



SMART-C- SPRAY 124

The SMART alternative to PWM



- ✓ **Auto** Nozzle Select
- ✓ **Altek True-Turn** -Turn Compensation
- ✓ **Nozzle Spy** Flow Monitoring
- ✓ No restrictions in nozzle usage
- ✓ Self Addressing can nodes (INC)
- ✓ Fast Regulation
- ✓ Low power requirement
- ✓ Easy Connection / Cables
- ✓ Self Diagnostics
- ✓ ISO -Connect
- ✓ Easy aftermarket fit

NOZZLE  SPY
FLOW MONITORING

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The new altek "Smart C Spray" uses the Altek INC 2.0 system which comprises of a series of modular INC units mounted directly to the boom of the sprayer controlling the Altek solenoid operated spray valves. These can be mounted in such a way to form Individual multiline nozzle control along the boom as well as sectional control by using the Altek multi-spray Master – Slave solenoid valve setup. The INC 2.0 Modules connect together in a "Daisy Chain" and can control in excess of 55 x units (55 x metres at 0.5m spacing).

A unique self-addressing concept is used to address each INC module, meaning all units have the same software and can be mounted in any position, at each start-up each module is addressed dynamically meaning installation and/or module replacement is extremely simple and trouble free.

All INC modules CAN communication as well as inputs and outputs are monitored and reported to the user should there be a fault via a powerful yet clear and intuitive diagnostic pop-up. This means any open circuits, short circuits, high or low power measurements are reported to the operator – pinpointing the issue to the unit/component. 2 x Status LEDs on each INC further report status via a blink code as secondary diagnostics.

In addition to the control of individual nozzles along the boom, the INC 2.0 units can also control multiple nozzles per position (Lines) so a "Twin line" or "Quad line" can also be Autonomously controlled by the same system.

