

DSmart 400 INSTRUCTION MANUAL



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Contents

1.	Introduction	3
2.	DSmart 400 Device Description	4
2.1	Front View of DSmart 400	4
2.2	Back View of DSmart 400.....	5
3.	Setting up DSmart 400	7
3.1	Device Power ON:	7
3.2	Login Menu - Enter the Password:	7
3.3	Main Menu:	7
3.3.1	Channel Selection	8
3.3.2	Sensor Setup.....	9
3.3.2.1	Analog Input Channel.....	10
3.3.2.2	Analog Output Channel	15
3.3.2.3	Analog Output channel -Parameter Entry.....	18
3.3.2.4	Digital Input	19
3.3.3	Threshold Setup.....	20
3.3.4	Data Acquisition selection	22
3.3.5	Data logging Interval Setup	23
3.3.6	System Clock	23
3.3.7	Device Auto Calibration	24
3.4	Analog Output Channel Value Recall.....	25
4.	USB data Storage.....	25
5.	Error Code	26
6.	Programming Device	27



1.Introduction

Thank you for purchasing the DSmart device. Before using the product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the DSmart 400 device. SNS's easy-to-use, plug-and-play DSmart 400 devices can integrate easily into the user's working environment requires no programming skills and enables the user to the device effortlessly.

A system consists of 5 stages:

a. Sensors (Analog Input):

The external sensors interface with DSmart 400 device on analog ports, it detects the physical quantities at the measuring points and delivers them to the device.

b. Analog Output:

The device has analog output ports which generate analog voltage output in the range of 0-5VDC to operate external devices or machines based on commands.

c. Digital Inputs and Outputs:

The user can interface external inputs of levels 5VDC/12VDC/24VDC to the device's digital inputs, the device senses and monitors active digital inputs on a real-time basis.

Digital outputs are potential free relays and the user can use these digital outputs to control external outputs.

d. DSmart 400 Device:

DSmart 400 device receives sensor data and digital inputs in real-time and logs data to internal memory, the user can download data over a USB stick. Additionally, it generates analog output as per user requirements. The devices of the DSmart series are preconfigured, but the user can change the configuration using the DSmartConfig software application.

e. DSmartConfig Application:

The DSmartConfig app works alongside the DSmart 400, allowing users to configure/set devices as required.

To better understand the user's needs and to better serve the user, we welcome and appreciate the user feedback.

2. DSmart 400 Device Description

2.1 Front View of DSmart 400

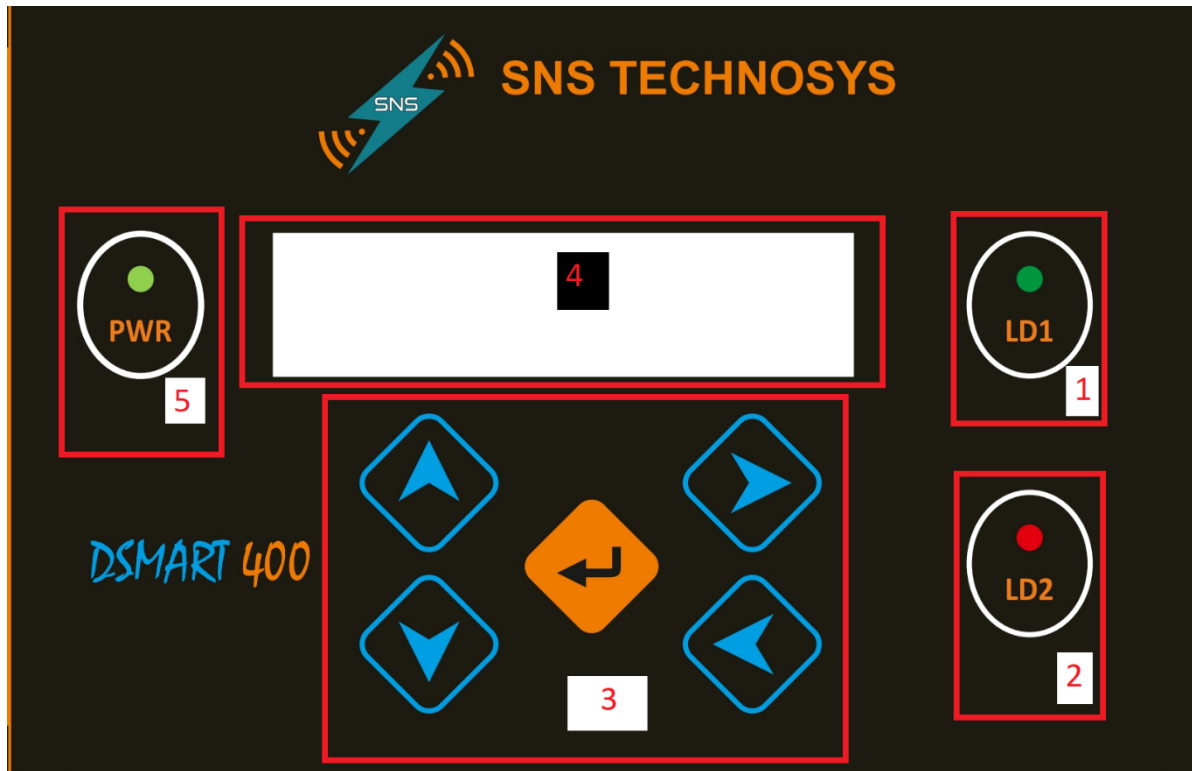


Fig 1. shows the front side of the DSmart 400

1. **LED1 (LD1):** It blinks while Data Logging
2. **LED2 (LD2):** It blinks while storing data in an external USB drive
3. **KEYs:** The device features a keypad with 5 buttons: up and down for vertical navigation, right to cycle through options (wrapping back to the start after reaching the end), left to return to the previous screen, and a middle button to save settings.
4. **DISPLAY SCREEN:** A display screen provides a comprehensive view of the device's operations and data.
5. **POWER SUPPLY LED (PWR):** Green colour; solid indicates the device is powered ON.



