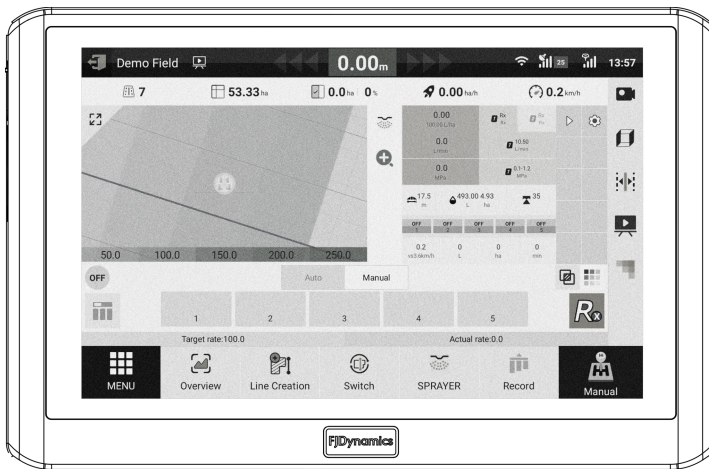




FJD Precision Spray System

Software User Manual



July 3, 2025 | Rev. 25.10x.1

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Revisions:

Version	Software	Date	Description
3.1	V25.10x.1	2025.7.3	1. Improve UI and optimize performance
3.0	V3.0.2	2024.10.21	1. PWM nozzle control 2. Variable-rate application with prescription maps

Read Before Use:

Operate in strict accordance with this software user manual.

If you have any questions during use, contact the service personnel.

Disclaimer:

- The purchased products, services, and features are stipulated by the contract. All or part of the products, services, and features described in this manual may not be within the scope of your purchase or usage. Unless otherwise specified in the contract, all the content in this manual is provided "AS IS" without warranties of any kind, express or implied.
- The content of this manual is subject to change due to product upgrades and other reasons. FJDynamics reserves the right to modify the content of this manual without notice.
- This manual only provides guidance for use of this product. Every effort has been made in the preparation of this manual to ensure accuracy of the content, but no information in this manual constitutes a warranty of any kind, express or implied.



Safety Instructions

Before using this product, ensure that you have read and understood all the operation instructions and precautions in the *FJDynamics Precision Spray System Hardware Installation Manual* and this manual.

Operator

1. People under eighteen or not meeting the age requirement of local laws and regulations are not allowed to operate this product.
2. Do not drive under the influence of medicines, alcohol, and drugs.
3. Do not drive when feeling tired.
4. Operators must hold the driving licenses as required by local laws and regulations.

Operating Environment

1. Drive in an open field far from the crowd and ensure that there are no irrelevant personnel or vehicles in the operation area.
2. Keep away from people, animals, obstacles, electric wires, tall buildings, airports, signal towers and other obstacles to protect operations from signal interference.
3. Do not operate the machine in extreme weather such as heavy rain, thick fog, snow, lightning, or strong wind.
4. Ensure that there are no people or obstacles around the machine's path during testing, calibration, adjustment, or automatic turning to prevent personal injuries or property damage.

Operation

1. Do not get on or off the vehicle during operation.
2. Stay in the vehicle and monitor the whole operation process to ensure timely intervention.
3. Drive the vehicle equipped with the system manually on public roads or in public areas.

Inspection

1. Ensure that the vehicle contains sufficient fuel and spray material.
2. Ensure that the parameters are calibrated in the control terminal before autosteering or spraying.
3. Ensure that the antennas and attitude sensor are installed properly. In case of any displacement, perform calibration before use.
4. Ensure that the cables are intact. Stop the operation and replace the cables in case of damage.
5. Ensure that all pipes are connected properly. Before operations, conduct a spraying test to check whether the integrated valve module and pipes work properly.



Others

1. Disassembling the product housing without authorization may invalidate the warranty.
2. Damage caused by force majeure events, such as lightning strikes, overvoltage, and collision, is not covered by the warranty.
3. Connect the devices strictly in accordance with this manual. When connecting cables such as data cables, hold the end of the plug and gently plug or unplug it. Do not pull the plug by force or twist it, which may break the pins.
4. Ensure that the power supply of this product meets the requirements. For details, see chapter 3 "Hardware Specifications".



Preface

Use of Manual

This manual describes how to use FJDynamics D3WAS-01 Precision Spray System through simple and clear operation processes, so that users can learn to perform each operation easily, quickly, and accurately.

Technical Support

Starting from the date of purchase, users will be provided with the technical support and upgrade services from FJDynamics.

Contact FJDynamics by any of the following methods:

Tel: +1 833-330-6660 (US)

Tel: +496 931 090 130 (Europe)

Official website: <https://www.fjdynamics.com>



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1 Product Introduction

1.1 Overview

FJDynamics D3WAS-01 Precision Spray System is a smart spraying system capable of automatic flow rate control, section control and independent nozzle control developed by FJDynamics. It is composed of an FJDynamics Auto Steer Kit, a VCU, and an integrated valve module equipped with multiple section valves.

The system offers high flexibility and scalability. With the addition of PWM nozzles and nozzle controllers, the system can achieve independent control of each nozzle's flow rate and on/off status, further enhancing spraying accuracy and efficiency.

The system can automatically control the flow rate depending on the vehicle speed, to ensure a desired application amount per unit area. In addition, automatic section control enables independent and automatic control of each section, reducing repeated spraying at headlands or in the operation area.

Thanks to stable rate control, timely section control, and high-precision assisted driving, the system is able to protect crops and reduce material costs, while ensuring satisfactory spraying performance.

1.2 Main Components

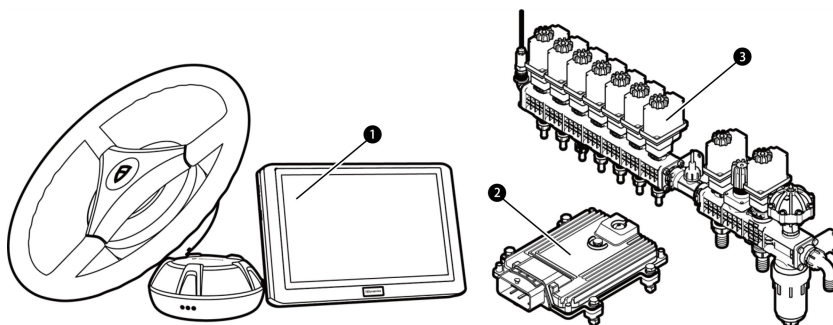


Figure 1 Main components

1	FJDynamics Autosteering Kit
2	Sprayer Controller (VCU)
3	Integrated valve (Optional)



1.3 Hardware Installation

1.3.1 FJDynamics Autosteering Kit



Refer to the *FJDynamics Auto Steer Kit Installation Instruction*.

1.3.2 VCU and Integrated Valve Module



Refer to the *FJDynamics Precision Spray System Hardware Installation Manual*.



2 Software Operation Instructions

2.1 Overview of Operation Processes

This chapter introduces the spraying feature and operation processes of the system from a new user's perspective.



For autosteering-related features, refer to the *FJDynamics Auto Steer System Software User Manual*.

Operation procedure for using the spraying feature of the system:

Installation and commissioning of FJDynamics Auto Steer System → Installation and commissioning of the precision spray system → Enable the feature → Set the implement → Set the material → Set the task → Set prescription maps → (Check record mode) → Set the spray settings → Start spraying → Check task data

2.2 Setting the Auto Steer System

The installation and commissioning process of FJDynamics Auto Steer Kit is as follows.

Select a language → Sign up and log in → Enter the installation information →

Connect to RTK → Obtain heading* → Set the vehicle parameters → Calibrate the angle sensor → Calibrate the vehicle → Calibrate the implement → Complete

* Drive the vehicle straight ahead for a while, and the heading is obtained automatically. If not, choose **MENU > SYSTEM > Heading calibration**.



Refer to the *FJDynamics Auto Steer System Software User Manual* for details.

2.3 Enabling the Feature

Select **MENU > APPLICATIONS** and enable the **FJDynamics Precision Spray System**.



Note: Features such as the ISOBUS, External Bluetooth RTK, and external radio cannot be used when the spraying feature is enabled.

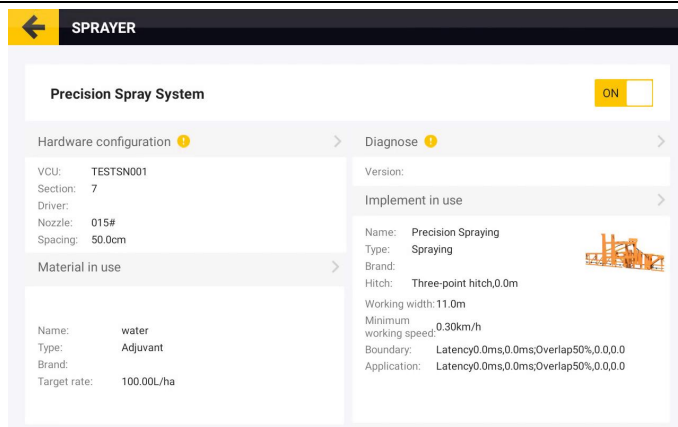


Figure 2 Enable the spraying feature

Once the spraying feature is enabled, two new windows will appear on the main interface, the VT and TC window, where the running status of the spraying system is displayed and the control of the spraying operation is performed. A **Sprayer** tab  will also appear in the bottom tool bar. Tap on it to switch between the multi-window spray interface and the main interface.

