



Knowledge grows

# Yara N-Sensor ALS-2

User manual - english



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# 1) Product summary



optional  
↔



(2 x) Brackets  
part no. 21-1361



(8 x) Bolts  
M6x8

## Delivery contains:



(2 x) N-Sensor Head ALS-2  
(left and right)  
part no. 21-6500



N-Sensor Head, rear side (two equivalent connectors for connecting the terminal and other Heads)



(1 x) Y-cable (2m)  
N-Sensor Head to power/  
LAN  
part no. 21-6583  
or 21-6586



(1 x) Connection cable (3m)  
N-Sensor Head to N-Sensor  
Head  
part no. 21-6581



(1 x) Elongation cable (4m)  
N-Sensor Head to elongation  
part no. 21-6582

# 1.1) Required and optional components

## Required:

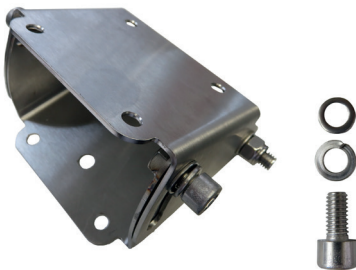


Terminal  
(with LAN (RJ 45))

## Optional equipment for tractor roof mounting of the N-Sensors ALS-2:



(1 x) Traverse  
Housing for roof mounting  
part no. 21-1360

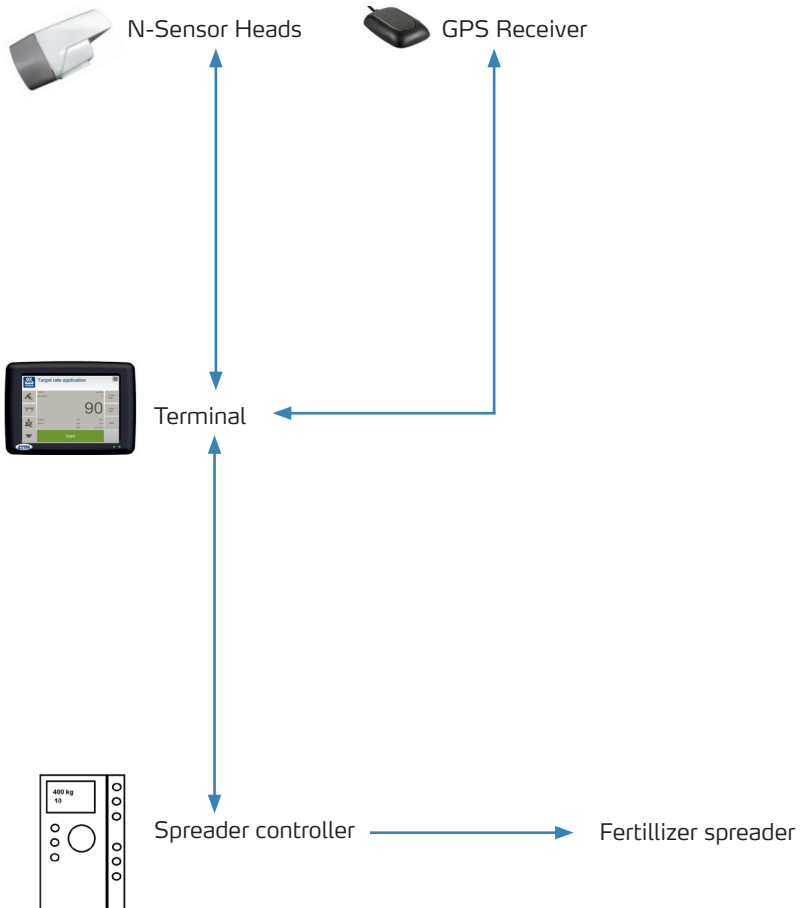


(2 x) Steel brackets with screws  
Direct mounting of the N-Sensor Heads without additional housing  
part no. 21-1361

# 1.2) Installation and components

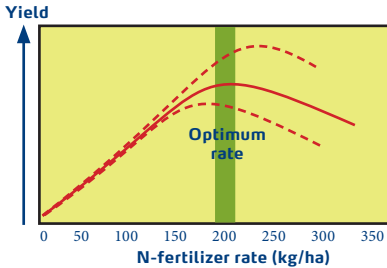
## Please Note:

The installation of the Yara N-Sensor should only be done by your local N-Sensor distributor or service company. Yara N-Sensor Head, terminal and spreader controller need to be configured properly. The installation is described in the Installation guide for technicians.

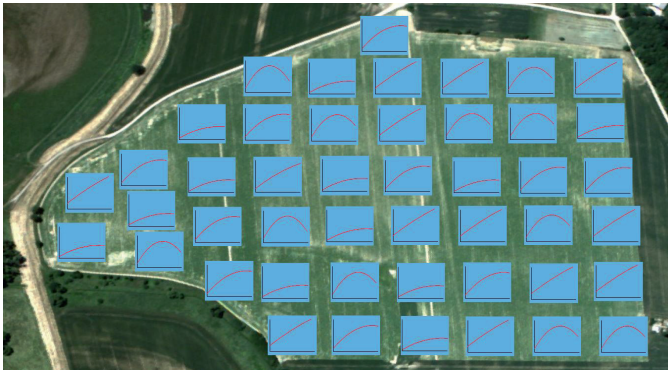


## 2) Introduction

Nutrient supply within a field can be highly variable. Uniform application of nitrogen fertilizer results in over- and under-fertilization. The challenge is to measure the current local nitrogen supply and adapt the fertilizer rate accordingly.



