

USER MANUAL

Intelligent Diagnostic Controller

IDC24-A IDC24-AF IDC24-AFL IDC24-F

IDP24-A* IDP24-AF* IDP24-AFL* IDP24-F*



*) Require software ID: DID-SW-001



Table of contents

| 1 | Ge | eneral | .3 |
|---|------|--|-----------|
| | 1.1 | Safety instructions | . 3 |
| 2 | Aj | pplication | .4 |
| 3 | In | stallation guide | . 5 |
| 4 | In | terface | . 6 |
| | 4.1 | LEDs | . 6 |
| | 4.2 | MTControl | . 6 |
| | 4.3 | Buttons - menus | . 7 |
| | 4.3 | 3.1 Test menu | . 7 |
| | 4.3 | 3.2 Diagnostic menu | . 7 |
| | 4.3 | 3.3 Control menu | . 8 |
| | 4.3 | 3.4 Setup menu | . 9 |
| | 4.4 | Bluetooth | . 9 |
| | 4.5 | Internal memory | . 9 |
| | 4.5 | 5.1 Standard | . 9 |
| | 4.5 | 5.2 local storage on microSD card | 10 |
| | 4.6 | Local/Remote | 10 |
| 5 | Co | onfiguration - ValConnect | 11 |
| 6 | Di | agnostic | 12 |
| | 6.1 | Partial stroke test | 12 |
| | 6.1 | 1.1 PST error and warning parameters | 16 |
| | 6.2 | Full stroke test | 22 |
| | 6.2 | 2.1 FST error and warning parameters | 24 |
| | 6.3 | Solenoid test | 26 |
| | 6.3 | 3.1 SOT error parameters | 28 |
| | 6.4 | Emergency shutdown test | 28 |
| 7 | Ca | alibration | 29 |
| | 7.1 | Automatic | 29 |
| | 7.2 | Endpoint calibration | 29 |
| | 7.3 | PST reference | 29 |
| | 7.4 | FST reference | 29 |
| | 7.5 | SOT reference | 29 |
| 8 | Te | est errors | 30 |
| | 8.1 | Partial stroke errors (401 to 419) | 30 |
| | 8.2 | Partial stroke warnings (431 to 440) | 38 |
| | 8.3 | Full stroke errors (451 to 468) | 47 |
| | 8.4 | Full stroke warnings (481 to 488) | 56 |
| | 8.5 | Solenoid valve test errors (501 to 514) | 62 |
| | 8.6 | Solenoid valve 2 test errors (551 to 564) | 64 |
| 9 | Sy | vstem errors | 58 |
| | 9.1 | Pump unit errors | 70 |
| 1 |) | Event log | 72 |
| ~ | 10.1 | Argument | /5 |
| 1 | 1 | Software revision list | 76 |



1 General

This manual cover software version:

Software ID: DID-SW-001 Software Version: 1.29

1.1 Safety instructions

For a safe installation of an IDC, 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.



2 Application

The IDC from Val Controls is an Intelligent Diagnostic Controller. To be used for valve testing and operation. It has an integrated microprocessor with very flexible software, which makes the IDC fits almost any hydraulic and pneumatic, rotary and linear, double acting and spring return actuator on the market.



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 or the display and keyboard
 - a. Configure the position feedback, through ValConnect
 - b. Configure the pressure feedback, through ValConnect
- 3. Auto calibrate the unit by pushing CAL button or using ValConnect.



4 Interface

4.1 LEDs

| LED | Colour | ON | OFF | Blinking |
|---------------------|--------|---------------------|-------------|----------------------|
| System: Red | Red | System error | - | Calibrating |
| System: Green | Green | System OK | - | Initializing |
| ESD | Red | ESD trip | ESD normal | - |
| Local | Yellow | Local mode | Remote mode | - |
| Closed ¹ | Red | Valve is closed | - | Moving towards close |
| Open ¹ | Green | Valve is open | - | Moving towards open |
| Pump | Green | Pump is running | - | - |
| MT | Red | MTControl is locked | - | - |
| TIP | Yellow | Test in progress | - | - |
| Fail | Red | Last test failed | - | - |
| Pass | Green | Last test passed | - | - |

¹) Open/close can be switched in the Interface section in ValConnect

System: Red and System: Green are the only LEDs available on the F model.

If both System: Red and System: Green is ON, the device is in bootloader mode. Power cycle the device to return to normal operation.

4.2 MTControl

MTControl can be used to operate the AF models without opening the Ex d enclosure. It requires a magnetic pen to "press" the buttons. The magnet must be aimed just beneath the buttons, see Figure 1. To unlock MTControl activate \rightarrow and then \leftarrow , the red MT LED will turn off if MTControl is unlocked.