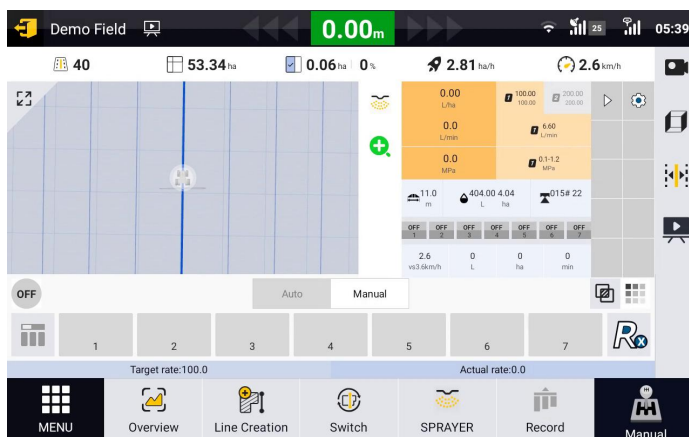


Figure 3 Sprayer tab

2.4 Setting the Implement

2.4.1 Connecting the Implement

When the spraying feature is enabled, the system gives a prompt for the VCU connection status. The disconnected VCUs are marked in red.

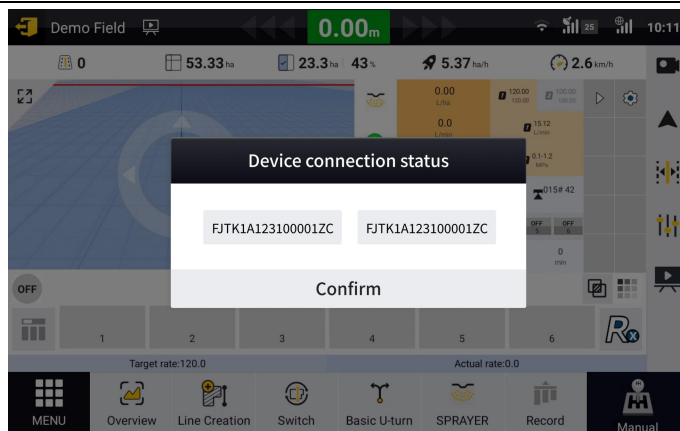


Figure 4 VCU connected

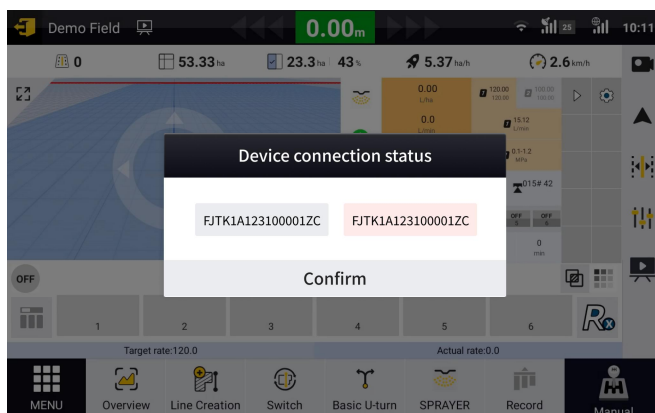


Figure 5 VCU disconnected

2.4.2 Setting the Implement Parameters

Setting the implement parameters correctly is vital for precise positioning and navigation. After the implement is connected, select **MENU** > **DEVICE SETTINGS** > **Implement Library** and

set up a new implement or edit an existing implement. Then go to **MENU** > **APPLICATIONS** > **Precision Spraying** and bond the implement to the currently connected spray VCU to define the necessary parameters for automatic section control.

To enter the implement settings screen, tap **New** or **Edit**. Choose "D3WAS" for **Control type**, fill in the basic information on the **Type** and **Information** interface, enter the measured parameters of the implement on the **Parameters** interface and check the



overall information on the **Summary** interface to complete the basic settings of an implement. The specific process is as follows:

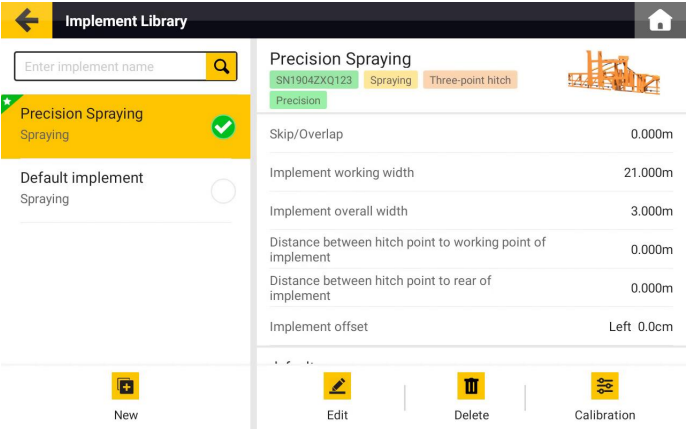


Figure 6 Implement Library

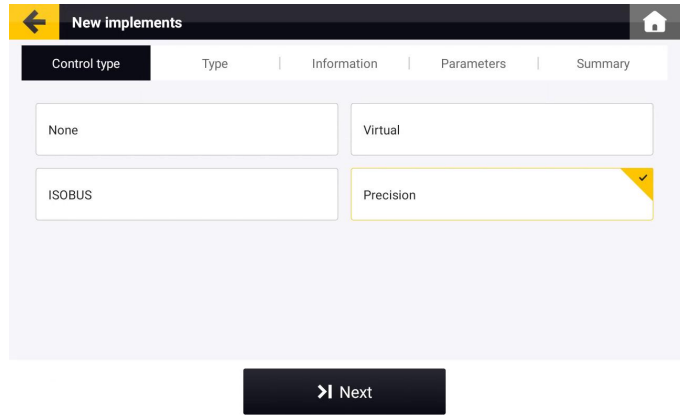


Figure 7 Implement Library-Control type

!

Note: When operating a D3WAS Spray System, please select **Precision** as the implement control type.

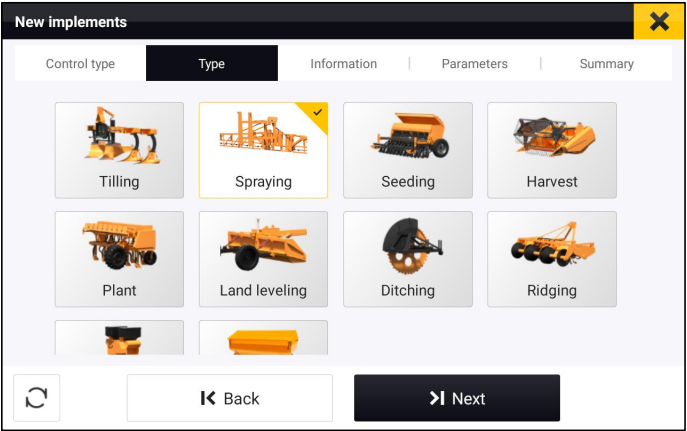


Figure 8 Implement Library-Type

!

Note: When operating D3WAS Spray System, please select **Spraying** as the implement type.

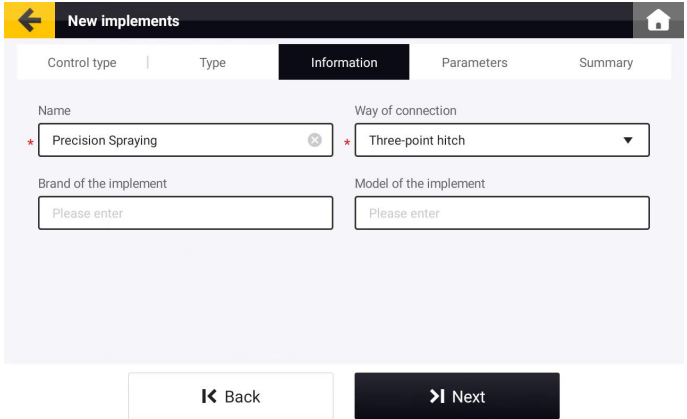


Figure 9 Implement Library-Information



New implements

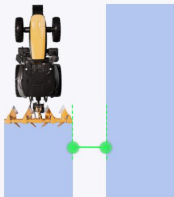
Control type

Type

Information

Parameters

Summary



Skip/Overlap ⓘ

0.000

m

Implement working width

* 15

m

Implement overall width

* 15

m

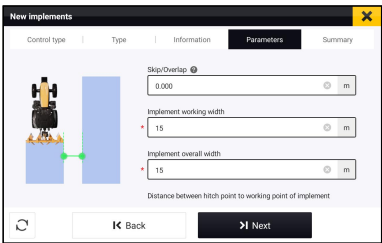
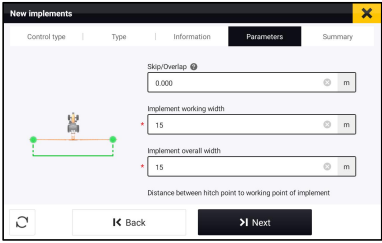
Distance between hitch point to working point of implement



⏪ Back

⏩ Next

Figure 10 Implement Library-Parameters

Parameter	Description	Illustration
skip/overlap	The spacing between two adjacent rows.	
Implement working width	The actual spraying width with all nozzles (sections) on.	