The target is to find the optimum nitrogen rate in order to maximize the farmer's profit and to protect the environment as much as possible.

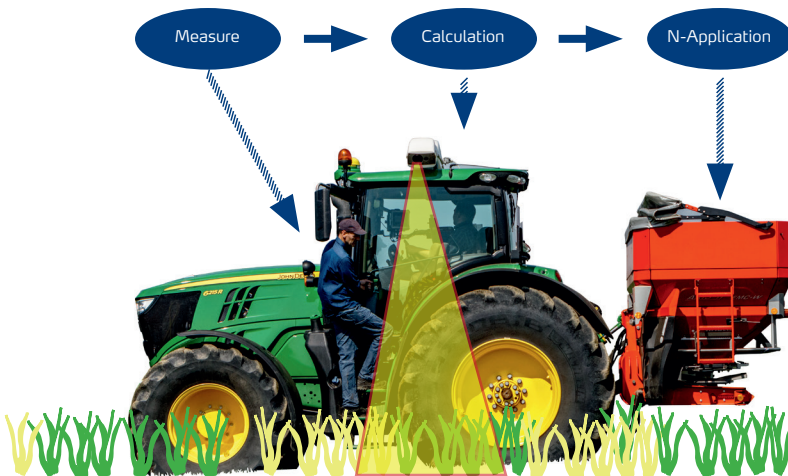


On heterogeneous fields, the optimum nitrogen rate can be different on every spot in the field.

Heterogeneous fields are the rule.

Site-specific crop management is a logical consequence.

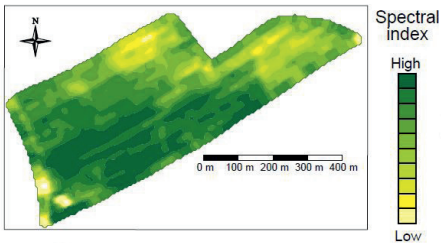
We use remote-sensing technology with tractor mounted sensors. The concept is:



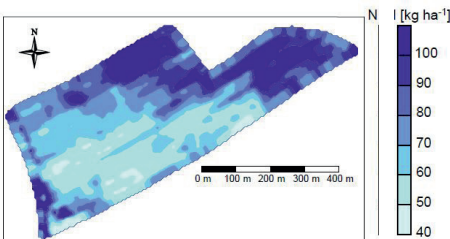
## 2.1) N-recommendation



The Yara N-Sensor measures light interaction with leaves. It emits light in the red and near-infrared range and measures the amount of reflected light. From the measured reflection of the leaves the N-uptake is calculated. The N-Sensor is typically mounted on an agricultural machine.



The Yara N-Sensor records the collected data. Areas which need more or less N will be identified automatically by the N-Sensor.



The Yara N-Sensor is connected to the spreader, which applies different N-rates during the scanning process. The minimum and maximum rates can be set in the terminal.

Benefits of using a N-Sensor:

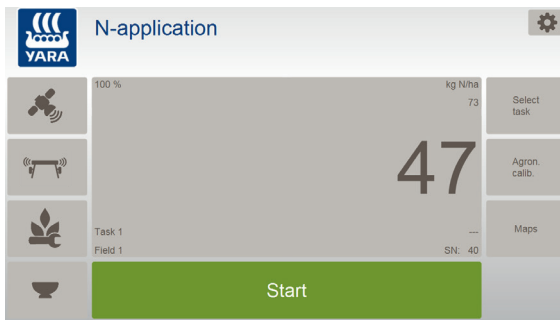
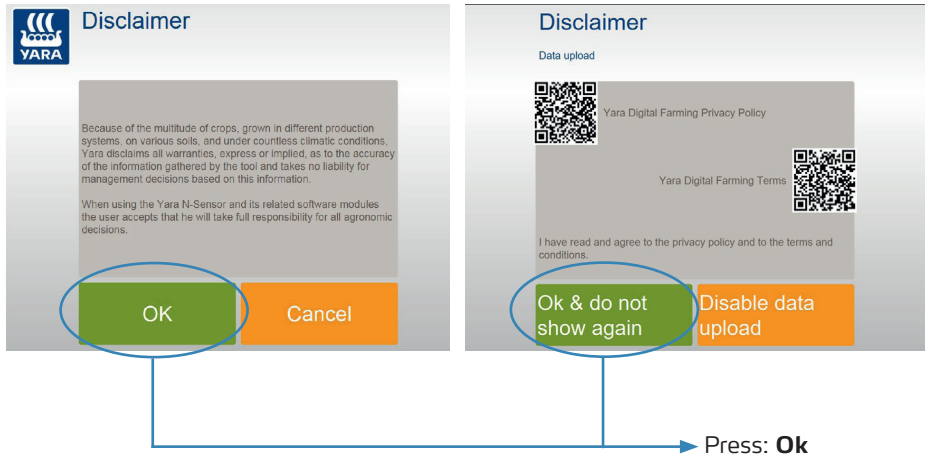
- Yield increase
- N savings
- Improved N balance
- Reduced risk of crop lodging
- Improved combine performance
- Enhanced and more even protein content