2.2 Back View of DSmart 400



Fig 2. shows the back side of the DSmart 400

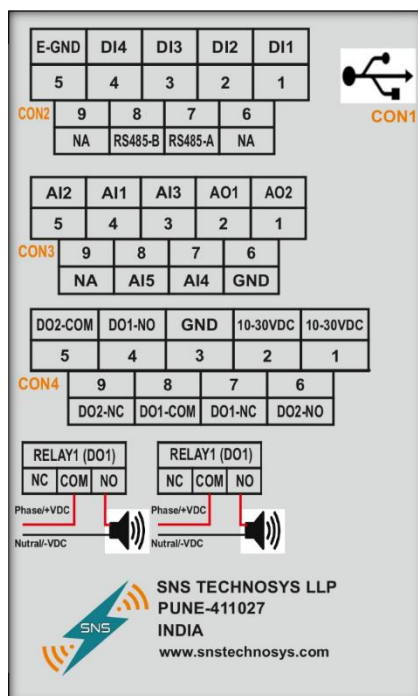


Fig 3. Connection Dig. of the DSmart 400



1. CON 1:- USB PORT:

CON1 is a type A USB port, the user can connect a USB drive, allowing the user to save data and report files directly. These files can then be easily accessed and opened on a computer for further analysis or storage.

2. CON 2: Digital Input and RS485 (9 pin D connector)

Pin 1	Digital Input 1
Pin 2	Digital Input 2
Pin 3	Digital Input 3
Pin 4	Digital Input 4
Pin 5	External Ground
Pin 6	Not applicable
Pin 7	RS485 A
Pin 8	RS485 B
Pin 9	Not applicable

3. CON3:- Analog Channel Input & Analog Channel Output (9 pin D connector(F))

Connect external sensors (0-5VDC or 4-20 mA) to AI1 to AI5 channels with respect to the Ground (GND) pin.

Use Analog Outputs (AO1 and AO2) with respective to-ground (GND) pin

Pin 1	Analog Output 1
Pin 2	Analog Output 2
Pin 3	Analog Input 3
Pin 4	Analog Input 1
Pin 5	Analog Input 2
Pin 6	Ground
Pin 7	Analog Input 4
Pin 8	Analog Input 5
Pin 9	Not applicable

4. CON 4: Digital Outputs - Potential free relay contact connection (9 pin D connector(F))

Pin 1	+VCC (10 to 30VDC)
Pin 2	+VCC (10 to 30VDC)
Pin 3	Ground
Pin 4	Relay 1 Normally Open
Pin 5	Relay 2 Common
Pin 6	Relay 2 Normally Open
Pin 7	Relay 1 Normally Close
Pin 8	Relay 1 Common
Pin 9	Relay 2 Normally Close



3. Setting up DSmart 400

3.1 Device Power ON:

Setting up the DSmart 400 device is a straightforward process. To begin, provide a power supply of +10VDC to +30VDC to the device.

The DSmart 400 device will get started. The green LED will be continuously ON.

3.2 Login Menu - Enter the Password:

Press and hold the 'Left' and 'Right' keys simultaneously of the keypad for 5-10 seconds, a password screen will appear on the display as shown in Figure 4. Using keypad, enter the correct password & press 'ENTER'. (For password contact admin)



Fig 4. shows the initial window DSmart400



Fig 5. shows the Password screen, enter the correct password

3.3 Main Menu:

After entering the password, the main menu screen will display. Refer Figure 6. To get into desired option, scroll, and press 'ENTER'.

The options present in the main menu are as follows:

- C1. Channel Selection
- C2. Sensor Setup
- C3. Threshold Setup
- C4. DO mapping
- C5. Data logging
- C6. Data Interval Setup
- C7. System Clock Set
- C8. Auto Calib



Fig 6. shows the main menu of the DSmart 400

3.3.1 Channel Selection

In menu select “Channel Selection” option and press enter, Channel selection consists of:

- A. **Five Analog Inputs:** AICH1, AICH2, AICH3, AICH4, AICH5
- B. **Four Digital Inputs:** DICH1, DICH2, DICH3, DICH4
- C. **Two Analog Outputs:** DACCH1, DACCH2

To activate or deactivate desired channels, the user can either ‘ENABLE’ or ‘DISABLE’ specific channels.

Press the ‘up’ arrow to ‘ENABLE’, and the ‘down’ arrow to ‘DISABLE’ a particular channel. The user can move to the next channel by pressing ‘ENTER’. Similarly, the user can select ‘ENABLE’ or ‘DISABLE’ each channel.

