ENGINEERING TOMORROW

Data Sheet

# Motor operated valve Type **ICMTS** with actuator Type **ICAD 600B-TS**

Designed to regulate the flow of transcritical gas or subcritical liquid from the gascooler in transcritical $CO_2$ systems


The ICMTS is a direct operated motorised valve driven by actuator type ICAD 600B-TS. The ICMTS is designed to regulate the flow of transcritical gas or subcritical liquid from the gascooler in transcritical $CO_2$ systems. The ICMTS can also be used for other control functions in $CO_2$ systems. The ICMTS valve is designed so that the opening and closing forces are balanced.

ICAD actuator can be controlled in multipleways:

- Using the following signals:
  - 0–20 mA/4–20 mA
  - 0–10 V/2–10 V
- By a digital input (on-off)
- Via data communication:
  - Modbus RTU (RS485)/Modbus TCP/IP (Ethernet)

ICAD 600B-TS actuators can also operate an ICMTS valve as an On/Off function supported by a digital input.

The ICMTS valve can be operated manually via the ICAD 600B-TS actuator or via the Multi-function tool for ICMTS (see the Ordering).

The actuator type 600B-TS is designed specifically for ICMTS valves.

ICAD B-TS incorporates an advanced MMI (Man Machine Interface) display with descriptive text and Icons, which gives the user a very intuitive, advanced and flexible set up procedure that can meet different applications. In addition to the display interface, ICAD B also incorporates Bluetooth communication to a mobile app and data communication, which give the user alternative Interfaces for optimal efficiency and convenience when setting up an ICAD B.

## Features

### Valves

- Designed for high pressure $CO_2$ systems with applications for a maximum working pressure of 140 bar / 2030 psig.
- Applicable to R744 ($CO_2$)
- Direct coupled connections
- Connection types are DIN butt weld, ANSI butt weld, DIN brazing and ANSI brazing
- Non-alloyed quality steel
- Compact design
- Regulating cone ensures optimum regulating accuracy, particularly at part load
- Manual opening possible via ICAD 600B-TS or Multi-function tool
- The PTFE seat provides excellent valve tightness
- Magnet coupling - real hermetic sealing
- ICAD 600B-TS include encoder function that will provide a true valve position feedback to Danfoss controller or non-Danfoss control systems.

### Actuator

- Specifically designed for ICMTS valve
- Advanced and high speed Digital Stepper Motor Technology
- Additional micro steps to provide more precise control
- High contrast LCD display and user friendly navigation keyboard
- Valve opening degree can be observed continuously
- Data connection via RS485 or Ethernet
- In addition to the onboard display, all configuration and readings from ICAD B actuators can be performed via Bluetooth (using Coolconfig mobile app) or via data communication
- Can easily be configured to different applications on-site. (change speed, ON/OFF, modulating valve)
- Open – Close time: 3 seconds
- Automatic Autodetection of valve size
- Quick Set up wizzard
- Modulating or ON/OFF operation
- Multiple speed selection during operation
- Logging of all events, warnings and alarms
- Password protection
- Multiple control options: Analog signals (0–20 mA, 4–20 mA, 0–10 V, 2–10 V), digital signal (On-off) and data communication (RS485 & Ethernet)
- Position feedback: Signals ( 0–20 mA , 4–20 mA) and Data communication (RS485 & Ethernet)
- 3 digital ON/OFF feedback
- Resolution: 20 micron/step (0.02 mm stroke pr. step)
- Total steps: 250 for ICMTS 20, 600 for ICMTS 50/80
- Auto Calibration, Neutral zone
- In the event of a power failure, multiple fail safe options are possible. During power failure, ICAD 600B-TS can be selected to:
  Close ICMTS
  Open ICMTS
  Stay in the position it was in, prior to power failure. Go to a specific ICMTS valve opening degree.
- Hermetic magnetic motor
- New design of hermetic flange connection to secure highest reliability of magnet coupling
- Enclosure: IP 67 (~NEMA 6)
- Approvals: CE, UL, CRN
- Connectors for easy installation and servicing

## Function

### ICMTS valve

The ICMTS motor valve is designed for use with ICAD 600B-TS.

The driving force from the actuator is transferred via a magnetic coupling (a) through the stainless steel top housing (b), thus eliminating the need for a packing gland. The rotational movement of the magnetic coupling (a) is transferred to a spindle (c) which in turn provides the vertical movement of the cone (d) and PTFE valve plate (e), to open and close the valve. The closing force of the actuator combined with the PTFE valve plate (e) provides an effective seal to prevent leakage across the valve port, when the valve is in the closed position. To prevent damage to the PTFE valve plate (e) from system debris, it is recommended to install a filter in the system.

Valve inlet pressure (P1) acting on the underside of the PTFE valve plate (e) also passes through the hollow cone assembly in ICMTS 20 (d) on to the top of the piston (g) or the bore in the piston of ICMTS 50/80 (d) and balances the pressure acting on the piston. Any trapped liquid across the throttle cone (d) is equalised down to the valve outlet without affecting the valve performance.

**Figure 1: ICMTS 20**

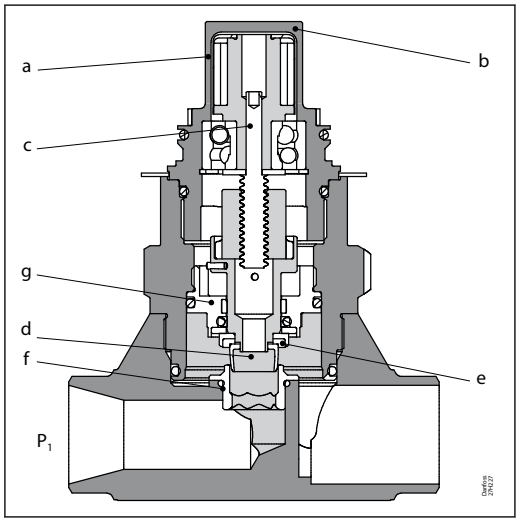
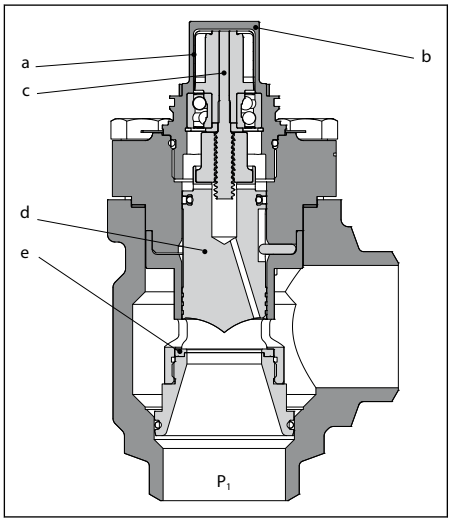



**Figure 2: ICMTS 50/80**




The actuators have a fully weather protected enclosure with none of the moving parts exposed to the environment.

The fast acting actuators and balanced valve design results in the valve being able to move from the fully closed to the fully open position in about 3-9 seconds.

The smallest cones in ICMTS 20 (A33 and A) are log-shaped in order to provide optimum regulation at small capacities and high pressure differentials.

Bigger cones in ICMTS 20 (B and C) are V-shaped in order to provide an optimum regulating curve for higher capacities.

### ICAD 600B-TS actuator

The design of ICAD 600B-TS is based on a digital stepper motor technology combined with an advanced MMI (Man Machine Interface), that gives excellent possibilities for having a high degree of flexibility with the same type of ICAD 600B-TS actuator.

The Opening Degree (0-100 %) of the actual ICMTS valve installed can be continuously observed on the ICAD 600B-TS display.

The advanced menu system will allow several parameters to be adjusted to obtain the required function.

Many different parameters can be configurated, among these:

- Modulating and ON/OFF control
- Analogue input
  0 – 20 mA or 4 – 20 mA
  0 – 10 V or 2 – 10 V
- Analogue output
  0 – 20 mA or 4 – 20 mA
- Automatic or manual control
- Change of ICMTS valve speed
- Automatic calibration
- Multiple Fail Safe set-up options during power cut

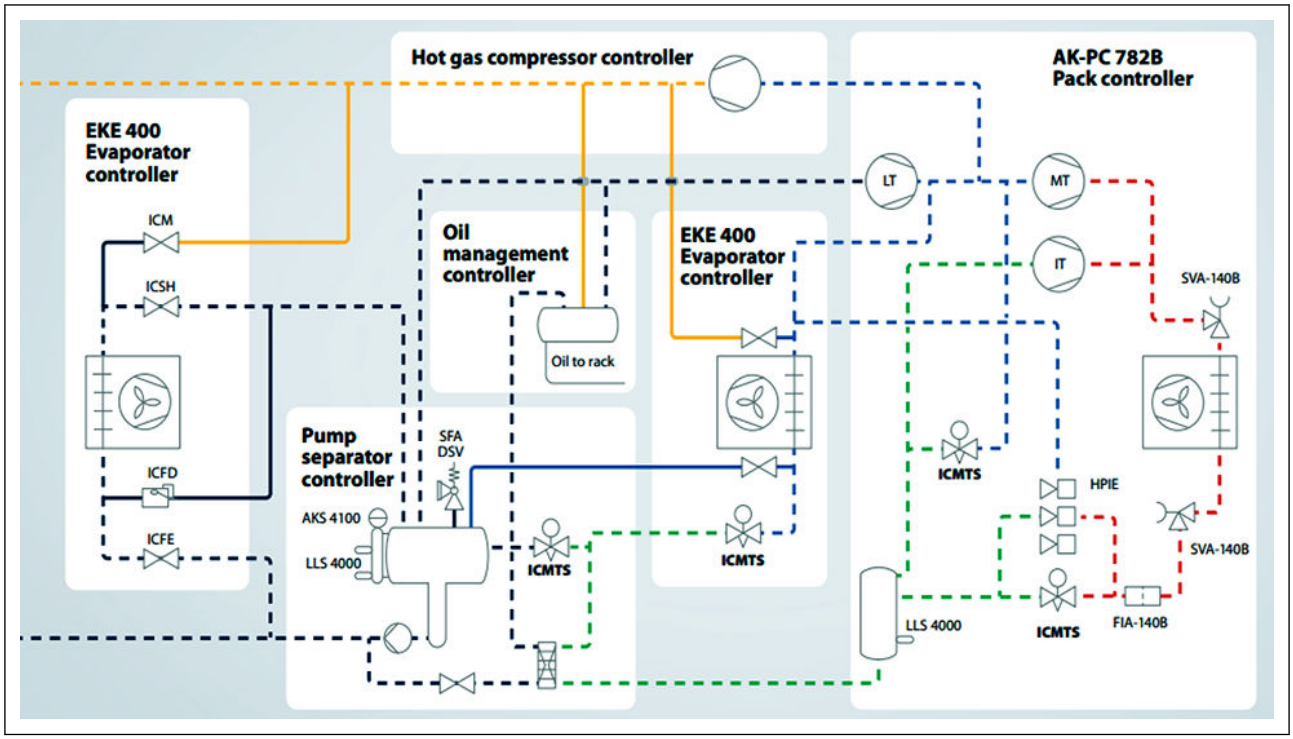
For service all Input and Output signals can be recalled and observed from the ICAD 600B-TS display.