Parameter	Description	Illustration
Implement overall width	The total width of the implement. It is used to reserve the safety distance during automatic path planning.	The screenshot shows the 'Parameters' tab of the 'New implements' dialog. The 'Implement overall width' is set to 15 m. A diagram on the left shows a tractor with a spray boom of width 15m.
Distance between hitch point to working point of implement	The vertical distance between the nozzles on spray boom and the hitch point of the tractor (the same applies to the front-hitched spray boom).	The screenshot shows the 'Parameters' tab of the 'New implements' dialog. The 'Distance between hitch point to working point of implement' is set to 0.000 m. A diagram on the left shows a tractor with a spray boom of length 2m.
Distance between hitch point to rear of implement	The total length of the implement. It is used to reserve the safety distance during automatic path planning.	The screenshot shows the 'Parameters' tab of the 'New implements' dialog. The 'Distance between hitch point to rear of implement' is set to 2 m. A diagram on the left shows a tractor with a spray boom of length 2m.
Implement offset	Offset from the spray boom center to the tractor centerline. It is used to determine the accurate position of the nozzles on the spray boom and reduce overlapping during path-to-path operations.	The screenshot shows the 'Parameters' tab of the 'New implements' dialog. The 'Implement offset' is set to 0.0 cm. A diagram on the left shows a tractor with a spray boom of length 2m.



←

Edit the implement - Precision Spraying

🏠

Control type

Type

Information

Parameters

Summary

Basic Information

Name	Precision Spraying	Way of connection	Three-point hitch
Brand of the implement	FJD	Model of the implement	ATS
Type of implement	Spraying		

Parameters

Skip/Overlap	0.000m
Implement working width	21.000m
Implement overall width	3.000m
Distance between hitch point to working point of implement	0.000m

⏪ Back

➡ Next

Figure 11 Implement Library-Summary



Refer to the *FJDynamics Auto Steer System Software User Manual* for details of implement settings.

Tab **Save** and enter the process of channel settings. Tab **Edit** in the channel below to edit the control parameters for the spray channel. A spray **Channel** can be seen as a tank containing a certain material. The spraying pattern can be customized and spraying performance optimized by completing the control parameters. Fill in the information and parameters on the interfaces of **Type**, **Latency**, **Overlap**, **Geometry**, and check the overall information on the **Overview** interface to complete the settings of control parameters for an advanced implement. The specific process is as follows:

←

Configuration

🏠

Implement control

Overview

Channel name	Type	Set state	Operation
default	Spraying	Set	✎

⏪ Back

➡ Next

Figure 12 Set up spray channel



←

Edit channel

🏠

Type

Offsets

Latency

Overlap

Geometry

Overview

Channel name

default

Target speed

3.6

⊗

km/h

Material Name

Default material

>

Minimum working speed

0.1

⊗

km/h

stop working when back

ON

☐

⏪ Back

⏩ Next

Figure 13 Channel-Type

Channel name	Enter the name of the current spray channel.
Material	Select the material used with current spray channel.
Target speed	Enter the target spraying speed, which should stick to the actual working habit.
Minimum working speed	Enter the minimum working speed under which the system will stop spraying when in auto spraying mode.
Stop working when back	Decide whether to work when back.

←

Edit channel

🏠

Type

Offsets

Latency

Overlap

Geometry

Overview

Forward/Back offset

Back

▼

0.0

m

⏪ Back

⏩ Next

Figure 14 Channel-Offsets

If the working units of the implement channel are not mounted on the center of the boom, there will be an offset of the channel. The direction and distance of offset can be edited.



← Edit channel
🏠

Type
Offsets
Latency
Overlap
Geometry
Overview

Boundary latency-ON

✕ ms

Boundary latency-OFF

✕ ms

Application latency-ON

✕ ms

Application latency-OFF

✕ ms

⏪ Back

⏩ Next

Figure 15 Channel-Latency

Signal transmission delay exists between the autosteering system, the spray VCU and the motor driver of each section and PWM nozzles. Once set, the control signal will be issues in advance of the time set with the latency parameter so that each section and PWM nozzle can be turned on just in time. With PWM nozzles, system latency is significantly reduced, allowing for a shorter latency time to be applied based on actual operating performance.

Boundary Latency ON	Latency compensation when entering field boundary, sections will be turned ON ahead of time. The default value is 500ms.
Boundary Latency OFF	Latency compensation when leaving field boundary, sections will be turned OFF ahead of time. The default value is 500ms.
Application Latency ON	Latency compensation when leaving sprayed area, sections will be turned ON ahead of time. The default value is 500ms.
Application Latency OFF	Latency compensation when entering sprayer area, sections will be turned OFF ahead of time. The default value is 1500ms.



← Edit channel
🏠

Type
Offsets
Latency
Overlap
Geometry
Overview

Boundary Switching Overlap ?

50 %

Boundary Start Overlap (a) ?

0.00 m

Boundary End Overlap (b) ?

0.00 m

Coverage Switching Overlap ?

50 %

Coverage Start Overlap (a) ?

0.00 m

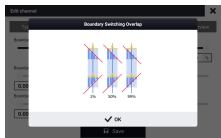
Coverage End Overlap (b) ?

0.00 m

⏪ Back

Next ⏩

Figure 16 Channel-Overlap

Boundary Switching Overlap	This parameter is used for automatic section control when crossing the field boundary where the sections will be turned on/off in sequence. The larger the overlap rate, the larger the area beyond the boundary will be sprayed.	
Coverage Switching Overlap	1%: Sections will be turned off once a tiny part of them just enters the worked area. 50%: Sections will be turned off when half of them enter the worked area. 99%: Sections will be turned off until they completely enter the worked area.	
Coverage Start Overlap (a)	Sections will be turned on a meters before it leaves the worked area.	
Coverage End Overlap (b)	Sections will not be turned off until b meters after it enters the worked area.	



Boundary Start Overlap (a)	Sections will be turned on a meters before it enters the field boundary.	
Boundary End Overlap (b)	Sections will not be turned off until b meters after it leaves the field boundary.	

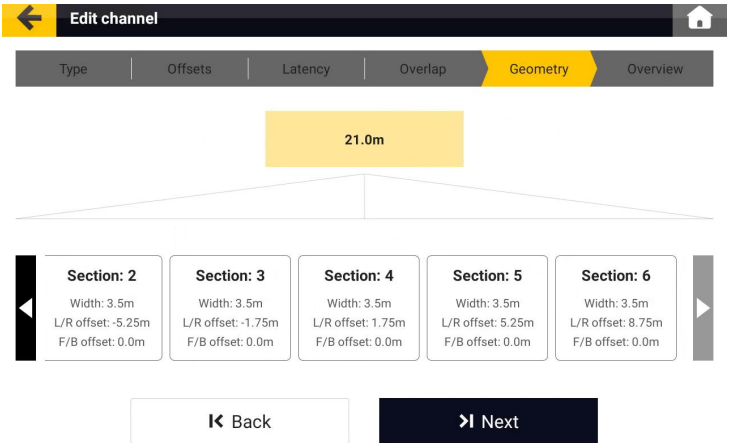
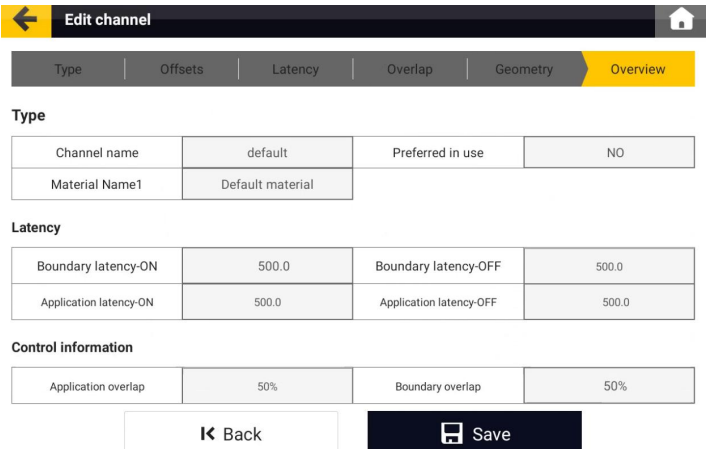


Figure 17 Channel-Geometry

The width of each section will be synchronized according to the parameters set up in the chapter ***Setting the Spraying Operation.***



Type

Channel name	default	Preferred in use	NO
Material Name1	Default material		

Latency

Boundary latency-ON	500.0	Boundary latency-OFF	500.0
Application latency-ON	500.0	Application latency-OFF	500.0

Control information

Application overlap	50%	Boundary overlap	50%
---------------------	-----	------------------	-----

Back Save

Figure 18 Channel-Overview

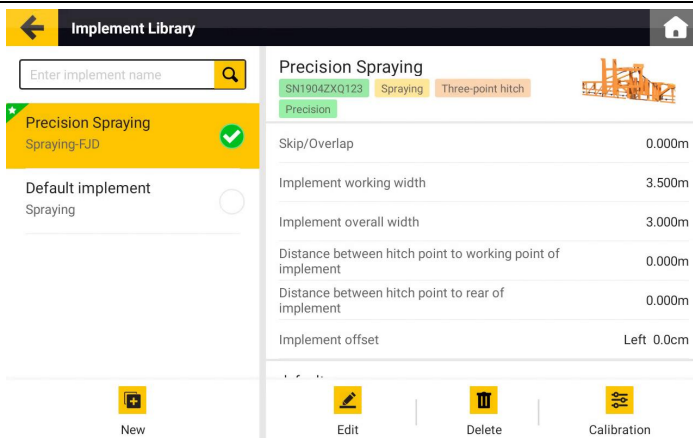


Figure 19 D3WAS implement

2.5 Setting the Material

Setting the material parameters correctly is vital for getting the proper rates for spraying. To set up a new material or edit an existing material, select **MENU > DEVICE SETTINGS > Material Library**, tab **New** or **Edit** and fill in all necessary parameters. Then go to **MENU > APPLICATIONS > Precision Spraying** and bond the material to the currently connected spray VCU to define the necessary parameters such as target rates for automatic rate control.