To return to the main menu, Press the ‘Left’ arrow on the keypad.





Fig 7. shows channels in the 'Channel Selection' option

3.3.2 Sensor Setup

Scroll 'up' and 'down' in the main menu, select the option "Sensor Setup" and press 'ENTER'. User can see below screen for "Sensor Setup".

It will show three options: "Analog Input", "Analog Output", and "Parameter Entry".

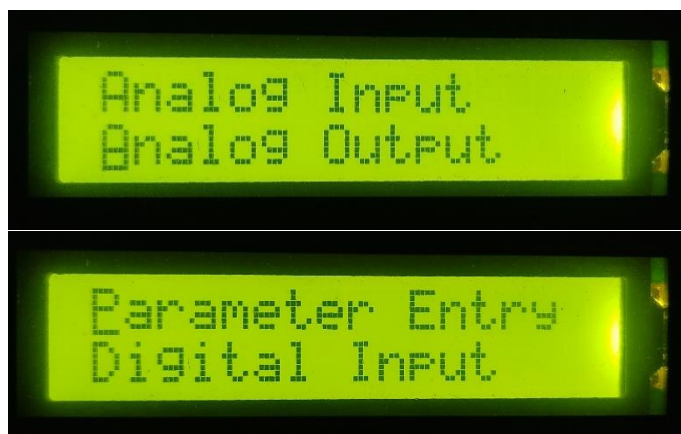


Fig 8. shows the options inside the 'Sensor Setup' option



3.3.2.1 Analog Input Channel

Scroll 'up' and 'down' in the main menu and select the option "Analog Input" and press 'ENTER'. Users can see below the screen of "Analog Input".

The display shifts to the next screen, which has two options: "Set Range" and "Default" as shown in Figure 9.

The user can scroll through any option using the 'up' and 'down' arrows on the keypad and pressing 'ENTER'.



Fig 9. shows options inside the 'Analog Input' option

Set Range: Press 'ENTER' on the 'Set Range', it will show five Analog input channels as shown in Figure 10.



Fig 10. shows five Analog input channels in the 'Set Range' option.

The user can select his desired Analog input channel, with the 'right' arrow in the keypad as shown in Figure 11. Press 'ENTER' to enter that Analog input channel.



Fig 11. shows cursor on 'I', AI2 Channel is selected. Press 'ENTER' to enter it

In each analog input, the user can set the 'Min range' and 'Max range' of the parameter. The user can enter the 'Min range', and 'Max range' in -100.0 to +2000.0 with the help of the keypad. The cursor will shift from 'Min range' to 'Max range' on pressing 'ENTER'.



Fig 12. shows 'Min range' and 'Max range' on the display screen



Fig 13. Shows error message Error 101

After setting the desired range, press 'ENTER'. The display screen will show below option:

Func type (Function type): This can be either 0-5V or 4-20mA

The user can change the selection of 'Func type' from 0-5V to 4-20mA by pressing the 'down' arrow. On pressing 'ENTER' the cursor will shift to 'Min Range' line

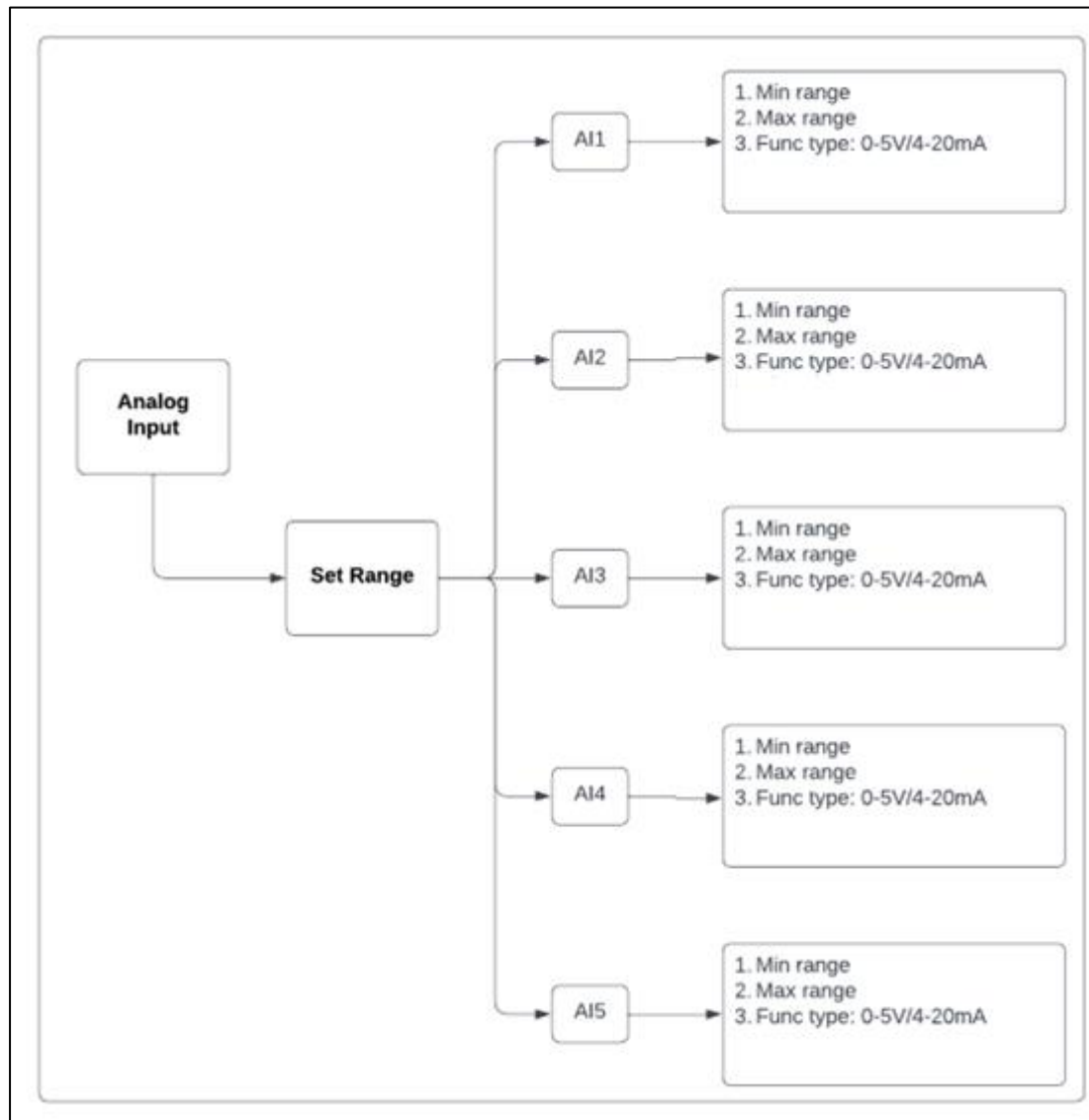
***Note:** Function type selections are based on which external sensor user want to connect to unit. (0-5VDC Analog Sensor or 4-20mA Analog Sensor)



