

ENGINEERING  
TOMORROW

*Danfoss*

User Guide

# ICM and ICMTS Motorized Valves and CVE Pilot valves with ICAD Actuators

Installation, Configuration and Troubleshooting



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## Introduction

ICAD is the actuator for control of ICM/ICMTS motorized valves and CVE pressure regulating pilot. The actuator control the opening degree of the valves according to the input signal received from the controller.

### ICM/ICAD overview

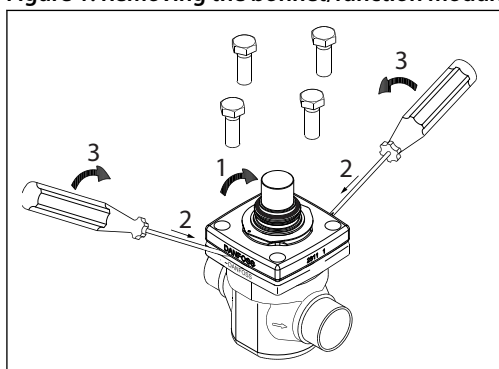
Table 1: Different ICAD variants are used depending of the specific valve, as follows:

| Actuator            | ICAD 600B | ICAD 1200B      | ICAD 600B-TS |
|---------------------|-----------|-----------------|--------------|
| Valve Size and Type | ICM 20    | ICM 40          | ICMTS 20     |
|                     | ICM 25    | ICM 50          | ICMTS 50     |
|                     | ICM 32    | ICM 65          | ICMTS 80     |
|                     |           | ICM 100         |              |
|                     |           | ICM 125         |              |
|                     |           | ICM 150         |              |
|                     |           | CVE pilot valve |              |

## Installation

1. All ICM and ICMTS valves and ICAD motor actuators must be installed in horizontal pipelines with the motor actuator in an upright position (+/- 45° for ICMTS 50/80)
2. Preparation of Valve Body ICM 20 and ICMTS 20 valves: both the integrated bonnet/function module and the separate valve seat must be removed from the valve body prior to welding. To remove the 20-A33 or ICM20-A valve seat use a 13mm socket wrench and to remove the 20-B66, ICM 20-B or 20-C valve seat, use a 12 mm hex key
  - 2.1. ICM 25 to 65 and ICMTS 50/80 valves, the integrated bonnet and function module should be removed as shown in the [Figure 1](#)
  - 2.2. ICMTS 20 valve, the function module should be removed as shown in the [Figure 1](#)
  - 2.3. ICM 100 to 150 valves, the function module and bonnet are separate pieces and do not need to be removed prior to welding. However, some form of arc welding should be used to weld the valve into the piping and care should be taken to protect the valve stem from becoming contaminated

**Figure 1: Removing the bonnet/function module from the body of the ICM 25 to 65 valves**



**Figure 2: Removing the bonnet/function module from the body of the ICMTS 20 valves**

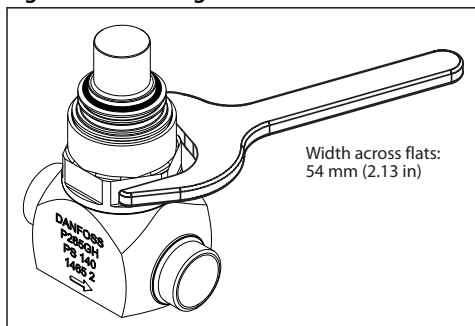
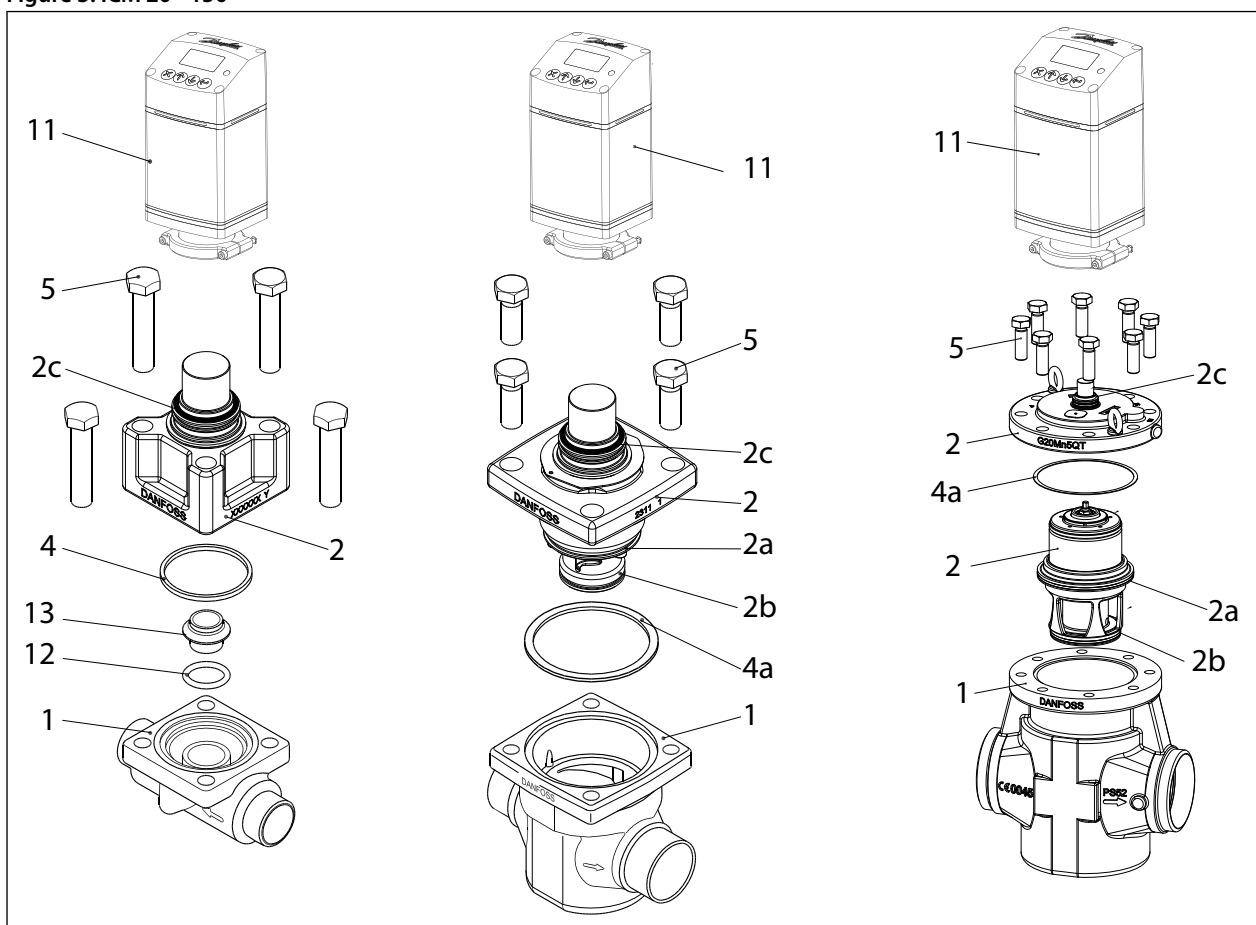
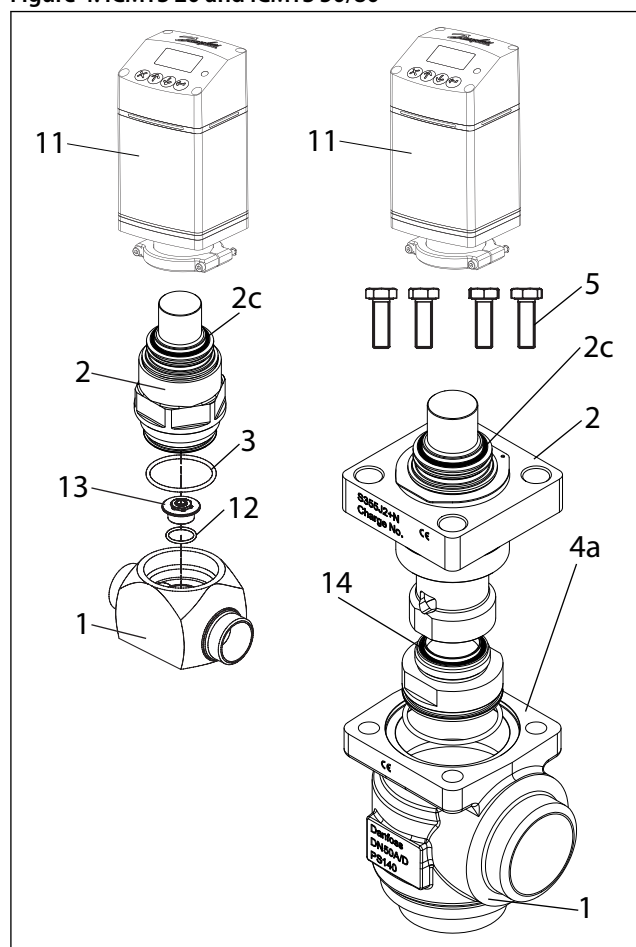


Figure 3: ICM 20 - 150



|    |                             |
|----|-----------------------------|
| 1  | Housing                     |
| 2  | Top cover / function module |
| 2a | O-ring                      |
| 2b | O-ring                      |
| 2c | O-ring                      |
| 4  | Gasket                      |
| 4a | Gasket                      |
| 5  | Bolts                       |
| 11 | Actuator                    |
| 12 | O-ring                      |
| 13 | Seat                        |
| 14 | O-ring                      |

Figure 4: ICMTS 20 and ICMTS 50/80



|    |                             |
|----|-----------------------------|
| 1  | Housing                     |
| 2  | Top cover / function module |
| 2c | O-ring                      |
| 3  | O-ring                      |
| 4  | Gasket                      |
| 4a | Gasket                      |
| 5  | Bolts                       |
| 11 | Actuator                    |
| 12 | O-ring                      |
| 13 | Seat                        |
| 14 | O-ring                      |

**⚠ CAUTION:**

Care should be taken to protect the ICM/ICMTS function module when it is removed and stored during installation of valve body.

1. Weld the valve body in line making sure that the arrow on the valve body is pointing in the direction of flow
  - 1.1. For ICM 20 through 65 and ICMTS 20 through 80, make sure that all debris is removed from valve body before bonnet/ function module is re-installed
  - 1.2. For the ICM 20 and ICMTS 20, make sure that the removable orifice seat is re-installed in the valve body with the small o-ring between the orifice seat and the body. Use a 13mm socket to tighten the 20-A33 or 20-A valve seat to a torque of 6.5 ft-lbs (9 N-m). Use a 12 mm hex key to tighten the 20-B66, 20-B or 20-C valve seat to a torque of 1.5 ft-lbs (2 Nm)

**DO NOT OVERTIGHTEN THE REMOVABLE SEAT.**

Make sure that the bonnet gasket or bonnet o-ring for ICMTS 20 is installed and in good condition.

- 1.3. For the ICM 25 through ICM 65, check that the two o-rings are installed on the function module and that the gasket located on the top of the valve body is installed and all are in good condition. A light coating of refrigerant oil on the bonnet o-rings and the cover gasket will facilitate assembly of the valve
- 1.4. For the ICMTS 50/80, check that the o-ring is installed on the function module and that the gasket located on the top of the valve body is installed and all are in good condition. A light coating of refrigerant oil on the bonnet o-ring and the cover gasket will facilitate assembly of the valve

**2. Install the bolts and torque to the following specifications:**

| Valve Body          | Nm  | ft lbs |
|---------------------|-----|--------|
| ICM 20              | 40  | 29     |
| ICM 25              | 100 | 74     |
| ICM 32              | 120 | 88     |
| ICM 40              | 120 | 88     |
| ICM 50              | 140 | 103    |
| ICM 65              | 150 | 110    |
| ICM 100 through 150 | 220 | 162    |

| Valve Body | Nm  | ft lbs |
|------------|-----|--------|
| ICMTS 20   | 100 | 74     |
| ICMTS 50   | 133 | 98     |
| ICMTS 80   | 84  | 62     |

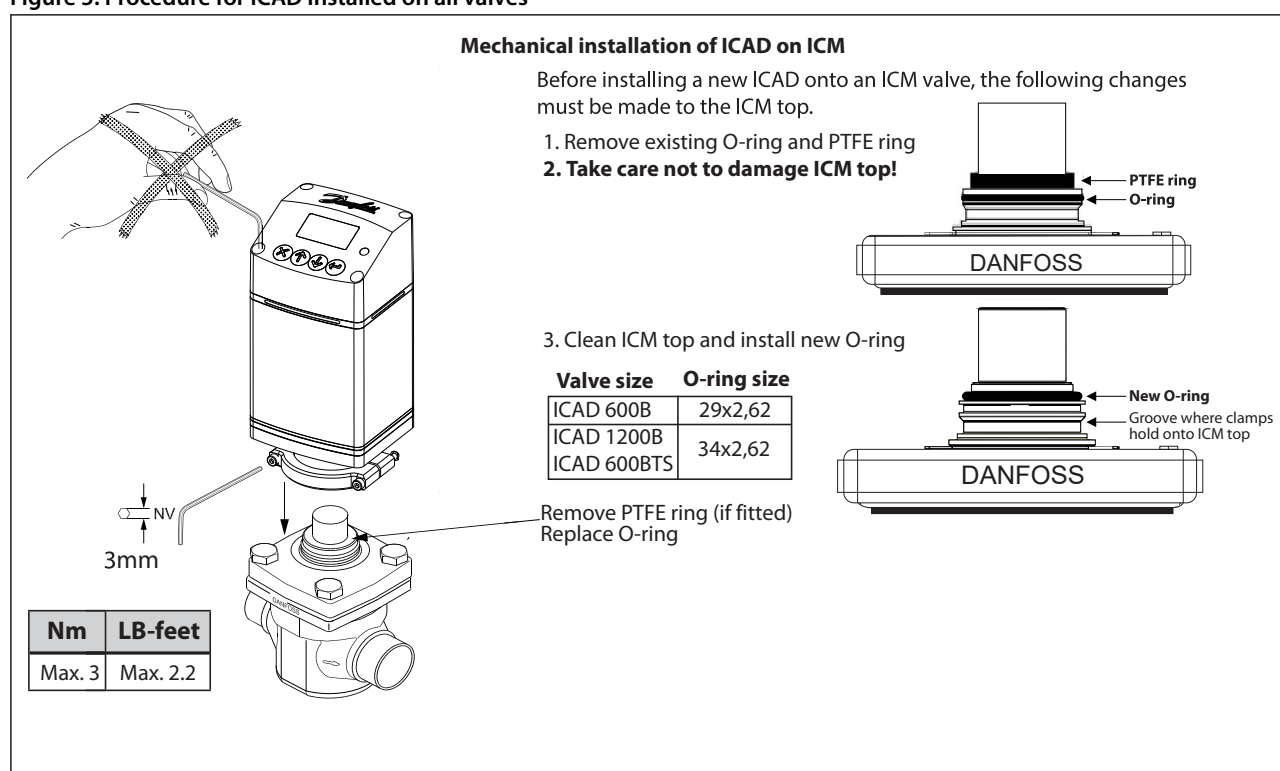
## 3. Install the ICAD Motor on the ICM/ICMTS valve:

The ICM/ICMTS valve must not be in its full opened position while the ICAD motor is calibrated with the valve (at a later step). Therefore, if the opening degree of the ICM/ICMTS valve was changed from the factory setting, it should be set to an opening degree between 0% and 75% using the manual magnet tool. To easily ensure correct positioning, turn the manual tool counter-clockwise until it is clear that it cannot be turned any further.

- 3.1. Make sure that the ICM/ICMTS adapter/valve stem and inner ICAD magnets are completely dry and free from any debris

## Mechanical installation

Figure 5: Procedure for ICAD installed on all valves



## General procedure for ICAD 600B/ICAD 600B-TS/1200B installed on all valves

- Check that the two socket screws are fully unscrewed counter clockwise with a 3 mm Hexagon key
- If valve is fitted with PTFE ring and O-ring, remove both and replace it with O-ring included in ICAD (as instructed in Figure 5)
- Mount ICAD by slowly lowering it on top of the valve
- The magnet coupling will drag the valve and ICAD together and in position
- Push ICAD in place
- Fasten valve and ICAD with the two socket set screws using a 3 mm Hexagon key

## Electrical data

Supply voltage is galvanically isolated from in-/output. ICAD is a Class III product.

PSUs connected to ICAD must be SELV<100 VA

For UL compliance: PSU must be Class 2 NEC

## Supply voltage

### 24 V DC (Tolerances; see Table 3)

**Table 2: Load**

|                         |       |
|-------------------------|-------|
| ICAD 600B, ICAD 600B-TS | 1.2 A |
| ICAD 1200B              | 2.0 A |

## 24 Volt DC ONLY

### CAUTION:

#### Please observe cable voltage drop

Please observe cable voltage drop. Distance between the applied DC transformer and the ICAD terminal box may cause a voltage drop. Cross section of cables and size of DC transformer must be calculated so that the voltage at all time at the ICAD terminal box<sup>(1)</sup>, both during standstill and during operation of ICAD, is within this range:

**Table 3: ICAD Supply voltage tolerances**

| Prefabricated ICAD cable length Code number |      | 1.5 m    | 3 m      | 10 m     | 15 m     |
|---------------------------------------------|------|----------|----------|----------|----------|
|                                             |      | 027H0426 | 027H0438 | 027H0427 | 027H0435 |
| Voltage ICAD terminal (600B/1200B) [V DC]   | Min. | 21       | 22       | 23       | 24       |
|                                             | Max. | 26.4     |          |          |          |

## Fail safe supply

### 24 V DC (Tolerances; see Table 3)

**Table 4: Load**

|                         |       |
|-------------------------|-------|
| ICAD 600B, ICAD 600B-TS | 1.2 A |
| ICAD 1200B              | 2.0 A |

## Data communication (RS485/Ethernet)

It is important that the installation of the data communication cable is done correctly. Remember termination at the bus termination.