# 3) N-Sensor software

## 1) Starting the N-Sensor software

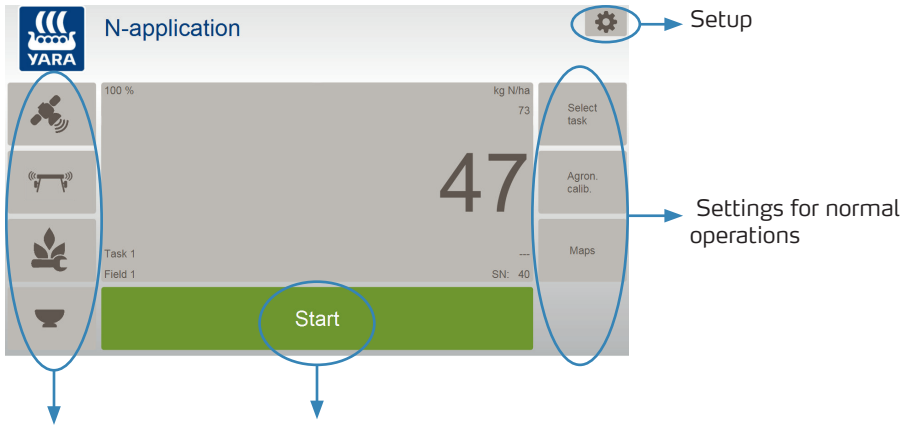


## 2) Accept Disclaimer



# 3) N-Sensor software

## 3) Menu overview

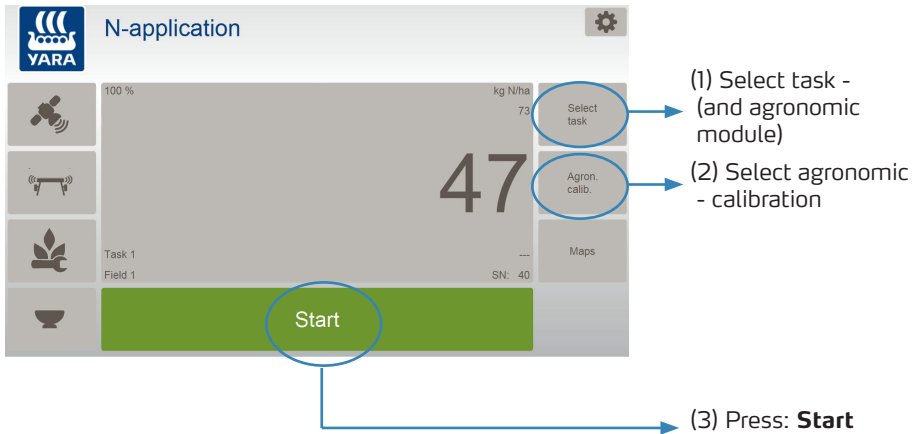


Status icons:

Start/Stop button

- grey = Ok
- yellow = Warning
- red = Critical warning or malfunction

## 4) General steps to start N-Sensor software modules

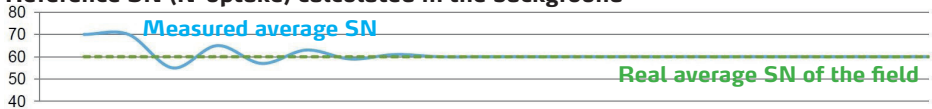


# 3.1) Target rate application module

## General information: Target rate application

- The module *Target rate application* uses a “self-learning” calibration, which applies a pre-selectable average rate on a field.
- No in-field calibration is required, because the reference N-uptake is calculated in the background. The N-Sensor needs some measurements to approach the mean value.

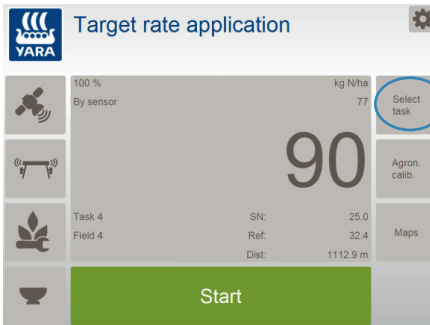
### Reference SN (N-uptake) calculated in the background



(Example - The average value and the variance differ in your field)

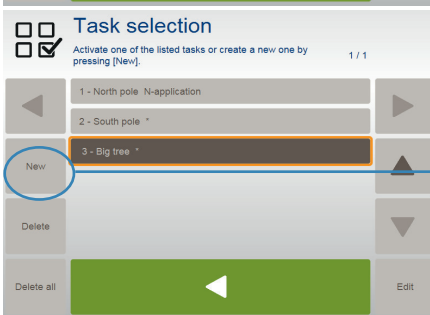
# 3.1) Target rate application module

5)



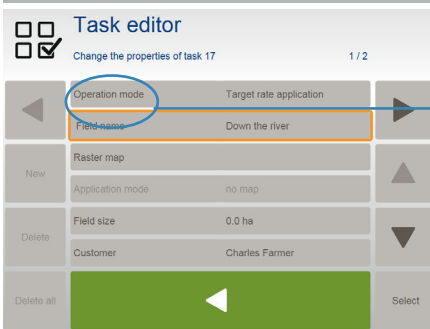
Press: **Select task**

6)



