Hardware ALS 2 (Active Sensor)

(21-6500) N-Sensor ALS 2

Content of a N-Sensor ALS package:

- 2 sensing heads
- 2 flexible mounting steel brackets
- Wiring harness
- Optional: white box (“traverse”, “shell”)

Not included:

- Operation terminal
- GPS receiver
- Roof mounting kit
- Spreader controller
- Adaptor cable for spreader controller

Contents of the Package

(21-6500) Sensing heads with brackets

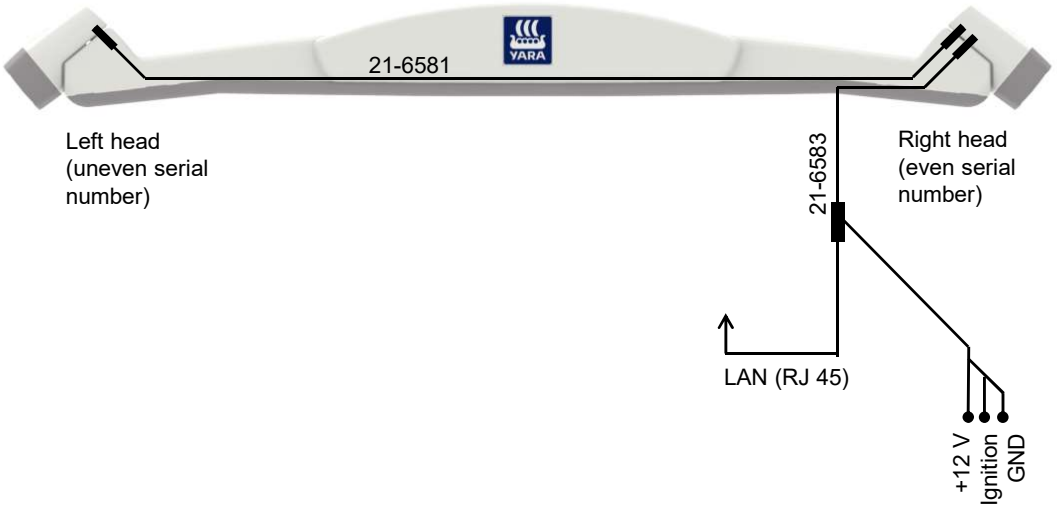
(21-6581) Connection cable, 3 m, head-to-head

(21-6582) Extension cable, 4 m

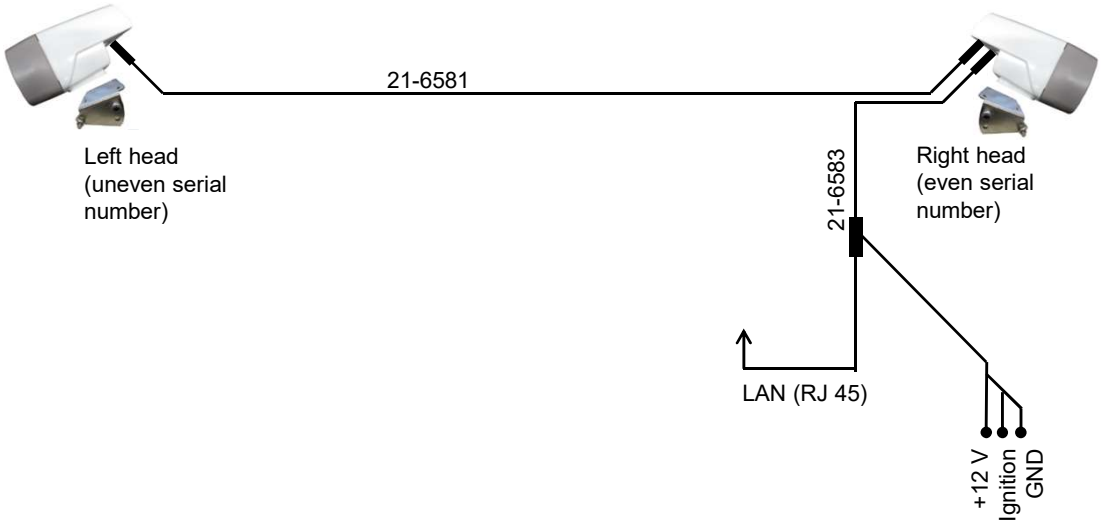
(21-6583) Y-adapter cable, 2 m, head-to-power, LAN