There are three main types of module currently available



Single line control INC Modules (4 x outputs) spaced at 2.0m typically



Twin line control INC Modules (4 x outputs) spaced at 1.0m typically

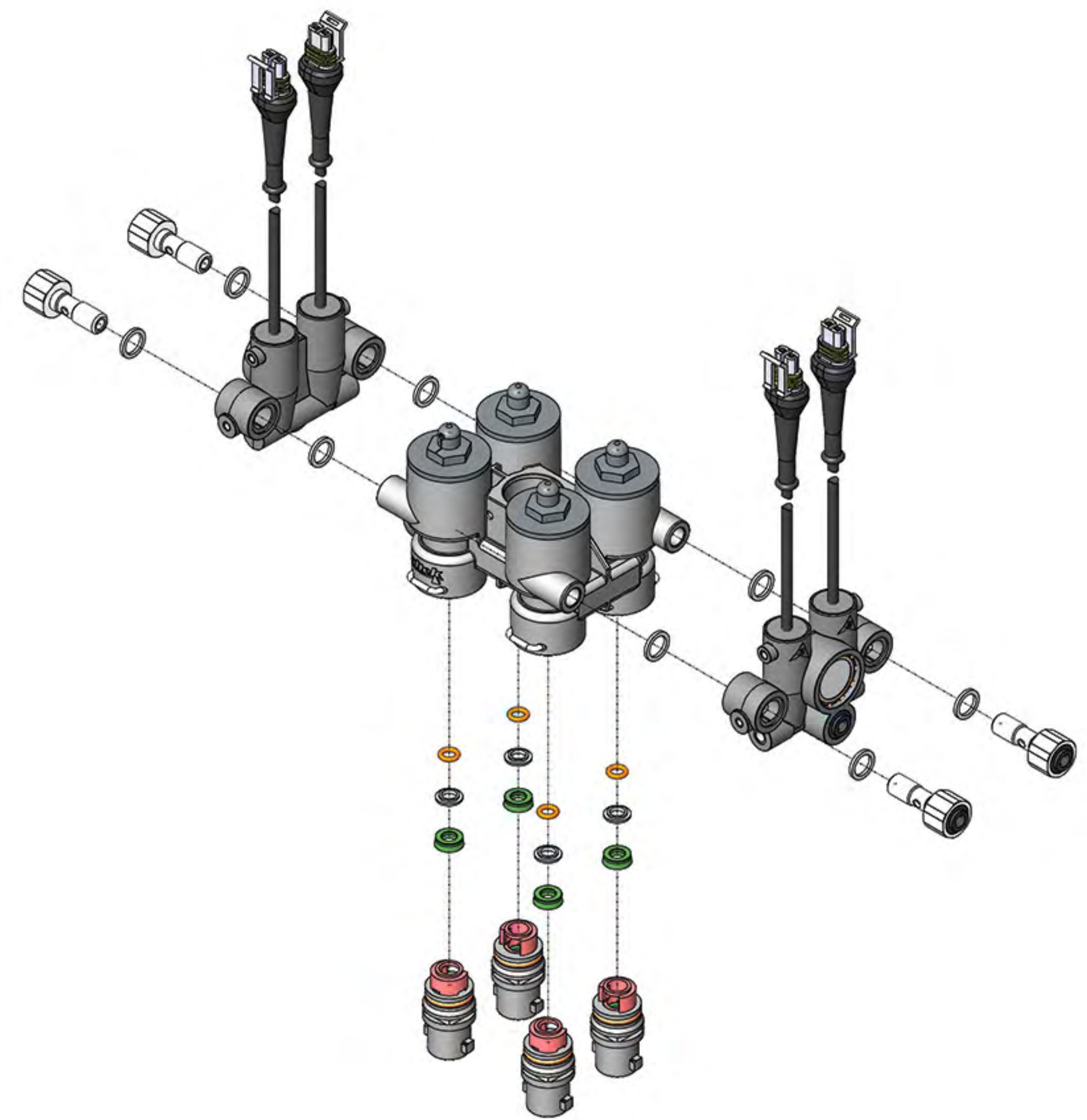
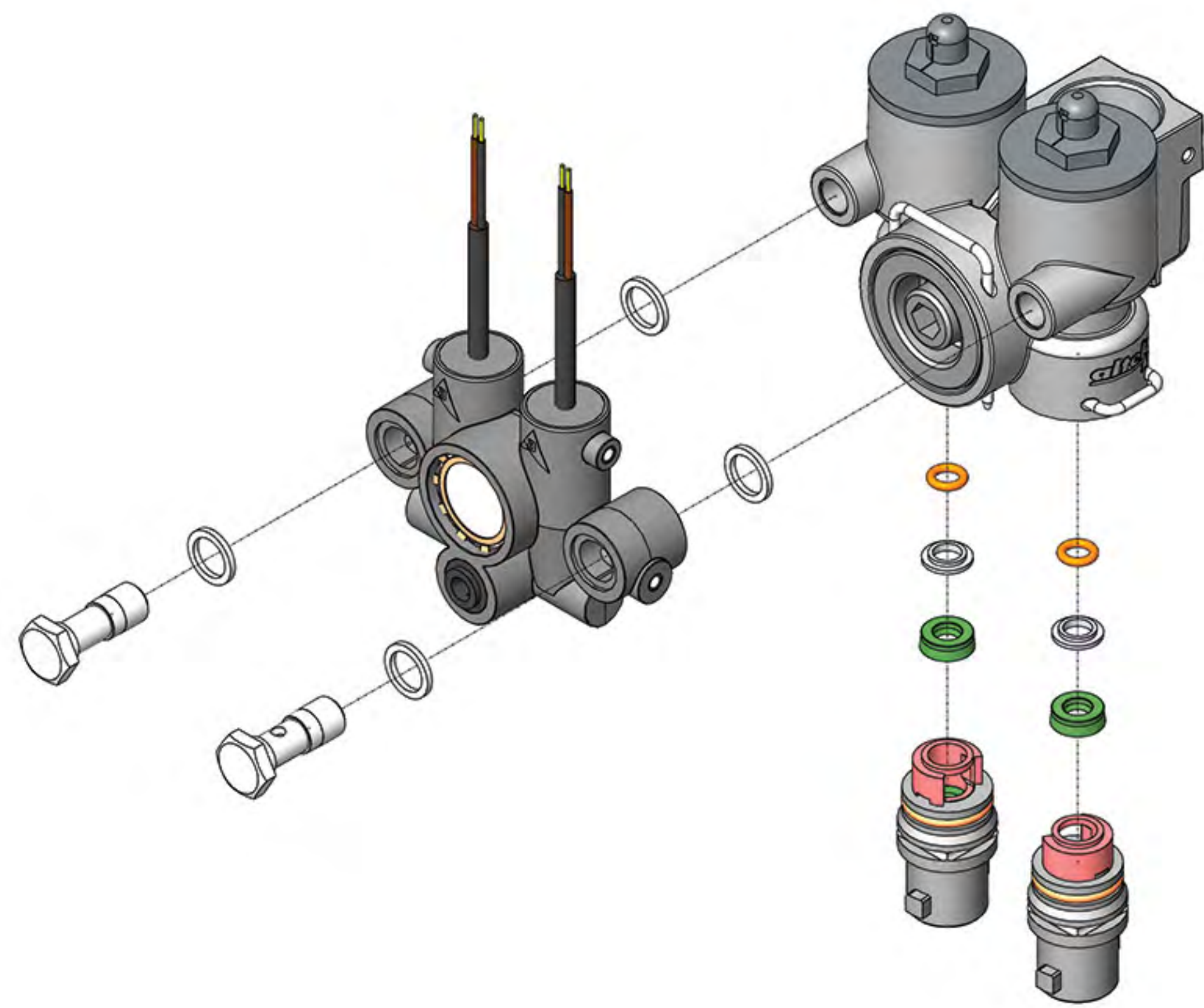