Press: **New**  
Remember: 1 task = 1 field

7)



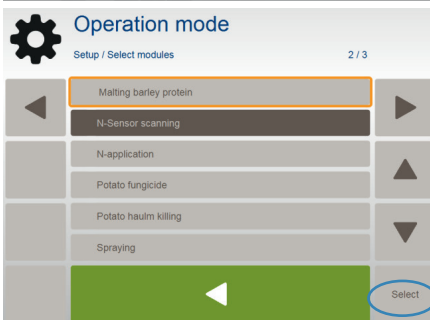
Press: **Operation mode**  
Choose: **Target rate application**

Use **arrows** to navigate to:  
**Target rate application**

Press: **Select**

Select and fill in the task menu  
the following optional information:

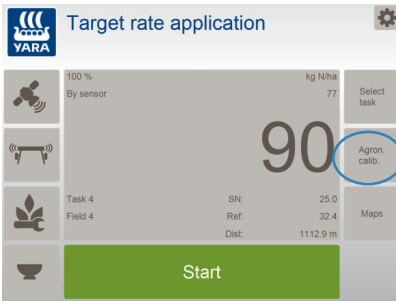
8)



- **Field name:** (File name in logfile)
- **Raster map:** (Stored as information in the logfile - only available if a rastermap is preset in the data directory)
- **Application mode:** (if map-file was selected.)
- **Field size**
- **Customer**
- **Worker**
- **Comment**

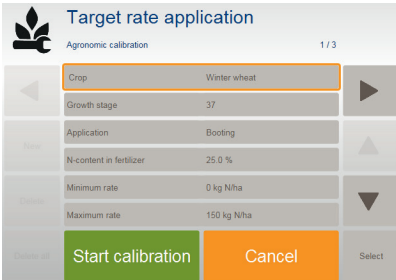
# 3.1) Target rate application module

9)



Press: **Agron. calib.**

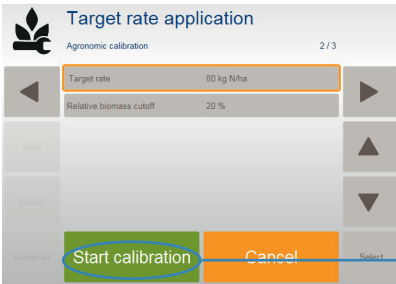
10)



Choose and enter:

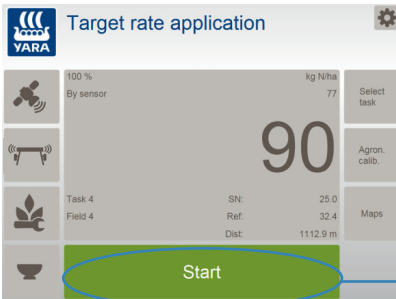
- **Crop**
- **Growth stage** (e.g. 37)
- **Application** (eg. booting)
- **N-content in fertilizer** in % (e.g. 25%)
- **Minimum rate** in kg/ha (e.g. 20 kg/ha)
- **Maximum rate** in kg/ha (e.g. 120 kg/ha)
- **Target rate** in kg/ha (e.g. 70 kg/ha)
- **Relative biomass cutoff** in % (e.g. 20%)

11)



Press: **Start calibration**

12)



Press: **Start**

- Drive over the field.
- The calibration works in the background
- Press **“Stop”** if you have finished N-application.

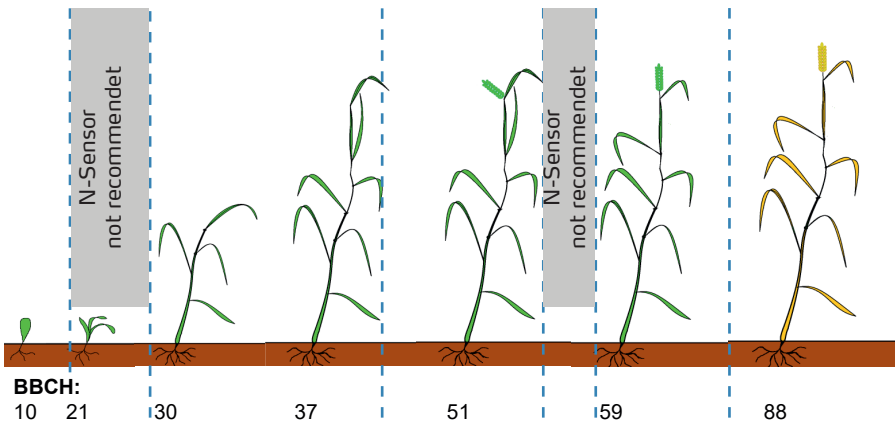
## 3.2) N-application module

### General Information: N-application

- The N-application operation mode is the standard mode to use the N-Sensor for many crops. (cereals, OSR, potatoes, sugar cane, cotton, maize,...)
- Reference plot calibration is required before N-application. (i. e. through N-Tester, if available in your specific country)
- Calibration curve (slope, biomass cutoff) depends on crop type and growth stage.
- For cereals in growth stage 37-51 you can choose between two calibration curves ("booting" and "protein dressing")
- You can set the general biomass cutoff factor.