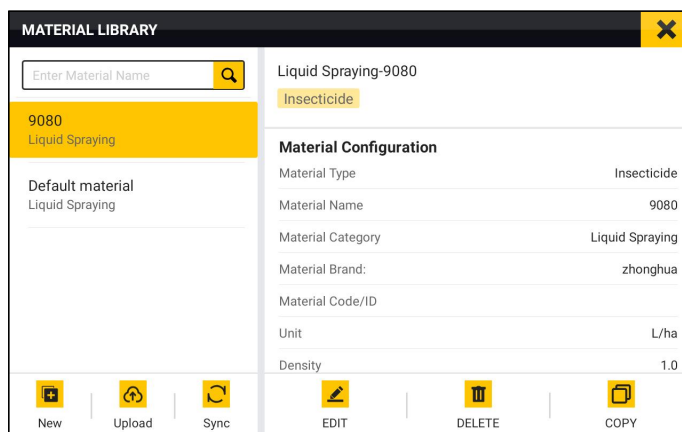


Figure 20 Material Library



EDIT MATERIAL

✕

Material Name

* water

Material Category

* Liquid Spraying

Material Type

* Water

Material Brand:

Please enter

Material Code/ID

Please enter

Unit

* L/ha

Density

* 1.0

Target Rate I

300.0

Target Rate II

600.0

Rate Increment

* 15.0

Rate Range

* 150.0 -- 900.0

Save

Figure 21 Edit material parameters

Material Name	Enter the name of the material.
Material Category	Please select the category of Liquid Spraying .
Material Type	Select the type of the material.
Unit	Select the unit for the material.
Target Rate I	Set the spraying amount per unit area.
Target Rate II	Optional target rate for fast switch during operation.
Rate Increment	Change in target rate with each adjustment.
Rate Range	Adjustable range of target rate.
Density	Enter the density of the liquid material. The value must be in the range of 0.8 to 1.2.
Material ID	Enter the material ID.
Brand	Enter the brand of the material.

2.6 Setting the Navigation Task

Set up a task to define the configuration for navigation operation, to meet the requirement of high-precision assisted driving. For quick setup of a new task, please go to **Overview** and complete the configuration of Field, Guidance line, Boundary, and Task. Note that only tasks belonging to the **Incomplete** group can be applied. For task details, please go to **MENU > FIELD > Field** to view specific information on **Field**.



Boundary, Guidance Line and **Task** in sequence.

Additionally, task can be easily finished, switched, or cleaned by the widgets near to the task.

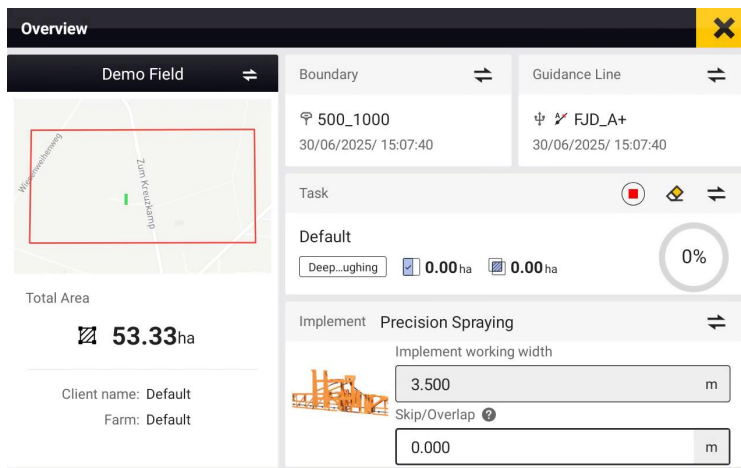


Figure 22 Task overview

 Refer to the *FJDynamics Auto Steer System Software User Manual* for details of task configuration.



2.7 Setting the prescription maps

To perform prescription-based operations, please prepare prescription maps in XML, SHP, or TIF format beforehand. These maps can be obtained from the FJD Farm Management System (FMS) or a third-party platform. Prescription maps can be imported via **Data Transfer**. Once imported, they can be viewed in **MENU > FIELD > Field > Prescription**.

Please note the following requirements when generating and importing the prescription file.

XML (ISOXML)	Import the XML file together with the bin file, or you may also import a zip file that contains the XML and bin file.
SHP (Shapefile)	For prescription maps in SHP format, please add "prescription" (case insensitive) into the name of each file(.shp, .shx, .dbf, .prj), otherwise they might be parsed as boundaries.
TIF (GEOTiff)	It may take some time (up to several minutes, depending on the file size) to import a TIF file, please wait patiently. Check the imported prescription map in MENU > FIELD > Field > current field > current task > Prescription .

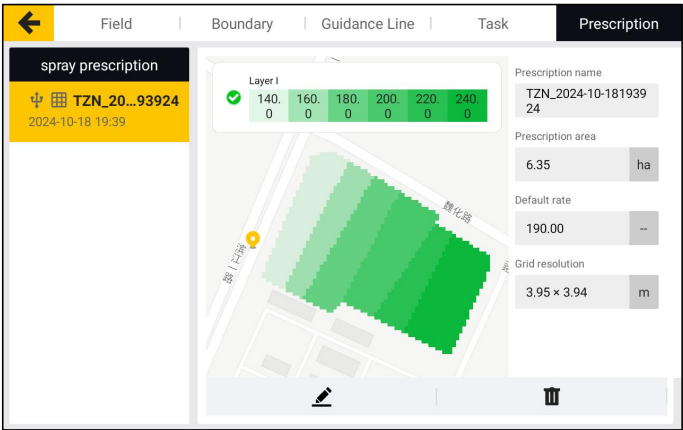


Figure 23 Display of prescription maps



2.8 PrescriptionSetting the Spraying Operation

Set the control parameters for the spraying operation to achieve automatic rate and section control. Tab  in the VT window and enter the spray setting interface.

2.8.1 Valve Settings

Set the hardware parameters of valves and sensors on the **Valve Settings** interface. Select the valve type and configure flowmeter coefficient, confirm the range of working pressure, set the pace of adjustment and open time of the control valve, and choose the type of section valves, and thus the necessary parameters for controlling the valve set are collected.

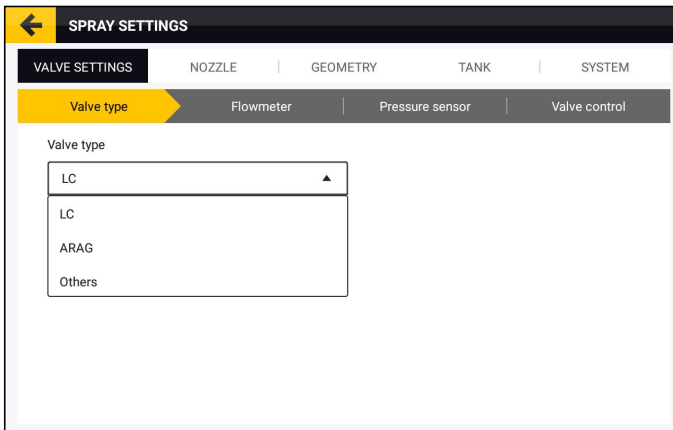


Figure 24 Valve settings

Set the flowmeter coefficient on the **Flowmeter** interface. Flowmeter coefficient is used to measure flow rate and needs to be calibrated before spray operation. Please refer to **Calibrating the Flowmeter** for details.

If the machine is not equipped with a flow meter, it can be configured here as not installed. Without a flow meter, the rate plus and minus buttons can be used to directly control the system pressure to control the rate.



←

SPRAY SETTINGS

VALVE SETTINGS

NOZZLE

GEOMETRY

TANK

SYSTEM

Valve type

Flowmeter

Pressure sensor

Valve control

!

The flowmeter needs to be calibrated when it is worn out. Press "Start" button and all sections will be on. Put in the actual consumption after the spraying. The system will update the coefficient automatically. Initial value: 120.9.

Installed

Flowmeter

Coefficient:120.9

▶

00:00:00

Consumption:

L

OFF

OFF

OFF

OFF

OFF

OFF

1

2

3

4

5

6

Figure 25 Flowmeter

Set the type of pressure sensor and the lower and upper pressure limit on the **Pressure** interface. The system supports pressure sensor that reports the value of current or valtage and pressure gage. Select the correct type and enter the corresponding relationship between the reported value and the system pressure. The lower limit can be set to 0.01 to 0.15 MPa, and the upper limit is 0.80 to 5.00 MPa. When the system pressure exceeds the lower limit, please check whether the waterway is in normal working condition. When the system pressure exceeds the upper limit, an overpressure alarm will appear, lower the speed, switch to nozzles with larger nozzle tip or lower target rate.