Quad line control INC Modules (8 x outputs) spaced at 1.0m typically

Note: As the modules are designed with flexible hardware/software and external cabling alternate nozzle spacing's, and spray control can be adapted to as required

Modular Design Twin & Quad Bodies:

Parts that are susceptible to wear or accidental damage can be easily replaced including the Nozzle holder clamp.



NOZZLE SPY FLOW MONITORING

This option provides feedback to the operator that all individual nozzle positions are operating correctly. Any deviations to the flow outputs outside of the set value will be indicated on the sprayer terminal in the operator cab.



User interface:



The In house developed 10" Touchscreen LT PC Terminal with integrated NavGuide GPS solution provides the User interface for the operator. The intuitive Lykketronic platform is used to setup the number of nozzles installed on the machine, nozzle size/colour installed at each position (assuming Twin or Quad line) as well as Virtual sections for manual control/override.

The NavGuide GPS solution can provide all typical Precision AG features and supports multiple GPS solutions including RTK, Variable Application Rate via Prescription map, Auto Steer control via Ag Junction ECXU-S1 and Filed data import export via shp file are only some of the features available.

Activation of ASC - VRA - ANS

**Manual Selection of Lines
Nozzle colour installed
Current nozzle/line status
Output per nozzle L/min**

1		0.00 l/min
2		0.99 l/min
3		0.00 l/min
4		1.48 l/min

**Forward speed
Application Rate**

12.0 Km/h

136 0% L/Ha

Master Spray

Auto/Man Regulation

Flow/Pressure reg

**Individual nozzle status
Manual section status**



INC control features:

INC:

The Lykketronic INC solution can control Auto Section Control (ASC) via GPS to individual nozzle resolution, this is typically with 0.5m spacing nozzles but can also support 0.3m and 0.25m as well as other spacings (e.g., Imperial) due to the flexible design of the module wiring and software setup parameters.

ANS:

Auto Nozzle Select (ANS) is a system designed to Automatically select the nozzle(s) installed on the machine most appropriate for the current speed or application rate. This feature requires at least a Twin line or Quad line (or more) to allow multiple nozzles to be used and/or in combination to adjust output dynamically as speed increases significantly or application rate varies (VRA map or dynamic rate adjustment).

All Chemical application nozzle type can be used with this system including Air inclusion nozzles & Twin nozzles.

Also, the ANS system can control two or more fertiliser application nozzles including Dribble bars, allowing a completely flexible solution for almost all applications.

Altek True Turn:

When a sprayer begins to turn the boom tip speeds vary significantly, this is magnified by the width of the boom along with the rate of turn.

As the INC system monitors and controls each nozzle position and line along with its relative forward speed it can also compensate the application rate accordingly

Flow Regulation:

Fast Flow & Pressure regulation using **Altek SBR500**

The Altek SBR 500 regulation valve has been developed to provide fast reacting and proportional flow control with integrated feedback if required to ensure controlled application at all times.