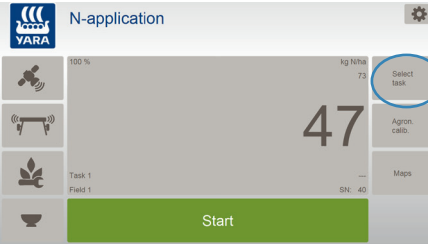
### Example cereals:

Tillering	Stem elongation	Booting or early protein dressing	protein dressing
(GS: 20-29)	(GS: 30-36)	(GS: 37-51)	(GS: 59-69)
N rate uniform	N rate variable	N rate variable	N rate variable



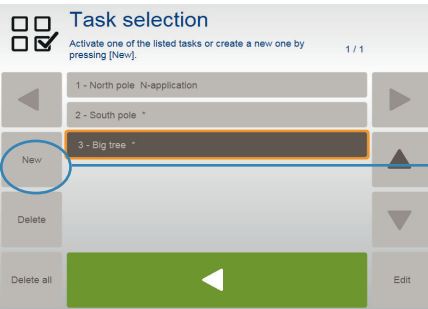
## 3.2) N-application module

13)



Press: **Select task**

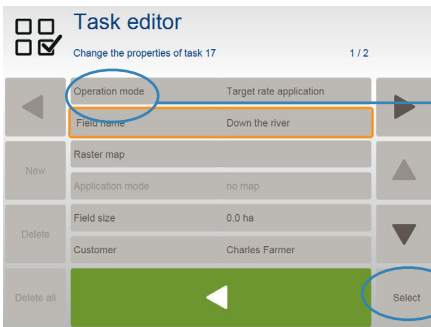
14)



Press: **New**

- Remember: 1 task = 1 field

15)



Press: **Operation mode**

- Choose: N-application

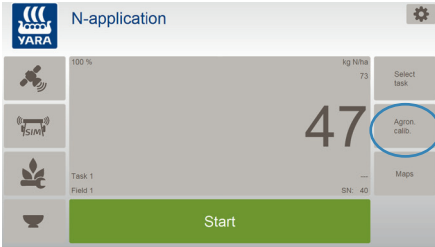
Use **arrows** to navigate to:  
**N-application**

Press: **Select**

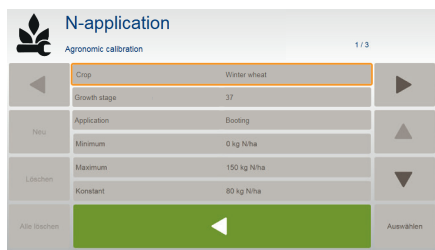
Select and enter in the Task Menu the following optional information:

- Field name:** (File name in logfile)
- Raster map:** (Assigned to task, stored in data directory)
- Application mode:** (if map-file was selected.)
- Field size**
- Customer**
- Worker**
- Comment**  
(Information stored in logfile)

## 3.2) N-application module

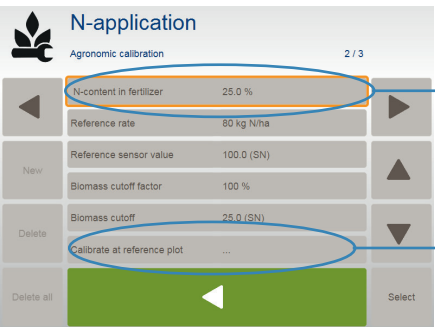
16) 

Press: **Agron. calib.**

17) 

Choose and enter:

- **Crop**
- **Growth stage** (e.g. 37)
- **Application** (eg. booting)
- **Minimum rate** in kg/ha (e.g. 20 kg/ha)
- **Maximum rate** in kg/ha (e.g. 120 kg/ha)
- **Uniform rate** in kg/ha (e.g. 60 kg/ha)

18) 

Press and choose: **N-content in fertilizer** in % (e.g 25%)

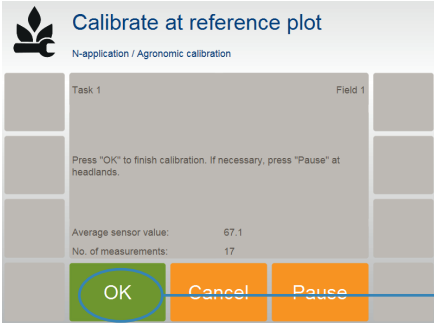
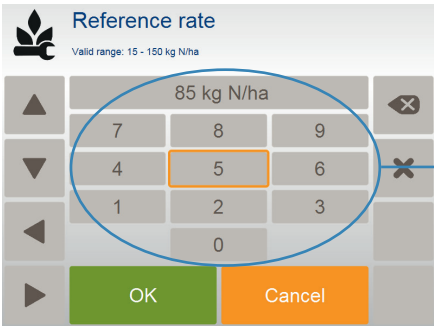
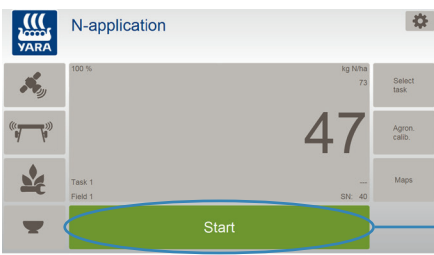
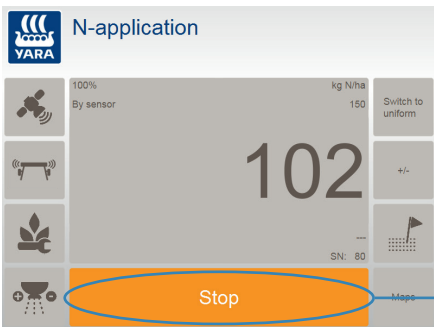
Press: **Calibrate at reference plot**

