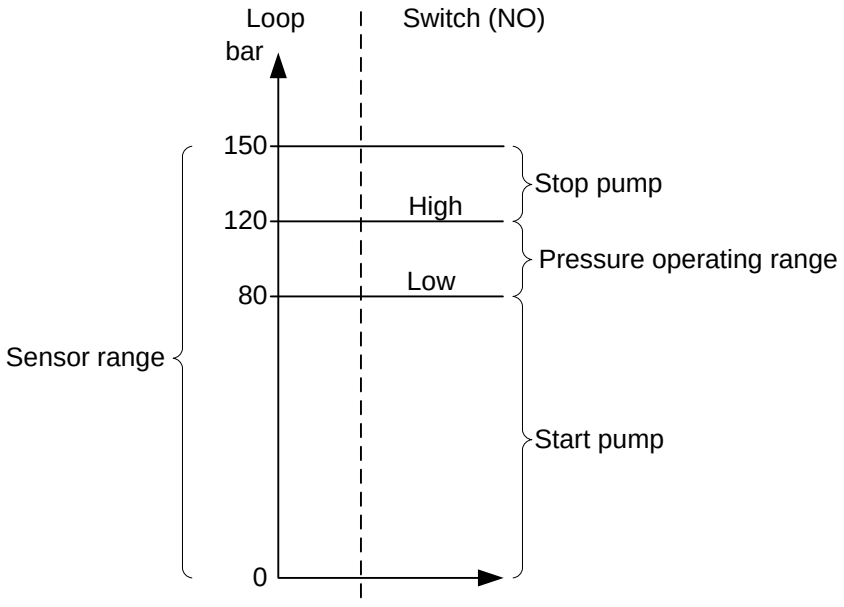
Motor Safety Relay: Set the relay input port. When the port is disconnected the motor will stop running.

Max Running Time: When the motor has been running for the specified period will an entry be made in the error log. To remove this error the motor must stop and the timer is then reset.

7.2 Pressure

Input signal: Configure which of the analogue or digital inputs that are used as the pressure signal. That can be either an analogue loop input or digital input from two switches. By setting the input signal to "None" the pump controller will not use pressure to determine if the pump should run or not.

Loop: If a loop input is selected as the input signal the user must configure at which pressure the pump must start and stop.
The pressure returned from the sensor at 4mA and 20mA must be entered into the IVC24.



Switches:

Normally open switches

Low	High	Pump
Open	Open	Start
Closed	Open	Don’t change
Closed	Closed	Stop
Open	Closed	Stop

7.3 Level

Input signal: Configure which of the analogue or digital inputs that is used as the level signal. That can be either an analogue loop input or digital input from a switch. By setting the input signal to “None” the pump controller will not use level to determine if the pump should run or not.

Loop: If a loop input is selected as the input signal the user must configure at which level the pump must stop.
The levels returned from the sensor at 4mA and 20mA must be entered into the IVC24.

7.4 Temperature

Input signal: Configure which of the analogue or digital inputs that is used as the temperature signal. That can be either an analogue loop input or digital input from a switch. By setting the input signal to “None” the pump controller will not use temperature to determine if the pump should run or not.

Loop: If a loop input is selected as the input signal the user must configure at which temperature the pump must stop.
The temperature returned from the sensor at 4mA and 20mA must be entered into the IVC24.

8 Test errors

8.1 Partial stroke errors

No. 401	PST start condition: Not full open
Description	The valve is not fully open
Trouble shooting	This error can be solved by • Make sure the valve is fully open

No. 404	PST start condition: In ESD mode
Description	The IVC is in ESD mode.
Trouble shooting	This error can be solved by: • Activate the ESD input

No. 411	PST Error: No breakaway
Description	Breakaway is not detected
Trouble shooting	This error may be due to: • Blocked output of actuator • Solenoid valve is stuck This error can be solved by: • Clear the output of the actuator • Increasing the Breakaway timeout

No. 415	PST error: Timeout while closing
Description	The valve did not move the desired PST travel before the closing timeout
Trouble shooting	This error can occur if: • The valve gets stuck during the test, due to an obstruction in the hydraulic/pneumatic system • The valve is moving slow It can be solved by: • Resolve the mechanical problem • Increasing the Closing timeout

No. 416	PST error: Total timeout
Description	The valve did not open within the opening timeout
Trouble shooting	This error can be caused by: • No supply pressure • The valve is stuck • The valve is moving slow • The solenoid valve cannot be activated It can be solved by: • Resolve the mechanical problem • Increase Opening timeout

No. 418	PST error: Wrong Switch. Position sensor reached 0%
Description	The 0% switch was activated before the SP switch. The position sensor reached 0 %
Trouble shooting	This error can be caused by: • Wrong configuration of the position switches • Position sensor was disconnected • Valve closed