Fig 14. shows 'Func type' in the 'Set Range' option

After setting the 'Min range', 'Max range', and 'Fun type', press 'left' arrow to move back to the AI channels as shown in Figure 11.

After setting these options for all five Analog input channels, by pressing the 'left' arrow again the display screen will move back to the options inside 'Analog input' option as shown in Figure 11.



Flowchart 1. shows all the options in the 'Set Range' option of 'Analog Input'



Default: Press 'ENTER' on the 'Default' option to enter. It would show five analog input channels.

The user can select his desired analog input channel. Press 'ENTER' to enter that Analog input channel.

In each Analog input, the user can set 'Name' and 'Unit' for the sensor.

Use the 'up' and 'down' arrows to change the 'Name' of the sensor. On pressing 'ENTER', the cursor will move to the 'Unit' row. Again, use the 'up' and 'down' arrows to change the 'Unit' of the sensor.

Options available on this screen are:

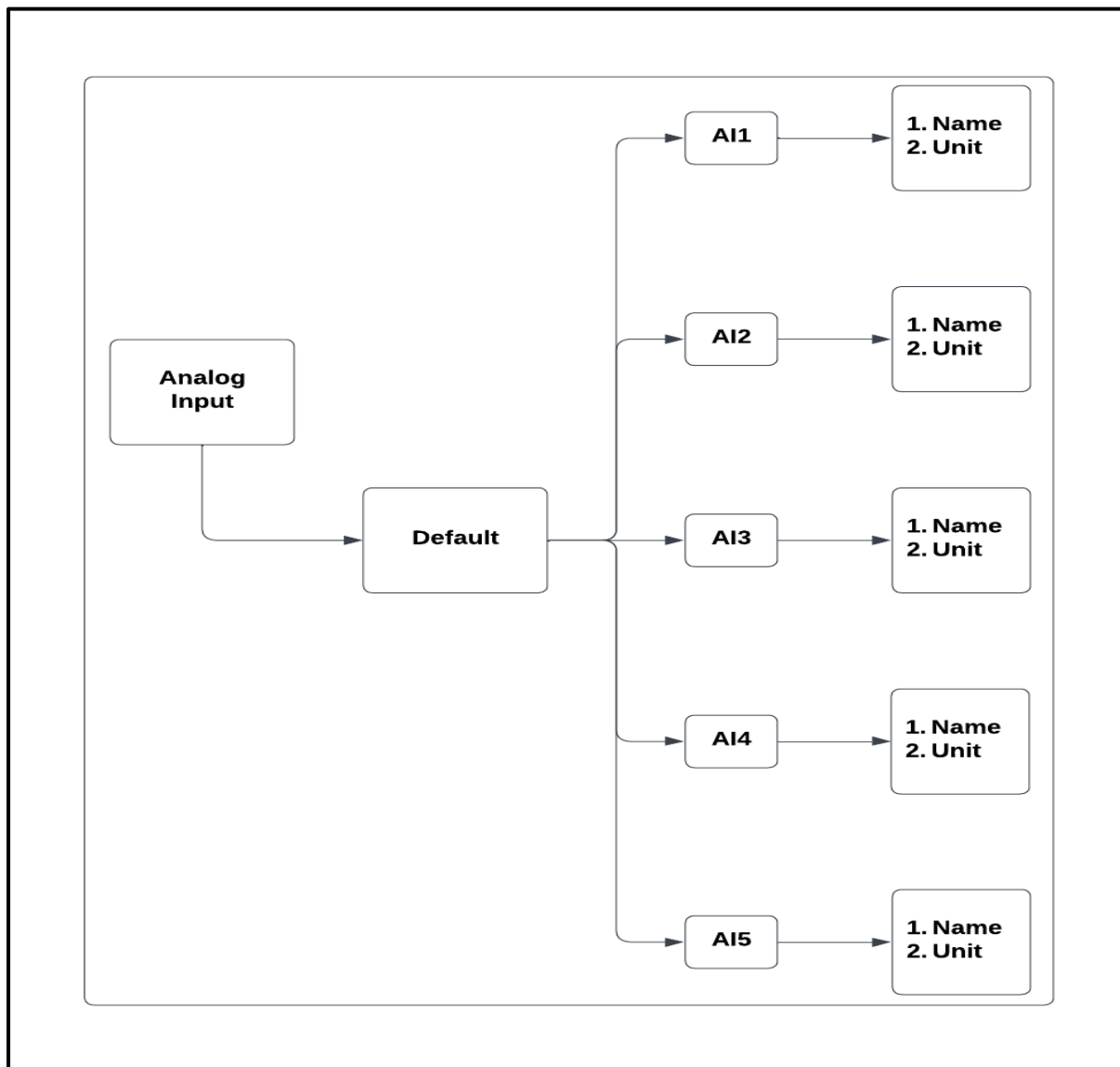
Name	Units				
Temperature	DegC	F	K		
Pressure	Pa	mbar	bar	N/m2	
Flow Rate	L/s	M3/s	mmH2O	Ft3/s	
Vibration	Cm/s2	m/s2	g	Mm/s	
Humidity	g/m3	Kg/m3			
Conductivity	uS/cm				
Level	Ft	psi	mm	cm	in
Volt	V				
Current	A				
Speed	MPH	MPS	KM/H	FT/S	