A password protection has been linked to the parameter of entering the correct ICMTS valve to avoid unintentional and non-authorised operation.

## Application

### ICMTS valve

**Figure 3: Application**




The ICMTS valve is developed for transcritical $CO_2$ applications. The ICMTS valve can be used in systems with flash gas bypass, parallel compression as well as in stand-alone application. The ICMTS valve can be used in transcritical and subcritical conditions.

## Media

### Refrigerants

Applicable to R744 ($CO_2$). ICMTS valves must not be used with flammable refrigerants. For further information, please contact your local Danfoss sales company.

### New refrigerants

Danfoss products are continually evaluated for use with new refrigerants depending on market requirements.

When a refrigerant is approved for use by Danfoss, it is added to the relevant portfolio, and the R number of the refrigerant (e.g. R513A) will be added to the technical data of the code number. Therefore, products for specific refrigerants are best checked at store.danfoss.com/en/, or by contacting your local Danfoss representative.

# Product specification

## Technical data

### ICMTS valve

**Table 1: Technical data - Valve**

| Features | Specifications |
|---|---|
| Connections | ICMTS valves are available with DIN butt weld connections, ANSI butt weld, DIN brazing and ANSI brazing |
| Design | Valve body and top cover material |
| Temperature range | Allowable TS: -60/+150 °C (-76/+302 °F)<br>Operation: -60/+120 °C (-40/+122 °F) for ICMTS 20 and -40/+50 °C (-40/+122 °F) for ICMTS 50/80<br>Ambient: -30/+50 °C (-22/+122 °F) |
| Pressure | Max. working pressure: 140 bar g (2030 psig) |
| MOPD | Max. opening pressure differential (MOPD)ICMTS: 90 bar (1305 psi) |
| Reaction time | The time it takes to move from Closed to Open position or in reverse order with maximum selected speed at ICAD 600B-TS is 3 seconds for ICMTS 20 and 9 seconds for ICMTS 50/80 |
| Surface protection | The external surface is treated in order to provide good corrosion protection |

### ICAD 600B-TS actuator

#### Technical data

**Table 2: Technical data - Actuator**

| Features | Specifications |
|---|---|
| Materials | Housing: Aluminium<br>Top part of ICAD: PBT thermo plastic |
| Weight | ICAD 600B-TS: 1.73 kg (3.81 lb) |
| Temperature range (ambient) | –30 °C / +50 °C (–22 °F / 122 °F) |
| Enclosure | IP 67 (~NEMA 6) |
| Cable connection | Cables not included. To be ordered separately<br>M12 connectors |
| Supply cable | 4 × 0.34 mm² (3 × ~22 AWG)<br>Ø4.8 mm (diameter 0.19") |
| Control cable | 7 × 0.25 mm² (7 × ~24 AWG)<br>Ø6 mm (diameter 0.24") |
| Data communication cable | 4 x 0.08 mm² (4 × ~26 AWG)<br>Ø6 mm (diameter 0.24") |

#### Electrical data

**Table 3: Electrical connections**

| Features | Specifications |
|---|---|
| Electrical data | Supply voltage is galvanic isolated from Input/Output |
| Supply voltage | Load: 24 V DC (Tolerances; see Table 3)<br>ICAD 600B-TS: 1.2 A |
| Fail safe supply | 24 V DC (Tolerances; see Table 3)<br>ICAD 600B-TS: 1.2 A |
| Analog input | Current:<br>Input range: 0/4 – 20 mA<br>Max input range: 0 – 24 mA<br>Input resistance: 120 Ω + diode voltage 0.7 V DC<br>Measurement error: <±1.5% of the full scale<br>Reverse polarity protection: yes<br>Overcurrent protection: yes |
| | Voltage:<br>Input range: 0/2 – 10 V DC<br>Max input range: 0 – 12 V DC<br>Measurement error: <±1.5% of the full scale<br>Reverse polarity protection: yes |
| Analog output | Output range: 0/4 – 20 mA<br>Load: <800 Ω<br>Output error: <±1.5% of the full scale |
| Digital input | *Digital ON/OFF input by means of voltfree contact (Signal/Telecom relays with gold-plated contacts recommended) – Voltage input used*<br>Rth rise(OFF): >10 kΩ<br>Rth fall(ON): < 45 Ω |

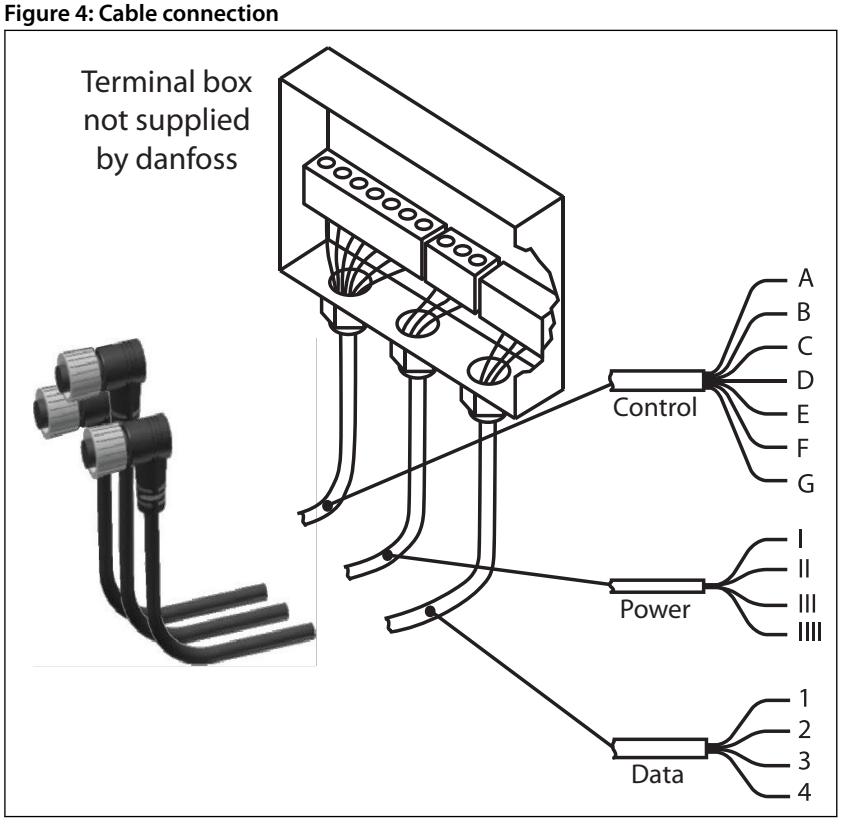
| Features | Specifications |
|---|---|
| Digital output | 3 pcs. NPN transistor output |
| | *External supply:* 7 – 24 V DC (same supply as for ICAD can be used, but please note that the galvanically isolated system will then be spoiled). |
| | *On resistance:* 55 Ω + diode voltage 0.7 V DC Max 70 Ω at 50 mA<br>Max Output current: 50 mA<br>Reverse polarity protection: Yes<br>Overcurrent protection: No |

**Table 4: 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 [V DC] | Min. | 21 | 22 | 23 | 24 |
| | Max. | 26.4 | | | |

## Cable connection

**Figure 4: Cable connection**




| | |
|---|---|
| **1** | Control cable |
| **2** | Power supply cable |
| **3** | Data cable |

**Figure 5: Cable Connectors - Rear view**

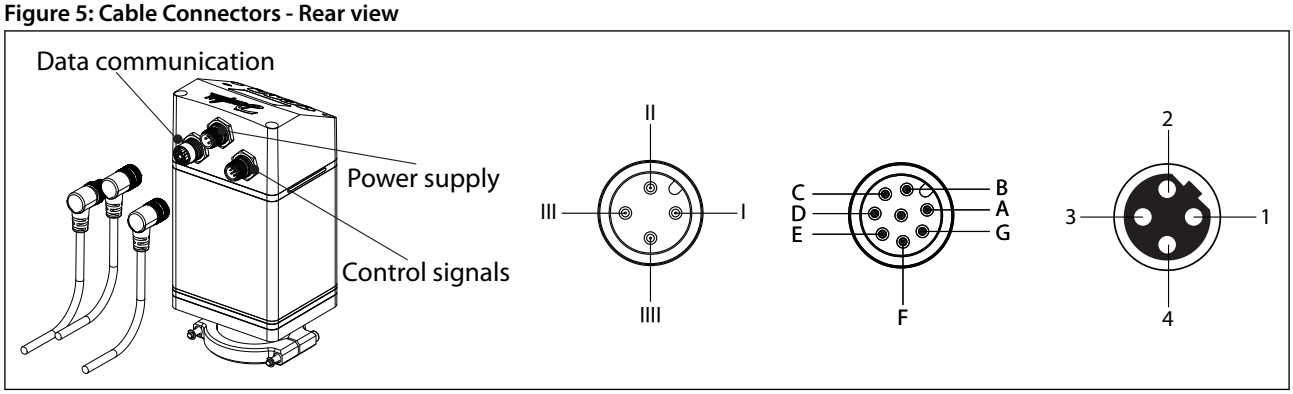
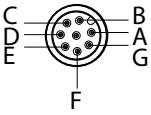
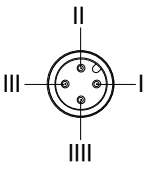