RS485: Max length of cable: 1200 m with specific cable and limited data rate. Follow RS485 standard.

Insulation from power supply input, metallic part and interface output: 500 V DC: For input/output connections.

## Analog Input - Current or Voltage

**Table 5: Current**

|                             |                                |
|-----------------------------|--------------------------------|
| Input range                 | 0/4 – 20 mA                    |
| Max input range             | 0 – 24 mA                      |
| Input resistance            | 120 Ω + diode voltage 0.7 V DC |
| Measurement error           | <±1.5% of the full scale       |
| Reverse polarity protection | yes                            |
| Overcurrent protection      | yes                            |

**Table 6: Voltage**

|                             |                          |
|-----------------------------|--------------------------|
| Input range                 | 0/2 – 10 V DC            |
| Max input range             | 0 – 12 V DC              |
| Measurement error           | <±1.5% of the full scale |
| Reverse polarity protection | yes                      |

## Analog Output

**Table 7: Current**

|                                                   |                                            |
|---------------------------------------------------|--------------------------------------------|
| Output range                                      | 0/4 – 20mA                                 |
| Load                                              | <800 Ω                                     |
| Output error                                      | <±1.5% of the full scale                   |
| Recommended external resistor for Hot application | R <sub>ext</sub> =800 Ω-load 1W power rate |

<sup>1</sup> Do not measure inside the ICAD itself (value can be checked in ICAD menu)

## Digital Input

Digital ON/OFF input by means of voltfree contact (Signal/Telecom relays with gold-plated contacts recommended)  
– Voltage input used.

**Table 8: Current**

|               |                |
|---------------|----------------|
| Rth rise(OFF) | >10 k $\Omega$ |
| Rth fall(ON)  | < 45 $\Omega$  |

## Digital Output

Digital Output - 3 pcs. NPN transistor output.

External supply

7 – 24 V DC (same supply as for ICAD can be used, but please note that the galvanically isolated system will then be spoiled).

On resistance

55  $\Omega$  + diode voltage 0.7 V DC

Max 70  $\Omega$  at 50 mA

Max Output current: 50 mA

Reverse polarity protection: Yes

Overcurrent protection: No

## Wiring the ICAD actuator

**There are three cables which are connected to the ICAD motor with M12 connectors:**

**Figure 6: Cable Connectors**

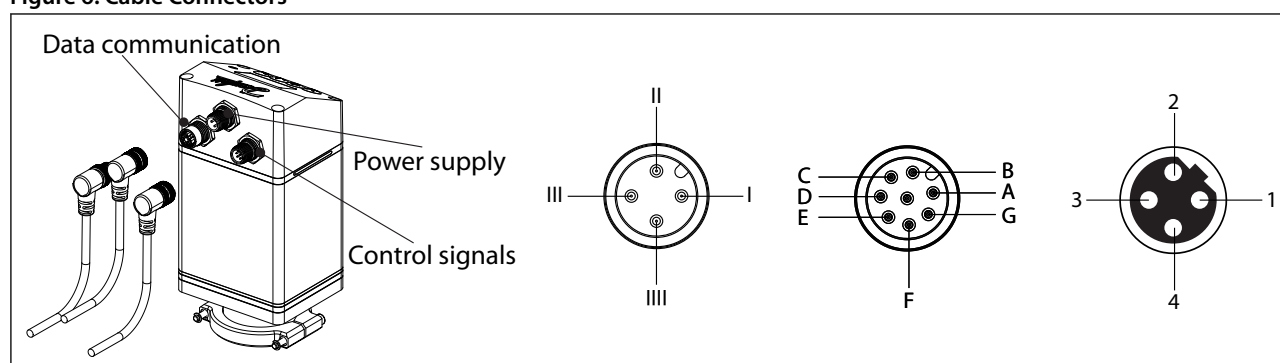
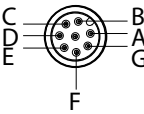
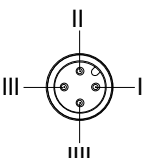
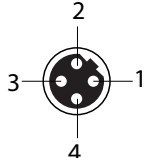


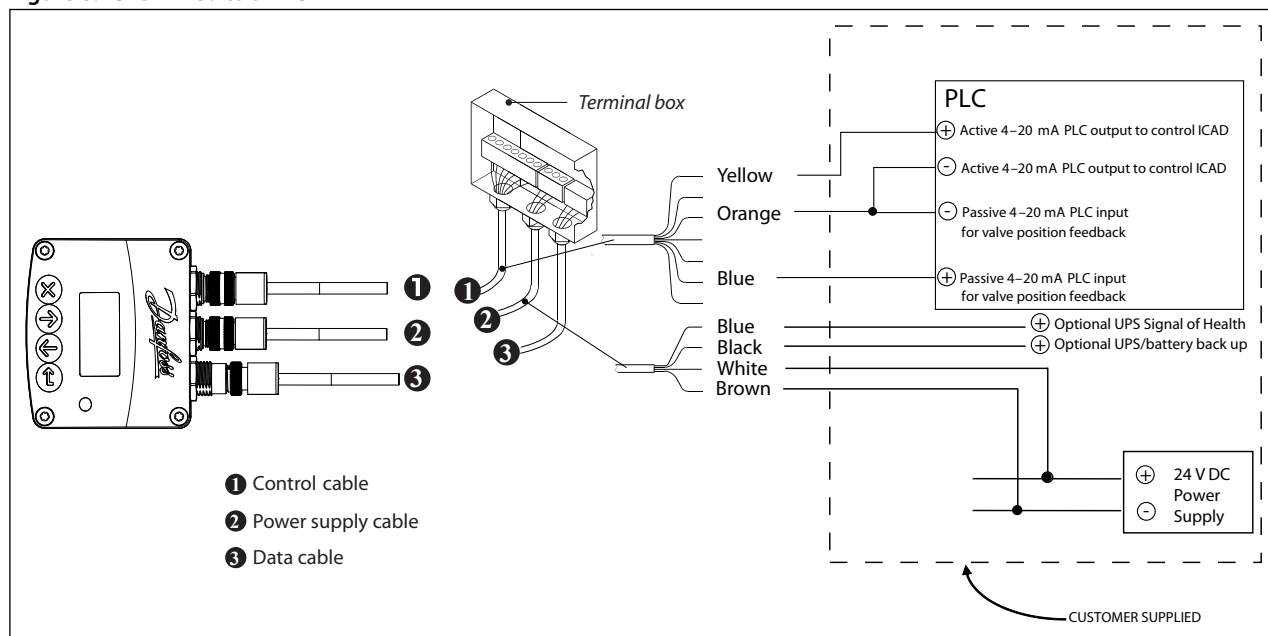
Figure 7: ICAD back Description

| ICAD back                                                                         | Ref | Color        |           | Description                                                                     |                  |
|-----------------------------------------------------------------------------------|-----|--------------|-----------|---------------------------------------------------------------------------------|------------------|
|  | A   | Black        | -         | Common alarm                                                                    | } Digital output |
|                                                                                   | B   | Brown        | -         | ICM fully open                                                                  |                  |
|                                                                                   | C   | Red          | -         | ICM fully closed                                                                |                  |
|                                                                                   | D   | Orange       | -         | GND ground                                                                      |                  |
|                                                                                   | E   | Yellow       | +         | 0/4 –20 mA Input                                                                |                  |
|                                                                                   | F   | Green        | +         | 0/2 – 10 V input or digital input for on/off control                            |                  |
|                                                                                   | G   | Blue         | +         | 0/4 –20 mA Output                                                               |                  |
|  | I   | Black        | +         | Fail safe supply. Battery / UPS* 19 V DC                                        |                  |
|                                                                                   | II  | White        | +         | Supply voltage                                                                  |                  |
|                                                                                   | III | Brown        | -         | 24 V DC 2A, or more, per ICAD recommended<br>ICAD PSU must be SELV**, >15 W     |                  |
|                                                                                   | IV  | Blue         | +         | UPS Signal of Health - optional depending on ID31:<br>'UPS supply' set to 'Yes' |                  |
| <b>RS485/ Ethernet</b>                                                            |     |              |           |                                                                                 |                  |
|  | 1   | White/Blue   | (-) / TX+ | Data – (B) / Transmit Pair(+)                                                   |                  |
|                                                                                   | 2   | White/Orange | GND / RX+ | Ground / Receiving Pair(+)                                                      |                  |
|                                                                                   | 3   | Blue         | (+) / TX- | Data + (A) / Transmit Pair(-)                                                   |                  |
|                                                                                   | 4   | Orange       | GND / RX- | Ground / Receiving Pair(-)                                                      |                  |

\*Uninterruptable Power Supply  
\*\*The ICAD is a class III appliance

Wiring diagram showing ICAD wired to a PLC or other type of third party electronics

Figure 8: ICAD wired to a PLC



**NOTE:**

Note: The ICAD supplies the power for the 4–20 mA feedback signal.

## Wiring diagram showing ICAD wired to a Danfoss EKC/EKE controller

Figure 9: ICAD wired to a Danfoss EKC controller - Analog I/O for modulating control

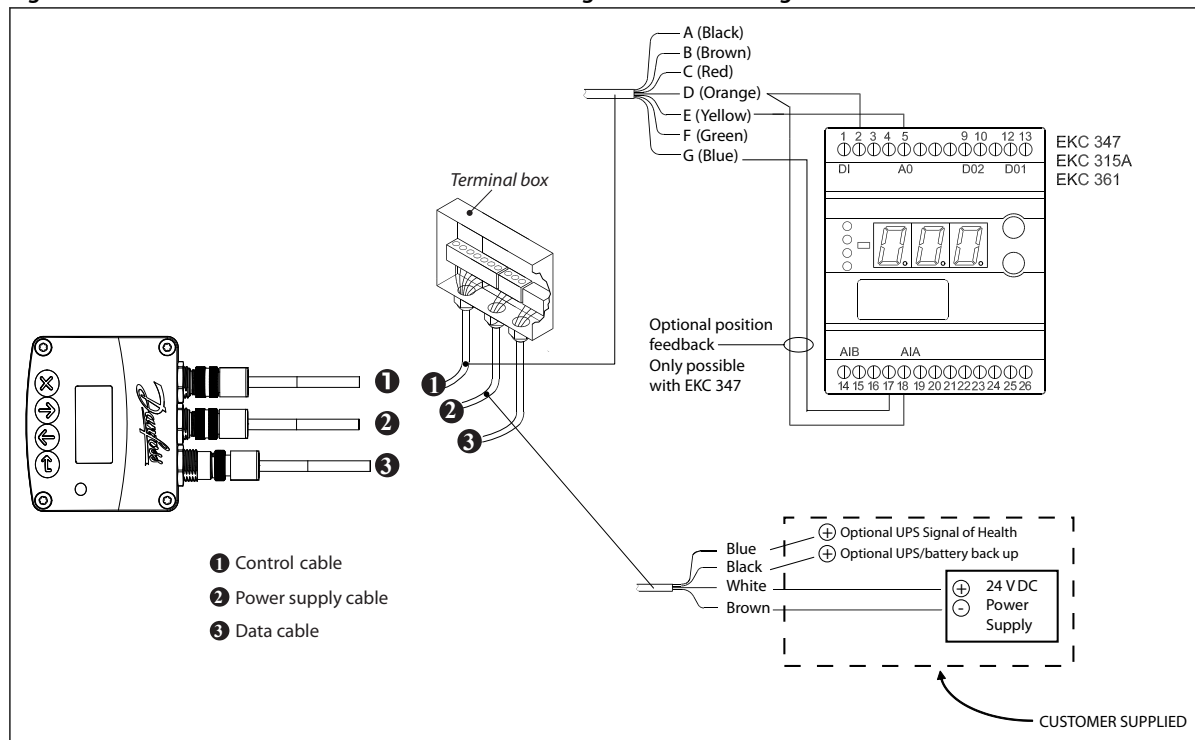
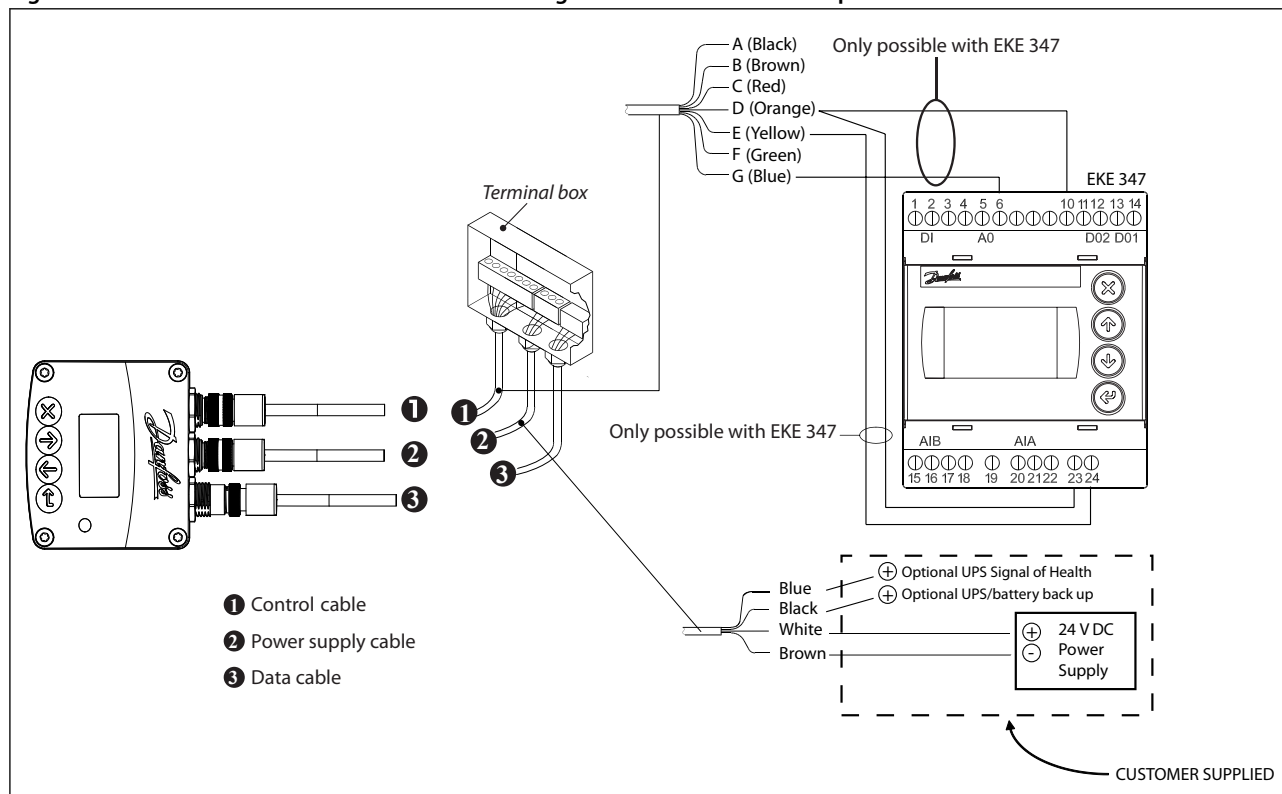


Figure 10: ICAD wired to a Danfoss EKE controller - Digital I/O for ON/OFF valve operation

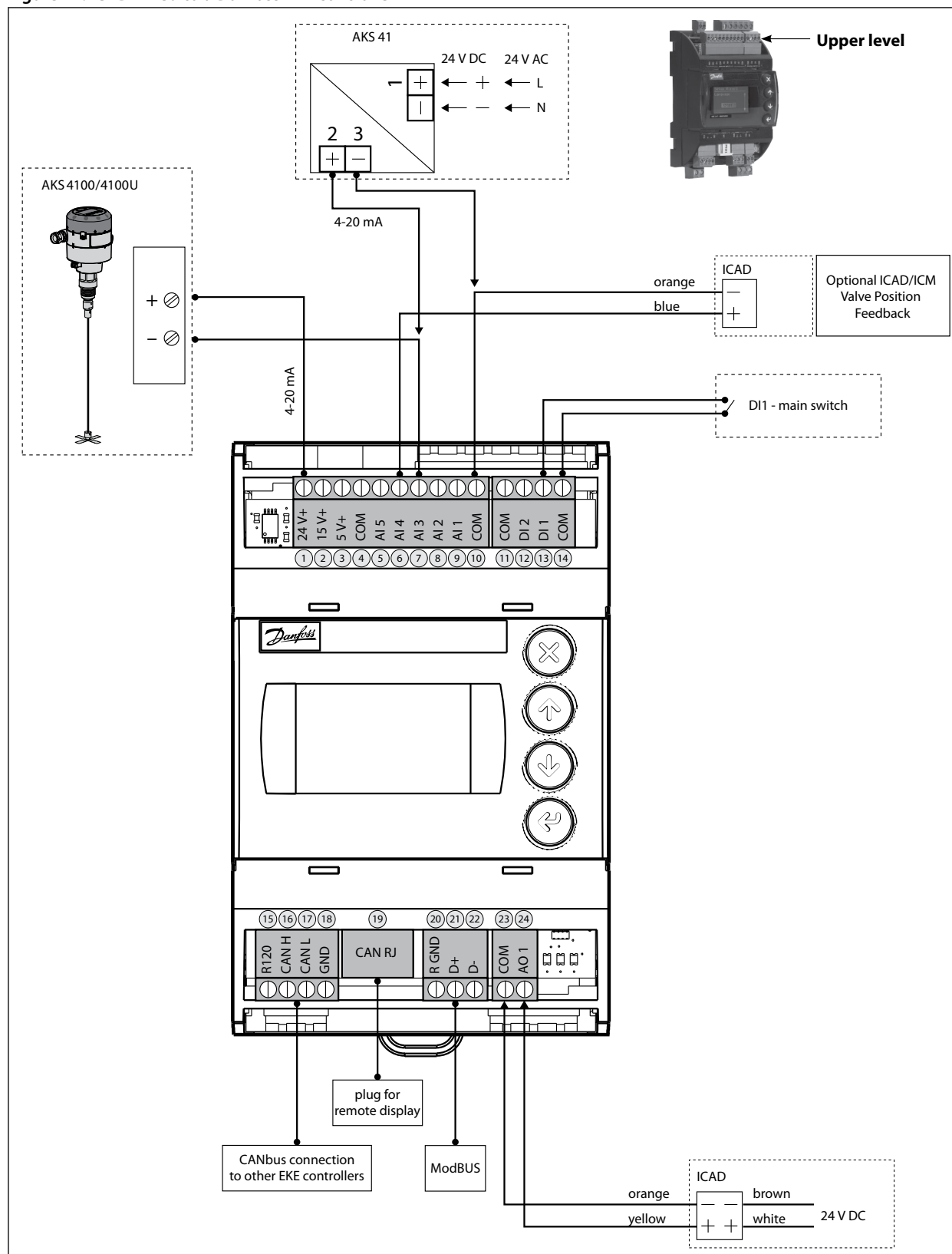


**NOTE:**

For instructions on completely wiring an EKE controller, please see the relevant EKE controller manual.