Fig 15. shows 'Name' and 'Unit' options in the 'Default' option of Analog Input

After setting the 'Name, and 'Unit' by pressing the 'left' arrow, the display screen will move back to the AI channels .

After setting these options for all five Analog input channels, by pressing the 'left' arrow again the display screen will move back to the options inside the 'Analog input' option.



Flowchart 2 shows all the options in the 'Default' option of 'Analog Input'



3.3.2.2 Analog Output Channel

On pressing 'ENTER' on the 'Analog Output' option. The display shifts to the next screen,

Default: Press 'ENTER' on the 'Default' option to enter. It would show two Analog output options.



Fig 16. shows 'AO1 Setup', and 'AO2 Setup' options in the 'Default' option of 'Analog Output'.

The user can select his desired analog output channel from the options shown in Figure 19. Press 'ENTER' to enter that analog output channel.

In each analog output, the user can set the 'Min' and 'Max' of that parameter. The user can enter the 'Min' and 'Max' in -100.0 to +2000.0 with the help of the keypad. The cursor will shift from 'Min' to 'Max' on pressing 'ENTER'. Refer to Fig 20.

After setting Min, and Max values and pressing 'ENTER'. The display screen will show two options: Sensor and Unit.

Use the 'up' and 'down' arrows to change the 'Sensor'. On pressing 'ENTER', the cursor will move to the 'Unit' row. Again, use the 'up' and 'down' arrows to change the 'Unit' of the sensor.

Options available on this screen are:

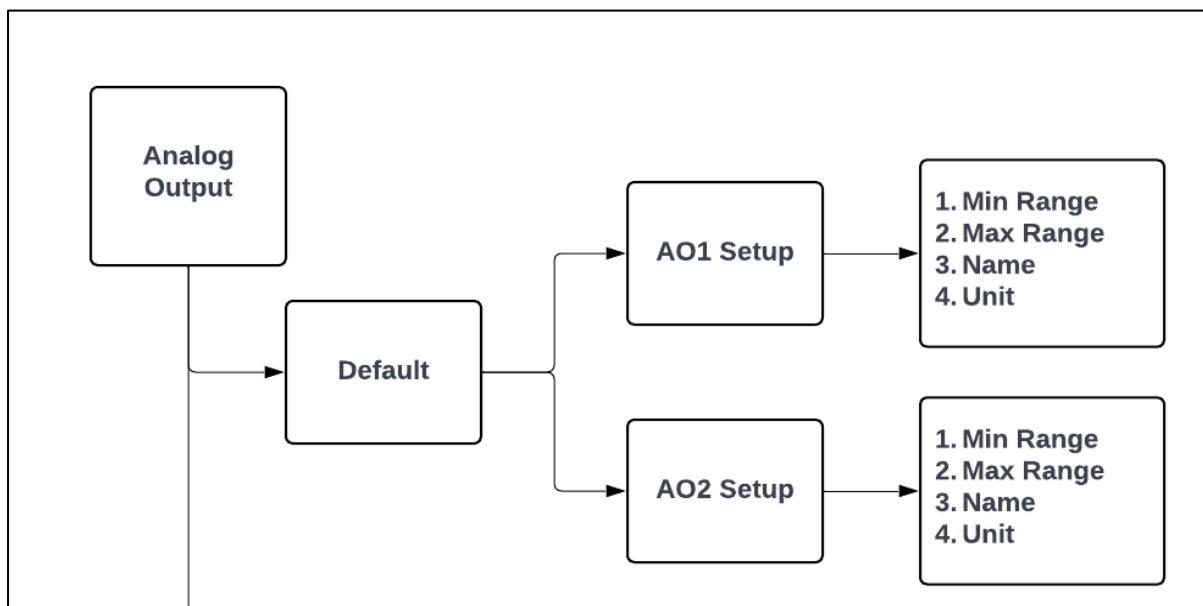
Name	Units				
Temperature	DegC	F	K		
Pressure	Pa	mbar	bar	N/m2	
Flow Rate	L/s	M3/s	mmH2O	Ft3/s	
Vibration	Cm/s2	m/s2	g	Mm/s	
Humidity	g/m3	Kg/m3			
Conductivity	uS/cm				
Level	Ft	psi	mm	cm	in
Volt	V				
Current	A				
Speed	MPH	MPS	KM/H	FT/S	