No. 419	PST error: Wrong Switch. SP
Description	The SP switch was activated before the 100% switch was released
Trouble shooting	This error can be caused by: • Wrong configuration of the position switches

No. 433	PST warn: Breakaway time is too low
Description	The breakaway time is lower than the breakaway time low warning
Trouble shooting	This alarm can be solved by: • Resolve the mechanical problem • Decrease the partial stroke breakaway time low warning

No. 434	PST warn: Breakaway time is too high
Description	The breakaway time is higher than the breakaway time high warning
Trouble shooting	This alarm can be solved by: • Resolve the mechanical problem • Increase the partial stroke breakaway time high warning

No. 435	PST warn: Closing time is too low
Description	The travel time is lower than the Travel time low warning
Trouble shooting	This alarm can be solved by: • Resolve the mechanical problem • Increase the partial stroke closing time low warning

No. 436	PST warn: Closing time is too high
Description	The closing time is higher than the Travel time high warning
Trouble shooting	This alarm can be solved by: • Resolve the mechanical problem • Increase the partial stroke closing time high warning

No. 437	PST warn: Travel too large
Description	During the partial stroke did the actuator move more than maximum travel alarm
Trouble shooting	To remove this alarm: • Perform service on the actuator and valve • Increase Max travel

No. 438	PST warn: Total time is too low
Description	The total time is lower than the Total time low warning
Trouble shooting	This alarm can be solved by: • Resolve the mechanical problem • Increase the partial stroke total time low warning

No. 439	PST warn: Total time is too high
Description	The total time is higher than the Total time high warning
Trouble shooting	This alarm can be solved by: • Resolve the mechanical problem • Increase the partial stroke total time high warning

8.2 Full stroke errors

No. 451	FST start condition: Not full open
Description	The valve is not fully open
Trouble shooting	This error can be solved by • Make sure the valve is fully open • Perform an endpoint calibration. • Increase the full stroke position deadband

No. 454	FST start condition: In ESD mode
Description	The IVC is in ESD mode.
Trouble shooting	This error can be solved by: • Activate the ESD input

No. 464	FST error: Timeout while closing
Description	The valve did not close before the closing timeout
Trouble shooting	This error can occur if: • The valve gets stuck during the test, due to an obstruction in the hydraulic/pneumatic system • The valve is moving slow It can be solved by: • Resolve the mechanical problem • Increasing the Closing timeout

No. 466	FST error: Total timeout
Description	The valve did not open within the opening timeout
Trouble shooting	This error can be caused by: • No supply pressure • The valve is stuck • The valve is moving slow • The solenoid valve cannot be activated It can be solved by: • Resolve the mechanical problem • Increase full stroke total timeout

No. 418	FST error: Wrong Switch. 0%
Description	The 0% switch was activated before the 100% switch was released
Trouble shooting	This error can be caused by: • Wrong configuration of the position switches

No. 483	FST warn: Breakaway time is too low
Description	The breakaway time is lower than the breakaway time low warning
Trouble shooting	This error can be solved by: • Resolve the mechanical problem • Decrease the full stroke breakaway time low warning

No. 484	FST warn: Breakaway time is too high
Description	The breakaway time is higher than the breakaway time high warning
Trouble shooting	This error can be solved by: • Resolve the mechanical problem • Increase the full stroke breakaway time high warning

No. 485	FST warn: Closing time is too low
Description	The closing time is lower than the closing time low warning
Trouble shooting	This error can be solved by: • Resolve the mechanical problem • Decrease the full stroke closing time low warning

No. 486	FST warn: Closing time is too high
Description	The closing time is higher than the closing time high warning
Trouble shooting	This error can be solved by: • Resolve the mechanical problem • Increase the full stroke closing time high

No. 487	FST warn: Total time is too low
Description	The closing time is lower than the total time low warning
Trouble shooting	This error can be solved by: • Resolve the mechanical problem • Decrease the full stroke total time low warning

No. 488	FST warn: Total time is too high
Description	The closing time is higher than the total time high warning
Trouble shooting	This error can be solved by: • Resolve the mechanical problem • Increase the full stroke total time high

8.3 Solenoid valve test

No. 501	SOT start condition: Not full open
Description	The valve is not fully open
Trouble shooting	This error can be solved by • Make sure the valve is fully open • Perform an endpoint calibration. Calibration menu (2) • Increase the solenoid position deadband in the Basic menu (4.1.2)

No. 502	SOT start condition: Low start pressure
Description	The measured pressure is below the start pressure minus the pressure deadband.
Trouble shooting	This error can be solved by: • Increase the pressure in the system • Decrease the Start pressure • Increase Pressure deadband