Optional: (21-1360) N-Sensor ALS box

Inside the Box



Wiring

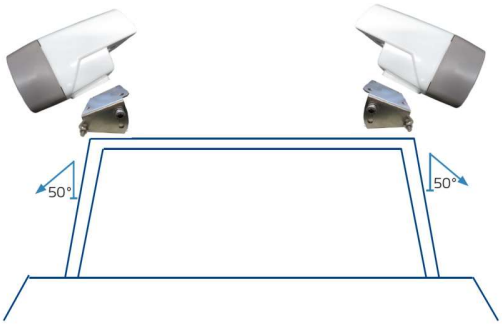


ALS 2 at a Glance

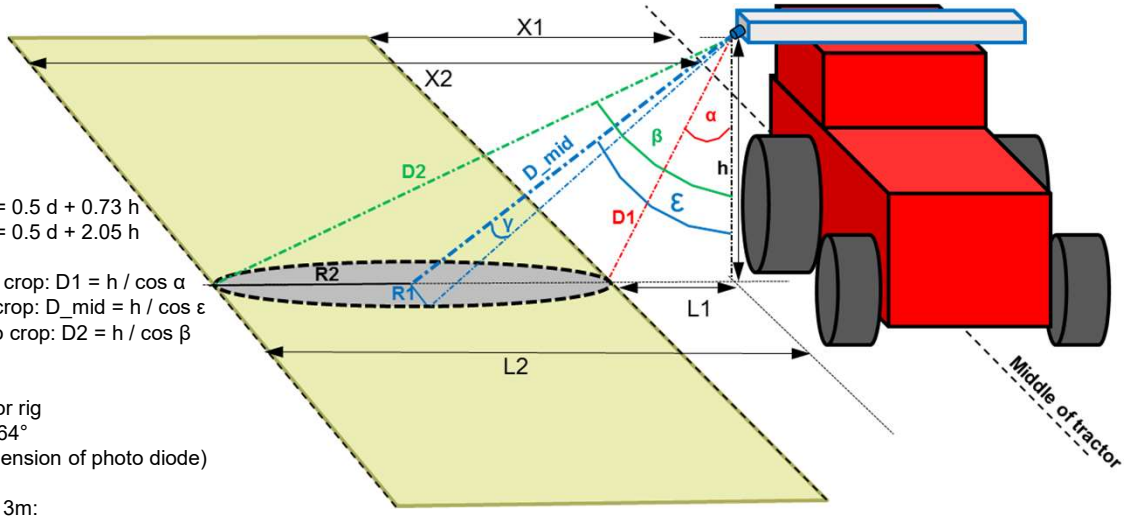
- Dimensions:
  - Almost same width as N-Sensor ALS-USB (if mounted with traverse)
  - Less weight of whole system incl. traverse (**16 kg** instead of 30 kg for ALS-USB)
- No additional operating electronics (main unit) required
- **Heads** can work as **separate, individual units**
- Fully factory calibrated, i. e. no radiometric calibration required
- Sensing heads directly connected to a **LAN** socket (RJ45) on the terminal
- LAN connection allows longer cable distances (>10 m) than USB (<=5 m)
- Humidity sensor inside the head
- Easily exchangeable desiccant cartridge
- Power switch through ignition power (or cable switch)

! ALS 2 heads are not compatible to ALS or ALS-USB heads !