←

SPRAY SETTINGS

VALVE SETTINGS

NOZZLE

GEOMETRY

TANK

SYSTEM

Valve type

Flowmeter

Pressure sensor

Valve control

Pressure sensor type:

Current

Current range

4.0

mA

20.0

mA

Pressure range

0

MPa

2.0

MPa

Normal pressure range

Current pressure: 0.0MPa

Pressure limit:

0.1

1.2

Lower limit: 0.01-0.15

Upper limit: 0.8-5.0

Save

Figure 26 Pressure sensor



Set the pace of adjustment and open time of control valve and the type of section valves on the **Valve control** interface. 21 sections are supported when using 2-wire section controls and 30 sections for 3-wire section controls.

The "**Auto close of main valve**" switch enables different section/main valve control logic. If this function is activated, the implement will prioritize closing the main valve over the sections when leaving the boundary, entering the worked area, and falling below the minimum spraying stop speed. If this mode is not enabled, the implement will prioritize closing the sections and keep the main valve open during task.

SPRAY SETTINGS

VALVE SETTINGS | NOZZLE | GEOMETRY | TANK | SYSTEM

Valve type | Flowmeter | Pressure sensor | **Valve control**

Proportional control valve

Pace of adjustment: Moderate

Valve open time: 13.0 S

Section valve

Interface: 3-wire

By-pass: Supported

Auto close of main valve: ☒ ON

Figure 27 Valve control

2.8.2 Nozzle

Set the nozzle type and nozzle tip of the nozzles installed on the spray boom on the **Nozzle** interface. In agricultural spraying, nozzles can be classified into traditional and PWM nozzles. Traditional nozzles offer a constant flow rate through a fixed orifice, while PWM nozzles utilize electronic control to modulate the pulse width, providing precise control over individual nozzles. This allows for variable rate application, improving spray performance. PWM nozzles need to be driven by additional controllers, with a group of 15 nozzles sharing a nozzle controller VCU.



SPRAY SETTINGS

VALVE SETTINGS | **NOZZLE** | GEOMETRY | TANK | SYSTEM

Nozzle

Nozzle Type: PWM (dropdown) | 20 (input) HZ (unit) | Nozzle tip: 03# (dropdown)

Driver

Nozzle 1-15: FJTK1A424510005ZC (dropdown)

Nozzle model recommendation ⓘ

Nozzle Type: Traditional (dropdown) | Nozzle Spacing: 100.0 (input) cm (unit)

Figure 28 Nozzle settings

If it is not clear which nozzle tip is required for the current task settings, enter the "Nozzle type", "Nozzle spacing", "Target rate", "Liquid density", "Target speed" and "Working pressure" in the **Calculator** on the right side of the interface. The system will automatically generate the recommended nozzle tips.

SPRAY SETTINGS

VALVE SETTINGS | **NOZZLE** | GEOMETRY | TANK | SYSTEM

Nozzle model recommendation ⓘ

Nozzle Type: PWM (dropdown) | Nozzle Spacing: 50.0 (input) cm (unit)

Target rate: 200.0 (input) L/ha (unit) | Liquid density: 1.0 (input) kg/L (unit)

Target speed: 3.6 (input) km/h (unit) | Working pressure: 0.28 (input) MPa (unit)

015# 0.55MPa | **02# 0.31MPa** | 025# 0.2MPa | 03# 0.14MPa | [Save icon]

Figure 29 Nozzle tip recommendation

2.8.3 Geometry

Set the physical geometry of the spray boom on the **Geometry** interface. The width of each section and the total working width will be calculated through the nozzle spacing and the number of the nozzles on each section. Tab the button in the upper right corner of the interface to edit the number of sections and nozzles on each section.

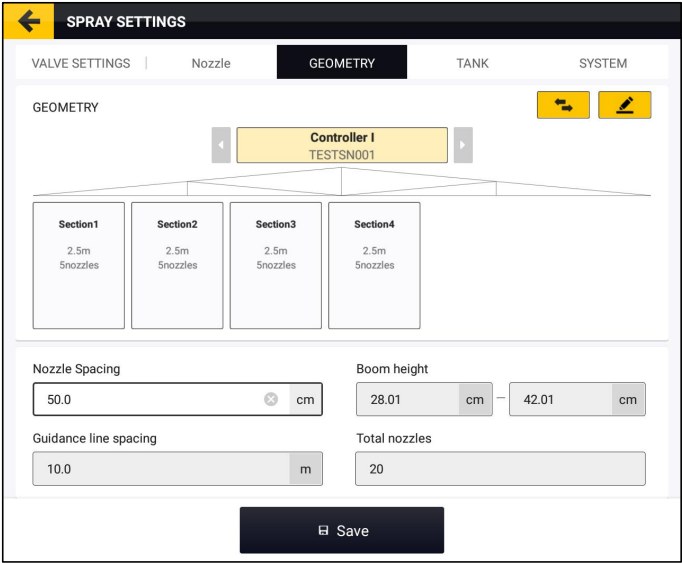
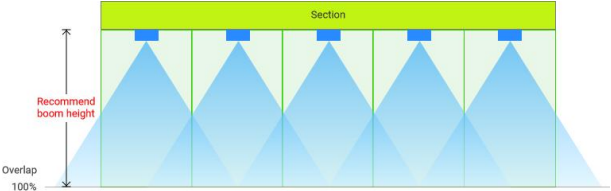


Figure 30 Geometry

Nozzle spacing	Uniform spacing of two adjacent nozzles mounted on the spray boom.
Working width	The total spray width. Due to the divergent characteristic of the spray pattern, there will be a small amount of spillover at both ends of the spray boom.
Height	Recommended boom height to achieve 100% overlap spray pattern under the current setting of nozzle spacing. 
Total nozzles	Total number of nozzles on all sections.

2.8.4 Tank

Set the rate and amount of material in the tank on the **Tank** interface. The target rate will be synchronized together with the material selected for spraying operation. Tab **Edit** in the top right corner and switch to another material if needed. The default rate increment and rate range are also synchronized with the selected material, while the



alternative solution provides a customized rate increment and a fixed rate range (50-150% of the target rate).

Before starting the operation, it is also necessary to define the capacity and balance of the tank. During the operation, the real-time tank balance will be calculated automatically according to the material consumption and displayed in the VT window. When the remaining capacity is lower than the preset Alert value, the tank balance sector in VT window will turn red as an alarm.

In the lower right corner of the interface, instructions on appropriate target rate and spray area are provided according to current configuration of spray parameters.

SPRAY SETTINGS

VALVE SETTINGS | NOZZLE | GEOMETRY | **TANK** | SYSTEM

Tank

Capacity: 1000 L

Balance: 500 L **Full**

Alert: ☐ 100 L ☒ 20 %

Tips

Maximum flow rate	4.00L/min
Maximum target rate	48.00L/ha
Maximum area supported	4.0ha
Area supported	2.0ha

Basic Information [Edit](#)

Material Name	herbicide	Material Type	Liquid Spraying
Density	1.1kg/L	Target Rate	250.00L/ha

☒ Rate Increment: 12.0 Rate Range: 200.0 – 400.0
☐ Rate Increment: 1 % Rate Range: 50% – 150%

Save

Figure 31 Tank

Maximum flow rate	Maximum flow rate supported by the current nozzle tip.
Maximum target rate	Maximum target rate supported according to the current nozzle tip, target speed and nozzle spacing. It is highly recommended that the target rate set with the material is not higher than this value.
Maximum area supported	Maximum area that can be sprayed with the current target rate when the tank is full.
Area supported	Area that can be sprayed with the current target rate and tank balance.



2.8.5 System

The **System** sector consists of several parts, Overview, Connection, Waterway, Softkey and Others. Overview is a summary of the other parts. In addition, the name and software version of the spray system is also shown here. Tab **Release note** to view the detailed information of current version.

← SPRAY SETTINGS

VALVE SETTINGS | NOZZLE | GEOMETRY | TANK | **SYSTEM**

Overview | Connection | Waterway | Softkey | Others

System

Precision Spray System

Connection

Controller

0

Driver

0

Flowmeter

Flowmeter

120.9

Pressure

Pressure sensor

0.1-1.2 MPa

Waterway

Sections:

6

nozzles

42

Softkey

Softkey activated

10

Others

Operation Hour

16min

Effective Distance

1.0km

Total Area

10.0ha

Total Application

1000.00L

Figure 32 System-Overview

← SPRAY SETTINGS

VALVE SETTINGS | NOZZLE | GEOMETRY | TANK | **SYSTEM**

Overview | **Connection** | Waterway | Softkey | Others

SN	Function	Status	Temperature	Voltage	Hardware	
N/A	DTU					Default DTU
TESTSN001	VCU			12.0	v0	
	Pressure					
	Flowmeter					
TESTSN003	VCU			0.0	v0	
TESTSN002	VCU			0.0	v0	

Figure 33 System-Connection



The version of DTU, running status, interface status, temperature, voltage/current, hardware and firmware version of VCU are displayed on the **Connection** interface. Before starting to use the system, please ensure that the DTU version is correct. Mismatched DTU versions between the system and the DTU will block normal communication with VCUs.

VCU-General	Green	VCU functioning correctly.
	Red	One or more items among temperature, voltage and interface status are in abnormal state.
VCU-Pressure	Green	Pressure sensor functioning correctly.
	Yellow	Underpressure.
	Red	Overpressure.
VCU-Flowmeter	Green	Flowmeter functioning correctly.
	Yellow	Flow pulse is not received (flow pulse shall not be received when the spray operation has not been activated).