No. 503	SOT start condition: High start pressure
Description	The measured pressure is above the start pressure plus the pressure deadband.
Trouble shooting	This error can be solved by: • Decrease the pressure in the system • Increase Start pressure • Increase Pressure deadband

No. 504	SOT start condition: In ESD mode
Description	The IVC is in ESD mode.
Trouble shooting	This error can be solved by: • Activate the ESD input

No. 511	SOT error: Timeout
Description	The pressure did not drop within max time
Trouble shooting	The solenoid valve did not react This error can be solved by: • Resolve the mechanical problem • Increase max time • Increase Pressure deadband

No. 512	SOT error: Breakaway, no pressure drop
Description	Breakaway is detected but there is no pressure drop
Trouble shooting	This error is generated when the pressure transmitter is not sensing the pressure drop. This error can be solved by: • Check pressure transmitter

No. 513	SOT error: Total timeout
Description	The valve did not open within the opening timeout
Trouble shooting	This error can be caused by: • No supply pressure • The valve is stuck • The valve is moving slow • The solenoid valve cannot be activated It can be solved by: • Resolve the mechanical problem Increase full stroke total timeout

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No. 514	SOT error: At 0% position
Description	The valve is at 0% position.
Trouble shooting	This error can be caused by: • No supply pressure • The solenoid valve cannot be activated • Wrong configuration of switches It can be solved by: • Resolve the mechanical problem Increase full stroke total timeout

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9 System errors

9.1 Pump unit errors

No. 601	Pump control. Low level.
Description	The measured level is below the specified value.
Trouble shooting	Check the oil level in the tank. If oil level is okay then check the following items in the menu. • Adjust pump stop level • Adjust loop configuration • Calibrate analogue input

No. 602	Pump control. Temperature.
Description	The measured temperature is above or below the specified values.
Trouble shooting	Check the temperature of the oil. If the temperature is okay then check the following items in the menu. • Adjust pump stop high level • Adjust pump stop low level • Adjust loop configuration • Calibrate analogue input

No. 610	Pump control. Motor safety relay
Description	The motor protection relay
Trouble shooting	Check the motor safety relay and the connection to the IVC.

No. 611	Pump control. Max running time
Description	The motor has been running for too long.
Trouble shooting	Investigate why the motor is still running. Or increase the max running time in the menu • Max running time

10 Event log

No. 1	IVC power on
Description	The IVC is power on

No. 2	System error
Description	An error was logged in the system error log.

No. 3	System error removed
Description	An error was removed from the system error log

No. 11	ESD line was power off
Description	The ESD line was power off. This event is only applicable for IVCs with external power supply.

No. 12	ESD line was power on
Description	The ESD line was power on. This event is only applicable for IVCs with external power supply.

No. 21	PST start
Description	A PST was started.

No. 22	PST finished
Description	A PST was finished

No. 23	Reference PST start
Description	A reference PST was started.

No. 24	Reference PST finished
Description	A reference PST finished

No. 25	PST aborted by operator
Description	A PST was aborted by the operator

No. 26	Reference PST aborted by operator
Description	A reference PST was aborted by the operator

No. 31	FST start
Description	A FST was started.

No. 32	FST finished
Description	A FST finished

No. 33	Reference FST start
Description	A reference FST was started.

No. 34	Reference FST finished
Description	A reference FST finished

No. 35	FST aborted by operator
Description	A FST was aborted by the operator

No. 36	Reference FST aborted by operator
Description	A reference FST was aborted by the operator

No. 41	SOT start
Description	A SOT was started.

No. 42	SOT finished
Description	A SOT finished

No. 43	Reference SOT start
Description	A reference SOT was started.

No. 44	Reference SOT finished
Description	A reference SOT finished

No. 45	SOT aborted by operator
Description	A SOT was aborted by the operator

No. 46	Reference SOT aborted by operator
Description	A reference SOT was aborted by the operator

No. 51	Operational remote
Description	The IVC was set in operational mode from a remote signal

No. 52	Fail position remote
Description	The IVC was set in fail position mode from a remote signal

No. 53	Operational local
Description	The IVC was set in operational mode from a local signal

No. 54	Fail position local
Description	The IVC was set in fail position mode from a local signal

No. 55	Operational communication
Description	The IVC was set in operational mode from a communication protocol

No. 56	Fail position communication
Description	The IVC was set in fail position mode from a communication protocol

No. 57	Set in local mode
Description	The IVC was set in local mode

No. 58	Set in remote mode
Description	The IVC was set in remote mode

No. 61	Auto calibration was started
Description	An auto calibration was started

No. 62	Auto calibration finished
Description	An auto calibration finished

No. 62	Auto calibration aborted
Description	An auto calibration was aborted

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