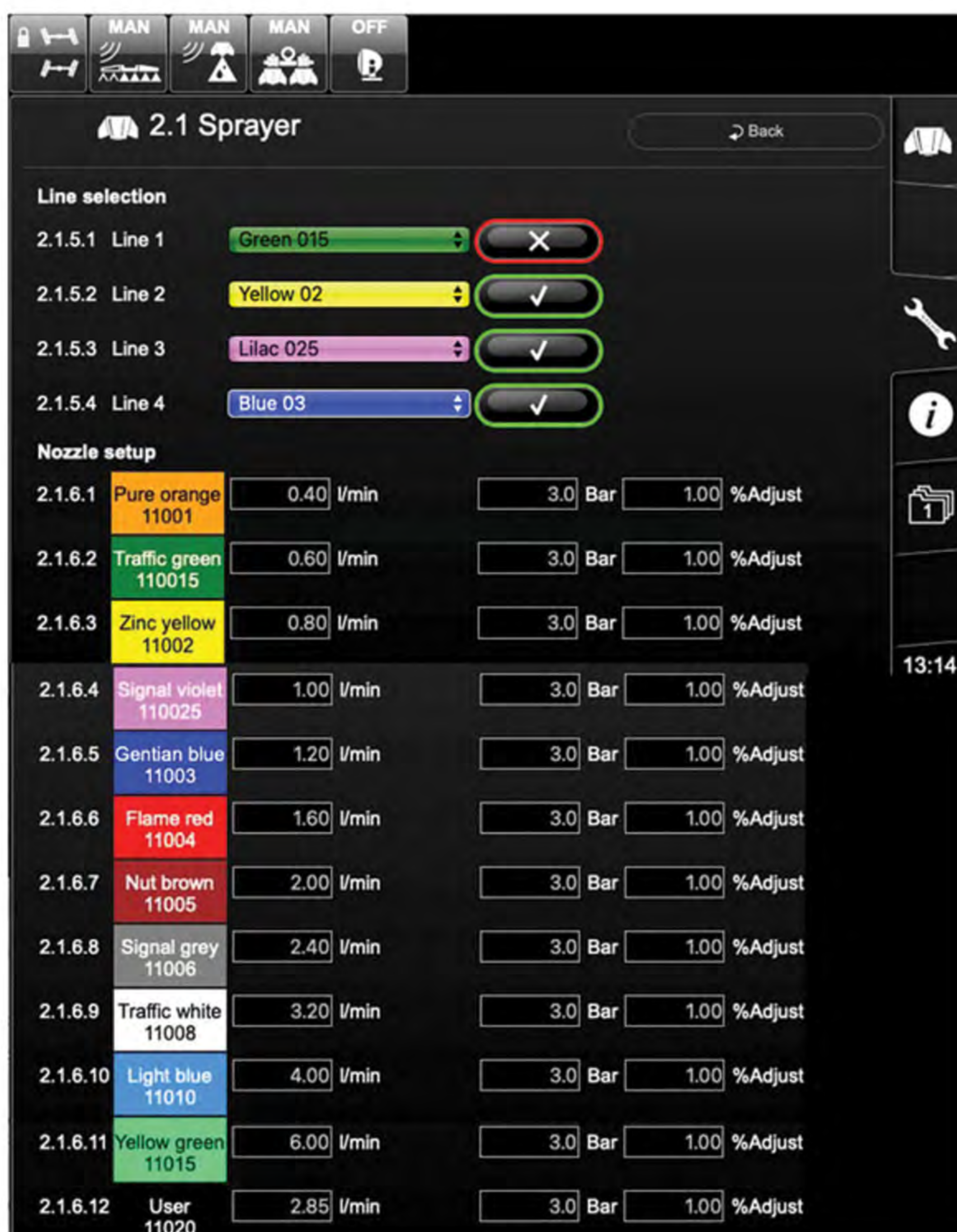
System setup:

The intuitive menu structure guides the operator to setup the system as the current application requires.

Nozzle installed and selected:

All ISO nozzle sizes are preset although all nozzle outputs can be adjusted manually or automatically for wear and User defined nozzles can also be entered as required, i.e., for liquid fertiliser with multiple settings.

The nozzle colour/size is entered for each nozzle position – the example shows a quad line machine fitted with Green 015, Yellow 02, Lilac 025 and Blue 03 nozzles. Nozzles not required for this application can be blocked as shown below – where Line 1 Green ISO 015 has a Red cross. This nozzle cannot be used manually or automatically in ANS or Turn Compensation modes.



The ANS system can be operated in 3 modes:



MAN – This allows manual operation of the Spray lines – typically used to manually select a specific nozzle(s) for an application, for instance to select the only liquid fertiliser nozzle installed on the Boom – or a specific type of nozzle for a specific application.



AUTO – This activates Auto Nozzle Select mode where the activated nozzles/lines are Automatically selected across the full boom width according to preset pressure parameters. This is explained in detail as below.