Figure 1: MTControl sensitive area



4.3 Buttons - menus

Four menus can be accessed from the main screen by pressing each of the buttons or using MTControl.

The F model only has one button. Pressing it for 3 seconds will initiate the auto calibration. The tests and auto calibration can be aborted by pressing the button for one second.

4.3.1 Test menu

| Test Menu | Description |
|-------------|-----------------------------|
| 1 Start PST | Start a partial stroke test |
| 2 Start FST | Start a full stroke test |
| 3 Start SOT | Start a solenoid test |

4.3.2 Diagnostic menu

| Diagnostic Menu | | tic Menu | Description |
|-----------------|-----|--------------------|---|
| 1 | PST | 1 | View the reference and latest partial stroke test values and limits |
| | | Date | Date the test was performed |
| | | Time | Time the test was performed |
| | | Last test result | Result of the latest test |
| | | Start pressure | Start pressure |
| | | React | SOV reaction time |
| | | Breakaway time | Breakaway time |
| | | Breakaway pressure | Breakaway pressure |
| | | PST time | PST time |
| | | Press | PST pressure |
| | | PrsTi | PST pressurising time |
| | | RetTi | PST return time |
| | | FilTi | Actuator fill time |
| | | Total time | PST total time |
| | | Max. travel | PST maximum travel |
| | | Min. pressure | PST minimum pressure |
| | | Enable errors | Enable errors |
| | | Enable warnings | Enable warnings |
| 2 | FST | | View the reference and latest full stroke test values and limits |
| | | Date | Date the test was performed |
| | | Time | Time the test was performed |
| | | Last test result | Result of the latest test |
| | | Start pressure | Start pressure |
| | | React | SOV reaction time |
| | | Breakaway time | Breakaway time |
| | | Breakaway pressure | Breakaway pressure |
| | | Breakaway pos. | Breakaway position error limit |
| | | limit | |
| | | FST time | FST time |
| | | DePrs | FST depressurising time |
| | | PrsTi | FST pressurising time |
| | | RetTi | FST return time |
| | | FilTi | Actuator fill time |
| | | Total time | FST total time |
| | | Enable errors | Enable errors |
| | | Enable warnings | Enable warnings |
| 3 | SOI | | View the reference and latest solenoid valve test values and limits |
| | | Date | Date the test was performed |
| | | Time | Time the test was performed |



| | Last test result | Result of the latest test |
|------|------------------|---|
| | Start pressure | Start pressure |
| | Reaction time | SOV reaction time |
| | Breakaway time | Breakaway time |
| | Total time | SOT total time |
| | Enable errors | Enable errors |
| 4 ES | T | View the latest Emergency shutdown test |
| | Date | Date the test was performed |
| | Time | Time the test was performed |
| | StaPr | Start pressure |
| | React | SOV reaction time |
| | BrkTi | Breakaway time |
| | BrkPr | Breakaway pressure |
| | FSTTi | FST time |
| | DePrs | FST depressurising time |
| | TotTi | EST total time |

4.3.3 Control menu

| Control Menu | | Description |
|--------------|--------|--------------------------|
| 1 | Manual | Manual operate the valve |



4.3.4 Setup menu

| Set | up Menu | Description |
|-----|--------------------|---|
| 1 | Calibration | |
| | 1 Auto calibration | Start the auto calibration |
| | 2 End point cal. | Start endpoint calibration |
| | 3 Start PST ref | Start the partial stroke reference |
| | 4 Start FST ref | Start the full stroke reference |
| | 5 Start SOT ref | Start the solenoid valve test reference |
| 2 | Identification | Software ID, Software version, serial no. and tag no. |
| 3 | Live | Current state of digital and analogue signals |
| 4 | Event log | The last 10 events |
| 5 | Scheduler | Configure the scheduler |
| 6 | HART | Configure HART communication |
| 7 | Modbus | Configure Modbus configuration |
| 8 | Display | Adjust the contrast and backlight |

4.4 Bluetooth

Bluetooth can be used to control the valve system though the IDC or to download signatures to a mobile device.

Range: IDC24-AF with external antenna: 20 meters IDC24-F with external antenna: 20 meters

IDC24-A with internal antenna: 2 meters IDC24-AF with internal antenna and glass lid: 2 meters

When connecting to a IDC with internal antenna, the connecting devices must be right in front of the IDC.

After the Tag no. is changed the device must be power cycled to update the Bluetooth name.

4.5 Internal memory

The device is available in two models, standard or with local storage on microSD card.

A signature contains all test data and a curve of the test.

4.5.1 Standard

The last 10 events are stored in memory.