## Wiring diagram showing ICAD wired to a Danfoss EKE controller

Figure 11: ICAD wired to a Danfoss EKE controller

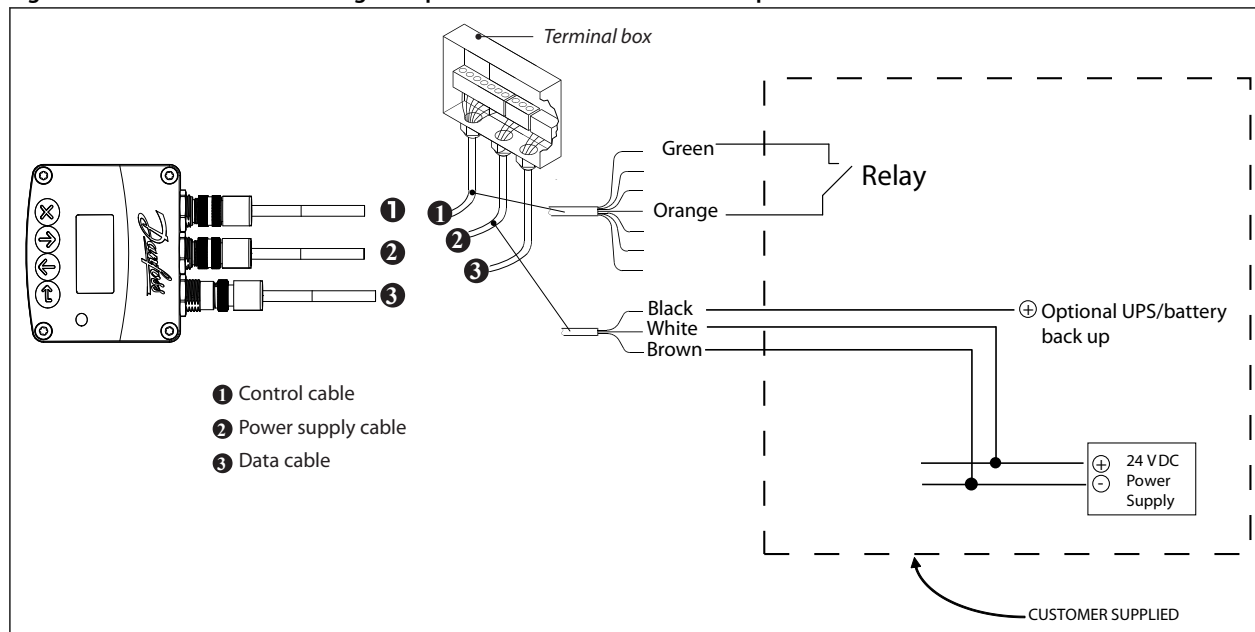


### NOTE:

For instructions on completely wiring an EKE controller, please see the relevant EKE controller manual.

## Wiring diagram showing ICAD wired with one digital input for ON/OFF solenoid valve operation

Figure 12: ICAD wired with one digital input for ON/OFF solenoid valve operation

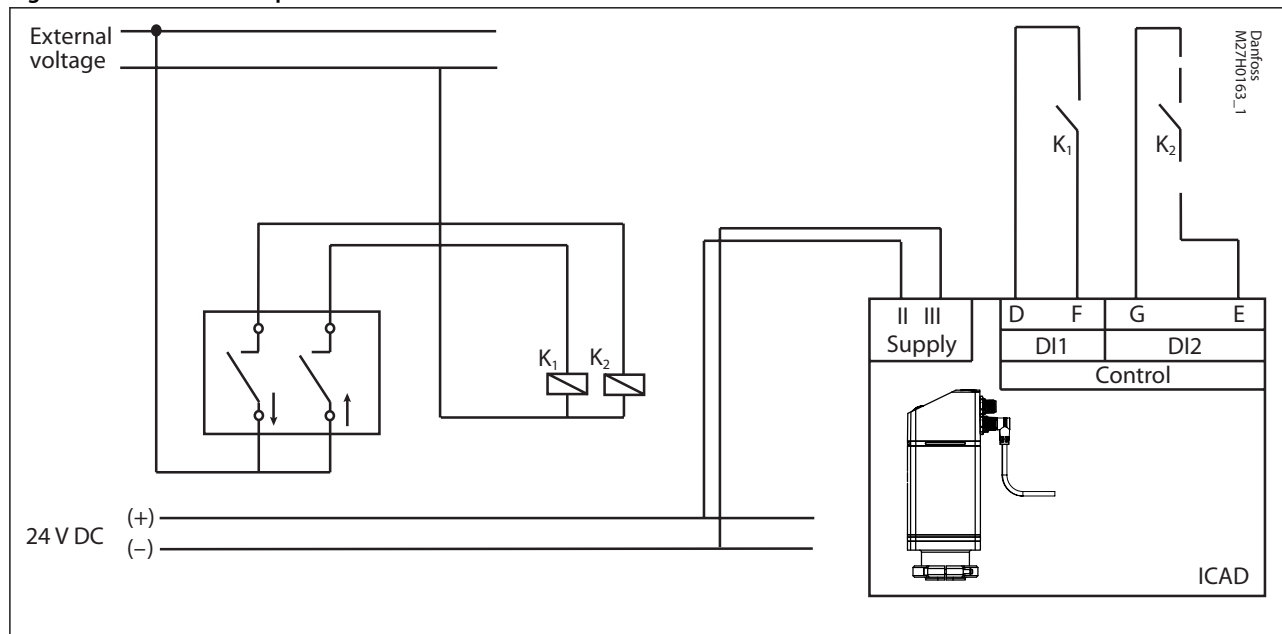


### NOTE:

The ICAD motor can be programmed to open or close when the relay is closed.

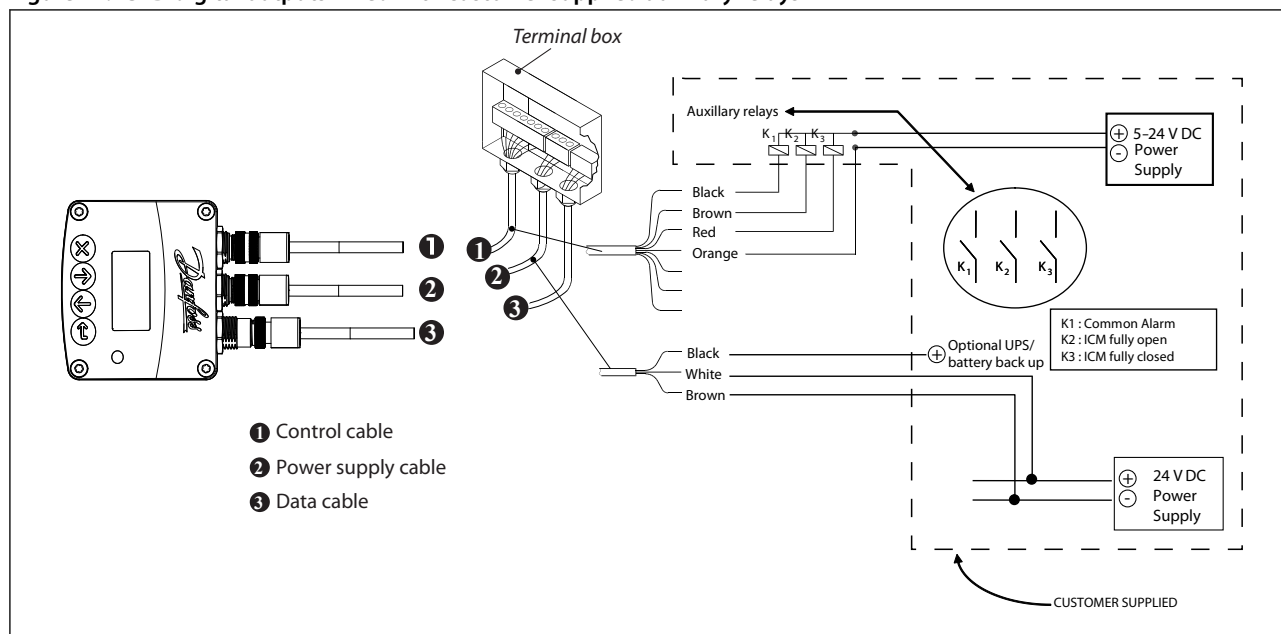
## Wiring diagram for floating 3-point control (open-neutral-close)

Figure 13: Neutral zone/3 points control



## Wiring diagram showing ICAD digital outputs wired with customer supplied auxiliary relays

Figure 14: ICAD digital outputs wired with customer supplied auxiliary relays



### NOTE:

The same 24 V DC power that powers the ICAD can be used with the ICAD digital outputs to power auxiliary relays (or other small load devices) but the system will no longer be galvanically isolated.

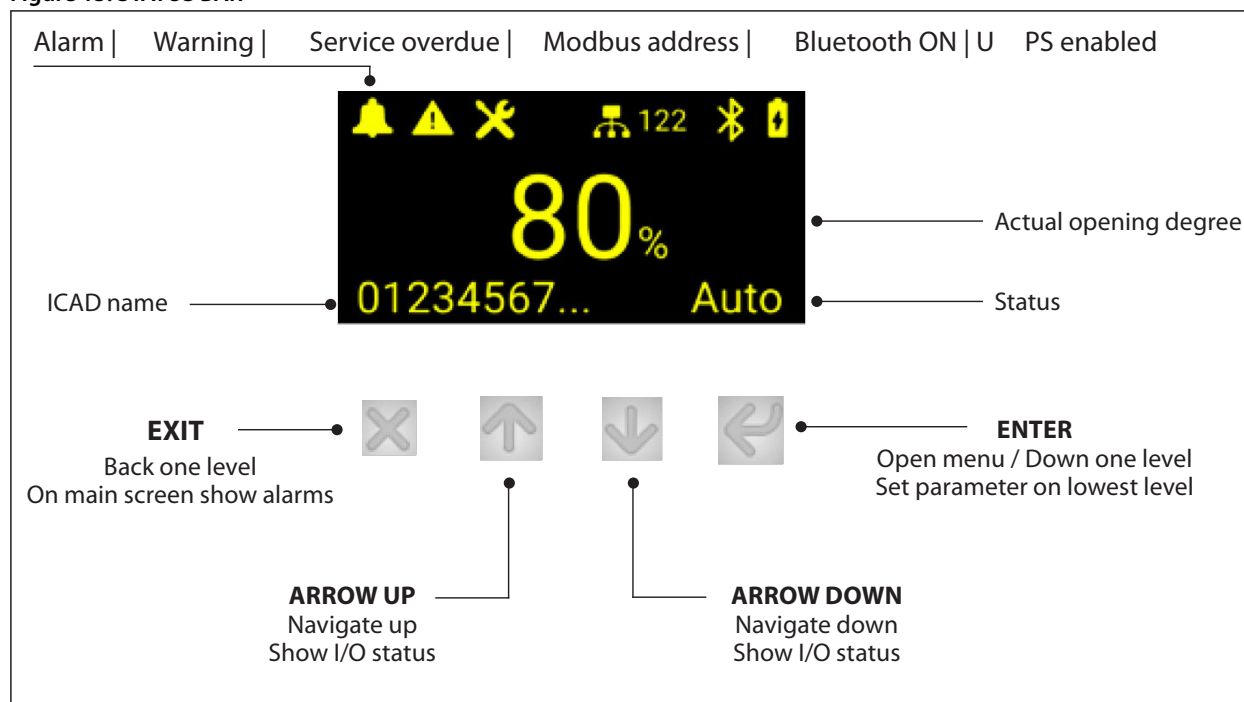
## ICAD overview

1. All ICAD actuators are digital stepper motors. As the control signal changes ICAD will electronically count steps up or down from its previous position. The actuator has an optical encoder which will actually measure the steps to recalibrate while operating if needed. In all cases, the ICAD actuators will recalibrate every time that power is cut and then reconnected. Recalibration is also accomplished when the valve is driven closed, the ICAD will take an extra closing step to make sure it is completely closed and start counting from 0 again
2. The ICAD actuators can also be put into manual mode. Once the manual mode entered, the valve can be opened and closed independent of the control signal. When in the manual mode, the display screen will flash the opening degree and continue to flash until the parameter is restored to its normal operation setting
3. The ICAD actuator can be controlled with an analog input for modulating control, 1 digital input for open/close solenoid function or with 2 digital inputs for floating 3-point control (open-neutral-close). The speed of the ICAD can be altered
4. The ICAD display will continuously display the ICM valve opening degree in % unless there is an alarm or the parameter list is being viewed.
5. The ICAD actuator can be connected to a 24 V d.c. UPS (uninterruptable power supply) and can be programmed for a specific action in the event of a disruption to the normal power supply (see parameters, **ID20** and **ID27**). Please note that the UPS provides a discrete short term action in the event of a power failure. It cannot be used for normal operation
6. The ICAD actuator also has an inverse function (see parameter **ID13**). This feature allows the valve to either open or close on a rising analog signal

## Operation the ICAD menu

1. To access the ICAD actuator menu, press enter button

**Figure 15: STATUS BAR**

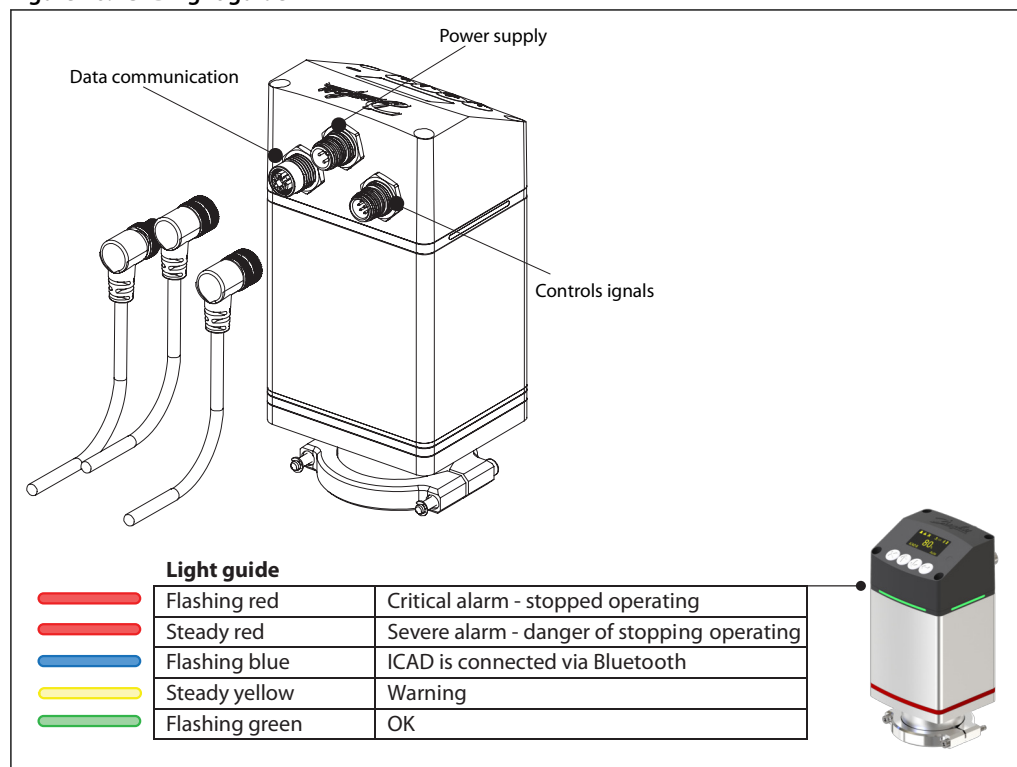


2. Once you are in the menu, use the UP (3) and DOWN (1) arrows to move through the list of parameters
3. To display and/or change the value of the parameter, press ENTER button to view the current settings
  - 3.1. To change the value of a parameter, use the up or down arrow to establish the new value for that parameter
  - 3.2. Once the new value for the parameter has been selected, press ENTER button to save the change and return to the menu
  - 3.3. Repeat this procedure for all parameters
  - 3.4. Exit from the parameter list by pressing EXIT button or simply wait for the ICAD to return to the main display

## Power on and start operation

ICAD has a light guide viewable from three sides, which indicates the status. Immediately after power on the light guide and display lights up.