Principle of Mounting Heads with or without Traverse



Mounting the ALS 2, Oblique View



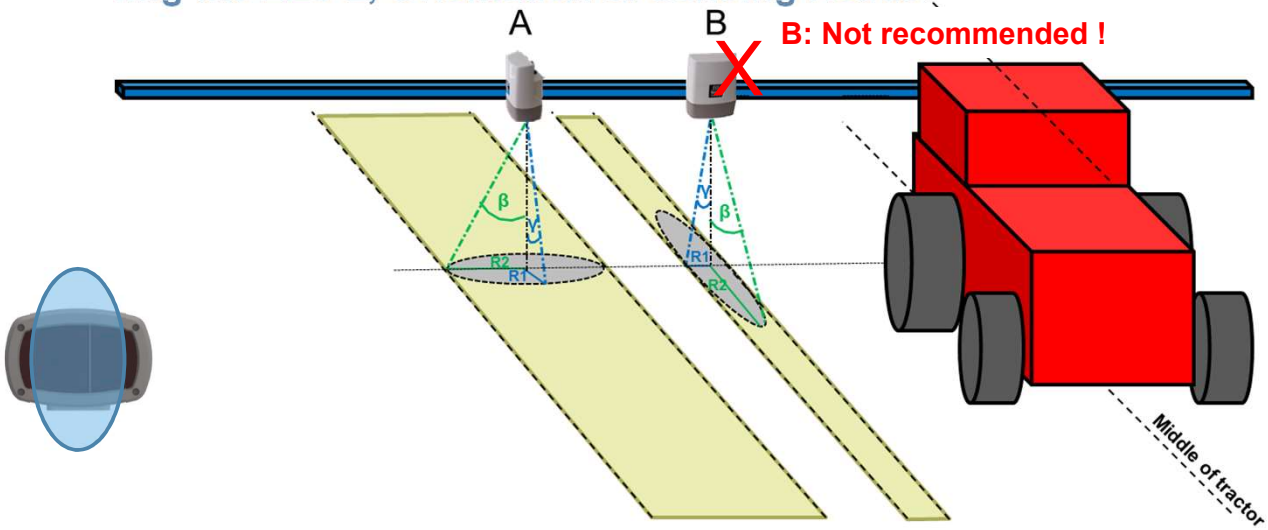
x1 = d/2 + h tan 36° = 0.5 d + 0.73 h
x2 = d/2 + h tan 64° = 0.5 d + 2.05 h

Minimum distance to crop: D1 = h / cos α
Medium distance to crop: D_mid = h / cos ε
Maximum distance to crop: D2 = h / cos β

where:
h: height of the sensor rig
α = 36°; ε = 50°; β = 64°
γ = 6° (limited by dimension of photo diode)

Typical values at h = 3m:
X1 = 3.2 m; X2 = 7.2 m => Strip width ~4 m on each side

Mounting the ALS 2, Orientation of Sensing Heads

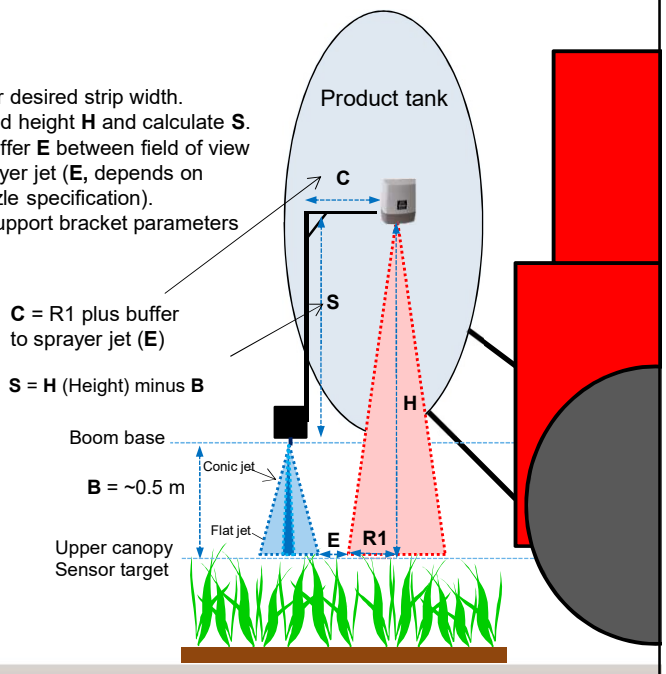


Please note: the orientation of the footprint is perpendicular to the housing dimensions of the sensing heads!!!
The width of the scanned strip width of orientation **B is only 40% compared to orientation A** !