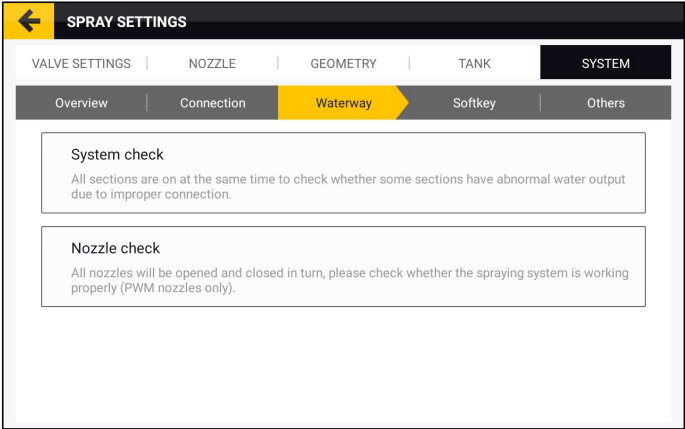


Figure 34 System-Waterway

Check waterway connection sequence and output condition on the **Waterway** interface.



System check	All sections are on at the same time to check whether some sections have abnormal water output due to improper connection.
Section check	All sections are on in turn to check whether some sections are disordered due to improper connection.
Nozzle check	All nozzles are on in turn to check whether some nozzles are disordered due to improper connection.

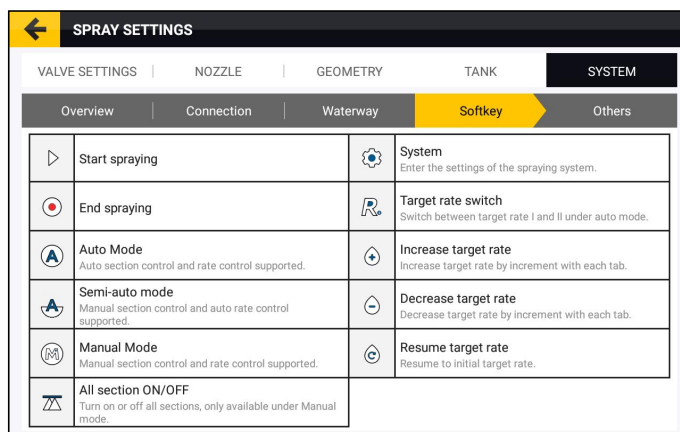


Figure 35 System-Softkey

Start/End spraying	These two buttons are used to start and end spraying operation.
System	This button provides shortcut to spray system interface.
Manual/Semi-auto/Auto mode switch	These three buttons are used to switch between manual, semi-auto and auto spray mode.
All section ON/OFF	This button is used to enable/disable all sections.
Target rate switch	This button is used to switch between target rate I and II.
Increase target rate	Increase target rate by increment with each tab.
Decrease target rate	Decrease target rate by increment with each tab.
Resume target rate	Resume to original target rate.

All shortcut softkeys presented in the VT window are displayed on the **Softkey** interface.



SPRAY SETTINGS

VALVE SETTINGS | Nozzle | GEOMETRY | TANK | **SYSTEM**

Overview | Connection | Waterway | Softkey | **Others**

Unit

Volume Pressure

Lifetime totals

Start Time	1970.01.01 02:16	Update Time	2013.01.25 00:36
Operation Hour	16min	Effective Distance	1.0km
Total Area	10.0ha	Total Application	1000.00L

Figure 36 System–Others

The unit of volume and pressure can be adjusted on the **Others** interface. The VCU lifetime totals are also presented here. Please refer to **Operation Data** to check the detailed task data of current operation.

Start time	The initial time that the spray VCU is activated.
Update time	Update time of current data.
Operation hour	Total operation hour since activation.
Effective mileage	Total effective mileage since activation.
Total area	Total working area since activation.
Total Application	Total amount of material applied since activation.

2.9 Preparing for the Operation

2.9.1 Calibrating the Integrated Valve

Before initial use, follow the steps below to calibrate the integrated valve.

1. Complete parameters configuration in Geometry first.
2. Ensure that the vehicle is in idle state and the gear is in neutral position.
3. Manually loosen the manual pressure regulator counterclockwise.
4. Start the spray pump and take it to its normal working condition. The master valve is closed at this moment, after the spray pump starts, the liquid will flow back to the water tank through the return port of the master valve.
5. Open all the section valves and the master valve under manual mode.
6. Fully open the control valve (pressure regulating valve) with the shortcut sofkeys



in the VT window.

7. Turn the manual pressure regulator clockwise until the system pressure is stable at



1.2~1.3 MPa.

8. Adjust the control valve (pressure regulating valve) with the shortcut sofkeys



in the VT window until the system pressure remains at around 0.3~0.5 MPa.

9. The calibration of the integrated valve is completed.

2.9.2 Calibrating the Flowmeter

The flowmeter coefficient is 1,20900 by default, which corresponds to the flowmeter specification of 120.900 pulse/L. When the actual consumption read from the tank scale is inconsistent with the consumption calculated by the system, it means the flow meter needs to be calibrated.

To calibrate the flowmeter, fill the tank with water, choose one nozzle from each section and place a container with a scale below. Select **MENU > APPLICATIONS > Precision Spraying > System > Flowmeter**, tab  to start spraying. All sections will be enabled, while sections can also be manually disabled according to actual test conditions, and the system will start to record the flow pulses at the same time. Spray at least 50 liter of liquids to ensure the accuracy. Tab  to stop spraying, sum up the total volume from all containers and convert the value to the total spray volume of the system. Enter the total volume into **Consumption** and tab , the flowmeter coefficient will be calculated and refreshed automatically. If the calibration fails, calibrate again or correct the flowmeter coefficient manually.

2.9.3 Calibrating Latency Compensation

The latency compensation in Implement Library is 800ms for Latency-ON and 1500ms for Latency-OFF by default. Unless there is a significant signal delay, there is no need to adjust the latencies.

After each adjustment, calibrate the latency compensation as follows. Create and apply a boundary with a straight line edge, switch to auto mode, and start the spraying operation. Enter the boundary in the direction vertical to the straight line edge of the boundary. If spraying starts some time after the vehicle enters the boundary, increase the **ON Latency Compensation**. Then, exit the boundary in the direction vertical to the boundary. If spraying stops some time after the vehicle leaves the boundary, increase the **OFF Latency Compensation**.



2.10 Starting the Operation

2.10.1 Switching the Display Mode

To switch between full screen mode and multi-window mode, tap the  button in the left top corner on the main screen or double-click the navigation map.

2.10.2 Spray System Window

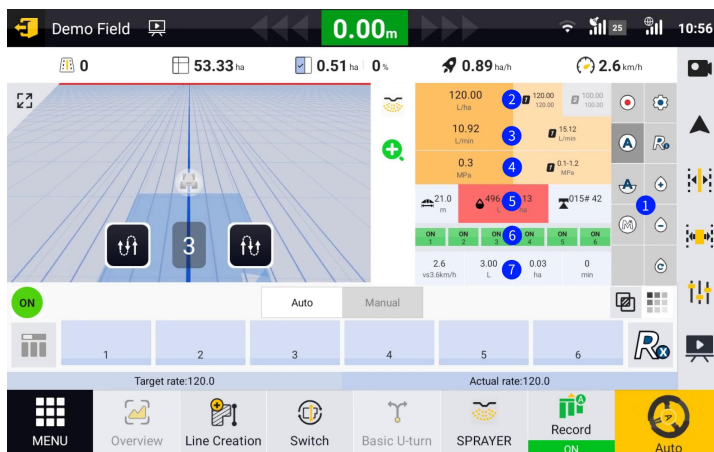


Figure 37 Spray system status window-VT

1	Softkeys	Shortcut softkeys, such as Start/End spraying button.
2	Rates	Real-time spray rate and target rates.
3	Flow rate	Real-time spray flow rate and target flow rate.
4	Pressure	Real-time system pressure and pressure limits.
5	Implement Info	Working width, tank balance&supported spray area, nozzle tip and quantity.
6	Section/nozzle status	On/off status of all sections/nozzles.
7	Spray data	Real-time&target speed, real-time spray rate, sprayed area and work hour.



Figure 38 Spray system status window-TC

1	Main valve status slider (Main switch)	Displays the status of the main valve. It can also be used to turn on/off the main valve under manual spray mode.
2	Section valve status buttons (Section switches)	Display the status of each section valve. They can also be used to turn on/off section valves under manual spray mode.
3	Real-time flow rate diagram	Displays the real-time flow rate of each section.
4	Section lock	Lock sections under manual spray mode in case of unintended activation.
5	Prescription setup	Entry to prescription map configuration interface.
6	Prescription rate	Tap to apply variable rates from prescription map.
7	Prescription map display	Tap to display prescription map in use on top of navigation map.

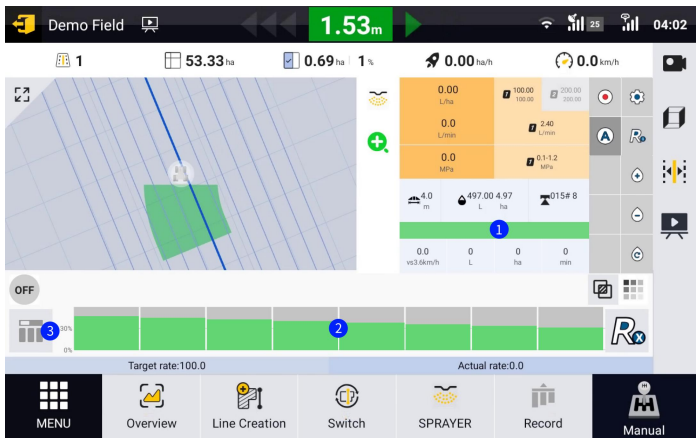


Figure 39 Spray system status-PWM nozzle control

1	PWM nozzle status-VT	Display the on/off status of all nozzles in general.
2	PWM nozzle status-TC	Display the on/off status of each nozzle.
3	PWM nozzle duty cycle	Display the duty cycle of each nozzle.
4	PWM nozzle group	Display nozzle groups.