Figure 16: ICAD light guide



The main screen layout and navigation is as described above. ICAD will start up in start-up wizard and in warning mode as the ICM configuration needs to be defined to start operation. Follow the steps on next page to set this up correctly.

## Bluetooth connection and data communication



In addition to the onboard display, all configuration and readings from ICAD B actuator can be performed via Bluetooth (using Coolcong mobile app) or via data communication. The CoolConfig allows the project engineer to generate the settings for the ICAD B offline, and hand over the file to the commissioning engineer at the appropriate time for the installation on one or multiple ICAD B.

CoolConfig can be downloaded and installed from iTunes Store, Google Play Store or Danfoss.com for PC version.



iTunes Store



Google Play Store



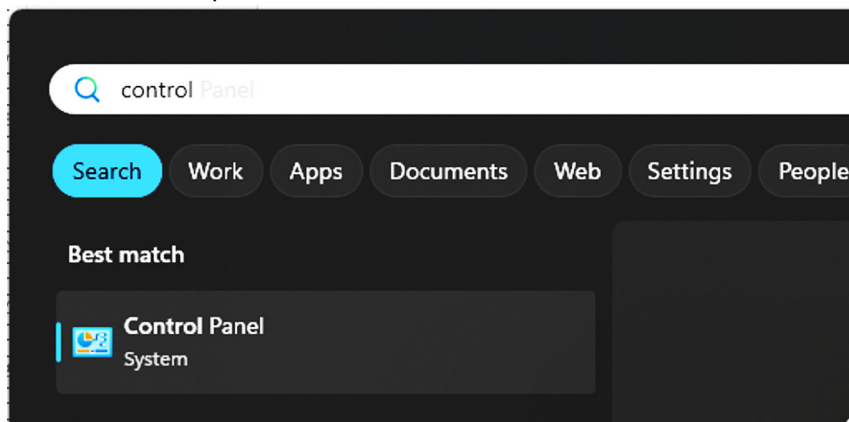
CoolConfig for PC

To connect with ICAD actuator, click *Start scanning* in CoolConfig and the list of available devices will be provided. To connect with a device, a password will be required. **The connection PIN is 1213 at first start-up (needs to be changed during start-up)** and serves to ensure that the connection is intentionally. Access is then read-only.

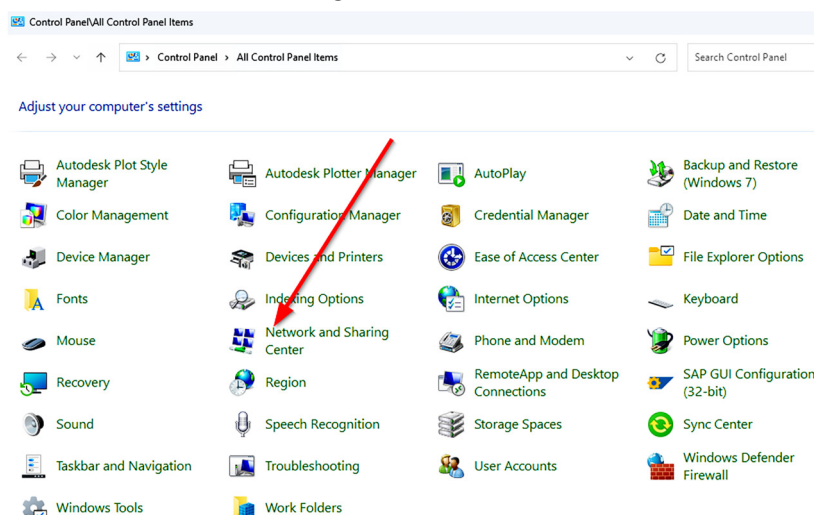
## Ethernet connection

### Follow steps below to connect to an ICAD over Ethernet

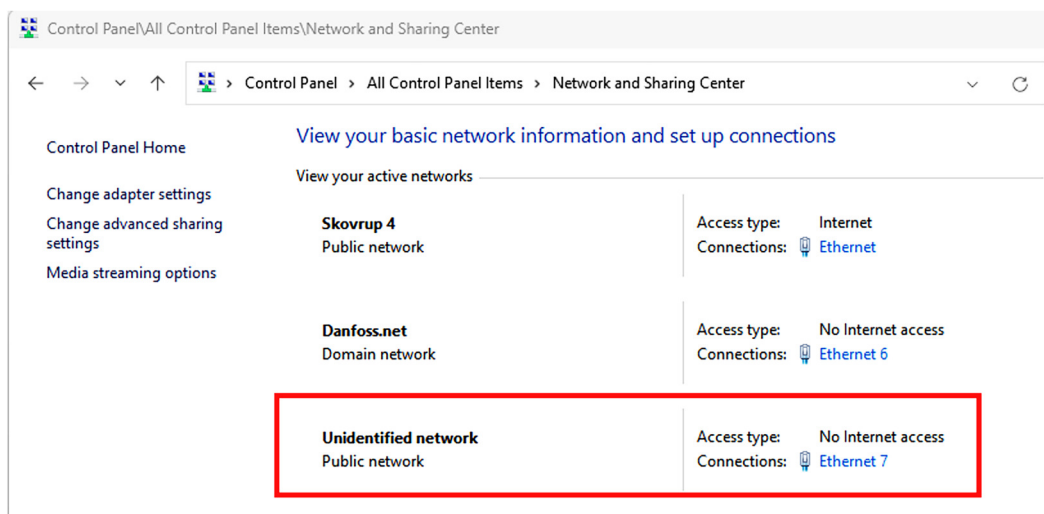
1. On Windows, open Control Panel:



2. Select Network and Sharing center:

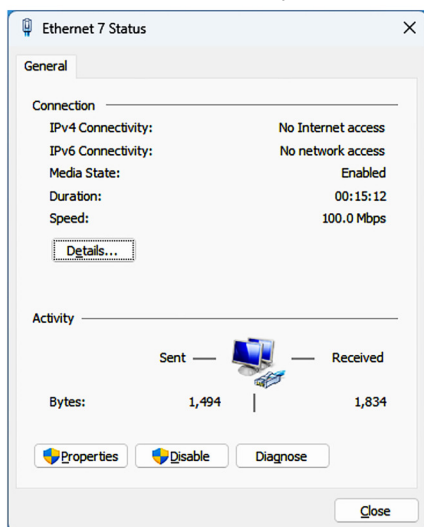


3. You will see a list over network connections:

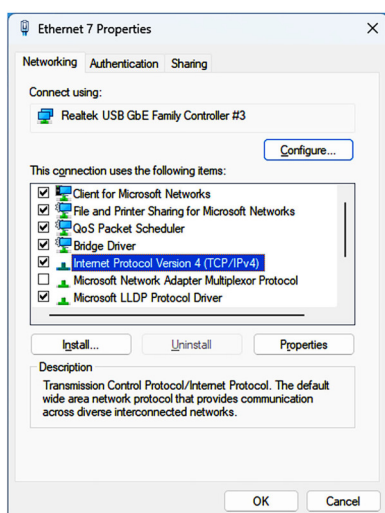


4. Normally you will be able to identify the network connection to the ICAD (the "Unidentified network" in image above), else try to unplug the ICAD and plug in again – you should be able to see the relevant network connection disappear/appear.

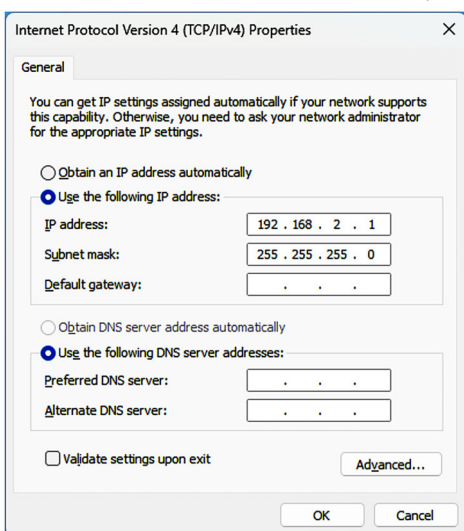
5. Click on Connections ("Ethernet 7" in image above):



6. Click on Properties (log-in if required):



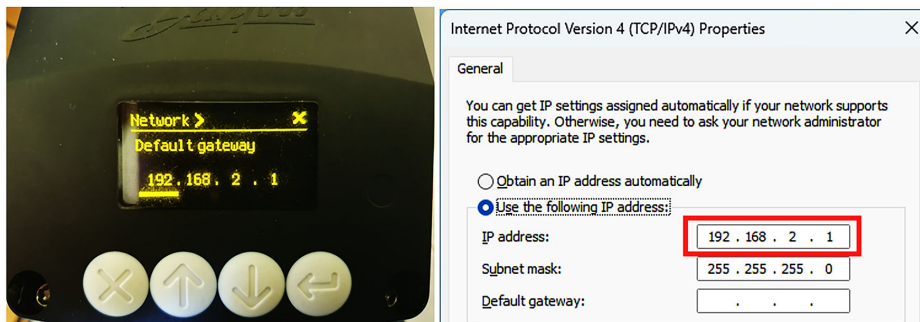
7. Select "Internet Protocol Version 4 (TCP/IP)", click "Properties" and enter values as shown below:



8. In this example it is assumed that the settings on the ICAD are (these are the default settings from ICAD firmware 15.21):

## ICM and ICMTS Motorized Valves with ICAD Actuators

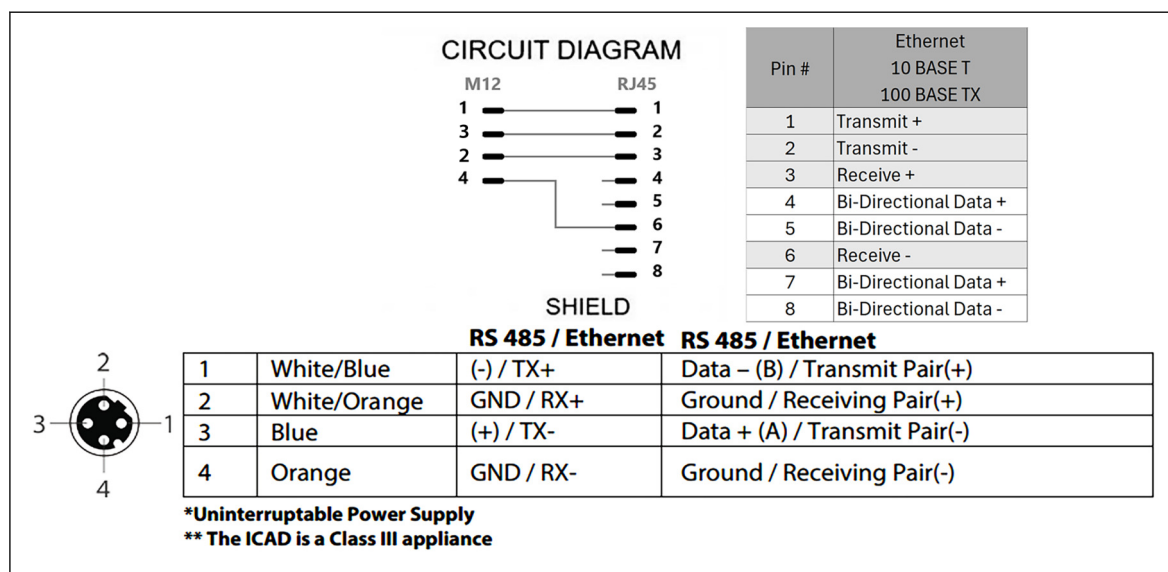
- a. IP mode..... = Static IP
  - b. IP address..... = 192.168.2.2
  - c. TCP port..... = 502
  - d. Subnet mask.... = 255.255.255.0
  - e. Default gateway = 192.168.2.1
9. Note that the “Default gateway” setting on the ICAD is only different from the “IP address” in the last value, and that the “Default gateway” on the ICAD is equal to the “IP address” of the “Ethernet 7” network connection:



10. Close all dialogs pressing OK, and you should now be able to connect to the ICAD.

### Cable for direct ICADB communication via Ethernet

Type M12 D 4P to RJ45



## Configuration of the ICAD actuator

When it is powered for the first time, the quick setup wizard will appear, follow the instructions from the set up wizard to have it configured. If the wizard is not used, the ICAD display will go into warning mode. This warning is a reminder that the ICM valve being moved by the ICAD has not been configured. Once the ICM valve size is selected, the ICAD actuator will calibrate itself to that particular size and will then be ready to receive a control signal.

### Parameter List

#### Service/Control Parameters

| Label ID | Parameter name    | Description and selection options                                                                                                                                                                                                                                                                                                                            | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID1      | Main switch       | <b>ICAD operating mode</b><br><b>0: Auto:</b> Input signal type (ID3) controls valve position<br><b>1: Manual:</b> user manually sets the valve position to be maintained<br><b>2: Config:</b> ICAD continues to operate as before. In config mode parameters can be changed but are not applied until setting main switch back to auto or manual            | 0    | 2    | 0               | 3000           | 3300                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID2      | Operation mode    | <b>Define ICAD mode</b><br><b>0: Modulating:</b> Valve positioning according to Analog Input (see ID3)<br><b>1: ON/OFF:</b> Operating ICM valve like an ON/OFF valve controlled via Digital Input (see ID23 for definition of fully close/fully open)<br><b>2: 3-point control:</b> Increase/Decrease Opening Degree by Digital Input.                       | 0    | 2    | 0               | 3001           | 3301                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID3      | Input signal type | <b>Type of AI signal from external controller</b><br>Only active when Operation mode (ID2) is set to Modulating. If the input signal received does not match this setting an Input signal out of bounds (A3) alarm will show.<br><b>0:</b> 0-20mA;<br><b>1:</b> 4-20mA;<br><b>2:</b> 0-10V;<br><b>3:</b> 2-10V;<br><b>4:</b> modbus;<br><b>5:</b> non config | 0    | 5    | 5               | 3002           | 3302                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID | Parameter name                       | Description and selection options                                                                                                                                                                                           | Min. | Max.     | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID4      | Requested Opening Degree (set-point) | <b>Set the desired opening degree</b><br>Only when main switch is set to manual (ID1=1)<br><b>0...100%</b> (min step – 1%)                                                                                                  | 0    | 100      | 0               | 3003           | 3303                       | 1             | 1 - 1                          | RW                                           | No                | 3 & 6, 16       |
| ID203    | Requested Opening Degree (set-point) | <b>The opening degree requested through Modbus</b><br>Only active when Main switch is set to auto (ID1=0) and input signal is set to Modbus (ID3=4). 0...10000 points, where 100 = 1% (i.e. 5021 = 50.21%; 10000 = 100.00%) | 0    | 10000    | 0               | 3004           | 3304                       | 2             | 1 - 1                          | RW                                           | No                | 3 & 6, 16       |
| ID24     | Service passcode (Level 2)           | <b>Change password for level 2 access.</b><br>Level 2 will give access to read/write parameters of level 2. See Column "Password level to Read - Write" and "Read only / Read Write"                                        | 0    | 99999999 | 12131400        | 3005 ... 3006  |                            | 4             | 2                              | W                                            | Yes               | 16              |