**Figure 6: ICAD back Description**

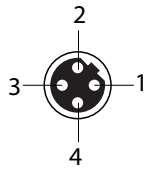



| ICAD back | Ref | Color | | Description |
|---|---|---|---|---|
| | A | Black | - | Common alarm |
| | B | Brown | - | ICM fully open |
| | C | Red | - | ICM fully closed |
| | D | Orange | - | GND ground |
| | E | Yellow | + | 0/4 –20 mA Input |
| | F | Green | + | 0/2 – 10 V input or digital input for on/off control |
| | G | Blue | + | 0/4 – 20 mA Output |

Digital output




| | | | |
|---|---|---|---|
| I | Black | + | Fail safe supply. Battery / UPS* 19 V DC |
| II | White | + | Supply voltage<br>24 V DC 2A, or more, per ICAD recommended<br>ICAD PSU must be SELV**, >15 W |
| III | Brown | - | |
| IIII | Blue | + | UPS Signal of Health - optional depending on ID31: 'UPS supply' set to 'Yes' |




**RS485/ Ethernet**

| | | | |
|---|---|---|---|
| 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(-) |

*Uniterruptable Power Supply
**The ICAD is a class III appliance

## Fail Safe supply options

**Figure 7: ICAD 600B-TS**

In the event of a power failure, multiple fail safe options are possible, provided that a ICAD-UPS or similar is used.

During power failure, ICAD can be selected to:
- Close ICM/ICMTS
- Open ICM/ICMTS
- Stay in the position it was in, prior to power failure
- Go to a specific valve opening degree

See ICAD-UPS for ICM/ICMTS for further information.

**NOTE:**
A fail safe supply (battery or UPS) is required.

## Facts and features

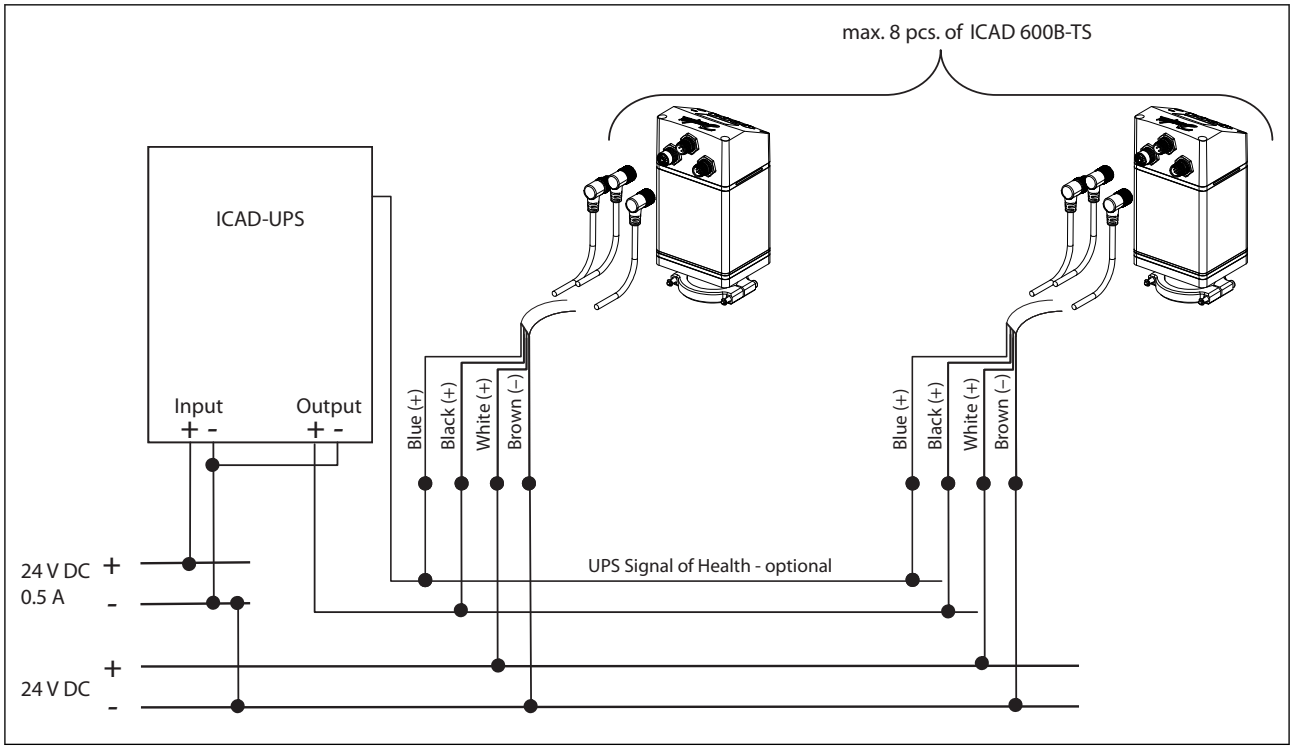
- Industrial product
- Can support up to 8 pcs of ICAD 600B-TS
- Integrated solution - battery and UPS
- Industrial approvals:
  CE, UL, GL (Germanisher Lloyd)
- DIN rail mounting
  - LED indication
  - Green (Power ON)
  - Yellow (Flashing: charging, Constant: Buffer mode (Failsafe supply to ICAD 600B- TS))
  - Red (Battery fully discharged/Battery faulty)
- 24 V DC supply → Same transformer as for ICAD 600B-TS can be used. Only +0.5 A extra load on the transformer
- Check of battery every 60 sec
- Adjustable buffer time[1]. (1, 2, 3, 5, 10, 15, 20, 30 or infinity) = Ensures longer battery life time
- Forced remote shutdown in buffer mode via digital input
- 3 digital volt free relay change over contacts for signals to PLC systems. (Power OK, Buffer mode (failsafe supply to ICAD), Alarm)

Code number: **027H0388**

For further information, please refer Instruction guide - AN000086416706.

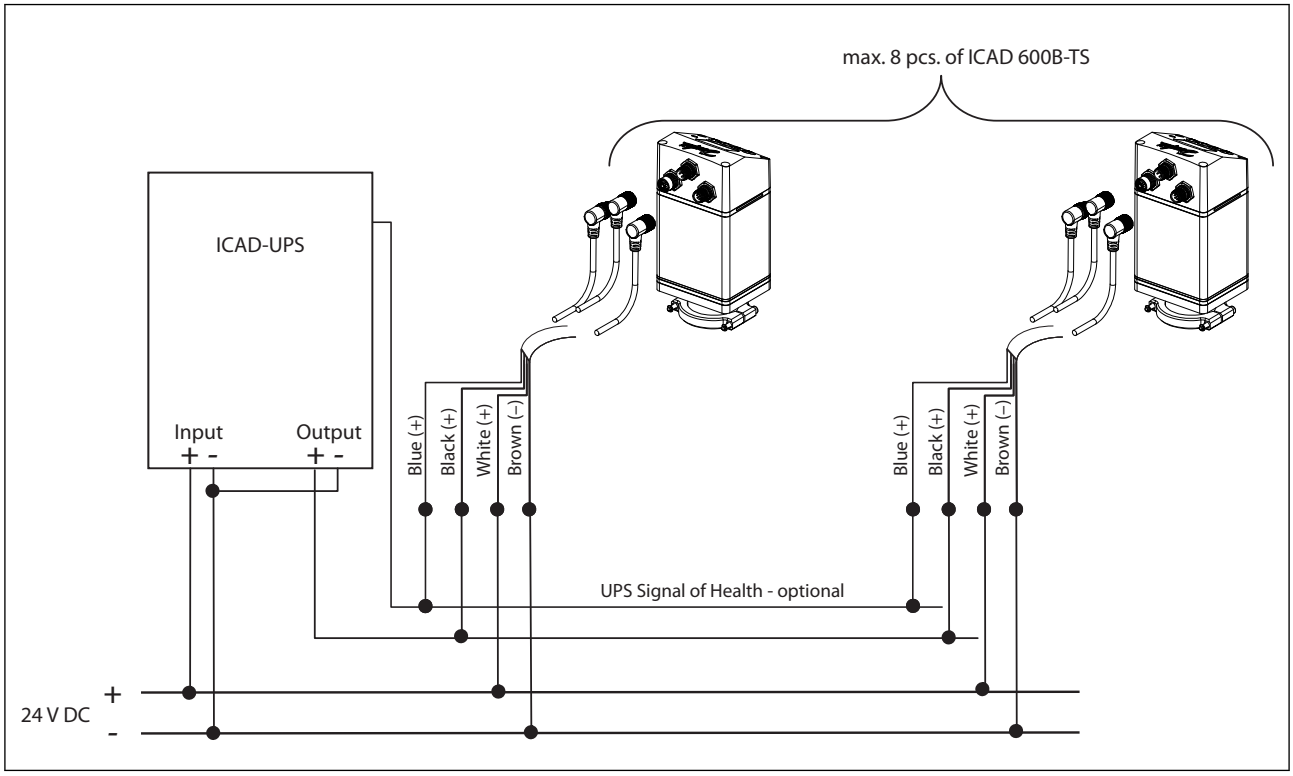
## Applications

**Figure 8: Seperate 24 V DC tranformer for both ICAD-UPS and ICAD**




[1] Buffer time is defined as the period where ICAD is only powered from the ICAD-UPS (i.e. not from main supply). On ICAD-UPS there is an adjustable buffer time setting (1, 2, 3, 5, 10, 15, 20, 30 min. or infinity). If set to 3, ICAD-UPS will switch off power to connected ICAD 600B-TS, 3 minutes after the power failure occurs. This ensures that the internal battery inside ICAD-UPS does not fully discharge

**Figure 9: One 24 V DC tranformer for ICAD-UPS and ICAD**




## ICAD-UPS for ICMTS

**Figure 10: ICAD-UPS**

ICAD-UPS is designed for using with ICM and ICMTS valves.