2.10.3 Manual Mode

Manual mode is suitable for spraying operations with the custom target rate and spraying areas, and also for ad hoc spraying operations.

In manual mode, sections and flow rate need to be controlled manually according to

the real demand. Switch to manual mode by tabbing  in the VT window, tab the main switch and section switches in the TC window, the corresponding section will be

turned on. Tab  to turn on all section at once. Spray flow rate will not change with

speed, tab  to adjust the flow rate manually.

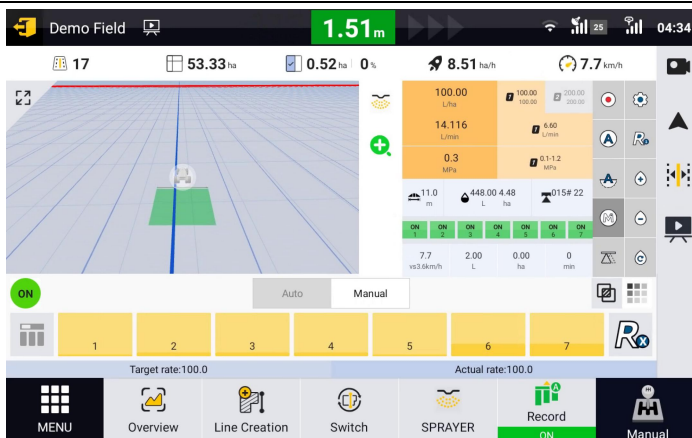


Figure 40 Manual mode

2.10.4 Semi-auto Mode

Semi-auto mode is suitable for spraying operations when the boundary is not specified and can be used in operations such as headlands spraying that do not require all sections to be activated.

In semi-auto mode, only sections need to be controlled manually according to the real demand, the system will automatically control the flow rate based on vehicle speed. The higher speed, the higher flow rate, and the real-time spray rate stays the same.

Switch to semi-auto mode by tabbing  in the VT window, turn on the master valve and section valves, the system will start spraying automatically when the vehicle speed

exceeds the minimum working speed. Tab  to adjust the target rate manually during the operation, the increment of each tab can be set in **MENU > APPLICATIONS > Precision Spraying > Tank**. The adjustments are all temporary and will lose effect after the speed drops below the minimum working speed or switching back to manual mode.

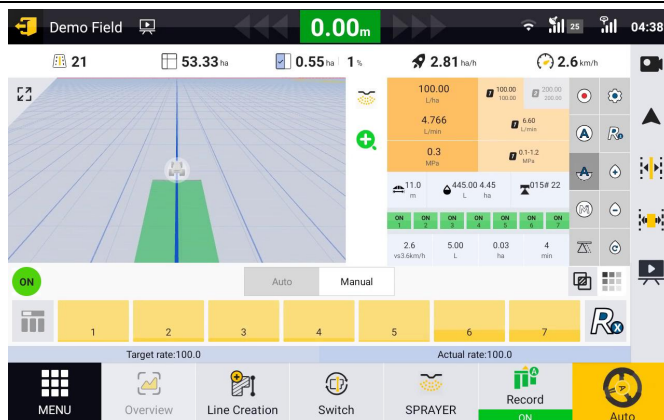


Figure 41 Semi-auto mode

2.10.5 Auto Mode

In auto mode, section status and flow rate are both automatically controlled. Spraying starts automatically when the vehicle moves inside the field boundary at a speed higher than the minimum working speed or leaves an area in the field that has been sprayed, and stops automatically when the vehicle moves outside the field boundary or enters an area in the field that has been sprayed. The higher speed, the higher flow rate, and the real-time spray rate stays the same. Switch to auto mode by tabing



in the VT window, start spray operation, the system will start spraying automatically when the vehicle speed exceeds the minimum working speed.

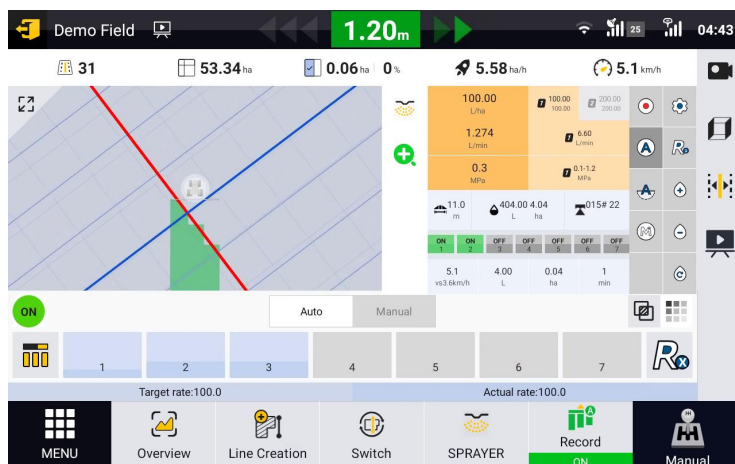


Figure 42 Fully-automatic mode



2.10.6 PWM Nozzle Control

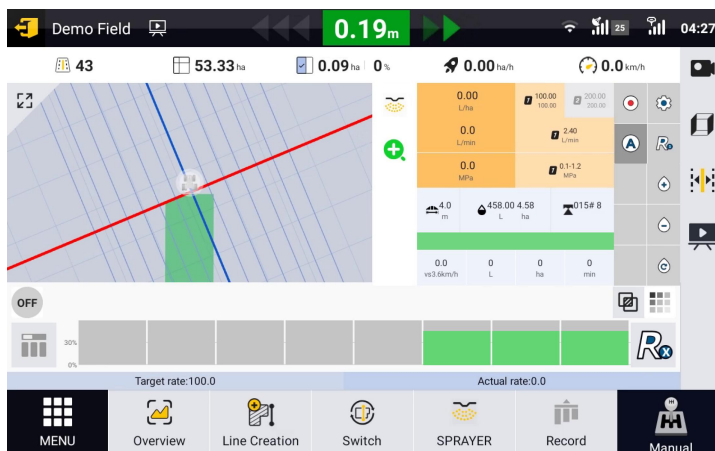


Figure 43 PWM nozzle control-on/off status

When the nozzle type is configured as "PWM nozzle", the TC window will display the on/off status and duty cycle of all nozzles. PWM nozzles only support Auto Mode, and the on/off status and duty cycle of the nozzles are automatically controlled by the system. The nozzles will be turned on when entering a field boundary and turned off when entering the sprayed area. With independent nozzle control, a much smaller overlapping area can be achieved compared to section control.

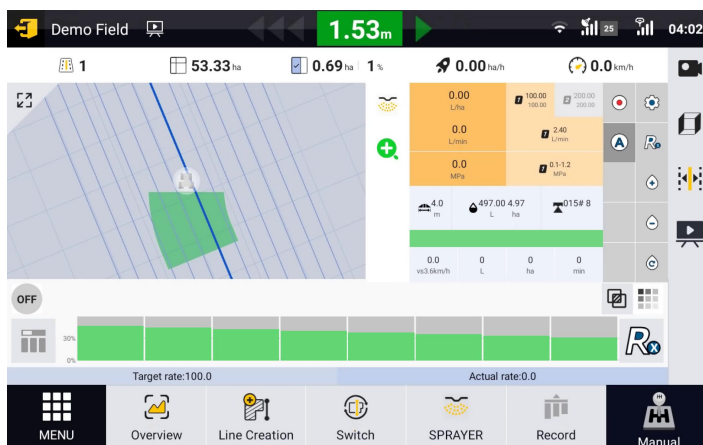


Figure 44 PWM nozzle control-turn compensation

During normal straight-line operation at constant speed, the nozzle duty cycle will be maintained at 70% and will be adjusted within the range of 30-70% to in real-time to tackle speed change. When executing curved guidance line or taking turns, the inner



circle nozzles will take a smaller duty cycle to ensure uniform spray application per unit area to prevent excessive spraying in the inner area.

2.10.7 Prescription Operation

Prescription map configuration interface can be entered by tabbing on the Rx button



in the TC window. Select the prescription map required for the current task from the drop-down menu and complete the configuration of the following control parameters.

Default rate	Rx rate will be replaced by default rate if it configured for "When Leaving Treatment Zone".
min & max	The minimum and maximum value out of all treatment zones.
ON/OFF Latency	Control signals will be issued ahead of time to deal with the delay of the control valve.
When Leaving Treatment Zone	The rate control strategy when leaving treatment zones.

Prescription

Choose a prescription map

TZN_2024-10-25115626

Default rate

150.00

min

0.0

max

200.0

ON/OFF Latency

0

ms

When Leaving Treatment Zone

Follow treatment zone

Cancel

OK

Layer I

100.0

120.0

140.0

160.0

180.0

200.0

Figure 45 Prescription map configuration

Once the prescription map is configured, a new Rx button  will appear in the TC window. Prescription rate will be applied by tabbing on the Rx button. Additionally, a prescription rate legend will appear on the navigation map and a prescription map display button  will appear in the toolbar on the right. When the real-time spraying



rate falls within a specific rate range, the track will be rendered using the corresponding color from the legend. The original prescription map will be displayed as a semi-transparent overlay by tabbing on the prescription map display button.