N-Sensor Boom Installation

Height of sensing head	Small radius of ellipse	Big radius of ellipse	Strip width = Diameter of ellipse crossline with driving direction
h [m]	R1 [m]	R2 [m]	2*R2 [m]
1.80	0.19	0.45	0.90
2.00	0.21	0.50	1.00
2.20	0.23	0.55	1.10
2.40	0.25	0.60	1.20
2.60	0.27	0.65	1.30
2.80	0.29	0.70	1.40
3.00	0.32	0.75	1.50
3.20	0.34	0.80	1.60
3.40	0.36	0.85	1.70
3.60	0.38	0.90	1.80

First choose your desired strip width.
Select the needed height **H** and calculate **S**.
Estimate your buffer **E** between field of view of sensor to sprayer jet (**E,** depends on sprayer and nozzle specification).
Calculate your support bracket parameters (**C = R1 + E**).



C = R1 plus buffer to sprayer jet (**E**)

S = **H** (Height) minus **B**

Main Differences between the N-Sensor Types (Oblique View)

Example for Sensor mounting height = **3 m**

	Opening angle	Strip width on each side	Min. distance from tractor	Max. distance from tractor	Covered area / sec. at tractor speed 15-20 km/h
Passive Sensor	12°	2.4 m	4.5 m	6.9 m	20 - 27 m²
Active Sensor ALS	16°	3.1 m	4.7 m	7.8 m	26 - 35 m²
Active Sensor ALS2 (Oblique View)	28°	4.0 m	3.2 m	7.2 m	33 - 44 m²

Power Supply ALS 2

- On average **each head** consumes **~1.6 A @ 12V** in operation with flash light on
- Peak consumption after switching on: **3.0A**, so it is recommended to provide at least **6A for a 2 head system**
- Power lines need to be connected to permanent 12V, min. 6A battery power
- Power supply must be **10...24** Volts, **never above 28V!**

- All power connections must be properly made
- Battery voltage must not drop below **11.5V** with flashes on (**10V** with flashes off)
- Power will be automatically switched on and off with ignition power
- No separate power switch required (unless not connected to ignition power)
- One fuse (4A) at the +12V cable, one fuse (1A) at the +12V ignition cable

Desiccant Cartridge (21-6530)

General

- Contains desiccant to keep interior of sensing heads dry
- Color indicator (blue <40%, pink >40%)
- Exchange when dew point temperature > approx. 0 °C

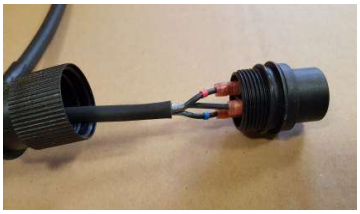
Exchange recommended every 2 years

- Under dry conditions!
- Remove old cartridge
- Remove protective sleeve from new cartridge
- Insert new cartridge into sensing head
- Dispose old cartridge

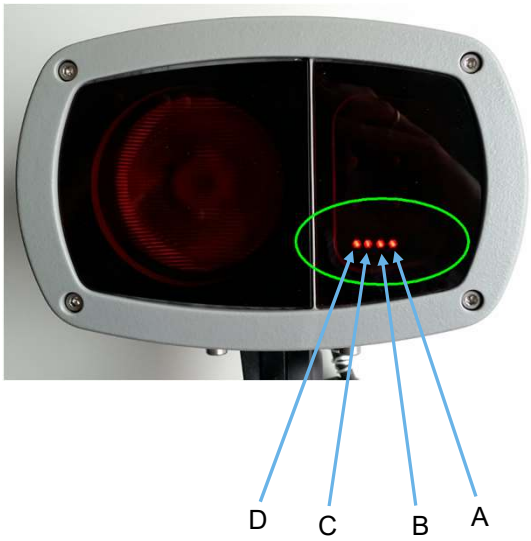
ALS 2 Main Cable Harness (21-6583)

- To connect terminal PC, power and LAN (RJ45)
- Will be delivered with Cobo-plug