In the event of power failure, there is a need to make sure that the ICM/ICMTS goes to a safe position. ICAD-UPS can be connected to the ICAD.

The solution of connecting ICMTS with ICAD to ICAD-UPS will give one of the following possibilities in the event of power failure:

- close ICM/ICMTS
- open ICM/ICMTS
- stay
- go to a specific ICM/ICMTS Opening Degree

When power supply has been re-established the system will automatically return to normal operation.

## Material specification

**Figure 11: ICMTS 20**

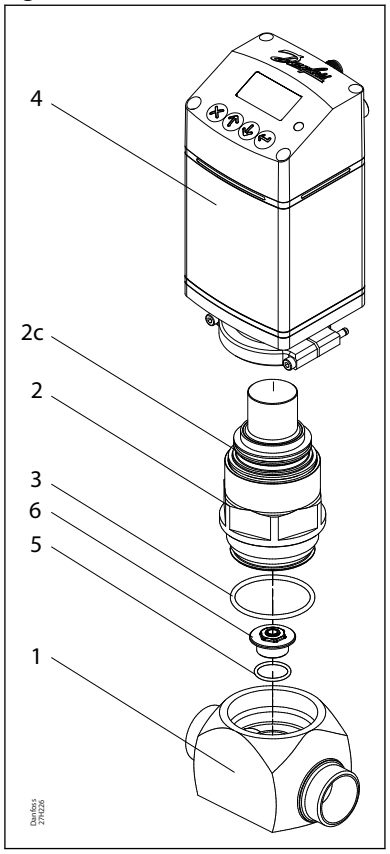



**Table 5: Material specification**

| No. | Part | Material | EN | ASTM |
|---|---|---|---|---|
| 1 | Housing | Low temperature steel | S235J2, EN10025 | A515 |
| 2 | Top cover / function module | Low temperature steel | S355J2, EN10025 | LCC, A352 |
| 2c | O-ring | Chloroprene (Neoprene) | | |
| 3 | O-ring | Chloroprene (Neoprene) | | |
| 4 | Actuator | | | |
| 5 | O-ring | Chloroprene (Neoprene) | | |
| 6 | Seat | Stainless steel | | |

**Figure 12: ICMTS 50/80**

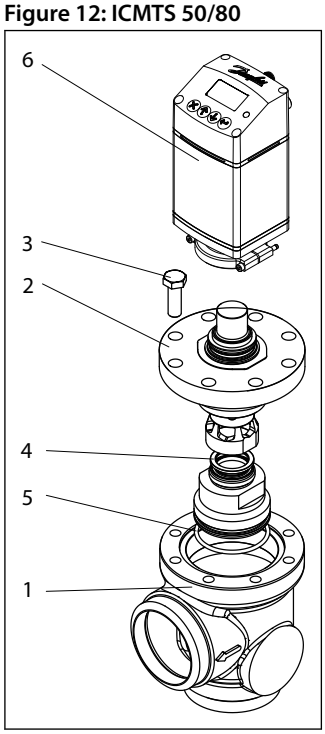



**Table 6: Material specification ICMTS 50/80**

| No. | Part | Material | EN | ASTM |
|---|---|---|---|---|
| 1 | Housing | Low temperature steel | S235J2, EN10025 | A515 |
| 2 | Top cover | Low temperature steel | S355J2, EN10025 | LCC, A352 |
| 3 | Bolt | 42CrMo4+QT DIN 933 Grade 8.8 | | |
| 4 | Seat | PTFE | | |
| 5 | O-ring | EPDM | | |
| 6 | Actuator | | | |

## ICMTS capacities

It is relatively complex to correctly size a valve for transcritical applications, especially as the mass flow of the refrigerant changes, drastically moving from transcritical to subcritical conditions. At the same time, temperature variations in the intermediate vessel downstream of the valve, will not significantly affect the sizing the valve.

It is recommended to calculate the ICMTS valve using Danfoss Coolselector®2. Quick capacity selection could be done using the following tables.

### ICMTS 20

It is recommended to calculate the ICMTS valve using Danfoss Coolselector software following these steps:

- Calculate the ICMTS valve as an expansion valve in the liquid line with the following conditions: Tcond = +30 °C, Tevap = temperature in the intermediate vessel, 0 K subcooling
- Check the selected valve for the winter conditions: e.g. Tcond = +15 °C with 5 K subcooling
- Possible part load of the system at Tcond = +30 °C, Tevap = temperature in the intermediate vessel, 10 K subcooling. (night operation or the smallest capacity step of the power pack). The part load of the valve should be above 10%.

Quick capacity selection could be done using the following table:

**Table 7: 0 K subcooling in the subcritical mode**

| | +15/+5 °C [kW] | +30/+5 °C [kW] | +38 (100 bar)/ +5 °C [kW] |
|---|---|---|---|
| ICMTS 20-A33 | 16.7 | 16.1 | 25 |
| ICMTS 20-A | 50 | 48 | 75 |
| ICMTS 20-B | 291 | 278 | 423 |
| ICMTS 20-C | 479 | 454 | 675 |

**Table 8: 5 K subcooling in the subcritical mode**

| | +15/+5 °C [kW] | +30/+5 °C [kW] | +38 (100 bar)/ +5 °C [kW] |
|---|---|---|---|
| ICMTS 20-A33 | 18.5 | 23 | 25 |
| ICMTS 20-A | 56 | 69 | 75 |
| ICMTS 20-B | 325 | 400 | 423 |
| ICMTS 20-C | 540 | 655 | 675 |

**Table 9: 10 K subcooling in the subcritical mode**

| | +15/+5 °C [kW] | +30/+5 °C [kW] | +38 (100 bar)/ +5 °C [kW] |
|---|---|---|---|
| ICMTS 20-A33 | 20.4 | 26.5 | 25 |
| ICMTS 20-A | 61 | 80 | 75 |
| ICMTS 20-B | 355 | 470 | 423 |
| ICMTS 20-C | 585 | 760 | 675 |

## ICMTS 50/80

**Table 10: Capacity range High Pressure expansion valve**

| | (1) [kW] |
|---|---|
| ICMTS 50 | 1485 |
| ICMTS 80A | 2970 |
| ICMTS 80B | 4500 |

(1) Pgascooler 90 bar / Tgascooler +35 °C / Tevap -10 °C / Preceiver 36 bar

**Table 11: Capacity range Gas Bypass valve**

| | (1) [kW] |
|---|---|
| ICMTS 50 | 648 |
| ICMTS 80A | 1296 |
| ICMTS 80B | 1944 |

## Dimensions and weights

### ICMTS 20

**Figure 13: ICMTS 20**

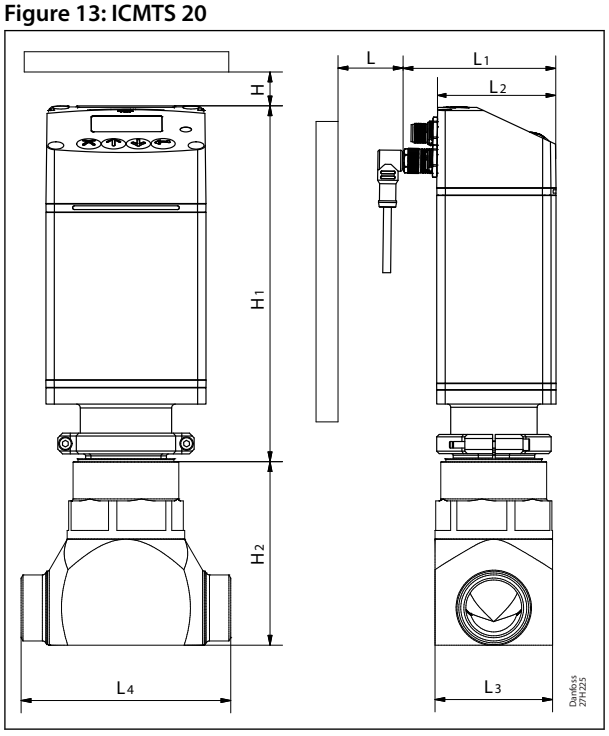



**Table 12: ICMTS 20**

| Connection | | H | $H_1$ | $H_2$ | L[1] | $L_1$ | $L_2$ | $L_3$ | $L_4$ | Weight ICMTS incl. ICAD 600A-TS |
|---|---|---|---|---|---|---|---|---|---|---|
| 25 D (1 in.) | mm | 40 | 195 | 94 | 65 | 86 | 68 | 60 | 107 | 3.3 kg |
| | in. | 1.58 | 7.68 | 3.7 | 2.56 | 3.39 | 2.68 | 2.36 | 4.21 | 6 lb. |

[1] Include space for ICAD Protection cap.