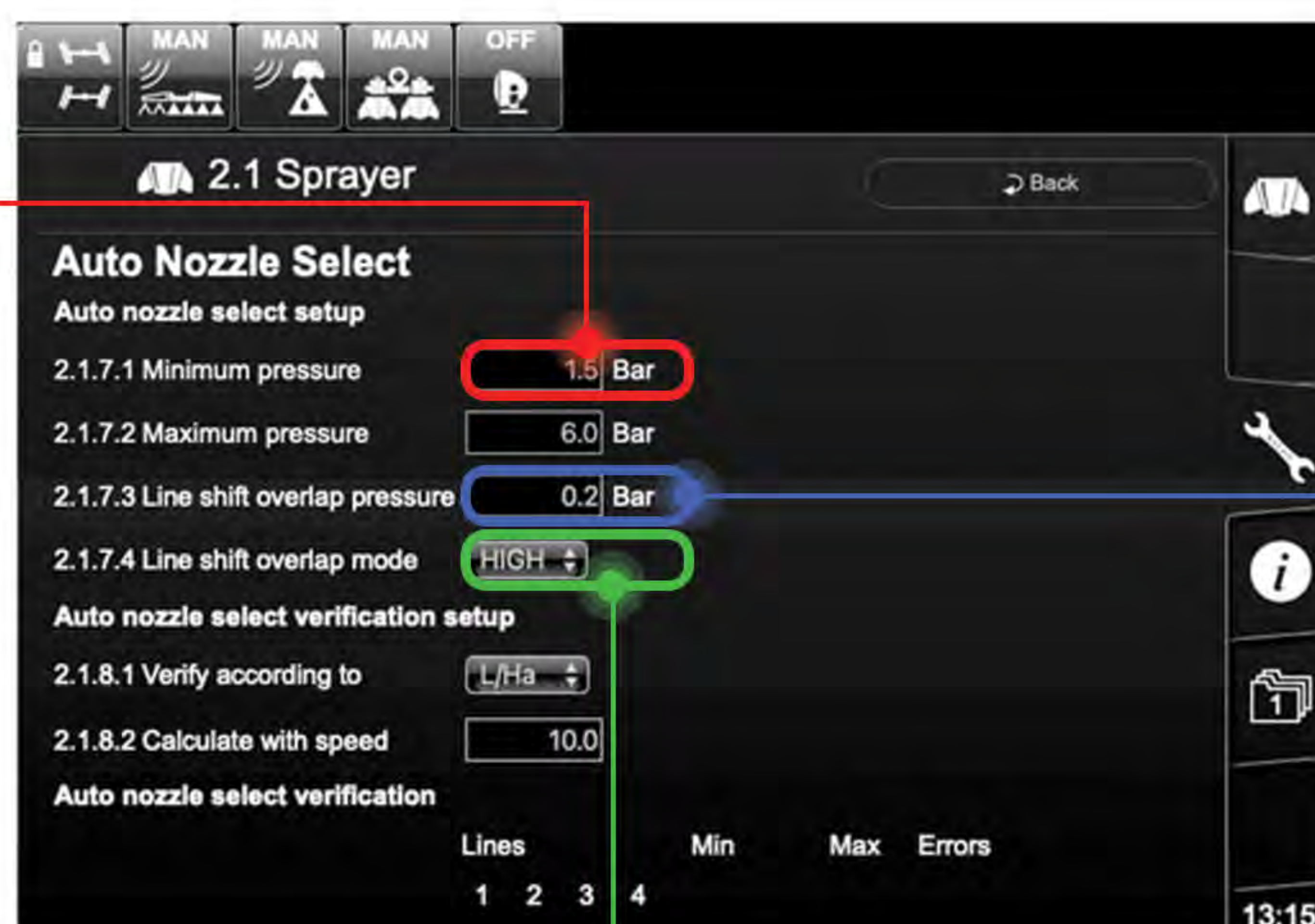


TURN – This mode allows Auto Nozzle Select as above, but automatically selects the ideal nozzle(s) according to the forward speed of each nozzle position, i.e., if the machine turns at 12kph the forward speed across the boom varies significantly as the rate of turn increases and therefore the nozzle selected by ANS is different across the boom width to suit the calculated forward speed of each individual nozzle

ANS Parameter setup:

Min/Max pressure

According to the nozzles installed and/or selected the Minimum desired operating pressure and maximum desired operating pressure are defined as shown below. Note this will vary according to type of nozzle installed – it is important to ensure all nozzles active are from the “same family” i.e., Lechler IDKT or IDTA.



Line shift overlap pressure

The Overlap pressure between nozzles is also defined to allow a “band” of overlap to avoid hysteresis when shifting from one nozzle to the next.

Line shift overlap mode

As spray pressure increases with an increase in forward speed and/or application rate, the nozzle selected will shift to the next available nozzle size/combination. The shift mode allows the nozzle to shift at the lowest possible pressure or highest according to application.



Nozzle verification:

The nozzle verification display allows a clear and intuitive overview to demonstrate the ANS operation according to the current parameters. If the current setup is not possible an Error is shown to highlight changes are required.

Note: The setup below shows the Nozzle on line 1 is not active therefore the ideal ANS operation cannot be made.

The ANS system can verify the current ANS setup according to:

L/Ha
Kph
L/min

The ANS auto shifting of nozzles in sequence from lowest output to highest is graphically represented showing line selected as well as corresponding output (L/Ha at 12kph shown).