The IDC will store test data from the last performed test of each type

- one PST
- one PST reference
- one FST
- one FST reference
- one SOT
- one SOT reference

DID-UM-002 Revision: 13



• one EST.

When a new test is performed, previously stored data will be overwritten in the device. To avoid data loss the operator shall download test data between the tests.

The IDC will store one test curve in memory until the unit is either powered off or a new test/reference test is performed. To avoid overwriting a test curve, the curve shall be downloaded between tests.

No test curves are generated during auto calibration. The recommended procedure to get reference tests with data and curves is as follows:

- 1) Perform an auto calibration
- 2) Perform a PST reference
- 3) Download PST reference signature
- 4) Perform a FST reference
- 5) Download FST reference signature
- 6) Download SOT reference signature (The SOT reference never contains a curve)

4.5.2 local storage on microSD card

All events and signatures are stored on the SD card. Up till 50.000 event logs and signatures can be stored on the SD card.

Note: In case of a full SD card no further data will be saved.

4.6 Local/Remote

The IDC has the option to use a Local/Remote selector. The table below shows when the interfaces are available. The communication protocols are always allowed to read parameters, but sending commands like "Start PST" will not work when the selector is in Local.

| | Selector: Local | Selector: Remote | No selector |
|------------------------|-----------------|-------------------------|--------------|
| Local interface | | | |
| USB | | | \checkmark |
| MTcontrol | | | \checkmark |
| Bluetooth | | | \checkmark |
| Local control panel | \checkmark | | \checkmark |
| Digital input from DCS | | | \checkmark |
| HART | | | \checkmark |
| Modbus | | | \checkmark |
| Fieldbus | | $\overline{\mathbf{v}}$ | |



5 Configuration - ValConnect

All configuration of the IDC must be done through a USB connection to a computer with ValConnect installed. ValConnect can be downloaded at <u>www.valcontrols.com</u>.

Disable PST, FST or SOT

PST, FST and SOT can be disabled, so that reference tests are not run during the autocalibration. This can be archived by setting all DO to "Not used" in valve configuration under each corresponding section in ValConnect.



6 Diagnostic

The IDC can perform tree different test types.

- Partial stroke test, PST
- Full stroke test, FST
- Solenoid test, SOT

Furthermore, the IDC can record signatures and record test data in case of emergency shutdowns.

• Emergency shutdown test, EST

6.1 Partial stroke test

The PST moves the system to a predefined position and back. The test can be initiated from the test menu, a communication protocol or a digital input depending on the configuration.

The system will move the distance specified by "PST travel". If PST travel is 20%, the actuator will move from 100% to 80%.

To avoid overshoot, a function called "PST overshoot prevention" is enabled as default. During the reference stroke, two partial strokes will be performed. The first partial stroke is used to measure the overshoot which is then avoided in the second stroke. In all further PST will use this function.

Below are signatures from typical partial strokes shown, including definitions on the different terms further used in this manual.



Figure 2: PST time definitions



Figure 3: PST position and pressure definitions

The IDC must be calibrated before it can perform a test.

When a test is started the position and pressure is evaluated. A test will not be started if the start conditions are not correct. The start conditions are as follow:

- Valve must be at the operational position
- Pressure must be within the Start pressure low and Start pressure high limits.

An error will indicate what the problem is.

The IDC monitors the position and pressure during the test. The IDC aborts the test and report an error if the limits in the error parameters are reached.

If a test does not reach the error limits it will run until finished and then the warning parameters are evaluated. See Figure 4 for flow diagram describing the general functional description of a PST.

If the system does not have a pressure sensor, all pressure related parameters, warnings and errors will be ignored.

The errors or warnings can only be removed by performing a successful test.









6.1.1 PST error and warning parameters

The error and warning parameters are automatically set during auto calibration and Partial stroke reference tests but can be manually adjusted through ValConnect, the display or remote communication.

PST errors

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

- Breakaway timeout = Reference breakaway time + reference PST time
- PST timeout = Reference total time
- Total timeout = 2 * Reference total time
- Minimum breakaway pressure = Reference pressure at SP
- Minimum allowed pressure = Reference minimum pressure 10% of Reference start pressure

The Start pressure low and high error limits are not set automatically and the function is disabled as default.

PST warnings

The partial stroke warning parameters are set to the following values after a successful calibration:

- Low breakaway time = Reference breakaway time -50%
- High breakaway time = Reference breakaway time + 50%
- Low breakaway pressure = Reference breakaway pressure -50%
- High breakaway pressure = Reference breakaway pressure + 50%
- Low partial stroke time = Reference partial stroke time -50%
- High partial stroke time = Reference partial stroke time + 50%
- Maximum travel = Move at reference stroke + 5 %









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Figure 9: Minimum allowed pressure



Start pressure

Varying start pressures has impact on the PST, this is shown in Figure 10. The breakaway time is increasing a lot along with the start pressure in the actuator. The PST return time also have a high dependence on the start pressure.