19) 

Press: **Start**

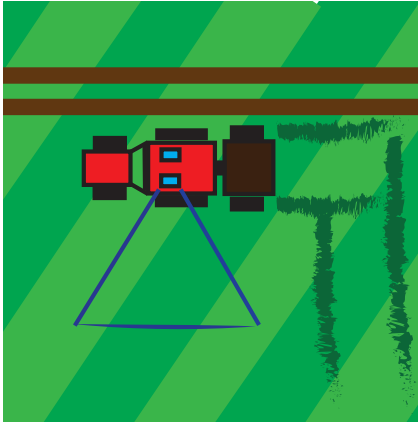
- Start at a normal-developed part of the field
- Drive slowly through reference area (15m)

## 3.2) N-application module

- 20)  Calibrate at reference plot  
N-application / Agronomic calibration
- Task 1 Field 1
- Press "OK" to finish calibration. If necessary, press "Pause" at headlands.
- Average sensor value: 67.1  
No. of measurements: 17
- OK Cancel Pause
- Press: **Ok**
- To finish calibration
- 21)  Reference rate  
Valid range: 15 - 150 kg N/ha
- 85 kg N/ha
- 7 8 9  
4 5 6  
1 2 3  
0
- OK Cancel
- Please note:  
The reference N-rate kg/ha is valid for the reference area of the calibration and not for the average of the whole field.
- Press: **OK**
  - Press: **Green arrow** to go back to main screen
- 22)  N-application
- 100% kg N/ha 73 Select task
- 47 Agron. calib.
- Task 1 Field 1 SN: 40 Maps
- Start
- Press: **Start**
- To start N-application during driving
- 23)  N-application
- 100% kg N/ha 150 Switch to uniform
- By sensor 102 +/-
- Task 1 Field 1 SN: 80 Maps
- Stop
- Press: **Stop**
- If you want to finish or pause your N-application

## 3.3) One-side N-Sensor usage

### Background



- For extended field border measurements, deactivate the left or right sensor individually via button.
- This prevents inaccurate measurements and spraying results from faulty sensor readings.
- This is not necessary when covering the field in parallel passes and turning at the ends.

### Preparation

1)



Activate mode:

Select: **Configure modules**

Press: **ALS-2**

2)



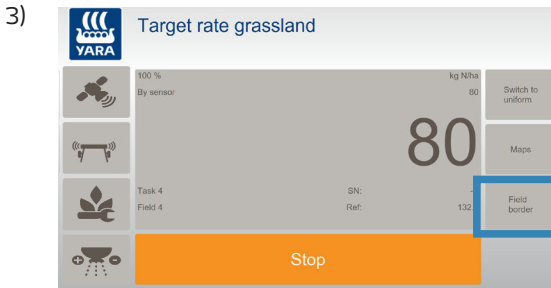
Press: **Field Border Switch**

Select: **On**

Press: back 2x to main menu

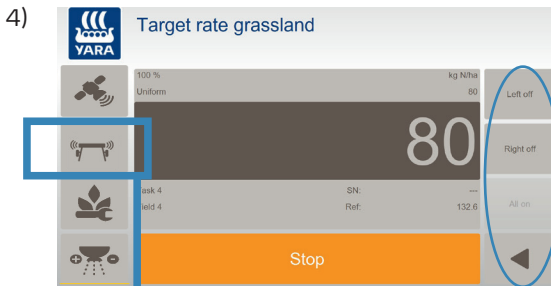
# 3.3) One-side N-Sensor usage

## Usage



Select Option:  
**Field border**

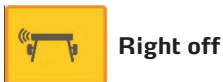
Note: You may need to deactivate certain auxiliary services to access this button.



Select Option:

**Left off**  
**Right off**

**All on** (normal mode)  
**Back** (main menu)



## 3.4) Additional modules

### 1) Free calibration

- Two-point calibration
- Designed for crops and conditions where no other recommendation is available

Free calibration		2 / 4
Agronomic calibration		
Reference rate 1	80 kg N/ha	
Reference sensor value 1	100.0 (SN)	
Reference rate 2	80 kg N/ha	
Reference sensor value 2	100.0 (SN)	
Biomass cutoff factor	100 %	
Biomass cutoff	20.0 (SN)	
Select		Select

### 2) N-Sensor Scanning

- Scan fields with the N-Sensor (S1, SN, GBI)
- Records data in standard log file format
- No on-line application
- No implement (spreader, sprayer) required
- Used for i. e. oilseed rape autumn scanning or grassland

N-Sensor scanning		1 / 2
Agronomic calibration		
Crop	Spring wheat	
Growth stage	37	
Working width	24.0 m	
Select		Select