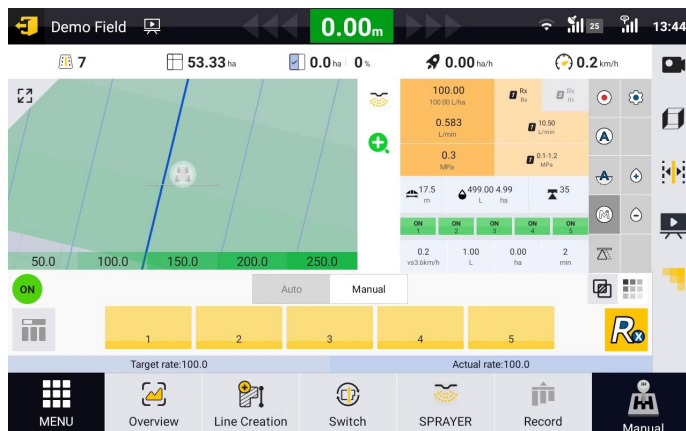


Figure 46 Prescription application

2.10.8 Overpressure Alarm

When the system pressure exceeds the upper limit, an alert will appear on the screen. Overpressure occurs probably because the vehicle speed or target rate is too high, and the nozzles cannot deliver the required flow rate. When this message is displayed, lower the vehicle speed or target rate immediately, or replace the nozzles with ones with suitable nozzle tip. If overpressure persists, the system automatically stops spraying after a 10s countdown.

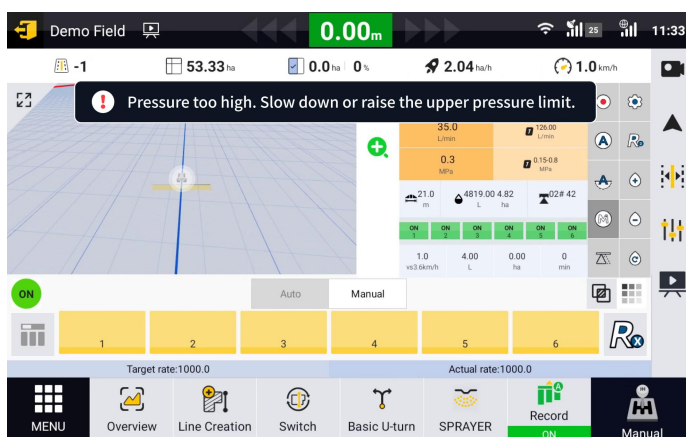


Figure 47 Overpressure alarm



2.11 Operation Data

2.11.1 Select Area Metering mode

When the spray system is enabled, the sprayed area is automatically recorded by section. If another area metering mode is needed, select **MENU > FIELD > Record mode** and switch modes.

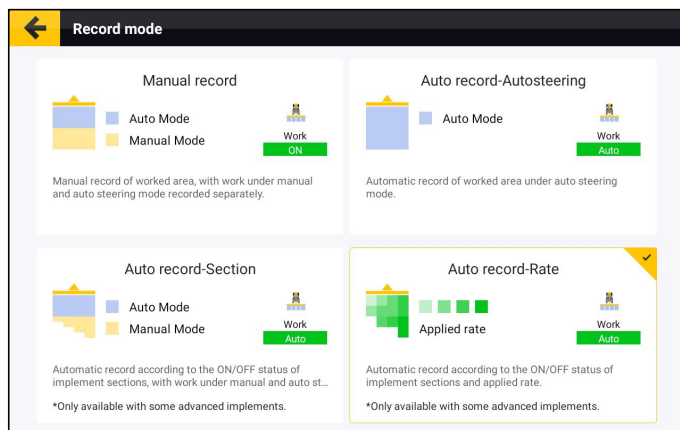


Figure 48 Recode mode

1	Manual record	Activated manually to record the area covered by the full boom.
2	Auto record-Autosteering	Activated automatically to record the area under auto piloting mode.
3	Auto record-Section	Default mode when the spray system is enabled, activated automatically to record the area where the sections are on.
4	Auto record-Rate	Default mode when a prescription map is applied, activated automatically to record the area where the sections are on while the actual rate is not 0.

2.11.2 Real-time Spray Data

Real-time data of the current spray operation can be viewed in the VT window, including real-time&target speed, real-time spray rate, sprayed area and work hour.



Figure 49 Real-time spraying data

2.11.3 Real-time Navigation Data

View the real-time data of the navigation operation at the top of the navigation window, including the current guidance line number, field area, operated area, operation efficiency, and current speed.

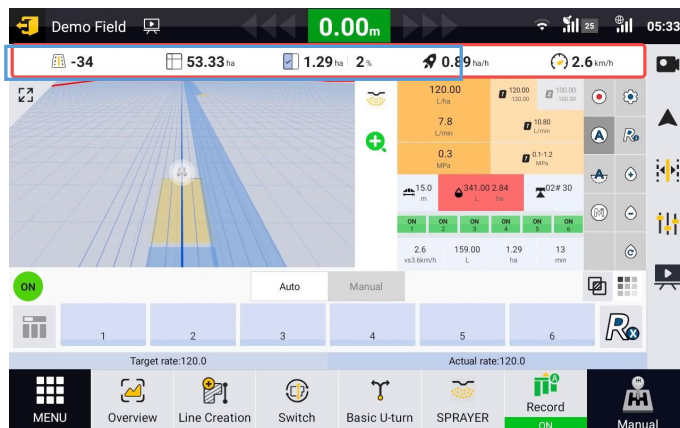


Figure 50 Real-time navigation data

2.11.4 Historical Task Data

Select **MENU** > **FIELD** > **Field** and view data of historical navigation tasks in the right column, including task name, the cumulative operation time, total area (the area enclosed by the applied boundary), operation area, effective operation area (the operation area inside the applied boundary), created time, start time, and end time.

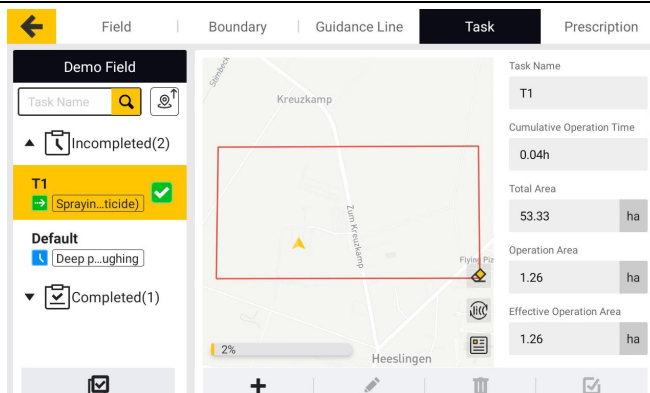


Figure 51 Data of historical navigation tasks

2.11.5 Historical Operation Data

Tap  at the bottom right corner on the **Task** interface and enter the interface of detailed historical operation data list of each operation.

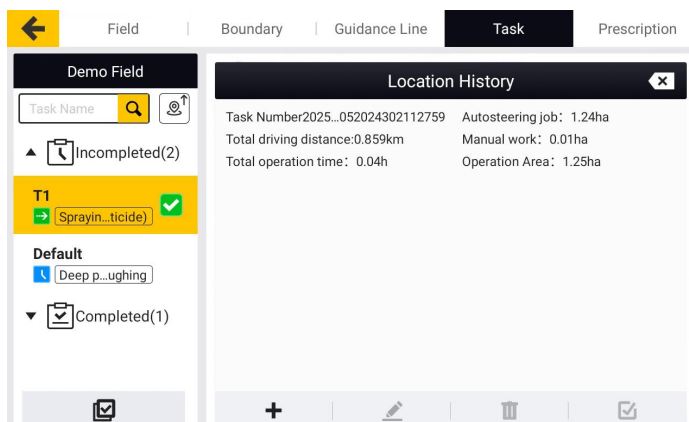


Figure 52 Data of historical operations

Task NO.	Task number of the operation.
Total driving distance	Total mileage of the spray operation.
Operation time	Durarion of the operation.
Operation area	Total work area of the operaton (area covered by the full boom).
Auto mode	Total operation area under auto piloting mode.
Manual mode	Total operation area under manual piloting mode.



3 Hardware Specifications

3.1 FJDynamics Autosteering Kit

For details, see "Main Hardware and its Specifications" of the *FJDynamics Autosteering Kit Software User Manual*.

3.2 Precision Spray System

No.	Component	Specifications
1	Spray controller	Supply voltage: DC 12 V Main Control Valve: 3A/12V Proportional Control Valve: 3A/12V Section Valves: 3A/12V Pressure Signal: Voltage Type: 0~10V Current Type: 0~20mA Flow Signal: 0~10KHz Communication Protocol: CAN Baud Rate: 250Kbps IP Class: IP67
2	Integrated valve (optional)	Operating voltage: 12 V Pressure resistance: 20 bar Normal operating pressure: 1.0~12 bar Flow Rate: 0~120L/min Boom Section Valves: 1~7 Inlet Water Hose Tail: Φ 25 mm (Optional: Φ 32mm) Return Water Hose Tail (two): Φ 25 mm Outlet Water Hose Tail: Φ 13 mm (Optional: Φ 16mm, Φ 20mm)



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