**NOTE:**
Weight is approximated only.

### ICMTS 50/80

**Figure 14: ICMTS DN 50**

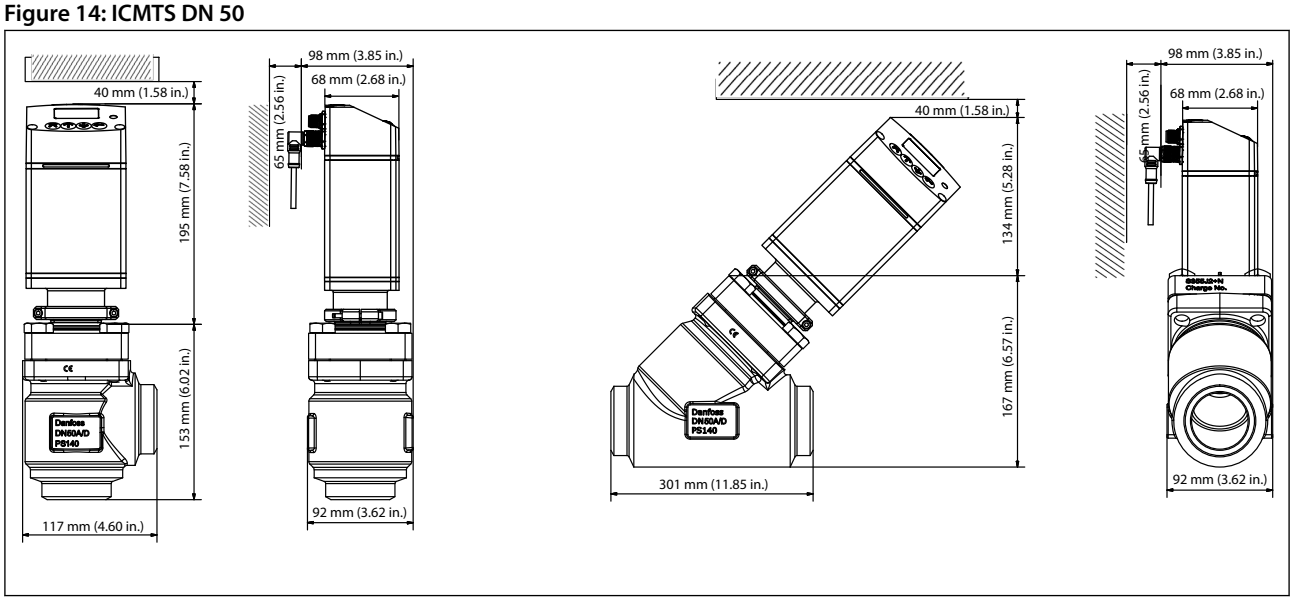
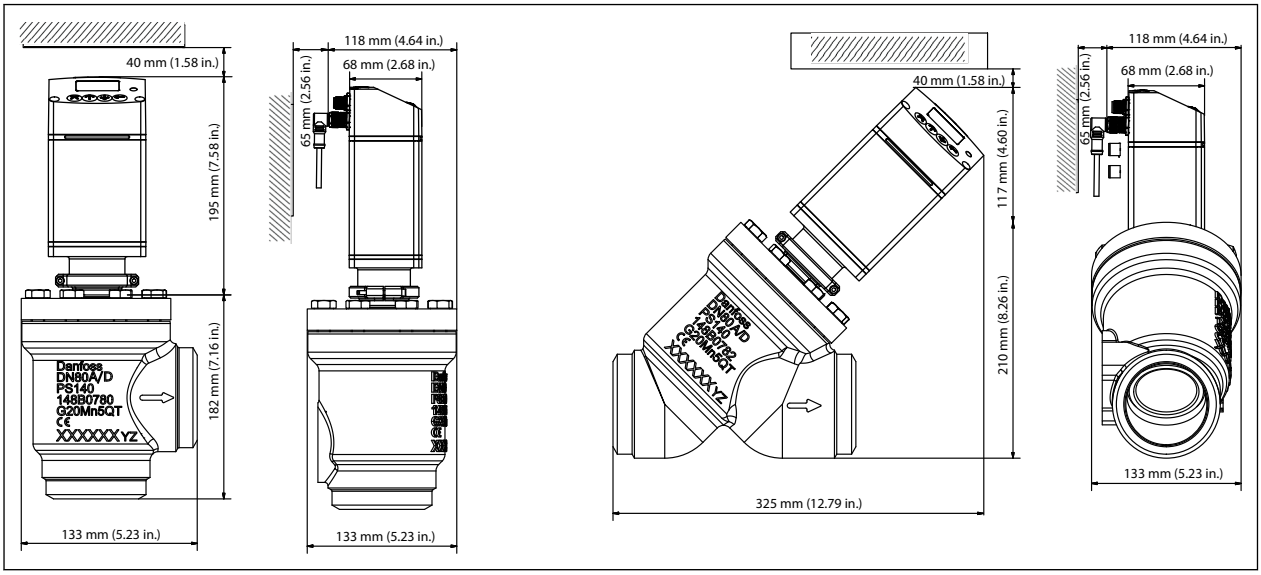


**Figure 15: ICMTS DN 80**




## Connections

### ICMTS 20

**Figure 16: Butt weld DIN (EN 10220)**

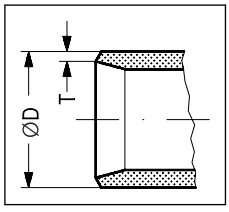



**Table 13: Butt weld DIN (EN 10220)**

| Size mm | Size in. | OD mm | T mm | OD in. | T in. |
|---|---|---|---|---|---|
| 25 | -1 | 33.7 | 2.6 | 1.327 | 0.103 |

### ICMTS 50/80

**There is a wide range of connection types and sizes available with ICMTS 50/80 valves:**

- **D**: Butt weld, DIN (EN 10216-2)
- **A**: Butt weld, ANSI (ASME B 36.10M SCHEDULE 80)
- **SA**: Brazing ASME (ASME B16.50)
- **SD**: Brazing DIN (DIN EN 1254-5)

**Figure 17: Butt weld DIN (EN 10216-2)**

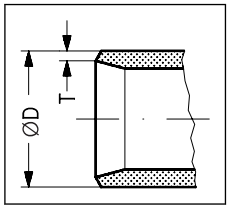



**Table 14: Butt weld DIN (EN 10216-2)**

| Size mm | Size in. | ØD mm | T mm | ØD in. | T in. |
|---|---|---|---|---|---|
| 50 | 2 | 60.3 | 5 | 2.37 | 0.20 |
| 80 | 3 | 88.9 | 7.1 | 3.5 | 0.28 |

Figure 18: Butt-weld ANSI

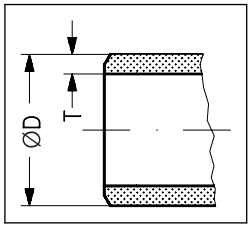



Table 15: A: Butt-weld ANSI (B 36.10)

| Size | Size | ØD | T | ØD | T | Schedule |
|---|---|---|---|---|---|---|
| mm | in. | mm | mm | in. | in. | |
| 50 | 2 | 60.3 | 5.6 | 2.37 | 0.22 | 80 |
| 80 | 3 | 88.9 | 7.6 | 3.5 | 0.30 | 80 |

Figure 19: SD: Brazing

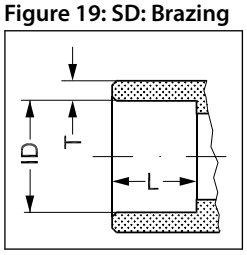
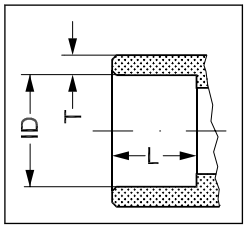



Table 16: SD: Brazing (DIN EN 1254-5)

| Size | ID | L |
|---|---|---|
| mm | mm | mm |
| 54 | 54.09 | 33 |

Figure 20: SA: Brazing

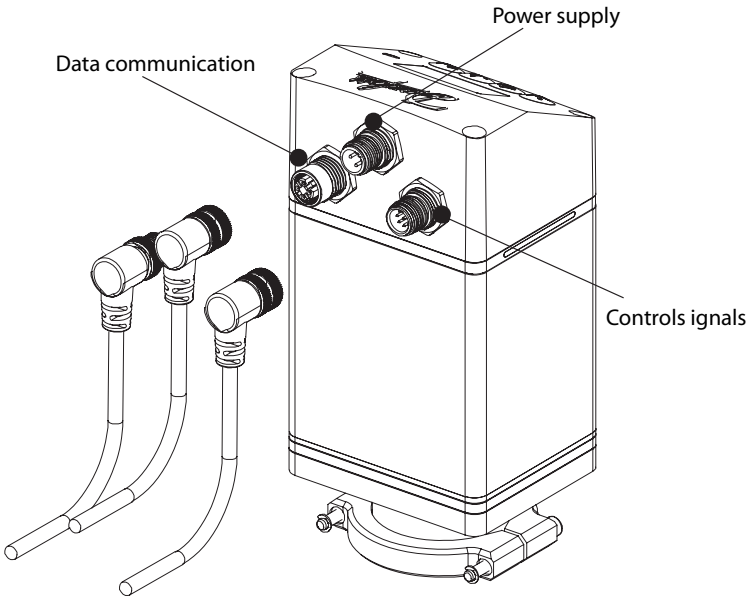



## General operation

### ICAD light guide

In addition to the onboard display, ICAD B is equiped with an status light guide visible from different angles. The light guide provides a continues status of ICAD B operation in real time.