Lines	1	2	3	4	Min	Max	Errors
	●	●	●	●	35.50	50.20	
	●	●	●	●	44.20	62.80	OK
	●	●	●	●	53.00	75.40	OK
	●	●	●	●	79.70	113.10	ERROR
	●	●	●	●	88.50	125.60	OK
	●	●	●	●	97.20	138.20	OK
	●	●	●	●	132.70	188.50	OK

Any Errors are shown in Red as per the 4th line shift between the nozzle on Line 4 and combination of nozzles on lines 2&3, where the Nozzle on line 4 can only produce 75.4 L/Ha at 12kph and the next available shift in ANS is a combination of Line/Nozzles 2 & 3 producing 79.70 L/Ha at 12kph.

The overlap of the application rate per Nozzle/Line selection is shown and if this corresponds to preset overlap and hysteresis OK is stated in Errors.

Note: The error shown can be solved by reducing the minimum pressure, increasing the maximum pressure or a combination of both or activating the nozzle on line 1



Range of operation:

The current ANS setup shown with all 4 x Lines active, demonstrates that at 100 L/Ha application rate the minimum forward speed is 3.0 kph and the maximum is 27.1kph whilst not exceeding 4.0 BAR maximum pressure or dropping below 1.8 Bar. Although this is typically not a normal application speed range the capability of the system can be seen and when Turning of the boom is considered the min and max speeds of the tips can vary significantly.

3.0kph Min speed
1.8 Bar Min
4.0 BAR Max
100 L/Ha

2.1 Sprayer							
Auto Nozzle Select							
Auto nozzle select setup							
2.1.7.1 Minimum pressure		1.8	Bar				
2.1.7.2 Maximum pressure		4.0	Bar				
2.1.7.3 Line shift overlap pressure		0.5	Bar				
2.1.7.4 Line shift overlap mode		HIGH					
Auto nozzle select verification setup							
2.1.8.1 Verify according to		Km/h					
2.1.8.3 Calculate with L/Ha		100					
Auto nozzle select verification							
Lines	1	2	3	4	Min	Max	Errors
	●	●	●	●	3.00	4.50	
	●	●	●	●	4.00	6.00	OK
	●	●	●	●	5.00	7.50	OK
	●	●	●	●	6.00	9.00	OK
	●	●	●	●	7.00	10.50	OK
	●	●	●	●	8.00	12.00	OK
	●	●	●	●	9.00	13.50	OK
	●	●	●	●	9.00	13.50	OK
	●	●	●	●	10.00	15.00	OK
	●	●	●	●	11.00	16.50	OK
	●	●	●	●	12.00	18.00	OK
	●	●	●	●	13.00	19.60	OK
	●	●	●	●	14.00	21.10	OK
	●	●	●	●	15.00	22.60	OK
	●	●	●	●	18.00	27.10	OK

27.1kph Max speed
1.8 Bar Min
4.0 BAR Max
100 L/Ha



Range of operation:

In order to provide greater flexibility of the INC 2.0 system, Lykketronic have developed an “ISO-Bridge” solution which will enable the INC system to work on machines using ISOBUS control platforms. This allows existing machines in the field to be upgraded to Individual Nozzle Control and benefit from the features of ANS and Turn Compensation along with future features of the INC 2.0 solution.

At present alongside the UK prototype machines, 2 x machines have been operating in the US with this system for several months trouble free – with the use of Lykketronic Remote support feature allowing the operator to utilise his Mobile phone as a WIFI hotspot, software updates and settings have been remotely managed in peak spraying season to ensure the operator is fully supported at all times.



James Wilson of H. A. Day and Sons, Farms 600 Ha of Arable and 50Ha of Veg crops near Cheltenham in Gloucestershire and sprays around 5500 Ha per annum.

James explains that they have been using single nozzle shut off systems on multi-lines for the past 9 seasons. Originally this was a twin line system until 4 seasons ago when they upgraded to a 4-line individual nozzle system. This was again upgraded to the latest altek Smart C Spray system during the latter part of 2020 in time for the Autumn. James explains why he feels this was the right decision.

Following another wet autumn and winter, some crop establishment on our heavy clay fields had been poor, areas that lay wet for long periods, were thin and bare, allowing problem blackgrass and other weeds to dominate. With some areas of fields looking good, with a thick healthy crop and contrasting thin area spread around the field, thickening with weeds, it was a difficult decision to know what to do with these fields. We could not easily write off some areas of the field without losing good crop. With manually patch spraying fields using the sprayers 3m sections it is very difficult to get all the blackgrass without sacrificing large areas of good crop due to the irregular shapes with which the weeds grow and spread.