### 3) Malting Barley Protein

- Absolute calibration for malting barley topdressing
- Developed only for Swedish conditions
- Target: Achieve specific protein level at harvest

Malting barley protein		1 / 3
Agronomic calibration		
Region	Norra Götaland	
Seeding month	April	
Seeding day	15	
Growth stage	31	
Variety	Tippel	
Biomass cutoff	20 SN	
Select		Select

### 4) Absolute N-Application OSR

- Application of N in winter oilseed rape based on absolute N-Sensor readings
- Assumptions:
  - No autumn application
  - Two applications in early spring
  - Yield level between 3 and 6 t/ha
  - Sufficient water supply

Absolute N-application OSR		1 / 3
Agronomic calibration		
Application	2nd dressing	
Growth stage	30	
Yield expectation	4 - 5 t/ha	
Mineralisation potential	medium	
N-content in fertilizer	27.0 %	
Select		Select

## 3.4) Additional modules

### 5) Spraying

- Application of farm chemicals
- User-defined calibration function (slope)
- Target rate approach

Parameter	Value
Crop	Winter wheat
Growth stage	31
Slope	1.0 %/SN
Minimum rate	0 l/ha
Maximum rate	150 l/ha
Target	80 l/ha

### 6) Herbicide Application

- Spot spraying of (green) weeds in a (brown) canopy
- Simple threshold approach (user-defined)
- Apply higher rate on green spots

Parameter	Value
Crop	Winter wheat
Growth stage	31
Minimum rate	20 l/ha
Uniform rate	80 l/ha
Biomass cutoff	50 SN

### 7) Base application

- Apply rates from a prescription map
- N-Sensor does not need to be present
- If present, N-Sensor readings are recorded, but not used for application
- Possible applications:
  - 1st Nitrogen dressing
  - Application of P and K
  - Liming

Parameter	Value
Uniform rate	90 kg/ha
Agent content	25.0 %
Map factor	50.0 %
Agent	P2O5
Unit	kg/ha

### 8) Absolute N-application cereals

- Application of N in winter cereals based on absolute N-Sensor readings
- Assumptions:
  - Crop: Winter wheat (winter barley under development)
  - Farming practice with 3 topdressings
  - No additional dressings (i. e. protein dressing)
  - Sufficient water supply
  - Final yield between 6-12 t/ha

Parameter	Value
Crop type	Winter wheat
Application	3rd dressing
Growth stage	39
Yield expectation	10 t/ha
Mineralisation potential	high
N-content in fertilizer	27.0 %

**Please Note: Further modules are available from third party companies**

## 3.4) Additional modules

### 9) Target rate grassland

- Designed for grassland
- The module *Target rate application* uses a “self-learning” calibration, which applies a pre-selectable average rate on a field.
- No in-field calibration is required.
- Reference N-uptake is calculated in the background.

### 10) N-application (zero plot)

- Sweden only
- Module works like the conventional N-application module, except that the reference N-rate is calculated including user inputs about
  - yield expectation
  - N-uptake at a none fertilized plot in the field
  - the total amount of N which has been applied until the date of the current N-application.

### 11) Target rate from scan

- Uses a map previously scanned with the N-Sensor (in log file format) as a basis
- N-Sensor is not used during process
- No in-field calibration is required
- Reference N-Uptake is the field average N-uptake from the pre-scanned map

Category	Parameter	Value
	Crop	Standard grassland
	Application	Cut 1
New	N-content in fertilizer	25.0 %
	Minimum rate	0 kg N/ha
	Maximum rate	150 kg N/ha
Delete	Target rate	100 kg N/ha

Buttons: Start calibration, Cancel, Select

Category	Parameter	Value
	Crop	Winter wheat
	Production target	Milling
New	Growth stage	37
	Minimum rate	0 kg N/ha
	Maximum rate	150 kg N/ha
Delete	Uniform rate	80 kg N/ha

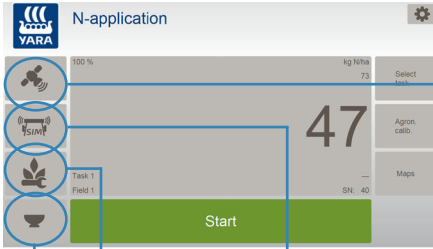
Buttons: [Green arrow button], Select

Category	Parameter	Value
	Crop	
	Growth stage	
New	Application	
	Minimum rate	0 kg N/ha
	Maximum rate	150 kg N/ha
Delete	Target rate	80 kg N/ha

Buttons: [Green arrow button], Select

**Please Note: Further modules are available from third party companies**

# 3.5) Status icons



**GPS: Connected**



**GPS: GPS Signal low or lost**  
(Weak signal - N-Sensor will work normal, no map function)



**GPS: No connection to GPS receiver**  
(Check wiring and power to GPS)



**N-Sensor: Active**



**N-Sensor: Operating temperature not reached**  
(The sensor readings may still be inaccurate)



**N-Sensor: Active**  
(one N-Sensor side deactivated)



**N-Sensor: Dew Suppression off**  
(Temporary disabled through diagnosis screen)



**N-Sensor: Calibration of optical system inaccurate**  
(Clean the optics. If warning persists contact service personnel)