Fig 17. shows 'Min' and 'Max' on the display screen



Fig 18. shows 'Sensor' and 'Unit' options on the display screen



Flowchart 3. shows all the options in 'Analog Output'



3.3.2.3 Analog Output channel -Parameter Entry

Parameter entry allows user to enter 50 values of AO1 and 50 values of AO2 channels. On pressing 'ENTER' on the 'Parameter Entry' option. The display shifts to the next screen, which has four options.

The user can add the 'CH No.' (The user can select the desired channel number up to a maximum of 100 channels), and 'AO1' After setting these two options, by pressing 'ENTER', the user can set the other two options.

On the second screen, the user can add 'AO2'.

When the channel number, AO1 value, and AO2 value are entered correctly, a message should be displayed saying accepted.

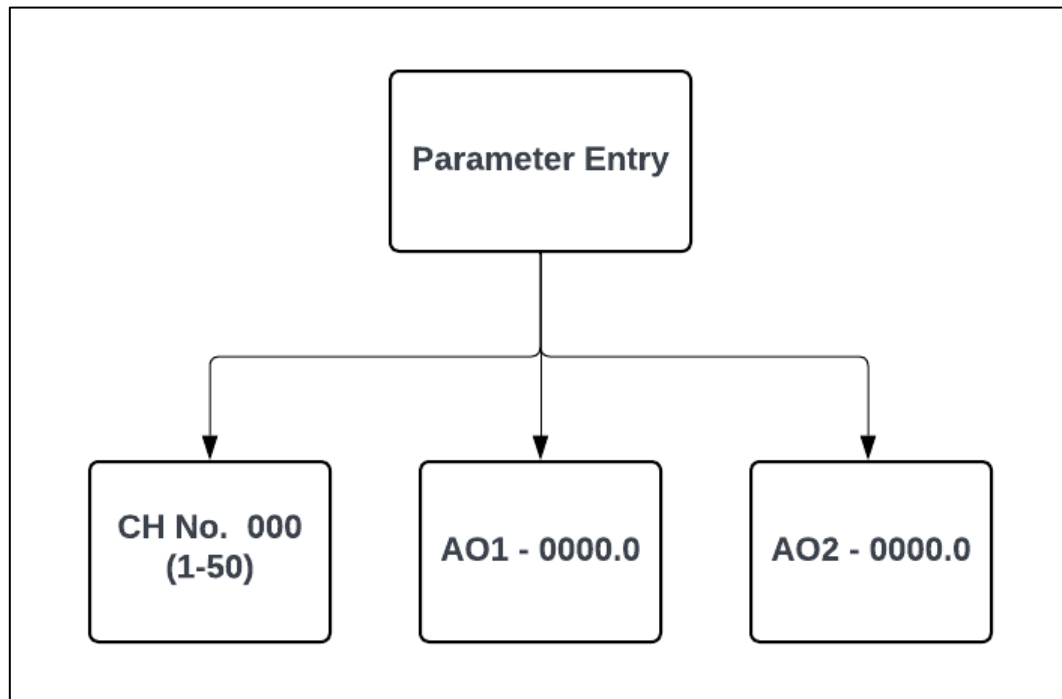
Refer to Fig 23, and Fig 24.



Fig 19. shows 'CH No.', and 'AO1' options in 'Parameter Entry'



Fig 20. shows 'AO2' options in Parameter Entry



Flowchart 4. shows all the options in 'Parameter Entry'

3.3.2.4 Digital Input

After the user enters the digital input, a window will appear as shown in Fig 21.



Fig 21. Shows Digital input active High/Low Option

The user can select "Active High" or "Active Low" using the Up/Down arrow keys.

A. Active High: This means that when the user inputs a digital value in the range of 5V to 24V, the user will see "High" at runtime, and when the user inputs 0V, the user will see "Low."



B. Active Low: This means that when the user inputs a digital value in the range of 5V to 24V, the user will see "Low" at runtime, and when the user inputs 0V, the user will see "High."

The user can set "Active High" or "Active Low" based on their input.

3.3.3 Threshold Setup

Threshold setup is allowed to user set 2 thresholds for each channel - Low threshold and High threshold.

Press 'ENTER' on the 'Threshold Setup' option to enter. It would show five analog input channels as shown in Figure 22.



Fig. 22 shows Threshold channel selection screen



Fig. 23 Shows Threshold setup in each channel.