+12 V (battery)	**Label "1", red colour mark, 4 A fuse**
GND (battery)	**Label "2", blue colour mark, no fuse**
+12 V (ignition)	**Label "3", no colour mark, 1 A fuse**

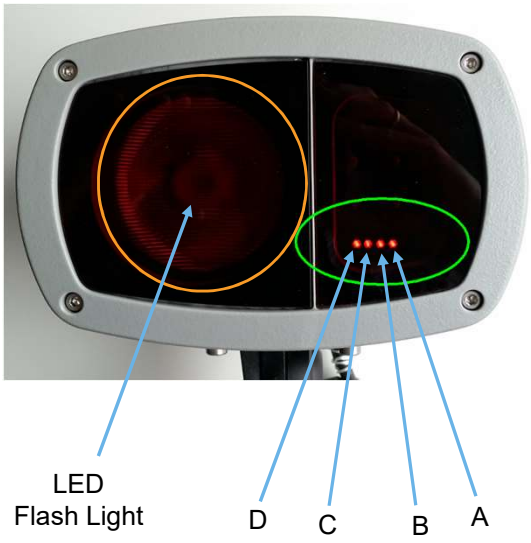


Status Indicators



LED	Name	Description
A	Power	• lights up, if (internal) power is available
B	Controller	• lights up, if firmware is started
C	Communication	• lights up, if Ethernet connection exists • illuminates irregularly during system start-up several times • flashes for a short time in 0.1sec cycle during Ethernet connection setup • blinks permanently, if Ethernet cable is disconnected and no connection is established
D	Measurement	• lights up permanently during an active connection to the N-Sensor software (measurement in progress) • flashes slowly in the event of a system update error

Starting Procedure



Starting up with connected Ethernet cable

- LED **A** and **B** switch on immediately
- LED **C** flashes slowly, then flashes quickly
- Big **LED flash light** flashes briefly
- LED **C** is on permanently
- LED **D** switched off first, lights up after being connected to N-Sensor software

Status Indicators

LED status	Description	Background
○ ○ ○ ○	off/off/off/off	• No 12V power supply • No firmware started • No Ethernet connection • No measurement started
○ ○ ● ● (◎ ● ●)	off/off/on/on (off/blinking/on/on)	• 12 V power supply ok • Firmware started • No Ethernet connection (blinks permanently if Ethernet is disconnected) • No measurement started
○ ● ● ●	off/on/on/on	• Ready for operation
● ● ● ●	on/on/on/on	• Active connection to measuring software. Doing measurements or at least ready for operation or
○ ○ ○ ●	off/off/off/on	• Powered on, but no firmware started, no Ethernet connection, not ready for operation • indicates a possible hardware error on head electronics

Configuration of the Active Sensor ALS 2

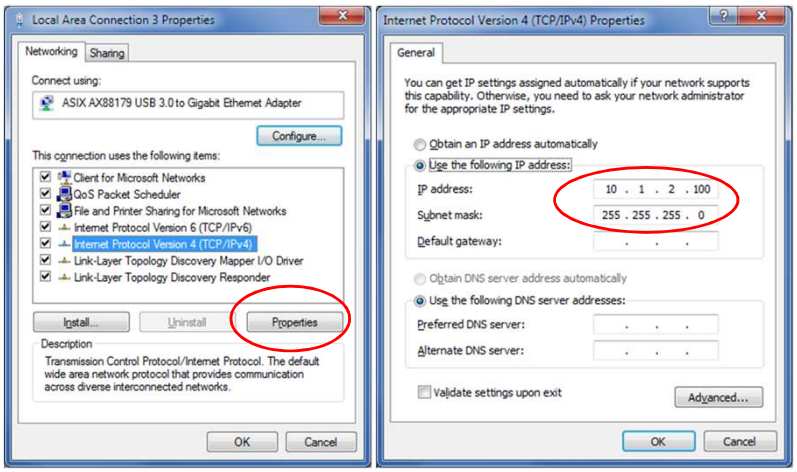
Configure Modules – N-Sensor ALS 2

Connection Setup of ALS 2 heads

- Sensing heads are connected to terminal through standard network (LAN) connection
- When heads are connected, the network will display as ***Unidentified network***
- IPv4 settings need to be adjusted
- From Windows ***Control Panel*** choose ***Network and Internet - Network and Sharing Center - Change Adapter Settings***
- Right-click on the network adapter that the sensing head(s) are physically connected to and choose ***Properties***