**Figure 21: ICAD light guide**




**Light guide**

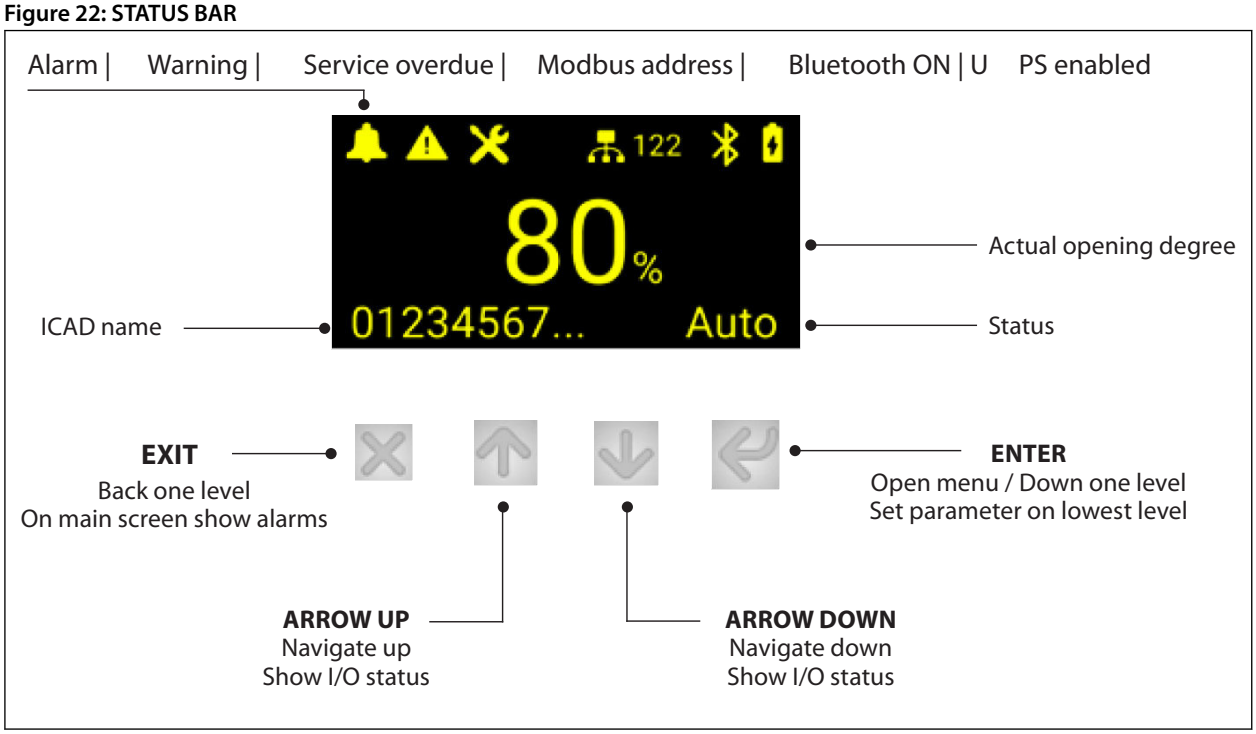
| | |
|---|---|
| Flashing red | Critical alarm - stopped operating |
| Steady red | Severe alarm - danger of stopping operating |
| Flashing blue | ICAD is connected via Bluetooth |
| Steady yellow | Warning |
| Flashing green | OK |

## Status bar

The main screen layout and navigation is as described below. ICAD will start up 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.

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

**Figure 22: STATUS BAR**




2. Once you are in the menu, use the UP and DOWN 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 (approx. 20 seconds)

## 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 wizzard 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 | **ICAD operating mode**<br>**0: Auto:** Input signal type (ID3) controls valve position<br>**1: Manual:** user manually sets the valve position to be maintained<br>**2: Config:** 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 | **Define ICAD mode**<br>**0: Modulating:** Valve positioning according to Analog Input (see ID3)<br>**1: ON/OFF:** Operating ICM valve like an ON/OFF valve controlled via Digital Input (see ID23 for definition of fully close/fully open)<br>**2: 3-point control:** Increase/Decrease Opening Degree by Digital Input. | 0 | 2 | 0 | 3001 | 3301 | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID3** | Input signal type | **Type of AI signal from external controller**<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>**0:** 0-20mA;<br>**1:** 4-20mA;<br>**2:** 0-10V;<br>**3:** 2-10V;<br>**4:** modbus;<br>**5:** non config | 0 | 5 | 5 | 3002 | 3302 | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |

| 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) | **Set the desired opening degree**<br>Only when main switch is set to manual (ID1=1)<br>**0…100%** (min step – 1%) | 0 | 100 | 0 | 3003 | 3303 | 1 | 1 - 1 | RW | No | 3 & 6, 16 |
| **ID203** | Requested Opening Degree (set-point) | **The opening degree requested through Modbus**<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) | **Change password for level 2 acess.**<br>Level 2 will give acess 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 | **Opening speed**<br>Only active when Operation mode (ID2) is set to 3-point. Percentage of full speed.<br>**1...100%** (min step – 1%) | 1 | 100 | 10 | 3011 | | 1 | 2 - 2 | RW | Yes | 3 & 6, 16 |
| **ID75** | Speed negative, 3-point | **Closing speed**<br>Only active when Operation mode (ID2) is set to 3-point. Percentage of full speed.<br>**1...100%** (min step – 1%) | 1 | 100 | 10 | 3012 | | 1 | 2 - 2 | RW | Yes | 3 & 6, 16 |
| **ID6** | Speed positive, on/off | **Opening speed**<br>Only active when Operation mode (ID2) is set to ON/OFF. Percentage of full speed<br>**1...100%** (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 | **Closing speed**<br>Only active when Operation mode (ID2) is set to ON/OFF. Percentage of full speed<br>**1...100%** (min step – 1%) | 1 | 100 | 100 - ICAD 600; 50 - ICAD 1200 | 3014 | | 1 | 2 - 2 | RW | Yes | 3 & 6, 16 |
| **ID7** | Speed, modulating | **Speed while modulating**<br>Only active when Operation mode (ID2) is set to Modulating.<br>Percentage of full speed<br>**1...100%** (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 | **Valve size detection for ICAD**<br>**0: No:** Not active<br>**1: Yes:** 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 |

| 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 | **Valve size detection action for ICAD**<br>**Note:** The allowed value of the parameter varies depends on the ICAD model parameter (ID73)<br>**12**: ICADTS ICMTS 50/80;<br>**11**: ICADTS ICMTS20;<br>**10**: Pilot Valve CVE;<br>**9**: ICAD1200B ICM150;<br>**8**: ICAD1200B ICM125;<br>**7**: ICAD1200B ICM100;<br>**6**: ICAD1200B ICM65;<br>**5**: ICAD1200B ICM50;<br>**4**: ICAD1200B ICM40;<br>**3**: ICAD600B ICM32;<br>**2**: ICAD600B ICM25;<br>**1**: ICAD600B ICM20;<br>**0**: not configured **No valve selected**. 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>**1: Open valve:** DI = ON = > Close ICM valve<br>**0: Close valve:** DI = ON = > 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>**1: On:** Increasing Analog Input signal => Decreasing opening degree<br>**0: Off:** Increasing Analog Input signal => Increasing opening degree<br>When Operation mode (ID2) is set to 3-point.<br>**1: On:** 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>**0: Off:** 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>**Note: Not active when Operation mode is set to ON/OFF. For ON/OFF control refer to DI funtion (ID23)** | 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>**1: Yes:** On/off mode with 2 step opening and/or 2 step closing. Activates parameters ID158...ID162<br>**0: No:** 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 |

| 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 | **2 step mode**<br>**2:** Open & close;<br>**1:** Close;<br>**0:** 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 | **Enable/Disable forced closing**<br>Not active when CVE valve is chosen (ID8)<br>**1: On:** When valve Opening Degree < 3% it will be forced to close regardless of requested ICM valve Opening Degree<br>**0: Off:** When valve Opening Degree < 3% no forced closing will take place.<br>**Disabling forced closing is not recommended as it can lead to leaking valves.** | 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>**2: Extended:** Calibration from fully closed to fully open<br>**1: Normal:** Forced calibration to fully closed<br>**0: None:** No calibration performed | 0 | 2 | 0 | 3018 | | 1 | 2 - 2 | RW | No | 3 & 6, 16 |
| **ID151** | Startup calibration | **Selection of startup calibration type**<br>**1: Extended:** Calibration from fully closed to fully open<br>**0: Normal:** Forced calibration to fully closed | 0 | 1 | 0 | 3027 | 3311 | 2 | 1 - 2 | RW | Yes | 3 & 6, 16 |