In each analog input, the user can set the 'Minimum Threshold' and 'Maximum Threshold'.

The user has set the minimum and maximum thresholds within a range that is set in the sensor setup. The minimum threshold should be less than the maximum threshold.

The user must ensure that the threshold value is within the range of the analog input sensor. If the threshold value is out of range or if the minimum threshold is greater than the maximum threshold, the user will receive an error. The details of the error are provided in the ERROR CODE section.

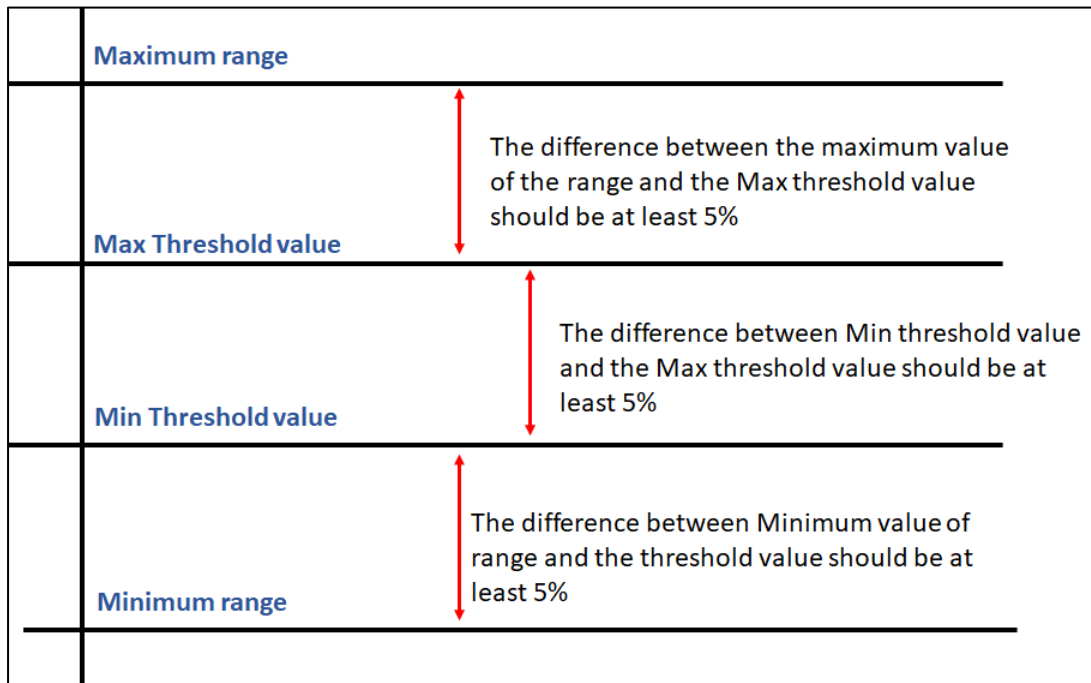


Fig 24. Threshold criteria

Digital Output Mapping

DO Mapping setup is allowed to user configure relay to Analog input and digital input.

For Analog input, the user has to set ThreshMin and ThreshMax.

After enter in DO Mapping window user will get below screen.



Fig. 25 shows DO Mapping screen

The user can set AICH1, AICH2, AICH3, AICH4, DICH1, DICH2, DICH3 and DICH4 for DO1 using the down arrow key.

The user can set AICH1, AICH2, AICH3, AICH4, DICH1, DICH2, DICH3 and DICH4 for DO2 using the down arrow key.

If the user does not want to map anything to DO, the user should select the 'None' option there.

*Note - For any miss behaviour of analog input user has to first set MinThresh and MaxThresh

The relay connections are shown in Fig XX. The user can make the relay connections according to their requirements.

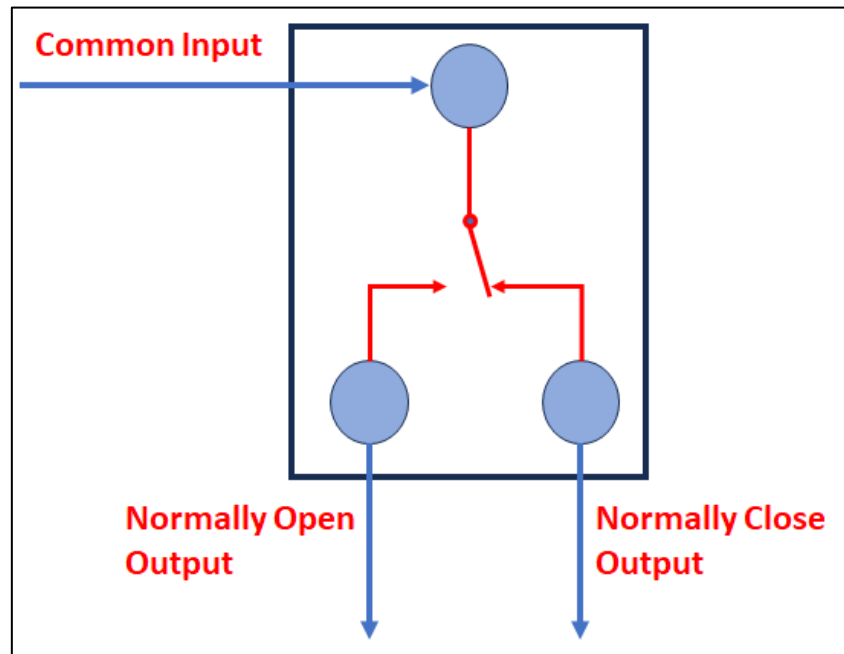


Fig 26. Relay connection

3.3.4 Data Acquisition selection

Data Logging setup is allowed to user turn ON/OFF Data logging.