Figure 10: Four PSTs with varying start pressures



Rough movement

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

The Figure 11 shows a signature from a valve with increased torque which leads to uneven movement. The measured times and pressures for this test does not give an error but in time the performance cab get so bad that it will give errors.



Figure 11: Rough movement



6.2 Full stroke test

The full stroke test will move the valve from 100%-0%-100%. The test can be initiated from the test menu, a communication protocol or a digital input depending on the configuration.

Signatures from typical full strokes shown in Figure 12 and Figure 13, including definitions on the different terms further used in this manual.



Figure 12: FST time definitions



Figure 13: FST pressure definitions

Before the IDC can perform a test, it must be calibrated.

When a test is started the position and pressure is evaluated. A test will not be started if the start conditions are not correct. The start conditions are as follow:

- Valve must be at the operational position
- Pressure must be within the Start pressure low and Start pressure high limits.

An error will indicate what the problem is.

The IDC monitors the position and pressure during the test. The IDC aborts the test and report an error if the limits in the error parameters are reached.

If a test does not reach the limits it will run until finished and then the warning parameters are evaluated.

If the system does not have a pressure sensor, all pressure related parameters, warnings and errors will be ignored.

The errors or warnings can only be removed by performing a successful test.



6.2.1 FST error and warning parameters

The error parameters are automatically set during auto calibration but can be manually adjusted through ValConnect or the display.

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

- Breakaway timeout = Reference breakaway time + Reference FST time
- FST timeout = Reference total time
- Total timeout = 2 * Reference total time
- Minimum breakaway pressure = Reference pressure at 50%

The Start pressure error limits are not set automatically and function is disabled.

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

- Low breakaway time = Reference breakaway time -50%
- High breakaway time = Reference breakaway time + 50%
- Low breakaway pressure = Reference breakaway pressure -50%
- High breakaway pressure = Reference breakaway pressure + 50%
- Low fail position stroke time = Reference fail position stroke time -50%
- High fail position stroke time = Reference fail position stroke time + 50%



Figure 14: Breakaway timeout

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Figure 16: Total timeout

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Figure 17: Minimum breakaway pressure

6.3 Solenoid test

The solenoid test performs a movement or pressure drop of the system to verify the operation of the solenoid operated valve, SOV. The test can be initiated from the test menu, a communication protocol or a digital input depending on the configuration.

System without pressure sensor: System is detecting movement in the system to verify SOV performance.

System with pressure sensor: System is detecting pressure drop in the system to verify SOV performance.

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



Figure 18: Solenoid test with pressure sensor

Before the IDC can perform a test the system must be calibrated. The calibration consists of two steps, an endpoint calibration and a reference.

When a test is started the position and pressure is evaluated. A test will not be started if the start conditions are not correct. The start conditions are as follow:

- Valve must be at the operational position
- Pressure must be within the Start pressure low and Start pressure high limits. This function can be disabled.

An error will indicate what the problem is.

The IDC monitors the position and pressure during the test. The IDC aborts the test and report an error if the limits in the error parameters are reached.

If a test does not reach the limits it will run until finished and then the warning parameters are evaluated.

If the system does not have a pressure sensor, all pressure related parameters, warnings and errors will be ignored.

The errors or warnings can only be removed by performing a successful test.



6.3.1 SOT error parameters

The error parameters are automatically set during auto calibration but can be manually adjusted through ValConnect or the display.

For the solenoid test the error parameters are set to the following values when using pressure sensor:

- Reaction timeout = Reference breakaway time
- Total timeout = Total time * 2

The Start pressure error limits is not set automatically and the function is disabled.

For the solenoid test the error parameters are set to the following values when not using pressure sensor:

- Reaction timeout = Reference breakaway time *2
- Total timeout = Total time * 2

6.4 Emergency shutdown test

When an Emergency shutdown test has been recorded then it can be analysed like the other test types. The measurements from an EST can be compared to similar measurements from PST, FST and SOT.

EST does not have error and warning parameters and will not generated diagnostic error codes.



7 Calibration

7.1 Automatic

The automatic calibration will go through the following steps:

- 1. Endpoint calibration
- 2. PST reference
- 3. FST reference
- 4. SOT reference

The calibration can take from 60 seconds up to 20 minutes depending on the travel time for the actuator. The valve must not have a travel time larger than 300 seconds.

The steps in the automatic calibration can be performed individually from the calibration menu.

7.2 Endpoint calibration

The endpoints calibration set the travel endpoints. It can be used if the position signal has been changed.