**N-Sensor: Simulation mode**  
(Only for testing purposes)



**N-Sensor: No connection to N-Sensor**  
(If persists check power)



**N-Sensor: Sensor over-range**  
(Check distance: Canopy to N-Sensor)



**N-Sensor: No valid Data from N-Sensor**  
(If persists contact service / N-Sensor will switch to uniform rate)



**Agronomic calibration: working**



**Warning: Low crop density**



**Warning: License required**



**Warning: Sprayer warning**  
(rate too low - increase vehicle speed)



**Spreader: Standby and not applying**



**Spreader: working**



**Warning: Spreader work with uniform rate**



**Warning: No valid data from spreader controller**  
(Check communication protocol or connection itself)

## 4) Technical data, conformity and safety instructions

<b>Optical parameters</b>	
Number of wavebands per head	4
Covered wavelengths (standard system)	670, 730, 740 and 770 nm
Spectral bandwidth (FWHM)	10 nm
Flash frequency	10 Hz
Field of view	28°
Average viewing direction	50° from nadir


<b>Parameters per head</b>	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	<b>Unit</b>
DC input voltage	11.5	12.0	28.0	V
DC current consumption @ 12V input voltage	-	0.85	1.6	A
Size, L x W x H	-	22.5 x 18.5 x 13.5	-	cm
Weight	-	1.8	-	kg
Operating temperature range	-20.0	-	70	°C
Storage temperature range	-40.0	-	85	°C
Measurement temperature range	0.0	-	50	°C
Humidity (25 °C)	10.0	-	100	%
Mounting height (above ground)	2	-	4	m
Area scanned (depending on mounting height and speed)	20	-	60	m <sup>2</sup> /s
Data acquisition interval	-	1	-	s
System connectors (power supply and LAN)	-	2	-	-

<b>Parameters including Traverse</b>	
Size complete system (L x W x H):	approx. 208 x 21 x 321.5 cm
Weight complete system:	approx. 15.3 kg (incl. 2 sensing heads + central frame, without wiring)
Weight central frame:	approx. 11.2 kg


## 4) Technical data, conformity and safety instructions

<b>Other operating conditions</b>	
Max. operating altitude	4000 m
Operating location	Outdoor use
Pollution level	4 (as defined in IEC 61010-1)
Protection against foreign objects and touch	Dust-tight, complete protection against contact (if connectors are in use or closed with protective cap)
Protection against water	Protection against water jets from any angle (if connectors are in use or closed with protective cap)


### Cleaning:

	Clean the N-Sensor ALS-2 with a damp cloth. Use only a little water and soap and no chemical detergents. Do not hold the N-Sensor under running water. Clean the red front glass carefully.
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### Recycling:

	The symbol of the crossed-out dustbin means that this electronic equipment must not be disposed of with household waste at the end of its life. It must be taken by the end user to a collection point for waste electrical equipment for recycling.
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### Manufacturer:

	YARA GmbH & Co. KG Hanninghof 35 48249 Dülmen Germany
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### Conformity:

	This product complies to all applicable EU directives. The EU Declaration of Conformity can be obtained from the distributor.
	This product complies to all applicable directives. The UKCA Declaration of Conformity can be obtained from the distributor. Importer for UK:  Yara UK Limited Harvest House, Europarc, Grimsby North East Lincolnshire, DN37 9TZ

## 4) Technical data, conformity and safety instructions

### Conformity:

 <b>New Zealand</b>	This product complies to all applicable standards. The Supplier's Declaration of Conformity can be obtained from the distributor. Importer for New Zealand: Yara Fertilizers (NZ) Ltd 4/211 Heretaunga St East Hastings 4130
 <b>Australia</b>	This product complies to all applicable standards. The Supplier's Declaration of Conformity can be obtained from the distributor. Importer for Australia: Yara Australia Pty Ltd Level 2, 200 Mary Street 4000 Brisbane
 <b>Ukraine</b>	This product complies to all applicable standards. The Certificate of Type Approval can be obtained from the distributor. Importer for Ukraine: ТОВ "Яра Україна" пр. В. Лобановського, 6а, офіс 142 м. Київ, 03037

### Safety instructions:

- Seal unused connectors with the protection cap supplied.
- Only use the cables supplied.
- The cable fuses must not be bridged and must only be replaced by fuses for the automotive sector and with the same value (4A or 1A).
- The installation of the N-Sensor and, if necessary, the traverse may increase the overall height of the vehicle. Observe the changed height for all operations.
- Assembly and installation must only be carried out by qualified personnel in compliance with the applicable laws, regulations and standards.
- The red frontpanel of the N-Sensor is made of glass. Damage to the panel may result in sharp-edged glass splinters.
- Do not look into the light source of the N-Sensor.
- Flashes of light (strobe effects) can cause epileptic seizures. Sensitive people should avoid looking at the flashing light of the N-Sensor.

## 5) Disclaimer

### **Please Note:**

Because of the multitude of crops, grown in different production systems, on various soils, and under countless climatic conditions, Yara disclaims all warranties, express or implied, as to the accuracy of the information gathered by the tool and takes no liability for management decisions based on this information.

When using the Yara N-Sensor and its related software modules the user accepts that he will take full responsibility for all agronomic decisions.