Press Enter on Data logging Setup, user can see the below screen



Fig. 27 Shows - Data logging Screen

After entering in Data Logging option, the user can select ON or OFF by pressing the down arrow key.

If the user wants to turn on data acquisition, then select ON and press the Enter key to save. Restart the device to active the selection, unit shall start data logging automatically as per set interval.

LD1, blue LED indicates the data logging ON or OFF. If the LD2 continuously blinks it means data logging is ON.



If the user wants to turn OFF data logging, then select OFF and press the Enter key to save. Restart the device to active the selection, data logging shall automatically turn OFF.

3.3.5 Data logging Interval Setup

Select the “data interval setup” option from the main menu list to set the data logging interval. User can see the below screen to set up data intervals.

The user can set the desired interval time in the ‘Time’ row with the help of a keypad and then press ‘ENTER’, cursor will shift to the next row ‘Tm unit’ (Unit of time such as ms, sec, Minute, Hours). Set the time unit, and press ‘ENTER’, the display screen will return to the main menu.

The minimum time interval is 100mS.



Fig 28. shows the display screen inside the ‘Data Interval Setup’ option

3.3.6 System Clock

The ‘System Clock Set’ allows the user to set the date and time.

Scroll ‘up’ and ‘down’ in the main menu and select option “System Clock set” and press ‘ENTER’. Users can see the screen below to set up data intervals.

Set data and time using arrow keys and press ‘ENTER’ to save.

Date format - DD/MM/YY

Time Format - HH/MM/SS



Fig 29. shows ‘Date’ and ‘Time’ inside the ‘System Clock Set’ option



3.3.7 Device Auto Calibration

The Auto Calibration process is an essential feature in the DSmart 400 device to ensure precise and accurate measurements from its analog input channels. Over time and due to various external factors, such as temperature changes or component aging, the raw readings from the ADC (Analog-to-Digital Converter) may deviate from their expected values.

After right-clicking on Auto Calibration, the user will see a password screen. Once the correct password is entered, the user will enter Auto Calibration mode (the Auto Calibration password will be with the admin).

After entering Auto Calibration, the screen will appear as shown in Fig 30. The user can then calibrate any desired analog input channel. If needed, the user can calibrate all the channels.



Fig 30. Inside autocalibration screen

When entering on AI1, a message will appear instructing the user to "Supply 70mV to AICH1." The user should provide 70mV to Analog Input Channel 1 (AICH1). Once the user provides 70mV, the device will calibrate at that value.

After calibrating at 70mV, the screen will prompt for 4000mV. The user should provide 4000mV. This process continues until the device requests 5000mV, and the user should provide the requested voltage for calibration.

If the user does not provide the input within 20 seconds, a timeout will occur, and the calibration screen will exit. The user will need to re-enter the calibration mode to continue.



3.4 Analog Output Channel Value Recall

To recall stored Analog Output channel and associated analog output step values, press and hold the “Up” key for 5-10 sec, on run time screen. The Channel Recall window will appear.

Enter the channel number the user wants to recall, and press the “ENTER” key.

The step value associated with the channel number will be visible to the user here and corresponding voltage output shall appear on respective analog output channels connector pins.

The user shall see the window of channel number and AO1 and AO2 values.



Fig. 31 shows AO Channel Selection

4. USB data Storage

The user can download all the data stored in the device through a pen drive. For this, the user should insert a USB stick into CON1. Then, all the data from the device (from the memory card) will be transferred to the USB.

The red LED will continuously blink until the data transfer is complete.

*Note - A memory card is necessary in the device.



5. Error Code

- **Error 101**
Analog Input Range Error
The minimum value should be less than the maximum value.
- **Error 102**
Threshold Range Error w.r.t Analog Input Range
The analog input threshold value should be within the range of the analog input.
- **Error 103**
Threshold Range Error
Threshold minimum value should be less than Threshold maximum value.
- **Error 201**
Analog Output Range Error
The minimum value should be less than the maximum value.
- **Error 202**
Analog Output Channel Number Error
Channel number should be greater than 0.
Channel number should be in between 0 & 50.
- **Error 203**
Analog Output Value Error
Analog Output value should be in between Analog Output Range.
- **Error 701**
Software Data Error
Send data via software once again.



6.Dsmart 400 Device Programming



Fig 32. Shows Programming cable

- The user should use the cable provided with the device as shown in Fig 32.
- One end of the cable will have an RS485 to USB converter, and the other end will have a D-sub connector.
- The user should connect the D-sub connector to CON2 of Dsmart 400 device and the RS485 to USB converter to the computer/laptop USB port.
- After connecting, the user should follow the instructions provided in the DSmartConfig manual and software.



Fig 33. Shows Rs485 connection with computer



Fig 34. Shows RS485 connection to DSmart400 Device