7.3 PST reference

Records a partial stroke reference signature and set the partial stroke error and warning parameters.

7.4 FST reference

Records a full stroke reference signature and set the full stroke error and warning parameters.

7.5 SOT reference

Record a solenoid test reference and set the solenoid test error parameters.



8 Test errors

8.1 Partial stroke errors (401 to 419)

| No. 401 | PST start condition: Not at operational |
|------------------|---|
| Description | The valve is not at the operational position |
| | The valve must be at the operational position to perform a partial stroke. All measured times and pressures depends on that the valve is at the end position. |
| Trouble shooting | This error can be solved by |
| | Make sure the valve is at the operational position Perform an endpoint calibration. Increase the partial stroke position deadband |

| No. 402 | PST start condition: Low start pressure |
|------------------|--|
| Description | The measured pressure is below Start pressure low |
| Trouble shooting | This error can be solved by: Increase the pressure in the hydraulic/pneumatic system Decrease Start pressure low |

| No. 403 | PST start condition: High start pressure | |
|------------------|---|--|
| Description | The measured pressure is above Start pressure high | |
| Trouble shooting | This error can be solved by: | |
| | Decrease the pressure in the hydraulic/pneumatic system Increase Start pressure high | |

| No. 404 | PST start condition: In ESD mode | |
|------------------|----------------------------------|--|
| Description | Emergency shutdown is detected | |
| | | |
| Trouble shooting | This error can be solved by: | |
| | • Activate the ESD input | |



| No. 406 | Aborted by the user |
|------------------|----------------------------------|
| Description | The test was aborted by the user |
| Trouble shooting | This error can be solved by: |
| | • Perform a new PST |

| No. 411 | PST Error: Pressure drop, no breakaway | |
|---------------------------|--|---|
| Description | Breakaway is not detected, but the pressure is below the Minimum breakaway | / |
| | pressure | |
| Trouble shooting | This error may be due to: | |
| | Actuator is stuck | |
| | Position sensor malfunction | |
| | This error can be solved by: | |
| | Check the actuator and valve Check the magitizer sensor | |
| | Check the position sensor Decreasing the Minimum breakaway pressure | |
| | | |
| 100 - | 5 | |
| 90 - | | |
| 80 - | | |
| | | |
| 70 - | | |
| 60 - 🕱 Minimum breakaw | ay pressure | |
| 50 - | | |
| 2 | Ref. Pressure | : |
| 40 - | - 2 Pressure | |
| 30 - | | |
| 20 - | - 1 | |
| | | |
| 10 - | | |
| 0 10 | 20 30 40 50 60 70 | |
| | Time (sec) | |






















| No. 417 | PST error: Total timeout, pressure |
|------------------|---|
| Description | The pressure did not reach the start pressure after the partial stroke |
| Trouble shooting | This error can be caused by:Low supply pressureIt can be solved by: |
| | Increase pressure Resolve the mechanical problem Increase PST total timeout |

| No. 418 | PST error: At 0% position |
|------------------|--|
| Description | The position measured to be 0% |
| Trouble shooting | This error can be caused by: Position sensor was disconnected Position sensor is operating in the illegal area Wrong configuration of the position switches The valve moved to 0% It can be solved by: Check the position sensor Make sure the position sensor is operating within the legal area Check the function of the position switches Decrease the PST travel |

| 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 |





8.2 Partial stroke warnings (431 to 440)



































8.3 Full stroke errors (451 to 468)

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

| No. 452 | FST start condition: Low start pressure |
|------------------|--|
| Description | The measured pressure is below Start pressure low |
| Trouble shooting | This error can be solved by: |
| | Increase the pressure in the hydraulic/pneumatic system Decrease the Start pressure low value |

| No. 453 | FST start condition: High start pressure |
|------------------|---|
| Description | The measured pressure is above Start pressure high |
| Trouble shooting | This error can be solved by: |
| | Increase the pressure in the hydraulic/pneumatic system Increase the Start pressure high value |

| No. 454 | FST start condition: In ESD mode |
|------------------|----------------------------------|
| Description | Emergency shutdown is detected |
| Trouble shooting | This error can be solved by: |
| | • Activate the ESD input |

| No. 456 | Aborted by the user |
|------------------|----------------------------------|
| Description | The test was aborted by the user |
| Trouble shooting | This error can be solved by: |
| | • Perform a new FST |































| No. 468 | FST error: At 0% position |
|------------------|--|
| Description | The 0% switch was activated before the 100% switch was released |
| Trouble shooting | This error can be caused by: Position sensor was disconnected Position sensor is operating in the illegal area Wrong configuration of the position switches The valve moved from 100% directly to 0% |
| | It can be solved by: Check the position sensor Make sure the position sensor is operating within the legal area Check the function of the position switches |