Connection Setup of ALS 2 heads

- Choose ***Internet Protocol Version 4 (TCP/IPv4)*** and click the ***Properties*** button
- Choose *Use the following IP address* and enter
  - ***IP address*****:** 10.1.2.100
  - ***Subnet mask:*** 255.255.255.0
- Press ***OK*** and then ***Close***
- The network adapter is now prepared to connect to the N-Sensor heads



Head Assignment

- System consists of two independent sensing heads
- Left/right assignment given by head ID number setting inside the head

Side	Head ID	Default IP address	Serial number*
Left	1	10.1.2.11	uneven
Right	2	10.1.2.12	even

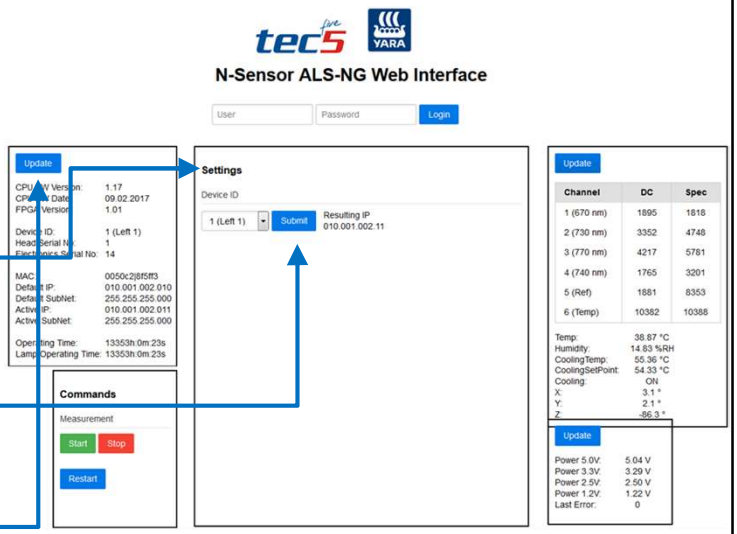
Last number indicates the head ID

- Head ID may be changed in a web browser (required if i. e. individual heads are exchanged)
- Licensing depends on serial number of left head (i. e. ID = 1)

*) typical default setting; may be changed without prior note

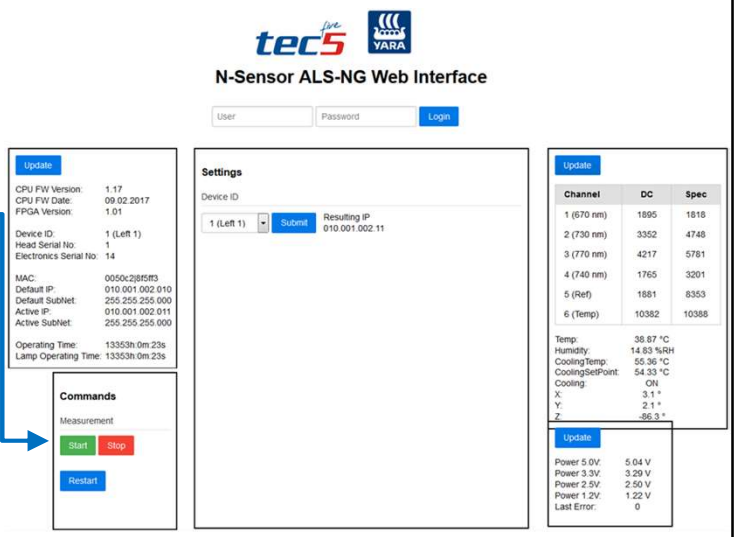
Changing Head-ID on the Web-Interface

- **Only connect 1 head to power and LAN !**
- Start a web browser
- Enter the respective IP address (usually 10.1.2.11 for left head or 10.1.2.12 for right head) in the web browser
- Check the device ID in the ***Settings*** window
- If changes are required, open the drop down box and select the desired ID
- Press ***Submit***
- Power the head off and on again
- Press ***Update*** in the respective boxes to check if changes were applied