| 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 | **Type of A0 signal for valve position.**<br>This selection must match the output expected to read this externally. AO signal calculation is based on the encoder.<br>**2: 4-20 mA;**<br>**1: 0-20 mA;**<br>**0: no signal** | 0 | 2 | 2 | 3020 | 3307 | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID21** | UPS supply | **Define if an Uninterruptible Power Supply (UPS) is applied to the ICAD.**<br>This enables A4 alarms (Low voltage of UPS supply).<br>**1: Yes:** UPS is attached<br>**0: No:** Nothing attached | 0 | 1 | 0 | 3023 | 3308 | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID22** | UPS setting | **Defines when the health indication of a UPS can be considered as good.**<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>**2: DI Low:** good health;<br>**1: DI High:** good health;<br>**0: Off:** 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 | **Defines if analog output should signal active alarms**<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.<br>**2: 22mA:** Analog output will be set to 22 mA in case of active alarms(s)<br>**1: 3.6mA:** Analog output will be set to 3.6 mA in case of active alarm(s)<br>**0: Off:** Analog output will continue to signal the valve position<br>**Note: When setting this to anything other than Off, the analog output will not signal valve position whenever ICAD is in alarm mode.** | 0 | 2 | 0 | 3021 | 3318 | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID20** | Emergency state | **Set the requested valve position for safe state**<br>Safe state occurs for A2, A3, A5, A8, A10, and can be a result of the boosting process during A9.<br>**3:** emergency opening degree (set position to ID27)<br>**2:** maintain position;<br>**1:** open valve;<br>**0:** close valve; | 0 | 3 | 0 | 3022 | 3319 | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID27** | Emergency OD | **The opening degree to use in safe state**<br>Only active when Emergency state (ID20) is set to emergency opening degree (ID27)<br>**0…100%** (min step – 1%) | 0 | 100 | 50 | 3026 | 3320 | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID229** | Reset alarm A9 | **Manual reset of active A9 alarm**<br>Only active If boost action (ID28) is set to once, and reset A9 alarms (ID31) is set to manual or auto.<br>**1: Yes:** 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.<br>**0: No:** Active alarms are not reset. (Default state) | 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 | **Defines how to manage when the opening degree is outside of the threshold of the max offset allowed (ID30).**<br>**2: Once:** 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>**1: Cycling**: Keep boosting 15 seconds, break for the time specified as boost delay (ID29), then raise A9 alarm. Cycle continues position has been regained.<br>**Note: It is not recommended to change this setting from default.** | 1 | 2 | 1 | 3030 | | 1 | 2 - 2 | RW | Yes | 3 & 6, 16 |
| **ID29** | Boost delay | **Minutes after boost before next boost and raise of A9 alarm.** 1…30 minutes (min step – 1)<br>**Note: It is not recommended to change this setting from default.** | 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>3…15% (min step – 1%) | 3 | 15 | 3 | 3032 | | 1 | 2 - 2 | RW | Yes | 3 & 6, 16 |
| **ID31** | Reset A9 Alarms | **Define how to Reset/ Suppress A9 alarm and DO Common Alarm ON.**<br>**2: Suppress:** Ignore detection of the stall. No alarm is raised and DO Common Alarm output remains OFF.<br>**1: Auto**: Reset when it is within max offset (ID30) limit again and reset delay time (ID32) has elapsed<br>**0: Manually:** User resets alarm using the reset alarm action.<br>**Note: It is not recommended to change this setting from default.** | 0 | 2 | 1 | 3033 | | 1 | 2 - 2 | RW | Yes | 3 & 6, 16 |
| **ID32** | Reset A9 Alarm delay | **Define the reset delay for A9 alarms.**<br>Only active when reset A9 alarm (ID31) is set to auto.<br>1…20 minutes (min step – 1)<br>**Note: It is not recommended to change this setting from default, and this value should always be longer than the boost delay (ID29)** | 1 | 20 | 5 | 3034 | | 1 | 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>**1: Turn On** Service reminder<br>**0: Turn Off** 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>**1: Yes**: 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>**0: No:** 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 | **Clear event log**<br>**1: Yes:** All event log entries will be hidden. The parameter will automatically be set back to 'no' when hide has finished<br>**0: No:** 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<br>(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>**1: enable;**<br>**0: disable** | 0 | 1 | 1 | 3076 | 3361 | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID236** | Factory reset | **Factory reset action for ICAD**<br>**1: Yes:** 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>**0: No:** Not active | 0 | 1 | 0 | 3087 | | 1 | 2 - 2 | RW | No | 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>**1...100%** (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>**1...100%** (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 | **Modbus RS485 network address of ICAD**<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>**8: 115200**<br>**7: 57600;**<br>**6: 38400;**<br>**5: 19200;**<br>**4: 14400;**<br>**3: 9600;**<br>**2: 4800;**<br>**1: 2400;**<br>**0: 1200;** | 0 | 8 | 6 | 3101 | 3392 | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID61** | Modbus parity | Set via **com type** on display:<br>**2:** even<br>**1:** odd<br>**0:** 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>**1:** 2 bits;<br>**0:** 1 bit | 0 | 1 | 0 | 3103 | 3394 | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ID237** | Modbus enable | Enable/disable Modbus to manage if data can be read and set via Modbus connection.<br>**1: enable;**<br>**0: disable** | 0 | 1 | 1 | 3104 | 3395 | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID155** | Modbus heartbeat enable | Active when ID2 is modulating and ID3 is modbus<br>**1: enable;**<br>**0: disable** | 0 | 1 | 0 | 3093 | 3378 | 2 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID156** | Modbus heartbeat interval | When ID155 Modbus heartbeat is enabled.<br>The interval with which the PLC should send Modbus requests to ICAD.<br>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 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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>**2:** Auto IP;<br>**1:** DHCP[1];<br>**0:** Static IP | 0 | 2 | 0 | 3180 | 3383 | 2 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID115** | Ethernet port | System **Port 502** is reserved specifically for Modbus applications. If you change this parameter, you must be sure what you are doing.<br>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>**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.* | 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.<br>Should be different from ID113 default gateway parameter.<br>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 | 0xFFFFFF00<br>255.255.255.0 | 3186 …<br>3187 | 3389 …<br>3390 | 4 | 1 - 2 | RW | Yes | 3 |

[1] 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>**3:** DI1 - on, DI2 - on;<br>**2:** DI1 - off, DI2 - on;<br>**1:** DI1- on, DI2 - off;<br>**0:** DI1- off, DI2 - off;<br>**Note that for ON/OFF only DI1 is active:**<br>**1:** DI1 - on<br>**0:** 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>**1:** Yes;<br>**0:** No | 0 | 1 | 0 | 3045 | 3329 | 1 | 1 | RO | No | 3 |
| **ID39** | DO (fully open) | DO Fully opened status (ON when OD > 97%)<br>**1:** Yes;<br>**0:** 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>**1:** Active;<br>**0:** 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>**1:** OK;<br>**0:** 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>**2:** config;<br>**1:** manual;<br>**0:** auto | 0 | 2 | 0 | 3055 | 3337 | 1 | 1 | RO | No | 3 |
| **ID2** | Mode | Readout ICAD mode<br>**2:** 3 – point;<br>**1:** on/off;<br>**0:** modulating | 0 | 2 | 0 | 3001 | 3301 | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID8** | Valve configuration | Readout the valve configuration for ICAD.<br>**12:** ICADTS ICMTS 50/80;<br>**11:** ICADTS ICMTS20;<br>**10:** Pilot Valve CVE;<br>**9:** ICAD1200B ICM150;<br>**8:** ICAD1200B ICM125;<br>**7:** ICAD1200B ICM100;<br>**6:** ICAD1200B ICM65;<br>**5:** ICAD1200B ICM50;<br>**4:** ICAD1200B ICM40;<br>**3:** ICAD600B ICM32;<br>**2:** ICAD600B ICM25;<br>**1:** ICAD600B ICM20;<br>**0:** 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 |

| 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>**1:** yes;<br>**0:** 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>**3:** emergency opening degree (set position to ID27)<br>**2:** maintain position;<br>**1:** open valve;<br>**0:** 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>**2:Once**: 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>**1: Cycling:** Keep boosting 15 seconds, break for the time specified as boost delay (ID29), then raise A9 alarm. Cycle continues position has been regained.<br>**Note: It is not recommended to change this setting from default.** | 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>**Note: It is not recommended to change this setting from default.** | 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>**3…15%** (min step – 1%) | 3 | 15 | 3 | 3032 | | 1 | 2 - 2 | RW | Yes | 3 & 6, 16 |

| 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>**2: Suppress:** Ignore detection of the stall. No alarm is raised and DO Common Alarm output remains OFF.<br>**1: Auto:** Reset when it is within max offset (ID30) limit again and reset delay time (ID32) has elapsed<br>**0: Manually:** User resets alarm using the reset alarm action.<br>**Note: It is not recommended to change this setting from default.** | 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>**Note: It is not recommended to change this setting from default, and this value should always be longer than the boost delay (ID29)** | 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>**1: enable;**<br>**0: disable** | 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>**1 = enable;**<br>**0 = disable** | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ID120** | 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 [**ID48** (while the device is working)] - [event/alarm **timestamp** (point in ID48 at which the current event occurred)] = minutes that have passed since the event/ alarm occurred (to show **XX minutes(or hours) ago)** | -1 | 4294967294 | 4294967295 (-1, or 0xFFFFFFFF in hex) | 3200 … 3201 | 3404 … 3405 | 4 | 1 | RO | No | 3 |
| **ID121** | 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 |
| **ID122** | 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 |
| **ID123** | 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 |
| **ID124** | 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 |
| **ID125** | 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 |
| **ID126** | 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 |
| **ID127** | 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 |
| **ID128** | 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 |
| **ID129** | 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 |
| **ID130** | 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 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ID131** | 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 |
| **ID132** | 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 |
| **ID133** | 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 |
| **ID134** | 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 |
| **ID135** | 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 |
| **ID136** | 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 |
| **ID137** | 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 |
| **ID138** | 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 |
| **ID139** | 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 |
| **ID140** | 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 |
| **ID141** | 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 |
| **ID146** | 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 |
| **ID148** | 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 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ID149** | 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 |
| **ID150** | 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 |
| **ID152** | 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 |

## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ID43** | 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 |
| **ID46** | 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 |
| **ID230** | Alarm A9 (total counter) | Total number of A9 alarms for the ICAD is tracked. | 0 | 32764 | 0 | 3124 | 3399 | 2 | 1 | RO | Yes | 3 |

| 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 0000 0100 0000 0110 -> alarms A2, A3, A8 have been set and active)<br>**0th bit:** A2 (IO MCU comm fail);<br>**1st bit:** A2 (open-load status);<br>**2nd bit:** A3 (AI error: > 22 mA);<br>**3rd bit:** A3 (AI error: < 2 mA);<br>**4th bit:** A3 (AI error: > 12 V);<br>**5th bit:** A3 (AI error: < 1 V);<br>**6th bit:** A4 (V FSS error);<br>**7th bit:** A5 (V PS error);<br>**8th bit:** A6 (Calibr fail);<br>**9th bit:** A7 (Overheating);<br>**10th bit:** A8 (Overheating);<br>**11th bit:** A9 (POM mode);<br>**12th bit:** A10 (SPI conn loss);<br>**13th bit:** A13 (Failed update);<br>**14th bit:** A20 (Detection fail);<br>**15th bit:** A2 (EEPROM operation fail);<br>**16th bit:** A2 (Bluetooth MCU comm fail);<br>**17th bit:** A3 (Modbus connection lost) | | | 0 | 3129 ... 3130 | 3400 ... 3401 | 4 | 1 | RO | No | 3 |
| **ID248** | Active warnings | Shows active warnings<br>**0th bit:** A1 (Valve not config);<br>**1st bit:** A11 (*reserved*);<br>**2nd bit:** A14 (SoH is bad);<br>**3rd bit:** A15 (Service overdue);<br>**4th bit:** A16 (Config. mode);<br>**5th bit:** A17 (Bluetooth conn);<br>**6th bit:** A18 (Vin >24+10%);<br>**7th bit:** A19 (Vin <24-15%);<br>**8th bit:** A1 (Input not config) | | | 0 | 3131 | 3402 | 2 | 1 | RO | No | 3 |
| **ID232** | Total events | Total number of events in the event log<br>(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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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** | |
| **ID253** | ICAD model | Readout the ICAD model type. **3:** ICADB TS **2:** ICAD 1200B; **1:** ICAD 600B; **0:** not configured; | 0 | 3 | 0 | 3057 | 3339 | 1 | 1 | RO | Yes | 3 |
| **ID8** | Valve configuration | Readout the valve configuration for ICAD **12:** ICADBTS ICMTS 50/80; **11:** ICADBTS ICMTS20; **10:** Pilot Valve CVE; **9:** ICAD1200B ICM150; **8:** ICAD1200B ICM125; **7:** ICAD1200B ICM100; **6:** ICAD1200B ICM65; **5:** ICAD1200B ICM50; **4:** ICAD1200B ICM40; **3:** ICAD600B ICM32; **2:** ICAD600B ICM25; **1:** ICAD600B ICM20; **0:** not configured | 0 | 13 | 0 | 3056 | 3338 | 1 | 1 | RO | No | 3 |
| **ID221** | SW Version (High) | Readout the sofware version of ICAD **nn**.xx | 0 | 255 | 0 | 3048 | 3332 | 1 | 1 | RO | No | 3 |
| **ID222** | SW Version (Low) | Readout the sofware version of ICAD xx.**nn** | 0 | 255 | 0 | 3049 | 3333 | 1 | 1 | RO | No | 3 |
| **ID143** | 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 |
| **ID102** | 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. **1:** configured; **0:** not configured | 0 | 1 | 0 | 3089 | | 1 | 1 - 2 | RW | Yes | 3 & 6, 16 |
| **ID235** | 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 |
| **ID48** | 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>**6: Config:** 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>**5: Valve detection:** ICAD is currently detecting a valve<br>**4: Safe state:** ICAD has stopped operation and applied the emergency state setting (ID20)<br>**3: Boost:** ICAD is currently boosting to achieve the requested position<br>**2: Calibration:** ICAD is currently calibrating<br>**1: Manual:** User manually sets the valve position to be maintained<br>**0: Auto:** 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>**3:Danfoss Admin;**<br>**2: Service;**<br>**1: Read only** | 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 (I.e. 234 = 23.4V; 100 = 10.0V) | 0 | 300 | 0 | 3059 | 3341 | **1** | **1** | RO | No | **3** |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ID103** | Controller ID | Readout the controller ID to determine that this is an ICAD. 70 = ICAD | | | 70 | 5001 | | | **1** | RO | No | |
| **ID231** | REBOOT | Reboot ICAD<br>**1: Yes:** The device will reboot. The parameter will automatically be set back to 'no'<br>**0: No:** Not active | 0 | 1 | 0 | 3088 | | **1** | **2 - 2** | RW | No | **3 & 6, 16** |
| **ID100** | Passcode entry | Enter password for level 2 or level 3 access | 0 | 99999999 | 0 | 3160 … 3161 | | **4** | **1** | W | No | **16** |