| No. 481 | FST warning: Breakaway pressure is too low |
|------------------|--|
| Description | The breakaway pressure is lower than Breakaway pressure low |
| Trouble shooting | This alarm can be solved by: |
| | Resolve the mechanical problemDecrease the Breakaway pressure low value |
| 100 | 5 |
| 90 - | |
| 80 - | - 4 Breakaway pressure high |
| 70 - | 3 <u>(a</u> |
| 50 | Breakaway pressure low Position Pressure |
| 40 - | 2 |
| 30 - | |
| 20 - | |
| 10 | |
| 0 | 5 10 15 20 25 Time (sec) |

8.4 Full stroke warnings (481 to 488)





















| No. 487 | FST warning: Total time is too low |
|------------------|---|
| Description | The FST total time is lower than FST total time low |
| Trouble shooting | This error can be solved by: Resolve the mechanical problem Decrease the FST total time low value |

| No. 488 | FST warning: Total time is too high |
|------------------|---|
| Description | The FST total time is higher than FST total time high |
| Trouble shooting | This error can be solved by: |
| | Resolve the mechanical problemIncrease the FST total time high value |



8.5 Solenoid valve test errors (501 to 514)

| No. 501 | SOT start condition: Not at operational |
|------------------|---|
| Description | The valve is not at the operational position |
| Trouble shooting | This error can be solved by Make sure the valve is at the operational position Perform an endpoint calibration. Increase the solenoid test position deadband |

| No. 502 | SOT start condition: Low start pressure |
|------------------|---|
| Description | The measured pressure is below Start pressure low |
| Trouble shooting | This error can be solved by: |
| | Increase the pressure in the systemDecrease the Start pressure low |

| No. 503 | SOT start condition: High start pressure |
|------------------|--|
| Description | The measured pressure is above Start pressure high |
| Trouble shooting | This error can be solved by: |
| | Decrease the pressure in the systemIncrease Start pressure high |

| No. 504 | SOT start condition: In ESD mode |
|------------------|----------------------------------|
| Description | Emergency shutdown is detected |
| Trouble shooting | This error can be solved by: |
| | • Activate the ESD input |

| No. 506 | Aborted by the user |
|------------------|----------------------------------|
| Description | The test was aborted by the user |
| | |
| Trouble shooting | This error can be solved by: |
| | • Perform a new SOT |



| No. 507 | SOT start condition: Pressure switch is not activated |
|------------------|--|
| Description | The test cannot start as the pressure switch is not activated. |
| Trouble shooting | This error can be solved by: |
| | • Make sure the switch is activated (Indicating OK pressure) |

| No. 511 | SOT error: Timeout |
|------------------|--|
| Description | Position based SOT: |
| - | Breakaway not detected within the max time |
| | Pressure based SOT: |
| | 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 Decrease Pressure deadband |



| No. 513 | SOT error: Total timeout |
|------------------|--|
| Description | Position based SOT: |
| | The valve did not open within the SOT total timeout |
| | Pressure based SOT: |
| | The pressure did not reach the start pressure within the SOT total 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 SOT total timeout value |

| No. 514 | SOT error: At 0% position |
|------------------|--|
| Description | The valve is at 0% position. |
| Trouble shooting | This error can be caused by: Position sensor was disconnected Position sensor is operating in the illegal area Wrong configuration of the position switches The valve moved from 100% directly to 0% It can be solved by: Check the position sensor Make sure the position sensor is operating within the legal area Check the function of the position switches |

8.6 Solenoid valve 2 test errors (551 to 564)

| No. 551 | SOT 2 start condition: Not at operational |
|------------------|---|
| Description | The valve is not at the operational position |
| Trouble shooting | This error can be solved by Make sure the valve is at the operational position Perform an endpoint calibration. Increase the solenoid test position deadband |



| No. 552 | SOT 2 start condition: Low start pressure |
|------------------|--|
| Description | The measured pressure is below Start pressure low |
| Trouble shooting | This error can be solved by: Increase the pressure in the system Decrease the Start pressure low |

| No. 553 | SOT 2 start condition: High start pressure |
|------------------|--|
| Description | The measured pressure is above Start pressure high |
| Trouble shooting | This error can be solved by: |
| | Decrease the pressure in the systemIncrease Start pressure high |

| No. 554 | SOT 2 start condition: In ESD mode |
|------------------|------------------------------------|
| Description | Emergency shutdown is detected |
| Trouble shooting | This error can be solved by: |
| | • Activate the ESD input |