## Service/Advanced Control Parameters

| Label ID | Parameter name            | Description and selection options                                                                                                                                                                                                                                             | Min. | Max. | Factory setting                | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|--------------------------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID5      | Speed positive, 3-point   | <b>Opening speed</b><br>Only active when Operation mode (ID2) is set to 3-point. Percentage of full speed.<br><b>1...100%</b> (min step – 1%)                                                                                                                                 | 1    | 100  | 10                             | 3011           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID75     | Speed negative, 3-point   | <b>Closing speed</b><br>Only active when Operation mode (ID2) is set to 3-point. Percentage of full speed.<br><b>1...100%</b> (min step – 1%)                                                                                                                                 | 1    | 100  | 10                             | 3012           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID6      | Speed positive, on/off    | <b>Opening speed</b><br>Only active when Operation mode (ID2) is set to ON/OFF. Percentage of full speed<br><b>1...100%</b> (min step – 1%)                                                                                                                                   | 1    | 100  | 100 - ICAD 600; 50 - ICAD 1200 | 3013           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID76     | Speed negative, on/off    | <b>Closing speed</b><br>Only active when Operation mode (ID2) is set to ON/OFF. Percentage of full speed<br><b>1...100%</b> (min step – 1%)                                                                                                                                   | 1    | 100  | 100 - ICAD 600; 50 - ICAD 1200 | 3014           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID7      | Speed, modulating         | <b>Speed while modulating</b><br>Only active when Operation mode (ID2) is set to Modulating. Percentage of full speed<br><b>1...100%</b> (min step – 1%)<br>For CVE valve max value = 50%                                                                                     | 1    | 100  | 100 - ICAD 600; 50 - ICAD 1200 | 3015           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID9      | Automatic valve detection | <b>Valve size detection for ICAD</b><br><b>0: No:</b> Not active<br><b>1: Yes:</b> Valve detection will be started. The parameter will automatically be set back to 'no' and ID8 valve configuration parameter will be set to the detected valve when detection has finished. | 0    | 1    | 0                              | 3009           | 3305                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID | Parameter name      | Description and selection options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID8      | Valve configuration | <b>Valve size detection action for ICAD</b><br><b>Note:</b> The allowed value of the parameter varies depends on the ICAD model parameter (ID73)<br><b>12:</b> ICADTS ICMTS 50/80;<br><b>11:</b> ICADTS ICMTS20;<br><b>10:</b> Pilot Valve CVE;<br><b>9:</b> ICAD1200B ICM150;<br><b>8:</b> ICAD1200B ICM125;<br><b>7:</b> ICAD1200B ICM100;<br><b>6:</b> ICAD1200B ICM65;<br><b>5:</b> ICAD1200B ICM50;<br><b>4:</b> ICAD1200B ICM40;<br><b>3:</b> ICAD600B ICM32;<br><b>2:</b> ICAD600B ICM25;<br><b>1:</b> ICAD600B ICM20;<br><b>0:</b> not configured <b>No valve selected.</b> Alarm A1 will become active                                                                                                                                                                                                       | 0    | 12   | 0               | 3010           | 3306                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID23     | DI function         | Defines what happens when DI is ON (DI terminals are shorted) Only active when operation mode (ID2) is set to ON/OFF.<br><b>1: Open valve:</b> DI = OFF => Close ICM valve<br><b>0: Close valve:</b> DI = OFF => Open ICM valve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0    | 1    | 0               | 3025           | 3310                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID13     | (Inverse) operation | When Operation mode (ID2) is set to modulating.<br><b>1: On:</b> Increasing Analog Input signal => Decreasing opening degree<br><b>0: Off:</b> Increasing Analog Input signal => Increasing opening degree<br>When Operation mode (ID2) is set to 3-point.<br><b>1: On:</b> DI1 = ON, DI2 = OFF => Decreasing opening degree<br>DI1 = OFF, DI2 = ON => Increasing opening degree<br>DI1 = DI2 = OFF => Maintain current position<br>DI1 = DI2 = ON => Maintain current position<br><b>0: Off:</b> DI1 = ON, DI2 = OFF => Increasing opening degree<br>DI1 = OFF, DI2 = ON => Decreasing opening degree<br>DI1 = DI2 = OFF => Maintain current position<br>DI1 = DI2 = ON => Maintain current position<br><b>Note: Not active when Operation mode is set to ON/OFF. For ON/OFF control refer to DI function (ID23)</b> | 0    | 1    | 0               | 3016           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID157    | 2 step ON/OFF       | Active if operation mode (ID2) is set to on/off<br><b>1: Yes:</b> On/off mode with 2 step opening and/or 2 step closing. Activates parameters ID158...ID162<br><b>0: No:</b> On/off mode with 1 step opening or closing, without additional steps while driving                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0    | 1    | 0               | 3270           | 3312                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID | Parameter name         | Description and selection options                                                                                                                                                                                                                                                                                                                                                         | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID158    | 2 step mode            | <b>2 step mode</b><br><b>2:</b> Open & close;<br><b>1:</b> Close;<br><b>0:</b> Open                                                                                                                                                                                                                                                                                                       | 0    | 2    | 2               | 3271           | 3313                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID159    | Open step              | Only active if 2 step mode (ID158) is set to 0 (Open) or 2 (Open & close)<br>The valve will stop in this position before moving to the fully open (100%) position 0...75% (min step – 1%)                                                                                                                                                                                                 | 0    | 75   | 20              | 3272           | 3314                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID160    | Close step             | Only active if 2 step mode (ID158) is set to 1 (Close) or 2 (Open & close)<br>The valve will stop in this position before moving to the fully closed (0%) position 0...75% (min step – 1%)                                                                                                                                                                                                | 0    | 75   | 20              | 3273           | 3315                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID161    | 1st step delay (Open)  | Only active if 2 step mode (ID158) is set to 0 (Open) or 2 (Open & close) 5...600 seconds (min step – 1)                                                                                                                                                                                                                                                                                  | 5    | 600  | 30              | 3274           | 3316                       | 2             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID162    | 1st step delay (Close) | Only active if 2 step mode (ID158) is set to 1 (Close) or 2 (Open & close) 5...600 seconds (min step – 1)                                                                                                                                                                                                                                                                                 | 5    | 600  | 30              | 3275           | 3317                       | 2             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID16     | Forced closing         | <b>Enable/Disable forced closing</b><br>Not active when CVE valve is chosen (ID8)<br><b>1: On:</b> When valve Opening Degree < 3% it will be forced to close regardless of requested ICM valve Opening Degree<br><b>0: Off:</b> When valve Opening Degree < 3% no forced closing will take place.<br><b>Disabling forced closing is not recommended as it can lead to leaking valves.</b> | 0    | 1    | 1               | 3017           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID17     | Automatic calibration  | ICAD indicates in display when calibration is taking place. Calibration is also performed after the selection of a valve (ID8). It will automatically set back to 0 after calibration is performed.<br><b>2: Extended:</b> Calibration from fully closed to fully open<br><b>1: Normal:</b> Forced calibration to fully closed<br><b>0: None:</b> No calibration performed                | 0    | 2    | 0               | 3018           |                            | 1             | 2 - 2                          | RW                                           | No                | 3 & 6, 16       |
| ID151    | Startup calibration    | <b>Selection of startup calibration type</b><br><b>1: Extended:</b> Calibration from fully closed to fully open<br><b>0: Normal:</b> Forced calibration to fully closed                                                                                                                                                                                                                   | 0    | 1    | 0               | 3027           | 3311                       | 2             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID | Parameter name   | Description and selection options                                                                                                                                                                                                                                                                                                                 | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID18     | AO Signal output | <b>Type of AO signal for valve position.</b><br>This selection must match the output expected to read this externally. AO signal calculation is based on the encoder.<br><b>2: 4-20 mA;</b><br><b>1: 0-20 mA;</b><br><b>0: no signal</b>                                                                                                          | 0    | 2    | 2               | 3020           | 3307                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID21     | UPS supply       | <b>Define if an Uninterruptible Power Supply (UPS) is applied to the ICAD.</b><br>This enables A4 alarms (Low voltage of UPS supply).<br><b>1: Yes:</b> UPS is attached<br><b>0: No:</b> Nothing attached                                                                                                                                         | 0    | 1    | 0               | 3023           | 3308                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID22     | UPS setting      | <b>Defines when the health indication of a UPS can be considered as good.</b><br>Only active if UPS supply (ID21) is set to yes. This enables the UPS signal of health alarm (A14) and shows the health state of the UPS for ICAD.<br><b>2: DI Low:</b> good health;<br><b>1: DI High:</b> good health;<br><b>0: Off:</b> no UPS health detection | 0    | 2    | 0               | 3024           | 3309                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## Service/Alarm Configuration Parameters

| Label ID | Parameter name         | Description and selection options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID19     | AO Alarm signal output | <p><b>Defines if analog output should signal active alarms</b><br/>Setting this to a value means that the output will be set to this value whenever ICAD is in alarm mode. Only active when AO signal (ID18) is set to 4-20mA.</p> <p><b>2: 22mA:</b> Analog output will be set to 22 mA in case of active alarms(s)</p> <p><b>1: 3.6mA:</b> Analog output will be set to 3.6 mA in case of active alarm(s)</p> <p><b>0: Off:</b> Analog output will continue to signal the valve position</p> <p><b>Note: When setting this to anything other than Off, the analog output will not signal valve position whenever ICAD is in alarm mode.</b></p> | 0    | 2    | 0               | 3021           | 3318                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID20     | Emergency state        | <p><b>Set the requested valve position for safe state</b><br/>Safe state occurs for A2, A3, A5, A8, A10, and can be a result of the boosting process during A9.</p> <p><b>3:</b> emergency opening degree (set position to ID27)</p> <p><b>2:</b> maintain position;</p> <p><b>1:</b> open valve;</p> <p><b>0:</b> close valve;</p>                                                                                                                                                                                                                                                                                                               | 0    | 3    | 0               | 3022           | 3319                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID27     | Emergency OD           | <p><b>The opening degree to use in safe state</b><br/>Only active when Emergency state (ID20) is set to emergency opening degree (ID27)</p> <p><b>0...100%</b> (min step – 1%)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0    | 100  | 50              | 3026           | 3320                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID229    | Reset alarm A9         | <p><b>Manual reset of active A9 alarm</b><br/>Only active if boost action (ID28) is set to once, and reset A9 alarms (ID31) is set to manual or auto.</p> <p><b>1: Yes:</b> Active A9 alarm will be reset, safe state will be cancelled and ICAD will go to the requested OD. This parameter will automatically be set back to 'No' once the alarm is reset.</p> <p><b>0: No:</b> Active alarms are not reset. (Default state)</p>                                                                                                                                                                                                                | 0    | 1    | 0               | 3035           | 3321                       | 1             | 1 - 1                          | RW                                           | No                | 3 & 6, 16       |

## Service/Boost Function Parameters

| Label ID | Parameter name       | Description and selection options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID28     | Boost action         | <b>Defines how to manage when the opening degree is outside of the threshold of the max offset allowed (ID30).</b><br><b>2: Once:</b> If boosting for 15 seconds did not allow to get back into position, then A9 alarm is raised and ICAD goes to Safe state (ID20) (if feasible), no calibration.<br><b>1: Cycling:</b> Keep boosting 15 seconds, break for the time specified as boost delay (ID29), then raise A9 alarm. Cycle continues position has been regained.<br><b>Note: It is not recommended to change this setting from default.</b> | 1    | 2    | 1               | 3030           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID29     | Boost delay          | <b>Minutes after boost before next boost and raise of A9 alarm.</b> 1...30 minutes (min step – 1)<br><b>Note: It is not recommended to change this setting from default.</b>                                                                                                                                                                                                                                                                                                                                                                        | 1    | 30   | 1               | 3031           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID30     | Max offset           | <b>Max offset value between encoder position and step counter position before boosting starts.</b><br>0.5...15% (min step – 1%)                                                                                                                                                                                                                                                                                                                                                                                                                     | 0.5  | 15   | 3               | 3032           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID31     | Reset A9 Alarms      | <b>Define how to Reset/ Suppress A9 alarm and DO Common Alarm ON.</b><br><b>2: Suppress:</b> Ignore detection of the stall. No alarm is raised and DO Common Alarm output remains OFF.<br><b>1: Auto:</b> Reset when it is within max offset (ID30) limit again and reset delay time (ID32) has elapsed<br><b>0: Manually:</b> User resets alarm using the reset alarm action.<br><b>Note: It is not recommended to change this setting from default.</b>                                                                                           | 0    | 2    | 1               | 3033           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID32     | Reset A9 Alarm delay | <b>Define the reset delay for A9 alarms.</b><br>Only active when reset A9 alarm (ID31) is set to auto. 1...20 minutes (min step – 1)<br><b>Note: It is not recommended to change this setting from default, and this value should always be longer than the boost delay (ID29)</b>                                                                                                                                                                                                                                                                  | 1    | 20   | 5               | 3034           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID    | Parameter name  | Description and selection options                                                                                                                                                                                                                                                                                                                                                              | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|-------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| <b>ID11</b> | Running current | The running current is the current applied while ICAD moves to the requested position. This can help to raise the internal temperature of ICAD when installed with cold liquid -30 °C (-22 °F) or lower passing through the ICM valve.<br>default: 300 mA for iCAD600<br>default: 500 mA for iCAD1200<br>default: 600 mA for CVE valve<br>(min step – 10 mA)                                   | 200  | 900  | 300/500/600     | 3110           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| <b>ID12</b> | Holding current | The holding current is the current applied while ICAD maintains position. This can help to raise the internal temperature of ICAD when installed with cold liquid -30 °C (-22 °F) or lower passing through the ICM valve.<br>default: 300 mA for iCAD600<br>default: 500 mA for iCAD1200<br>default: 600 mA for CVE valve<br>(min step – 10 mA)                                                | 100  | 900  | 300/500/600     | 3111           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| <b>ID14</b> | Boost current   | The boost current is the current applied while ICAD moves during A9 alarm (POM mode) or for start-boost (first 6 steps). This can help to raise the internal temperature of ICAD when installed with cold liquid -30 °C (-22 °F) or lower passing through the ICM valve.<br>default: 550 mA for iCAD600<br>default: 900 mA for iCAD1200<br>default: 900 mA for CVE valve<br>(min step – 10 mA) | 200  | 900  | 550/900/900     | 3118           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## Service/System Parameters

| Label ID | Parameter name         | Description and selection options                                                                                                                                                                                                                                                                                                                                     | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID49     | Service reminder       | Use a service reminder for when the valve should be serviced in order to maintain operation of the system. ICAD will initiate a warning when Time to next service (ID50) reaches 0. Valves should be checked once a year. This is enabled by default.<br><b>1: Turn On</b> Service reminder<br><b>0: Turn Off</b> Service reminder                                    | 0    | 1    | 0               | 3062           | 3349                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID51     | Reset service interval | Reset the current service interval. This is required when ICAD has warning 'Service interval overdue (A15)' active, and the valve has been physically examined by a technician.<br><b>1: Yes:</b> Time overdue will be reset. Time to next service will be set to Service interval. The parameter will automatically be set back to 'no'.<br><b>0: No:</b> Not active | 0    | 1    | 0               | 3066           |                            | 1             | 2 - 2                          | RW                                           | No                | 3 & 6, 16       |
| ID234    | Service interval       | Indicates the service interval until the valve should be checked. This is by default once a year. 1...999 (in days)                                                                                                                                                                                                                                                   | 1    | 999  | 365             | 3065           | 3352                       | 2             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID26     | Clear event log        | <b>Clear event log</b><br><b>1: Yes:</b> All event log entries will be hidden. The parameter will automatically be set back to 'no' when hide has finished<br><b>0: No:</b> Not active                                                                                                                                                                                | 0    | 1    | 0               | 3123           |                            | 1             | 2 - 2                          | RW                                           | No                | 3               |
| ID52     | User logout time       | The time user remains logged in to service mode without doing any actions before automatically logged out 30...1200 (in seconds)                                                                                                                                                                                                                                      | 30   | 1200 | 360             | 3067           |                            | 2             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID53     | ICAD name              | Name assigned to ICAD as the identification shown on built-in display and for connection via Bluetooth. 16 ASCII symbols, 8bits per symbol (2 symbols per register)                                                                                                                                                                                                   |      |      | ICAD            | 3068 ... 3075  | 3353 ... 3360              | 30            | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID54     | Bluetooth enable       | Enable ICAD to broadcast Bluetooth for remote connection via APP.<br><b>1: enable;</b><br><b>0: disable</b>                                                                                                                                                                                                                                                           | 0    | 1    | 1               | 3076           | 3361                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID236    | Factory reset          | <b>Factory reset action for ICAD</b><br><b>1: Yes:</b> All parameters will be returned to factory default settings, and the event log will be cleared. The parameter will automatically be set back to 'no' when factory reset has finished<br><b>0: No:</b> Not active                                                                                               | 0    | 1    | 0               | 3087           |                            | 1             | 2 - 2                          | RW                                           | No                | 3 & 6, 16       |

# ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID     | Parameter name                                   | Description and selection options                                                                                                                                   | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|--------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| <b>ID164</b> | 0–10 V input type:<br>High voltage limit         | Only active if Input signal type (ID3) is set to 0–10 V. Note: High limit can only be set to a value higher than the Low limit. 10 points: 1 V, i.e. 56: 5.6 V      | 1    | 100  | 100 (10.0 V)    | 3133           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| <b>ID165</b> | 0–10 V input type:<br>Low voltage limit          | Only active if Input signal type (ID3) is set to 0–10 V. Note: Low limit can only be set to a value lower than the High limit. 10 points: 1 V, i.e. 56: 5.6 V       | 0    | 99   | 0 (0.0 V)       | 3134           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| <b>ID166</b> | <b>0–10 V</b> input type:<br>High OD limit       | Only active if Input signal type (ID3) is set to 0–10 V. Note: High OD limit can only be set to a value higher than the Low OD limit.                               | 1    | 100  | 100 (100% OD)   | 3135           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| <b>ID167</b> | <b>0–10 V</b> input type:<br>Low OD limit        | Only active if Input signal type (ID3) is set to 0–10 V. Note: Low OD limit can only be set to a value lower than the High OD limit.                                | 0    | 99   | 0 (0% OD)       | 3136           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| <b>ID168</b> | <b>2–10 V</b> input type:<br>High voltage limit  | Only active if Input signal type (ID3) is set to 2–10 V. Note: High limit can only be set to a value higher than the Low limit. 10 points: 1V, i.e. 56: 5.6 V       | 21   | 100  | 100 (10.0 V)    | 3137           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| <b>ID169</b> | <b>2–10 V</b> input type:<br>Low voltage limit   | Only active if Input signal type (ID3) is set to 2–10 V. Note: Low limit can only be set to a value lower than the High limit. 10 points: 1V, i.e. 56: 5.6 V        | 20   | 99   | 20 (2.0 V)      | 3138           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16S      |
| <b>ID170</b> | <b>2–10 V</b> input type:<br>High OD limit       | Only active if Input signal type (ID3) is set to 2–10 V. Note: High OD limit can only be set to a value higher than the Low OD limit.                               | 1    | 100  | 100 (100% OD)   | 3139           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| <b>ID171</b> | <b>2–10 V</b> input type:<br>Low OD limit        | Only active if Input signal type (ID3) is set to 2–10 V. Note: Low OD limit can only be set to a value lower than the High OD limit.                                | 0    | 99   | 0 (0% OD)       | 3140           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| <b>ID172</b> | <b>0–20 mA</b> input type:<br>High current limit | Only active if Input signal type (ID3) is set to 0–20 mA. Note: High limit can only be set to a value higher than the Low limit. 10 points: 1 mA, i.e. 123: 12.3 mA | 1    | 200  | 200 (20.0 mA)   | 3141           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID | Parameter name                                      | Description and selection options                                                                                                                                             | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID173    | <b>0–20 mA</b><br>input type:<br>Low current limit  | Only active if Input signal type (ID3) is set to <b>0–20 mA</b> .<br>Note: Low limit can only be set to a value lower than the High limit. 10 points: 1 mA, i.e. 123: 12.3 mA | 0    | 199  | 0 (0.0mA)       | 3142           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID174    | <b>0–20 mA</b><br>input type:<br>High OD limit      | Only active if Input signal type (ID3) is set to <b>0–20 mA</b> .<br>Note: High OD limit can only be set to a value higher than the Low OD limit.                             | 1    | 100  | 100 (100%OD)    | 3143           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID175    | <b>0–20 mA</b><br>input type:<br>Low OD limit       | Only active if Input signal type (ID3) is set to <b>0–20 mA</b> .<br>Note: Low OD limit can only be set to a value lower than the High OD limit.                              | 0    | 99   | 0 (0% OD)       | 3144           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID176    | <b>4–20 mA</b><br>input type:<br>High current limit | Only active if Input signal type (ID3) is set to <b>4–20 mA</b> .<br>Note: High limit can only be set to a value higher than the Low limit. 10 points: 1mA, i.e. 123: 12.3 mA | 41   | 200  | 200 (20.0mA)    | 3145           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID177    | <b>4–20 mA</b><br>input type:<br>Low current limit  | Only active if Input signal type (ID3) is set to <b>4–20 mA</b> .<br>Note: Low limit can only be set to a value lower than the High limit. 10 points: 1mA, i.e. 123: 12.3 mA  | 40   | 199  | 40 (4.0 mA)     | 3146           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID178    | <b>4–20 mA</b><br>input type:<br>High OD limit      | Only active if Input signal type (ID3) is set to <b>4–20 mA</b> .<br>Note: High OD limit can only be set to a value higher than the Low OD limit.                             | 1    | 100  | 100 (100% OD)   | 3147           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID179    | <b>4–20 mA</b><br>input type:<br>Low OD limit       | Only active if Input signal type (ID3) is set to <b>4–20 mA</b> .<br>Note: Low OD limit can only be set to a value lower than the High OD limit.                              | 0    | 99   | 0 (0%OD)        | 3148           |                            | 2             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## Service/Display Parameters

| Label ID | Parameter name | Description and selection options                                                             | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|----------------|-----------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID56     | Backlight      | Manage the backlight level of the built-in display on ICAD<br><b>1...100%</b> (min step – 1%) | 1    | 100  | 50              | 3091           | 3381                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID57     | Contrast       | Manage the contrast level of the built-in display on ICAD<br><b>1...100%</b> (min step – 1%)  | 1    | 100  | 50              | 3092           | 3382                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## Service/Network Parameters, (RS485)

| Label ID | Parameter name         | Description and selection options                                                                                                                                                                                                                                               | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID58     | Modbus network address | <b>Modbus RS485 network address of ICAD</b><br>This is shown in display when the ICAD supports Modbus communication and Modbus is enabled.                                                                                                                                      | 1    | 247  | 1               | 3100           | 3391                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID59     | Modbus baud rate       | The baud rate your Modbus RS485 controller uses to be able to communicate with ICAD via Modbus.<br><b>8: 115200</b><br><b>7: 57600;</b><br><b>6: 38400;</b><br><b>5: 19200;</b><br><b>4: 14400;</b><br><b>3: 9600;</b><br><b>2: 4800;</b><br><b>1: 2400;</b><br><b>0: 1200;</b> | 0    | 8    | 6               | 3101           | 3392                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID61     | Modbus parity          | Set via <b>com type</b> on display:<br><b>2:</b> even<br><b>1:</b> odd<br><b>0:</b> no parity<br>Other = custom setup via Modbus                                                                                                                                                | 0    | 2    | 2               | 3102           | 3393                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID63     | Modbus stops bits      | Modbus stops bits<br><b>1:</b> 2 bits;<br><b>0:</b> 1 bit                                                                                                                                                                                                                       | 0    | 1    | 0               | 3103           | 3394                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID     | Parameter name            | Description and selection options                                                                                                                                                                                                                                               | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|--------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| <b>ID237</b> | Modbus enable             | Enable/disable Modbus to manage if data can be read and set via Modbus connection.<br><b>1: enable;</b><br><b>0: disable</b>                                                                                                                                                    | 0    | 1    | 1               | 3104           | 3395                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| <b>ID155</b> | Modbus heartbeat enable   | Active when ID2 is modulating and ID3 is modbus<br><b>1: enable;</b><br><b>0: disable</b>                                                                                                                                                                                       | 0    | 1    | 0               | 3093           | 3378                       | 2             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| <b>ID156</b> | Modbus heartbeat interval | When ID155 Modbus heartbeat is enabled. The interval with which the PLC should send Modbus requests to ICAD. If the ICAD does not receive any (read/write parameter) Modbus request during this interval, the A3 Alarm (signal lost) will be set 5...120 seconds (min step – 1) | 5    | 120  | 30              | 3094           | 3379                       | 2             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## Service/Network Parameters, (Ethernet)

| Label ID | Parameter name           | Description and selection options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Min.       | Max.       | Factory setting             | Mod-bus address  | Alternative Mod-bus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Mod-bus function                   |
|----------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|-----------------------------|------------------|-----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|------------------------------------|
| ID116    | IP address mode          | Use parameters ID112, ID113, ID114 to set a Static IP.<br>Read the current automatically received with DHCP or Auto IP address in the ID114 parameter.<br><b>2:</b> Auto IP;<br><b>1:</b> DHCP <sup>(1)</sup> ;<br><b>0:</b> Static IP                                                                                                                                                                                                                                                                                                                                                                              | 0          | 2          | 0                           | 3180             | 3383                        | 2             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16                          |
| ID115    | Ethernet port            | System <b>Port 502</b> is reserved specifically for Modbus applications. If you change this parameter, you must be sure what you are doing. The following ports are used by the Modbus/TCP protocol:<br>• By default, the protocol uses Port 502 as local port in the Modbus server.<br>• You can set the local port as you wish in the Modbus client. Usually, port numbers starting at 2000 are used.<br><i>*If the communication partners offer the option of setting the port numbers for the server, then it is also possible to communicate using the Modbus/TCP protocol via a port other than Port 502.</i> | 1          | 32764      | 502                         | 3181             | 3384                        | 2             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16                          |
| ID114    | Ethernet IP address      | Set the desired static IP address or read the automatically received IP. Should be different from ID113 default gateway parameter. 0x00000000...0xDFFFFFFF (4 x 8-bit values, e.g. 0xff010203 = 255.01.02.03 address)                                                                                                                                                                                                                                                                                                                                                                                               | 0x00000000 | 0xDFFFFFFF | 0xC0A80202<br>192.168.2.2   | 3182 ...<br>3183 | 3385 ...<br>3386            | 4             | 1 - 2                          | RW                                           | Yes               | Only multiple write allowed 16 & 3 |
| ID113    | Ethernet Default Gateway | For static IP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0x00000000 | 0xDFFFFFFF | 0xC0A80001<br>192.168.0.1   | 3184 ...<br>3185 | 3387 ...<br>3388            | 4             | 1 - 2                          | RW                                           | Yes               | 3                                  |
| ID112    | Ethernet Subnet Mask     | For static IP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0x00000000 | 0xDFFFFFFF | 0xFFFFFFFF<br>255.255.255.0 | 3186 ...<br>3187 | 3389 ...<br>3390            | 4             | 1 - 2                          | RW                                           | Yes               | 3                                  |

<sup>(1)</sup> The device first makes a request to a DHCP server for an address. If the device does not receive an IP address, which happens when there is no DHCP server on the network or when the DHCP server is not responding, the device assigns itself an address. Auto IP addresses always follow this pattern: 169.254.x.y, where x and y are any two numbers between 0 and 255. Unlike DHCP, Auto IP does not require a router or a separate server to assign an IP address.

## Status/I/O Status

| Label ID | Parameter name   | Description and selection options                                                                                                                                                                                                                                                                                                    | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID37     | DI               | Readout the digital input when the operation mode (ID2) is set to ON/OFF or 3-point control.<br><b>3:</b> DI1 - on, DI2 - on;<br><b>2:</b> DI1 - off, DI2 - on;<br><b>1:</b> DI1 - on, DI2 - off;<br><b>0:</b> DI1 - off, DI2 - off;<br><b>Note that for ON/OFF only DI1 is active:</b><br><b>1:</b> DI1 - on<br><b>0:</b> DI1 - off | 0    | 3    | 0               | 3044           | 3328                       | 1             | 1                              | RO                                           | No                | 3               |
| ID38     | DO (fully close) | DO Fully closed status (ON when OD < 3%)<br><b>1:</b> Yes;<br><b>0:</b> No                                                                                                                                                                                                                                                           | 0    | 1    | 0               | 3045           | 3329                       | 1             | 1                              | RO                                           | No                | 3               |
| ID39     | DO (fully open)  | DO Fully opened status (ON when OD > 97%)<br><b>1:</b> Yes;<br><b>0:</b> No                                                                                                                                                                                                                                                          | 0    | 1    | 0               | 3046           | 3330                       | 1             | 1                              | RO                                           | No                | 3               |
| ID40     | DO (alarm show)  | DO common alarm status (Active when there are active alarms)<br><b>1:</b> Active;<br><b>0:</b> OFF                                                                                                                                                                                                                                   | 0    | 1    | 0               | 3047           | 3331                       | 1             | 1                              | RO                                           | No                | 3               |

## Status/Next Service

| Label ID | Parameter name       | Description and selection options                                                                                                                                                                                                  | Min. | Max.       | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID233    | Time overdue         | Once the service interval has passed, and Time to next service (ID50) has reached 0, the time overdue is calculated. Time is updated every 30 minutes and calculated as full days (24 hours) based on runtime. 0...32764 (in days) | 0    | 32764      | 0               | 3063           | 3350                       | 2             | 1                              | RO                                           | Yes               | 3               |
| ID50     | Time to next service | Readout the days remaining of the current service interval (ID234). Time is updated every 30 minutes and calculated as full days (24 hours) based on runtime. 0...999 (in days)                                                    | 0    | 999        | 365             | 3064           | 3351                       | 2             | 1                              | RO                                           | Yes               | 3               |
| ID48     | Run time             | Readout the run time in full hours for the ICAD from when it was first powered on or factory reset. Saved every 30min 0...4294967293 (in minutes)                                                                                  | 0    | 4294967293 | 0               | 3060 ... 3061  | 3347 ... 3348              | 4             | 1                              | RO                                           | Yes               | 3               |

## Status/Supply

| Label ID | Parameter name           | Description and selection options                                                                                                                               | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID228    | Power supply voltage (V) | Readout the current power supply voltage to ICAD in Volt. 0...300 points, where 10 = 1V (i.e. 234 = 23.4V; 100 = 10.0V)                                         | 0    | 300  | 0               | 3054           | 3336                       | 2             | 1                              | RO                                           | No                | 3               |
| ID227    | UPS health               | Readout the state of the UPS. Only active when UPS supply (ID21) is set to yes and the UPS setting (ID22) is not set to off.<br><b>1:</b> OK;<br><b>0:</b> Poor | 0    | 1    | 0               | 3052           | 3335                       | 1             | 1                              | RO                                           | No                | 3               |

## Status/Read Outs Parameters

| Label ID | Parameter name      | Description and selection options                                                                                                                                                                                                                                                                                                                                                                                                                  | Min. | Max.  | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID1      | Main switch         | Readout the main switch state of ICAD.<br><b>2:</b> config;<br><b>1:</b> manual;<br><b>0:</b> auto                                                                                                                                                                                                                                                                                                                                                 | 0    | 2     | 0               | 3055           | 3337                       | 1             | 1                              | RO                                           | No                | 3               |
| ID2      | Mode                | Readout ICAD mode<br><b>2:</b> 3 – point;<br><b>1:</b> on/off;<br><b>0:</b> modulating                                                                                                                                                                                                                                                                                                                                                             | 0    | 2     | 0               | 3001           | 3301                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID8      | Valve configuration | Readout the valve configuration for ICAD.<br><b>12:</b> ICADTS ICMTS 50/80;<br><b>11:</b> ICADTS ICMTS20;<br><b>10:</b> Pilot Valve CVE;<br><b>9:</b> ICAD1200B ICM150;<br><b>8:</b> ICAD1200B ICM125;<br><b>7:</b> ICAD1200B ICM100;<br><b>6:</b> ICAD1200B ICM65;<br><b>5:</b> ICAD1200B ICM50;<br><b>4:</b> ICAD1200B ICM40;<br><b>3:</b> ICAD600B ICM32;<br><b>2:</b> ICAD600B ICM25;<br><b>1:</b> ICAD600B ICM20;<br><b>0:</b> not configured | 0    | 13    | 0               | 3056           | 3338                       | 1             | 1                              | RO                                           | No                | 3               |
| ID34     | AI (current, mA)    | Readout the analog input when the operation mode (ID2) is set to modulating and the input signal (ID3) is set to use current (0-20mA or 4-20mA) 0...22000 points, where 1000 = 1mA (i.e. 10031 = 10.031mA; 7062 = 7.062mA)                                                                                                                                                                                                                         | 0    | 22000 | 0               | 3041           | 3325                       | 2             | 1                              | RO                                           | No                | 3               |
| ID35     | AI (voltage, V)     | Readout the analog input when the operation mode (ID2) is set to modulating and the input signal (ID3) is set to use voltage (0-10V or 2-10V) 0...12000 points, where 1000 = 1V (i.e. 1291 = 1.291V; 10372 = 10.372V)                                                                                                                                                                                                                              | 0    | 12000 | 0               | 3042           | 3326                       | 2             | 1                              | RO                                           | No                | 3               |

## ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID | Parameter name   | Description and selection options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Min. | Max.  | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID36     | AO (current, mA) | Readout the analog output when AO signal output (ID18) is set to use (0-20mA or 4-20mA) 0...22000 points, where 1000 = 1mA (i.e. 10031 = 10.031mA; 7062 = 7.062mA)                                                                                                                                                                                                                                                                                                                                                                                           | 0    | 22000 | 0               | 3043           | 3327                       | 2             | 1                              | RO                                           | No                | 3               |
| ID21     | UPS supply       | Readout of Uninterruptible Power Supply (UPS) is applied to the ICAD. This enabled A4 alarms (Low voltage of UPS supply).<br><b>1:</b> yes;<br><b>0:</b> no                                                                                                                                                                                                                                                                                                                                                                                                  | 0    | 1     | 0               | 3023           | 3308                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID20     | Emergency state  | Readout of the requested valve position for safe state. Safe state occurs for A2, A3, A5, A8, A10, and can be a result of the boosting process during A9.<br><b>3:</b> emergency opening degree (set position to ID27)<br><b>2:</b> maintain position;<br><b>1:</b> open valve;<br><b>0:</b> close valve;                                                                                                                                                                                                                                                    | 0    | 3     | 0               | 3022           | 3319                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID28     | Boost action     | Readout of boost action. How to manage when the opening degree is outside of the threshold of the max offset allowed (ID30).<br><b>2:Once:</b> If boosting for 15 seconds did not allow to get back into position, then A9 alarm is raised and ICAD goes to Safe state (ID20) (if feasible), no calibration.<br><b>1: Cycling:</b> Keep boosting 15 seconds, break for the time specified as boost delay (ID29), then raise A9 alarm. Cycle continues position has been regained.<br><b>Note: It is not recommended to change this setting from default.</b> | 1    | 2     | 1               | 3030           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID29     | Boost delay      | Readout of boost delay. Minutes after boost before next boost and raise of A9 alarm.<br>1...30 minutes (min step – 1)<br><b>Note: It is not recommended to change this setting from default.</b>                                                                                                                                                                                                                                                                                                                                                             | 1    | 30    | 1               | 3031           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID30     | Max offset       | Max offset value between encoder position and step counter position before boosting starts.<br><b>3...15%</b> (min step – 1%)                                                                                                                                                                                                                                                                                                                                                                                                                                | 3    | 15    | 3               | 3032           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID | Parameter name       | Description and selection options                                                                                                                                                                                                                                                                                                                                                                                                                  | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID31     | Reset A9 Alarms      | Define how to Reset/ Suppress A9 alarm and DO Common Alarm ON.<br><b>2: Suppress:</b> Ignore detection of the stall. No alarm is raised and DO Common Alarm output remains OFF.<br><b>1: Auto:</b> Reset when it is within max offset (ID30) limit again and reset delay time (ID32) has elapsed<br><b>0: Manually:</b> User resets alarm using the reset alarm action.<br><b>Note: It is not recommended to change this setting from default.</b> | 0    | 2    | 1               | 3033           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID32     | Reset A9 Alarm delay | Define the reset delay for A9 alarms. Only active when reset A9 alarm (ID31) is set to auto. 1...20 minutes (min step – 1)<br><b>Note: It is not recommended to change this setting from default, and this value should always be longer than the boost delay (ID29)</b>                                                                                                                                                                           | 1    | 20   | 5               | 3034           |                            | 1             | 2 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID42     | Temperature          | Readout the internal temperature measured on the ICAD motor board in degree celcius. -500...1400 points, where 10 = 1°C (i.e. -125 = -12.5°C; 1245 = 124.5°C)                                                                                                                                                                                                                                                                                      | -500 | 1400 | 0               | 3050           | 3334                       | 2             | 1                              | RO                                           | No                | 3               |
| ID54     | Bluetooth            | Manage if ICAD broadcasts Bluetooth for remote connection via APP.<br><b>1: enable;</b><br><b>0: disable</b>                                                                                                                                                                                                                                                                                                                                       | 0    | 1    | 1               | 3076           | 3361                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID237    | Modbus               | Enable/disable Modbus to manage if data can be read and set via Modbus connection.<br><b>1 = enable;</b><br><b>0 = disable</b>                                                                                                                                                                                                                                                                                                                     | 0    | 1    | 1               | 3104           | 3395                       | 1             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |

## Alarms/Alarm Parameters

| Label ID     | Parameter name                                  | Description and selection options                                                                                                                                                                                                                                                                                                                                     | Min. | Max.       | Factory setting                       | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|--------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------|---------------------------------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| <b>ID120</b> | A1 timestamp (Warn: Valve no config)            | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set<br><b>[ID48</b> (while the device is working)] - [event/alarm <b>timestamp</b> (point in ID48 at which the current event occurred)] = minutes that have passed since the event/ alarm occurred (to show <b>XX minutes(or hours) ago</b> ) | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3200 ... 3201  | 3404 ... 3405              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID121</b> | A2(1) timestamp (Alarm: IO MCU comm fail)       | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set                                                                                                                                                                                                                                           | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3202 ... 3203  | 3406 ... 3407              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID122</b> | A2(2) timestamp (Alarm: Motor open-load status) | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set                                                                                                                                                                                                                                           | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3204 ... 3205  | 3408 ... 3409              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID123</b> | A3(1) timestamp (Alarm: AI error: > 22 mA)      | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set                                                                                                                                                                                                                                           | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3206 ... 3207  | 3410 ... 3411              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID124</b> | A3(2) timestamp (Alarm: AI error: < 2 mA)       | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set                                                                                                                                                                                                                                           | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3208 ... 3209  | 3412 ... 3413              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID125</b> | A3(3) timestamp (Alarm: AI error: > 12 V)       | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set                                                                                                                                                                                                                                           | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3210 ... 3211  | 3414 ... 3415              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID126</b> | A3(4) timestamp (Alarm: AI error: < 1 V)        | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set                                                                                                                                                                                                                                           | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3212 ... 3213  | 3416 ... 3417              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID127</b> | A4 timestamp (Alarm: V FSS error)               | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set                                                                                                                                                                                                                                           | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3214 ... 3215  | 3418 ... 3419              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID128</b> | A5 timestamp (Alarm: V PS error)                | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set                                                                                                                                                                                                                                           | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3216 ... 3217  | 3420 ... 3421              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID129</b> | A6 timestamp (Alarm: Calibr fail)               | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set                                                                                                                                                                                                                                           | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3218 ... 3219  | 3422 ... 3423              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID130</b> | A7 timestamp (Alarm: Overheating)               | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set                                                                                                                                                                                                                                           | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3220 ... 3221  | 3424 ... 3425              | 4             | 1                              | RO                                           | No                | 3               |

## ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID     | Parameter name                                 | Description and selection options                                                                                           | Min. | Max.       | Factory setting                       | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|--------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------|------------|---------------------------------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| <b>ID131</b> | A8 timestamp (Alarm: Overheating)              | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3222 ... 3223  | 3426 ... 3427              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID132</b> | A9 timestamp (Alarm: POM mode)                 | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3224 ... 3225  | 3428 ... 3429              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID133</b> | A10 timestamp (Alarm: SPI conn loss)           | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3226 ... 3227  | 3430 ... 3431              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID134</b> | A11 timestamp (reserved)                       | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3228 ... 3229  | 3432 ... 3433              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID135</b> | A13 timestamp (Alarm: Failed update)           | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3230 ... 3231  | 3434 ... 3435              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID136</b> | A14 timestamp (Warn: SoH is bad)               | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3232 ... 3233  | 3436 ... 3437              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID137</b> | A15 timestamp (Warn: Service overdue)          | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3234 ... 3235  | 3438 ... 3439              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID138</b> | A16 timestamp (Warn: Config. mode)             | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3236 ... 3237  | 3440 ... 3441              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID139</b> | A17 timestamp (Warn: Bluetooth conn)           | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3238 ... 3239  | 3442 ... 3443              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID140</b> | A18 timestamp (Warn: Vin >24+10%)              | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3240 ... 3241  | 3444 ... 3445              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID141</b> | A19 timestamp (Warn: Vin <24-15%)              | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3242 ... 3243  | 3446 ... 3447              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID146</b> | A20 timestamp (Alarm: Detection fail)          | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3244 ... 3245  | 3448 ... 3449              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID148</b> | A2(3) timestamp (Alarm: EEPROM operation fail) | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3246 ... 3247  | 3450 ... 3451              | 4             | 1                              | RO                                           | No                | 3               |

## ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID     | Parameter name                                      | Description and selection options                                                                                                         | Min. | Max.       | Factory setting                       | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|--------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------|------------|---------------------------------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| <b>ID149</b> | A2(4) timestamp (Alarm: Bluetooth MCU comm fail)    | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set               | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3248 ... 3249  | 3452 ... 3453              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID150</b> | A3(5) timestamp (Alarm: Modbus connection lost)     | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set               | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3250 ... 3251  | 3454 ... 3455              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID152</b> | A1(2) timestamp (Warn: Input signal not configured) | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or -1 (0xFFFFFFFF in hex) if the alarm is not set               | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3252 ... 3253  | 3456 ... 3457              | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID153</b> | A1(3) timestamp (Warn: Passcode not set)            | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or 4294967295 (-1 or 0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3254... 3255   |                            | 4             | 1                              | RO                                           | No                | 3               |
| <b>ID154</b> | A1(4) timestamp (Warn: Bluetooth PIN not set)       | Timestamp of the alarm occurrence relative to the runtime counter (ID48), Or 4294967295 (-1 or 0xFFFFFFFF in hex) if the alarm is not set | -1   | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3256... 3257   |                            | 4             | 1                              | RO                                           | No                | 3               |

## Alarms/Event Log Parameters

| Label ID     | Parameter name           | Description and selection options                                                                                                                                        | Min. | Max.       | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|--------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| <b>ID43</b>  | Stalls                   | Readout the total stalls (times ICAD stopped due to A9 alarms) done by the ICAD from when it was first powered on. Saved every 30min.                                    | 0    | 32764      | 0               | 3120           | 3396                       | 2             | 1                              | RO                                           | Yes               | 3               |
| <b>ID46</b>  | Full strokes             | Readout the total strokes (movement) done by the ICAD from when it was first powered on. Saved every 30min. Full strokes are defined as 0% to 100% to 0% opening degree. | 0    | 4294967293 | 0               | 3121 ... 3122  | 3397 ... 3398              | 4             | 1                              | RO                                           | Yes               | 3               |
| <b>ID230</b> | Alarm A9 (total counter) | Total number of A9 alarms for the ICAD is tracked.                                                                                                                       | 0    | 32764      | 0               | 3124           | 3399                       | 2             | 1                              | RO                                           | Yes               | 3               |

# ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID | Parameter name  | Description and selection options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Min. | Max. | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID241    | Active alarms   | Shows active alarms (e.g. value 0x00000406 = 0000 0000 0000 0000 0100 0000 0110 -> alarms A2, A3, A8 have been set and active)<br><b>0th bit:</b> A2 (IO MCU comm fail);<br><b>1st bit:</b> A2 (open-load status);<br><b>2nd bit:</b> A3 (AI error: > 22 mA);<br><b>3rd bit:</b> A3 (AI error: < 2 mA);<br><b>4th bit:</b> A3 (AI error: > 12 V);<br><b>5th bit:</b> A3 (AI error: < 1 V);<br><b>6th bit:</b> A4 (V FSS error);<br><b>7th bit:</b> A5 (V PS error);<br><b>8th bit:</b> A6 (Calibr fail);<br><b>9th bit:</b> A7 (Overheating);<br><b>10th bit:</b> A8 (Overheating);<br><b>11th bit:</b> A9 (POM mode);<br><b>12th bit:</b> A10 (SPI conn loss);<br><b>13th bit:</b> A13 (Failed update);<br><b>14th bit:</b> A20 (Detection fail);<br><b>15th bit:</b> A2 (EEPROM operation fail);<br><b>16th bit:</b> A2 (Bluetooth MCU comm fail);<br><b>17th bit:</b> A3 (Modbus connection lost) |      |      | 0               | 3129 ... 3130  | 3400 ... 3401              | 4             | 1                              | RO                                           | No                | 3               |
| ID248    | Active warnings | Shows active warnings<br><b>0th bit:</b> A1 (Valve not config);<br><b>1st bit:</b> A11 ( <i>reserved</i> );<br><b>2nd bit:</b> A14 (SoH is bad);<br><b>3rd bit:</b> A15 (Service overdue);<br><b>4th bit:</b> A16 (Config. mode);<br><b>5th bit:</b> A17 (Bluetooth conn);<br><b>6th bit:</b> A18 (Vin >24+10%);<br><b>7th bit:</b> A19 (Vin <24-15%);<br><b>8th bit:</b> A1 (Input not config)<br><b>9th bit:</b> A1 (Passcode not set);<br><b>10th bit:</b> A1 (Bluetooth PIN not set);                                                                                                                                                                                                                                                                                                                                                                                                            |      |      | 0               | 3131           | 3402                       | 2             | 1                              | RO                                           | No                | 3               |
| ID232    | Total events    | Total number of events in the event log (the maximum value is changeable, depends on the types of events in the event log)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0    | 1000 | 0               | 3132           | 3403                       | 2             | 1                              | RO                                           | No                | 3               |

## Info

| Label ID     | Parameter name        | Description and selection options                                                                                                                                                                                                                                                                                                                                                                                                                   | Min.   | Max.       | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No    | Modbus function |
|--------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|----------------------|-----------------|
| <b>ID53</b>  | ICAD name             | Name assigned to ICAD as the identification shown on built-in display and for connection via Bluetooth. 16 ASCII symbols, 8bits per symbol (2 symbols per register)                                                                                                                                                                                                                                                                                 |        | ICAD       | 3068 ... 3075   | 3353 ... 3360  | 30                         | 1 - 2         | RW                             | Yes                                          | <b>3 &amp; 6, 16</b> |                 |
| <b>ID253</b> | ICAD model            | Readout the ICAD model type.<br><b>3:</b> ICADB TS<br><b>2:</b> ICAD 1200B;<br><b>1:</b> ICAD 600B;<br><b>0:</b> not configured;                                                                                                                                                                                                                                                                                                                    | 0      | 3          | 0               | 3057           | 3339                       | 1             | 1                              | RO                                           | Yes                  | 3               |
| <b>ID8</b>   | Valve configuration   | Readout the valve configuration for ICAD<br><b>12:</b> ICADBTS ICMTS 50/80;<br><b>11:</b> ICADBTS ICMTS20;<br><b>10:</b> Pilot Valve CVE;<br><b>9:</b> ICAD1200B ICM150;<br><b>8:</b> ICAD1200B ICM125;<br><b>7:</b> ICAD1200B ICM100;<br><b>6:</b> ICAD1200B ICM65;<br><b>5:</b> ICAD1200B ICM50;<br><b>4:</b> ICAD1200B ICM40;<br><b>3:</b> ICAD600B ICM32;<br><b>2:</b> ICAD600B ICM25;<br><b>1:</b> ICAD600B ICM20;<br><b>0:</b> not configured | 0      | 13         | 0               | 3056           | 3338                       | 1             | 1                              | RO                                           | No                   | 3               |
| <b>ID221</b> | SW Version (High)     | Readout the software version of ICAD nn.xx                                                                                                                                                                                                                                                                                                                                                                                                          | 0      | 255        | 0               | 3048           | 3332                       | 1             | 1                              | RO                                           | No                   | 3               |
| <b>ID222</b> | SW Version (Low)      | Readout the software version of ICAD xx.nn                                                                                                                                                                                                                                                                                                                                                                                                          | 0      | 255        | 0               | 3049           | 3333                       | 1             | 1                              | RO                                           | No                   | 3               |
| <b>ID143</b> | Hardware version      | Format MM.CC (1 byte Motor PCB, 1 byte Connector PCB) (e.g. value 0x0102 = 01.02v - > 01 Motor PCB version, 02 Connector PCB version) (reserved up to 0xFFFFFFFF)                                                                                                                                                                                                                                                                                   | 0x0000 | 0xFFFF     | 0x0000          | 3156 ... 3157  | 3345 ... 3346              | 4             | 1                              | RO                                           | No                   | 3               |
| <b>ID102</b> | Previously configured | Indicates if this ICAD has previously been configured. This controls when the setup wizard is shown when connecting to ICAD via the APP.<br><b>1:</b> configured;<br><b>0:</b> not configured                                                                                                                                                                                                                                                       | 0      | 1          | 0               | 3089           |                            | 1             | 1 - 2                          | RW                                           | Yes                  | 3 & 6, 16       |
| <b>ID235</b> | Serial number         | The unique serial number of ICAD. Number generated by: nnnnnnnCCCCCCCCPPWWYY - running number (n) + Product number (Cs) + Mfg place& time nnnnnnn part - 2 registers CCCCCCCC PP parts - 5 registers, in ASCII symbols, 8bits per symbol (2 symbols per register) WW part - 1 register YY part - 1 register D part - 1 register                                                                                                                     |        |            | 0               | 3077 ... 3086  | 3362 ... 3371              | 30            | 1                              | RO                                           | Yes                  | 3               |
| <b>ID48</b>  | Run time              | Readout the run time in full minutes for the ICAD from when it was first powered on. Saved every 30min (in minutes)                                                                                                                                                                                                                                                                                                                                 | 0      | 4294967293 | 0               | 3060 ... 3061  | 3347 ... 3348              | 4             | 1                              | RO                                           | Yes                  | 3 & 6, 16       |

## Non-displayed Parameters

| Label ID | Parameter name       | Description and selection options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Min. | Max.  | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function |
|----------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|-----------------|
| ID55     | Screen saver         | Manage the time elapsed without user actions before the built-in display of ICAD goes to sleep mode (in seconds). Pressing any button ends the screen saver mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 30   | 1200  | 360             | 3090           | 3380                       | 2             | 1 - 2                          | RW                                           | Yes               | 3 & 6, 16       |
| ID226    | Status               | Readout the current ICAD status<br><b>6: Config:</b> ICAD continues to operate as before. In config mode parameters can be changed but are not applied until setting main switch back to auto or manual<br><b>5: Valve detection:</b> ICAD is currently detecting a valve<br><b>4: Safe state:</b> ICAD has stopped operation and applied the emergency state setting (ID20)<br><b>3: Boost:</b> ICAD is currently boosting to achieve the requested position<br><b>2: Calibration:</b> ICAD is currently calibrating<br><b>1: Manual:</b> User manually sets the valve position to be maintained<br><b>0: Auto:</b> Input signal type (ID3) controls valve position | 0    | 6     | 0               | 3051           | 3322                       | 1             | 1                              | RO                                           | No                | 3               |
| ID33     | Current OD           | Readout the opening degree (OD).<br>0...10000 points, where 100 = 1%<br>(i.e. 5219 = 052.19%; 10000 = 100.00%)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0    | 10000 | 0               | 3040           | 3323                       | 2             | 1                              | RO                                           | No                | 3               |
| ID211    | Requested OD         | Readout the requested opening degree automatically matching the settings for input type and operation mode. 0...10000 points, where 100 = 1%<br>(i.e. 5219 = 052.19%; 10000 = 100.00%)                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0    | 10000 | 0               | 3053           | 3324                       | 2             | 1                              | RO                                           | No                | 3               |
| ID254    | Current access level | Readout the current access level corresponding to user login. This manages rights for reading and writing parameters, and controls what the user sees<br><b>3: Danfoss Admin;</b><br><b>2: Service;</b><br><b>1: Read only</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1    | 3     | 1               | 3058           | 3340                       | 1             | 1-2                            | RW                                           | No                | 3               |
| ID239    | Battery voltage      | Readout the current voltage of the UPS battery, when this is attached and enabled. 0...300 points, where 10 = 1V<br>(i.e. 234 = 23.4V; 100 = 10.0V)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0    | 300   | 0               | 3059           | 3341                       | 1             | 1                              | RO                                           | No                | 3               |