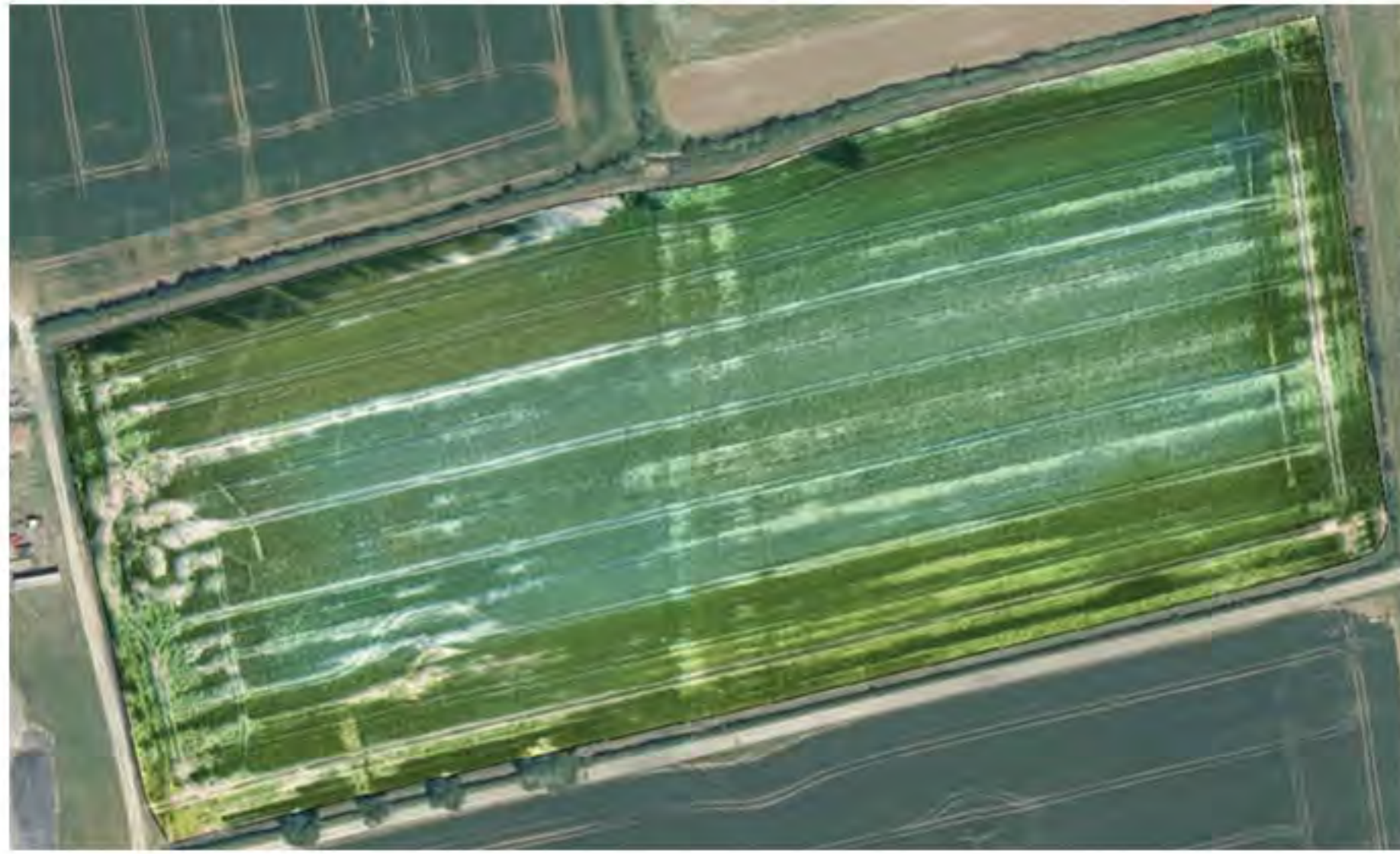
Using a mosaicked drone image of the field, it was possible to identify the problem patches, then draw over the top of the image, creating zones which can be sprayed.

These zones were then turned into shape files and loaded into the sprayers Smart C Spray Controller which then allows us to apply product using the Individual Nozzle Control. The sprayer is simply driven over the whole field and it automatically turns the required nozzles on when needed (and off when not) with no operator input.