| No. 556 | Aborted by the user |
|------------------|----------------------------------|
| Description | The test was aborted by the user |
| Trouble shooting | This error can be solved by: |
| | • Perform a new SOT |

| No. 557 | SOT 2 start condition: Pressure switch is not activated |
|------------------|--|
| Description | The test cannot start as the pressure switch is not activated. |
| Trouble shooting | This error can be solved by: |
| | • Make sure the switch is activated (Indicating OK pressure) |



| No. 561 | SOT 2 error: Timeout |
|------------------|--|
| Description | Position based SOT: |
| | Breakaway not detected within the max time |
| | Pressure based SOT: |
| | 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. 562 | SOT 2 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 Decrease Pressure deadband |
| | Check pressure transmitterDecrease Pressure deadband |

| No. 563 | SOT 2 error: Total timeout |
|------------------|--|
| Description | Position based SOT: |
| | The valve did not open within the SOT total timeout |
| | Pressure based SOT: |
| | The pressure did not reach the start pressure within the SOT total 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 SOT total timeout value |



| No. 564 | SOT 2 error: At 0% position |
|------------------|--|
| Description | The valve is at 0% position. |
| Trouble shooting | This error can be caused by: Position sensor was disconnected Position sensor is operating in the illegal area Wrong configuration of the position switches The valve moved from 100% directly to 0% |
| | It can be solved by: Check the position sensor Make sure the position sensor is operating within the legal area Check the function of the position switches |



9 System errors

| No. 102 | Position loop (AI10) is not connected |
|------------------|---|
| Description | The AI10 has been selected as the position signal, but there is not connected a potentiometer |
| Trouble shooting | Connect a potentiometer to AI10Select another position signal |

| No. 103 | Position loop (AI1) is not connected |
|------------------|--|
| Description | The AI1 has been selected as the position signal, but there is not connected a potentiometer |
| Trouble shooting | Connect sensor to AI1 Select another position signal |

| No. 113 | Analogue output 1 is not calibrated |
|------------------|---|
| Description | Analogue output 1 calibration data has not been set |
| Trouble shooting | Contact Val Controls |

| No. 114 | Analogue output 2 is not calibrated |
|------------------|---|
| Description | Analogue output 2 calibration data has not been set |
| Trouble shooting | Contact Val Controls |

| No. 115 | Pressure loop is not connected |
|------------------|---|
| Description | A pressure input has been selected but no sensor is detected on the input |
| Trouble shooting | Connect a pressure sensor to the inputChange the configuration |



| No. 321 | Pressure input 1 is high |
|------------------|--|
| Description | The Prevent open at high pressure function is activated and Pressure input is over the limit |
| Trouble shooting | This error can be caused by: |
| | • High pressure |
| | It can be solved by: |
| | • Lower the pressure |
| | • Increase the pressure limit |
| | • Disable the function |

| No. 322 | Pressure input 2 is high |
|------------------|---|
| Description | The Prevent open at high pressure function is activated and Pressure input is over the limit |
| Trouble shooting | This error can be caused by: High pressure It can be solved by: |
| | Lower the pressure Increase the pressure limit Disable the function |

| No. 354 | SD card error |
|------------------|---|
| Description | There is a problem with the SD card |
| Trouble shooting | This error can be caused by: SD card not inserted SD card not properly inserted in socket Faulty SD card It can be solved by: Insert a SD card Remove the SD card and insert it again |



9.1 Pump unit errors

| No. 601 | Pump control: Low level. |
|------------------|--|
| Description | The measured level is below the specified value. |
| Trouble shooting | This error can be caused by: Low oil level Mal functioning sensor High value of Level Low limit It can be solved by: Refill the tank with oil |

| No. 602 | Pump control: Temperature. |
|------------------|--|
| Description | The measured temperature is above or below the limit values. |
| Trouble shooting | This error can be caused by: Low oil temperature High oil temperature Sensor malfunction It can be solved by: Change oil temperature Adjust temperature Low limit Adjust temperature High limit |

| No. 603 | Pump control: Low pressure |
|------------------|--|
| Description | The measured pressure is below the limit value |
| Trouble shooting | This error can be caused by: |
| | Pressure is lower than the low alarm valueLow pressure switch is active |
| | It can be solved by: |
| | Let the pump increase the pressure Adjust pressure Low limit Check low pressure switch |



| No. 604 | Pump control: High pressure |
|------------------|--|
| Description | The measured pressure is above the limit value |
| Trouble shooting | This error can be caused by: |
| | Pressure is higher than the high alarm valueHigh pressure switch is active |
| | It can be solved by: |
| | Relieve the pressure Adjust pressure High limit Check high pressure switch |

| No. 610 | Pump control: Motor safety relay |
|------------------|--|
| Description | The motor protection relay is active |
| Trouble shooting | This error can be caused by: |
| | Motor safety relay has been activatedMotor safety relay malfunction or disconnected |

| No. 611 | Pump control. Max running time |
|------------------|--|
| Description | The motor has been running for too long. |
| Trouble shooting | This error can be caused by: |
| | • Digital output to the motor has been On longer than the Max running time |
| | It can be solved by: |
| | Investigate what causes the motor to run. Is it not able to get the pressure within the limits? Increase the Max running time Disable the Max running time feature |