## Ordering

### Table 17: ICMTS 20

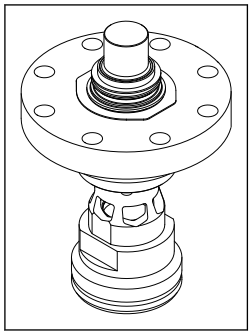
| Type | Code number |
|---|---|
| **ICMTS 20**(*) | |
| ICMTS 20-A33 | 027H1084 |
| ICMTS 20-A | 027H1085 |
| ICMTS 20-B66 | 027H1093 |
| ICMTS 20-B | 027H1086 |
| ICMTS 20-C | 027H1087 |

(*) ICMTS 20 available with 25mm butt weld DIN (EN 10220) connectors

### Table 18: ICMTS 50/80 housings

| Type | Code number |
|---|---|
| SVL-140B 50 A/D ANG | 148B5861 |
| SVL-140B 50 A/D STR | 148B5862 |
| SVL-140B 50 SA/SD ANG | 148B6861 |
| SVL-140B 50 SA/SD STR | 148B6862 |
| SVL-140B 80 A/D ANG | 148B5971 |
| SVL-140B 80 A/D STR | 148B5972 |

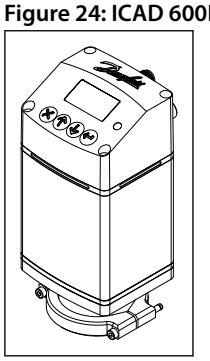
### Figure 23: ICMTS top part



### Table 19: Top part complete

| Type | Code no. |
|---|---|
| ICMTS 50A Function module $K_v$ 9 (DN50) | 027H3510 |
| ICMTS 80A Function module $K_v$ 18 (DN80) | 027H3511 |
| ICMTS 80B Function module $K_v$ 27 (DN80) | 027H3512 |

### Figure 24: ICAD 600B-TS



### Table 20: ICAD 600B-TS for ICMTS 20-80

| Type | Code no. |
|---|---|
| ICAD 600B-TS, with display, Bluetooth, RS485 | 027H0495 |
| ICAD 600B-TS, with display, Bluetooth, Ethernet | 027H0496 |
| ICAD 600B-TS, without display, Bluetooth, Rs485 | 027H0498 |
| ICAD 600B-TS, without display, Bluetooth, Ethernet | 027H0499 |

## Spare parts

### ICMTS 20

**Figure 25: Valve orifice**

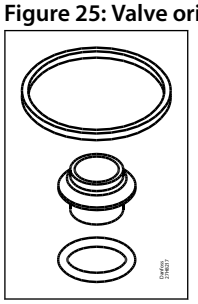


**Table 21: Service kit 1 - valve orifice for ICMTS 20**

| Type | Code no. |
|---|---|
| Gasket kit with orifice for B and C cones | 027H1192 |
| Gasket kit with orifice for A33 and A (new design) cones | 027H1193 |

**Figure 26: ICMTS top part**

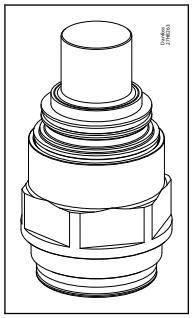


**Table 22: Service kit 2 – Top part with cone complete**

| Type | Code no. |
|---|---|
| ICMTS 20-A33 top part with cone and orifice kit | 027H1088 |
| ICMTS 20-A top part with cone and orifice kit | 027H1080 |
| ICMTS 20-B66 top part with cone and orifice kit | 027H1094 |
| ICMTS 20-B top part with cone and orifice kit | 027H1081 |
| ICMTS 20-C top part with cone and orifice kit | 027H1082 |

### ICMTS 50/80

**Figure 27: Service Kits**

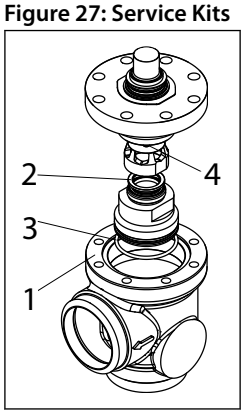
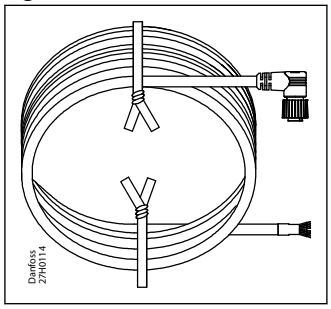


**Table 23: Inspection/Repair kits**

| Type | Code no. |
|---|---|
| Inspection ICMTS 50 Kit (Flat gasket pos. 1, O-ring pos. 3) | 027H3412 |
| Inspection ICMTS 80 Kit (Flat gasket pos. 1, O-ring pos. 3) | 027H3413 |
| Repair kit ICMTS 50 (Flat gasket pos. 1, O-ring pos. 3, PTFE sealing pos. 2, M4 Bolts pos. 4) | 027H3414 |
| Repair kit ICMTS 80 (Flat gasket pos. 1, O-ring pos. 3, PTFE sealing pos. 2, M4 Bolts pos. 4) | 027H3415 |

## Accessories

**Figure 28: Cable for ICAD**




*Cables should be ordered separately.*

**Table 24: ICAD B cable set with 3x cables (power supply, control signal and data communication)**

| Length | Code no. |
|---|---|
| ICAD B Cable set 1,5m (3x cables) | 027H0464 |
| ICAD B Cable set 3m (3x cables) | 027H0465 |
| ICAD B Cable set 10m (3x cables) | 027H0466 |
| ICAD B Cable set 15m (3x cables) | 027H0467 |

**Table 25: ICAD A and ICAD B cable set with 2x cables (power supply and control signal)**

| Length | Code no. |
|---|---|
| ICAD A and ICAD B Cable set 1,5m (2x cables) | 027H0426 |
| ICAD A and ICAD B Cable set 3,0m (2x cables) | 027H0438 |
| ICAD A and ICAD B Cable set 10m (2x cables) | 027H0427 |
| ICAD A and ICAD B Cable set 15m (2x cables) | 027H0435 |

**Table 26: Accessories**

| Type | Code no. |
|---|---|
| Service kit 600B-TS (10 pcs of o-rings for magnetic coupling) | 027H0429 |

**Figure 29: ICAD-UPS**

**Table 27: ICAD-UPS**

| Type | Code no. |
|---|---|
| ICAD-UPS | 027H0388 |

**Figure 30: ICAD Protection Cap**

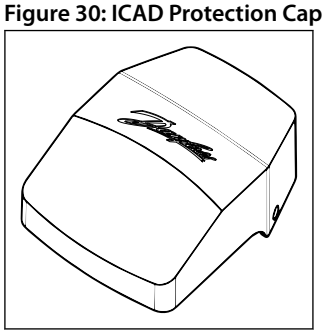


**Table 28: ICAD Protection Cap**

| Type | Code no. |
|---|---|
| ICAD-B Protective cover | 027H0468 |

**Figure 31: Multi-function tool**

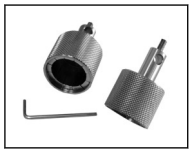


**Table 29: Multi-function tool**

| Type | Code no. |
|---|---|
| Multi-function tool | 027H0181 |

## Certificates, declarations, and approvals

The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

Some approvals may change over time. You can check the most current status at danfoss.com or contact your local Danfoss representative if you have any questions.

**Table 30: ICMTS**

| File name | Document type | Document topic | Approvals Authority |
|---|---|---|---|
| 033F0691.AI | Manufacturers Declaration | RoHS | Danfoss |
| 033F0686.AS | Manufacturers Declaration | PED | Danfoss |

**Table 31: ICAD B**

| File name | Document type | Document topic | Approvals Authority |
|---|---|---|---|
| E258350 | Electrical - Safety Certificate | - | UL |
| 027R0723 | Manufacturers Declaration | FCC | Danfoss |

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