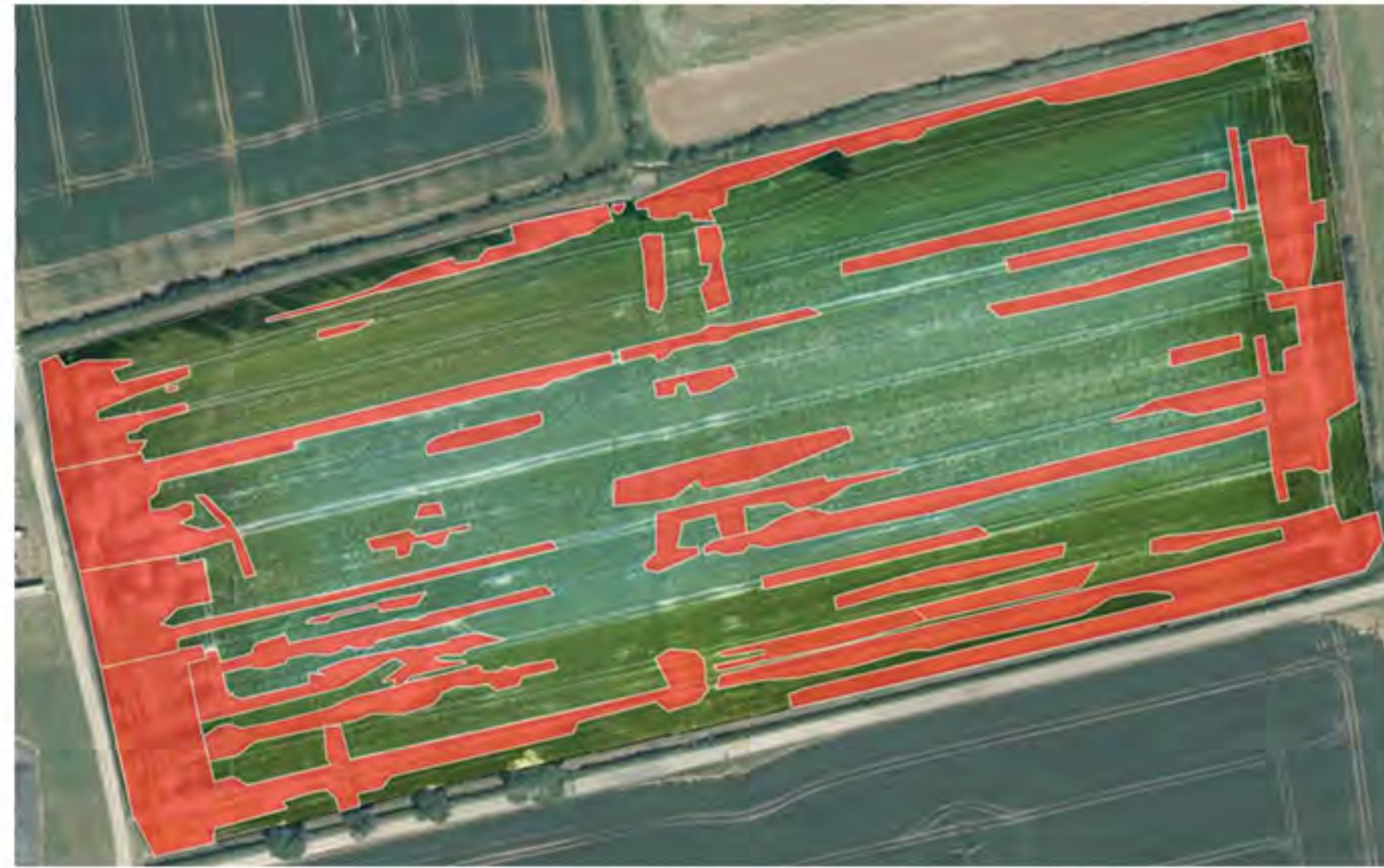
This allowed accurate application of herbicide to the problem areas only and enabled the retention of 66% of the crop in the field below, which alternatively we would have had to spray off most, if not all of the field.

Following the herbicide treatments, we were then able to flip the herbicide map, to apply fungicide and liquid fertiliser to the wheat, whilst not applying it to the previously desiccated areas. Thus, saving money by only applying products to where they were needed and not wasting it on the 33% of the field with no crop.

With the smart C spray system these applications were sprayed effectively in 0.5m sections, minimising any waste in crop and applied products.



Drone images, mosaicked together to create high resolution image of problem field



Drone image with weed areas marked out to be sprayed off in red



Yellow area is the reversed map, spraying only the remaining crop.

Following the success of the black grass treatments we have now used the system to apply pesticides and fertilisers more efficiently by identifying areas of poor crop establishment within a field, these are marked out with a smartphone, and no pesticides and fertilisers were applied to these areas.





Your partner for precision farming applications



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