10 Event log

| No. 1 | IDC power on |
|-------------|---------------------|
| Description | The IDC is power on |

| No. 2 | System error |
|-------------|--|
| Description | An error was logged in the system error log. |
| Argument | System error no. |

| No. 3 | System error removed |
|-------------|--|
| Description | An error was removed from the system error log |
| Argument | System error no. |

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

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

| No. 13 | ESD reset |
|-------------|---|
| Description | An ESD reset was issued. This event is only applicable for IDCs 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. |

DID-UM-002 Revision: 13


| 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 |
|-------------|-------------------------------------|
| Description | The IDC was set in operational mode |

| No. 52 | Fail position remote |
|-------------|---------------------------------------|
| Description | The IDC was set in fail position mode |
| | |

| No. 57 | Set in local mode |
|-------------|-------------------------------|
| Description | The IDC was set in local mode |

| No. 58 | Set in remote mode |
|-------------|--------------------------------|
| Description | The IDC 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. 63 | Auto calibration aborted |
|-------------|---------------------------------|
| Description | An auto calibration was aborted |

DID-UM-002 Revision: 13



| No. 71 | Endpoint calibration was started |
|-------------|-------------------------------------|
| Description | An endpoint calibration was started |

| No. 72 | Endpoint calibration finished |
|-------------|----------------------------------|
| Description | An endpoint calibration finished |

| No. 73 | Endpoint calibration aborted |
|-------------|-------------------------------------|
| Description | An endpoint calibration was aborted |

| No. 81 | A scheduler action is required |
|-------------|---------------------------------|
| Description | An auto calibration was started |

| No. 82 | Auto calibration finished | |
|-------------|------------------------------|--|
| Description | An auto calibration finished | |

10.1 Argument

For the events describing an action the argument denotes what is the responsible for the action.

| No. | Responsible | Description |
|-----|-------------|---|
| 1 | Remote | The action was initiated through Remote controlled digital inputs |
| 2 | Local | The action was initiated through Local controlled digital inputs |
| 3 | Menu | The action was initiated through the local interface on the device- |
| | | |
| 11 | HART | The action was initiated through HART communication |
| 12 | Modbus | The action was initiated through Modbus communication |
| | | |
| 21 | ESD | The action was initiated as an ESD occurred |
| | | |
| 31 | Auto cal. | The action was initiated by the auto-calibration procedure |
| 32 | Scheduler | The action was initiated by scheduler |



11 Software revision list

Version 1.09.00

New functions

• Control a digital output based on the value of an analogue input

Version 1.10.00

- HART revision increased to 04
- Control a digital output with a digital input

Version 1.10.01

• Minor improvements

Version 1.10.02

• Bluetooth stability improvements

Version 1.13.00

- Added System Error 113 and 114. AO1 And AO2 not calibrated
- Added System Error 102: AI10 not connected
- Added System Error 103: AI1 not connected
- Added Disable Bluetooth from Digital input
- Improvements to EST recording

Version 1.14.00

- Endpoint calibration can be performed from ValConnect
- Bluetooth and MTcontrol enable functions are combined with Local switch

Version 1.14.01

• Minor improvements

Version 1.14.02

• Show psi on main page

Version 1.15.00

- HART SV, is now the status of the last PST. (Can be changed through ValConnect)
- Open/close extra LED blink when moving can be disabled
- Minor improvements

Version 1.16.00

• New feature: Wait at SP in PST

VAL CONTROLS Intelligent Valve Control

Version 1.17.00

• Feature: Reverse open/close output on HART and Modbus

Version 1.18.00

- Feature: Immune to spikes on ESD line
- Feature: HART TV can retransmit Closed by LCP alarm

Version 1.19.00

- Feature: Virtual DO
- Feature: Add on-time to "DI to DO" function

Version 1.20.00

• Feature: Prevent open at high pressure

Version 1.21.00

• Feature: Bluetooth Pin

Version 1.23.00

• Feature: Unify HART SV, TV and QV settings

Version 1.24.00

• Feature: Pump controller high- and low-pressure alarm

Version 1.25.00

• Feature: SOT 2

Version 1.29.00

• Add functionality to DA control