## ICM and ICMTS Motorized Valves with ICAD Actuators

| Label ID     | Parameter name | Description and selection options                                                                                                      | Min. | Max.     | Factory setting | Modbus address | Alternative Modbus address | Size in bytes | Password level to Read - Write | Read only (RO) / Read Write (RW) / Write (W) | Persistent Yes/No | Modbus function      |
|--------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------|------|----------|-----------------|----------------|----------------------------|---------------|--------------------------------|----------------------------------------------|-------------------|----------------------|
| <b>ID103</b> | Controller ID  | Readout the controller ID to determine that this is an ICAD. 70 = ICAD                                                                 |      |          | 70              | 5001           |                            |               | <b>1</b>                       | RO                                           | No                |                      |
| <b>ID231</b> | REBOOT         | Reboot ICAD<br><b>1: Yes:</b> The device will reboot. The parameter will automatically be set back to 'no'<br><b>0: No:</b> Not active | 0    | 1        | 0               | 3088           |                            | <b>1</b>      | <b>2 - 2</b>                   | RW                                           | No                | <b>3 &amp; 6, 16</b> |
| <b>ID100</b> | Passcode entry | Enter password for level 2 or level 3 access                                                                                           | 0    | 99999999 | 0               | 3160 ... 3161  |                            | <b>4</b>      | <b>1</b>                       | W                                            | No                | <b>16</b>            |
| <b>ID101</b> | Bluetooth PIN  | Enter the four-digit (0000) PIN required for Bluetooth connection                                                                      | 0000 | 9999     | 1213            | 3162 ... 3163  |                            | <b>6</b>      | <b>1</b>                       | W                                            | Yes               | <b>16</b>            |

## Troubleshooting

### Overview

Figure 17: Manual tool



Table 9: Manual tool

| Used for                   | Description         | Code number |
|----------------------------|---------------------|-------------|
| ICM 20-32                  | Multi-function tool | 027H0180    |
| ICM 40-150 and ICMTS 20-80 | Multi-function tool | 027H0181    |

The ICAD actuator has a number of very useful service parameters which should always be consulted first. In addition, a manual tool should always be available to manually close the valve completely in the event the ICAD has failed. When using the manual tool, turn the tool clockwise to open the valve and counterclockwise to close the valve.

#### NOTE:

When rotating the valve manually you are changing the position of the valve to a value different than what is in the actuator's memory. Therefore, a calibration must be performed when ICAD is remounted to the valve. If power is cut from the actuator prior to using the manual tool or after the valve has been adjusted, no problem will occur as the valve will automatically recalibrate itself once power is restored. Power can easily be disconnected and reconnected by unscrewing and then reconnecting the power cable from the ICAD actuator.

### Warnings and Alarms

Table 10: Warnings - Flashing yellow

| Description                                               | ICAD warning text | Definition of event | Comments                               |
|-----------------------------------------------------------|-------------------|---------------------|----------------------------------------|
| No Valve type selected. Passcode or Bluetooth PIN not set | A1                | Warning ON          | At start-up A1 will be displayed       |
| State of health - UPS                                     | A14               | Warning ON          | State of health for UPS battery        |
| Service overdue                                           | A15               | Warning ON          |                                        |
| Configuration mode                                        | A16               | Warning ON          |                                        |
| Bluetooth connection                                      | A17               | Warning ON          | Bluetooth connection                   |
| High supply voltage                                       | A18               | Warning ON          | Supply voltage higher then 24V DC +10% |
| Low supply voltage                                        | A19               | Warning ON          | Supply voltage lower then 24V DC -15%  |

Table 11: Alarms - Flashing red

| Description                            | ICAD alarm text | Definition of event | Comments                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------|-----------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Controller fault                       | A2              | Alarm ON            | Internal fault inside electronics. Carry out: 1) Power OFF and Power ON If A2 still active. 2) Make a Reset to factory setting If A2 still active. Return ICAD to Danfoss                                                                                                                                                          |
| Input error                            | A3              | Alarm ON            | Not active if <b>ID2</b> = 2, or <b>ID3</b> = 4 When <b>ID3</b> = 0 and AI A > 22 mA When <b>ID3</b> = 1 and AI A > 22 mA or AI A < 2 mA When <b>ID3</b> = 2 and AI A > 12 V When <b>ID3</b> = 3 and AI A > 12 V or AI A < 1 V<br>Modbus connection lost when <b>ID3</b> =4 (modbus input) and <b>ID155</b> =1(heart-beat enabled) |
| Low voltage of fail safe Supply        | A4              | Alarm ON            | If fail safe supply < 18V and if <b>ID21</b> (UPS supply) is 1 (yes)                                                                                                                                                                                                                                                               |
| Check supply to ICAD                   | A5              | Alarm ON            | If supply voltage < 18 V                                                                                                                                                                                                                                                                                                           |
| Calibration extended failed            | A6              | Alarm ON            | Check valve type selected. Check presence of foreign body internally in valve                                                                                                                                                                                                                                                      |
| Internal temperature alarm             | A7              | Alarm ON            | Temperature for stepper motor component too high. Ventilate/lower ambient ICAD temperature                                                                                                                                                                                                                                         |
|                                        | A8              | Alarm ON            |                                                                                                                                                                                                                                                                                                                                    |
| POM mode (Preventive Operational Mode) | A9              | Alarm ON            | If ICAD meets too high torque from ICM valve (increased friction/sticking surfaces) ICAD automatic goes into POM mode to overcome lost step.                                                                                                                                                                                       |

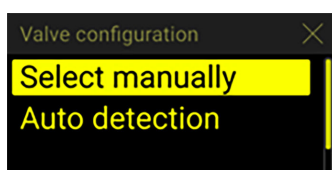
## ICM and ICMTS Motorized Valves with ICAD Actuators

| Description               | ICAD alarm text | Definition of event | Comments                      |
|---------------------------|-----------------|---------------------|-------------------------------|
| SPI connection loss       | A10             | Alarm ON            |                               |
| Failed update             | A13             | Alarm ON            | Update of the software failed |
| Valve size detection fail | A20             | Alarm ON            | Active if <b>ID9</b> set to 1 |

For ordering manual tool please download the data sheet [Spare parts and accessories](http://www.danfoss.com) from [www.danfoss.com](http://www.danfoss.com)

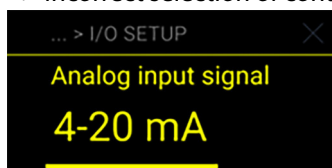
The alarms and service values work together to allow the user to quickly diagnose the source of operating issues. The most common alarms are:

**A1:** The user has not selected the valve type. Each ICAD actuator is capable of driving several different valve sizes. Upon installation of the valve, it is mandatory that the user select the valve size from parameter **ID8** or choose Automatic detection with parameter **ID9**.



**A3:** The control signal is out of the range of the selected values. The most common causes of this problem are:

1. Improper wiring
2. Incorrect selection of control signal (parameter **ID3**)



3. The source of the control signal is not outputting the correct type of signal

**A9:** The valve is locked, disconnect and remove motor. Use magnetic tool to slowly open/close the valve thru the full range. There should be at no point a sticking/tight spot. You may need to remove the valve bonnet/module to clean debris or replace the bonnet/module if it is damaged. If A9 alarm continues please contact Danfoss with application details.

Of course, there are numerous other alarm messages designed to protect the equipment and help to diagnose problems as pro-actively as possible. Most of these alarms are fairly self-explanatory.

### Troubleshooting Tips

#### The valve does not appear to close or stay closed completely

- The display shows 0% opening degree but the valve can be driven further closed with the manual tool
  - **Solution:** Recalibrate the valve. In addition, if the manual tool has been used to open or close the valve, the valve should turn very easily. If there appears to be resistance in opening or closing the valve, replace the module.
- The display shows 0% opening degree and the valve cannot be driven closed any further with the manual tool
  - **Solution:** Pull the function module and check to ensure that there are 2 o-rings on the module for ICM 25 and larger. For size ICM 20, make sure valve seat is installed

## The valve does not appear to be moving to the correct position

- Check service value **ID34**. This is the mA input from the control system. The degree of opening is linearly proportional to the mA input. (For example, if 4–20 mA was chosen as the input range and the service value shows 12 mA, the valve should be 50% open.)

| Status read outs |        |
|------------------|--------|
| AI               | 3,4 mA |
| AO               | 10 mA  |
| DO               | ON     |



- *Solution:* Check parameter **ID3** to make sure that the correct scale was selected

| Control settings > |         |
|--------------------|---------|
| Input signal       | 4-20 mA |



- Compare service value **ID34** to the value reported to be the output from the control system. If necessary, measure the actual current into the ICAD
  - *Solution:* If the two values do not equate, check wiring, paying special attention to wire polarity. If measured mA does not equate to the stated controllers output, the problem is likely to be in the control system. If measured mA does not equate to the value seen in **ID34** and everything is wired properly, the problem is likely with the ICAD actuator
- The ICAD was not mounted properly on the valve stem
  - *Solution:* Check to make sure that the ICAD set screws are evenly torqued around the base of the ICAD

## The valve does not appear to be opening fast enough or seems too fast

- The speed of the ICM valves are preset at the factory:
  - For ICM valves 20, 25, and 32, the preset speed is 100%
  - For ICM valves 40, 50, 65, 100, 125, and 150, the preset speed is 50%
- *Solution:* Check parameter **ID5**, **ID75**, **ID6**, **ID76** and **ID7** to note the actual setting and adjust accordingly

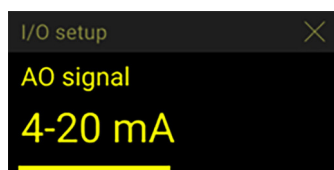
## The valve position feedback signal is not working with the customer supplied controller/PLC

- A power supply was installed in the 4–20 mA/0–20 mA feedback loop. The ICAD motor actuator supplies power for the 4–20 mA/0–20 mA feedback loop
  - *Solution:* Remove any power source that may be supplied to the feedback loop
- Wiring problem
  - *Solution:* Check the service value of **ID36** (the analog output signal) to see what the ICAD is outputting. If nothing is revealed, check the output wire (blue) with an ammeter to verify the actual output value.

| Status read outs |        |
|------------------|--------|
| AI               | 3,4 mA |
| AO               | 10 mA  |
| DO               | ON     |



- The feedback output signal was not turned on in parameter **ID18**



- **Solution:** Change this parameter to the appropriate signal

## Frequently Asked Questions

### What happens in the event of a power failure?

The ICAD actuator will remain in the position it is in when power is lost. There are two approaches to solving the issue:

- Add a UPS (Uninterruptible Power Supply) device to the power wiring. This is easily accomplished with the brown (-) and black (+) wires in the power cable bundle. A UPS device is available from Danfoss and can provide up to 10 amps of power for up to 90 seconds in order to move the valve to the desired position. Because of the high amperage, the UPS is capable of providing power to several ICAD actuators depending on the size of the actuator.

#### **NOTE:**

The UPS is not a continuous power supply. It is only meant to change the valve position once in the event of a power failure.

- Add a solenoid valve in front of the ICM in order to stop refrigerant flow. This is a simple solution provided that there is no issue associated with the additional pressure drop through the solenoid valve

### How much power do I need to supply to the ICAD?

The total power required depends on the ICAD size and the number of ICAD's powered by the dc power supply. The power for each ICAD is:

- ICAD 600B / 600B-TS (ICM 20, 25, and 32) and ICAD 600B-TS (ICMTS 20, 50, and 80), the requirement per valve is approximately 30 watts
- ICAD 1200B (ICM 40, 50, 65, 100, 125, and 150) the requirement per valve is approximately 50 watts

### How can I monitor the valve position remotely?

The control wiring bundle provides for a 4 – 20 mA or 0 – 20 mA signal output with the blue (+) and orange (-) wires. The signal can be sent to:

- A remote display
- A PLC or PC
- Another ICAD actuator to provide the same input signal (daisy chain)

### At what minimum OD%/mA will the ICAD automatically close and calibrate?

The ICAD will automatically close or be closed when the opening degree is below 3% which corresponds to 4.48 mA. After it is closed it will give a few extra steps to calibrate the valve.

### If the 4–20 mA signal is lost while the valve is open, will the ICAD close the valve?

Yes, if the input signal is lost while the valve is open, the ICAD will close the valve and it will be flashing red (AI input error). Please see Table 10: Alarms - Flashing red.

### How many turns/revolutions with the manual tool will fully open/close ICM valve?

- ICM 20: 1.25 turns
- ICM 25: 2.5 turns
- ICM 32: 3 turns

- ICM 40: 4 turns
- ICM 50: 5 turns
- ICM 65: 5 turns
- ICM 100: 12.75 turns
- ICM 125: 15.25 turns
- ICM 150: 18.25 turns
- ICMTS 20: 1.25 turns
- ICMTS 50/80: 3 turns

### Does the ICAD make a high frequency noise?

Yes, when the ICAD is at standstill, it will generate a high frequency noise which is normal

### What size wire gauge is recommended to run to the ICADs?

The typical wire gauge is 22 AWG. For power wiring, the recommended maximum lengths (for 22 AWG) are:

- ICAD 600B / 600B-TS - 27 m (90 feet)
- ICAD 1200B - 15 m ( 50 feet)

Heavier wire gauge will allow for longer lengths of power wiring. For example with 17 AWG, maximum lengths are:

- ICAD 600B / 600B-TS - 86 m (285 feet)
- ICAD 1200B - 51 m (170 feet)

Control wire lengths can be as long as 457 m (1500 feet)

### When running wire to the ICADs, does the wire need to be shielded?

There is no need for shielded cable; however, if used, the EMC capabilities of the ICAD will be improved.

### What to do if passcode or PIN for Bluetooth communication is lost?

Turn OFF and ON power supply to ICAD. Once ICAD will be turning on (after displaying Danfoss logo but no later then 10 seconds), please touch Magnetic Pen (148H6229) to marked round place next to ICAD display (see fig.18) and hold it for 5 seconds.

Passcode will be reset and you will be asked to enter new passcode and PIN.

Fig.18. ICAD B



Fig. 19. Danfoss Magnetic Pen. Code number 148H6229



## What to do if ICAD is not visible over Bluetooth?

### **1 First step**

Ensure that the ICAD is powered on and not already connected to another Bluetooth device (ICAD is not flashing blue).

Ensure that the Phone has Bluetooth on in the general phone settings (Settings > Bluetooth)

Ensure that the app has the appropriate permissions configured:

- For iOS ensure that Bluetooth is permitted in Settings > Apps > Cool Config (Bluetooth is on)
- For Android (below version 13) enable Location access (required to show and sort scan results according to distance) in Settings > Apps > Cool Config App permissions (Nearby devices)

Check that the model number corresponds to a Bluetooth model (label on the back of ICAD includes any of the following code numbers: 027H0485, 027H0486, 027H0488, 027H0489, 027H0490, 027H0491, 027H0493, 027H0494, 027H0495, 027H0496, 027H0498 or 027H0499).

Ensure that the ICAD has Bluetooth enabled (Bluetooth icon is displayed in top right corner). If this is not shown in the display of ICAD, navigate to Menu > Service > System > Bluetooth (ID54) and set this parameter to Enable (1).

If the device has worked before referring to the section "How to unpair".

### **2 How to unpair**

#### **2.1 iOS**

Step-by-step instructions

1. **Open Settings:** Open the Settings app on your iPhone or iPad.
2. **Navigate to Bluetooth:** Tap Bluetooth.
3. **Find the device:** Find the ICAD you want to unpair in the list of devices.
4. **Access device options:** Tap the "i" or "More Info" button (a circle with a lowercase "i" inside) next to its name.
5. **Unpair the ICAD:** Select Forget This Device. Confirm by tapping Forget Device again when the pop-up appears

#### **2.2 Android**

Step-by-step instructions

1. **Open Settings:** Open the Settings app on your Android device.
2. **Navigate to Bluetooth:** Go to Connected devices or Connections, then tap Bluetooth. You may need to turn Bluetooth on if it's not already.
3. **Find the device:** Look for **ICAD** in the list of paired or previously connected devices.
4. **Access device options:** Tap the gear icon (⚙️) or the three-dot menu (⋮) next to the name of the ICAD.
5. **Unpair the ICAD:** Tap Unpair or Forget to remove the device from your phone.
6. **Confirm (if prompted):** If a confirmation pop-up appears, tap Forget device to complete the process.

After having completed the unpairing of your phone and ICAD, follow the normal connection sequence, by scanning on CoolConfig Mobile, and pressing the ICAD in the results screen to pair the ICAD again. Remember to allow the pairing.

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