Changing Head-ID on the Web-Interface

- **Only connect 1 head to power and LAN !**
- Enter the respective IP address (usually 10.1.2.11 for left head with internal ID 1 or 10.1.2.12 for right head with internal ID 2) in the web browser
- To test the head, press the ***Start*** button in the ***Commands*** box
- The head should start flashing visibly
- Whenever the ***Update*** button is pressed in the top right information box, the current raw sensor data should be displayed
- Now connect the other sensing head instead and repeat the procedure
- If the web interface of both heads is displayed correctly and if both heads are flashing when the ***Start*** button is pressed, the system has passed the connection test

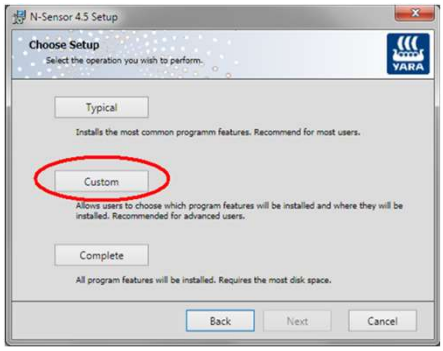


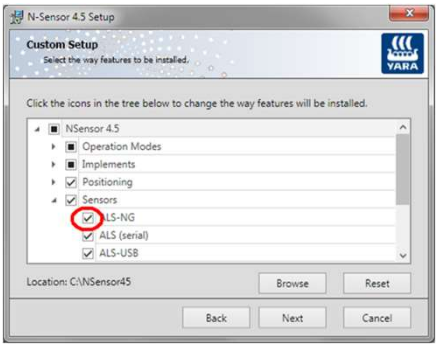
Reset of IP address through Service Cable (21-6584)

- If IP-address of the head is lost it is first recommended to just try the most likely addresses, namely the de-fault address (10.1.2.10) and the addresses assigned to the standard device IDs (10.1.2.11 to 10.1.2.18)
- If the head still cannot be found, the IP address can be reset through a special service cable
- Connect the head to the PC
- Plug the service cable into the free socket at the head
- Turn the switch to position "*II*" (customer default) and power up the head. Head should now be available at the default IP address (i. e. 10.1.2.10)
- Use a web browser to adjust the device ID accordingly
- Remove service cable (or switch back to position *0*) and reboot head.
- It should now be available at the respective IP address (i. e. 10.1.2.11 to 10.1.2.18)

Software Installation

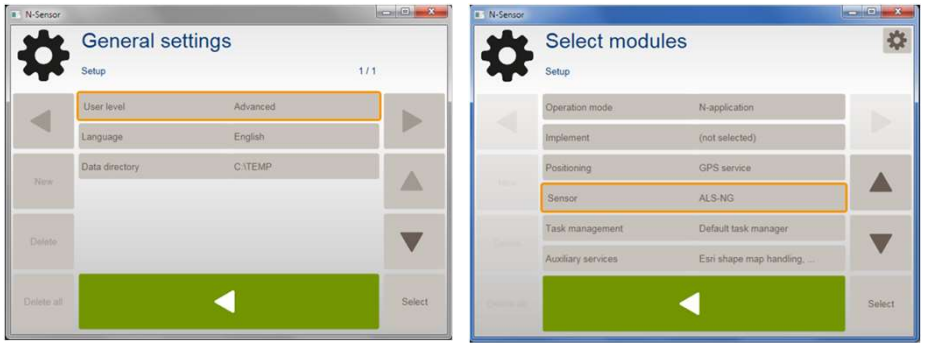
- ALS 2 sensor will only work with N-Sensor software version 4.5 or higher !
- During N-Sensor software setup, choose *Custom*
- Select the correct sensor "*ALS-NG*" (will be renamed to "ALS 2" in later versions)
- Uncheck all other sensor types, which are not physically present on the tractor





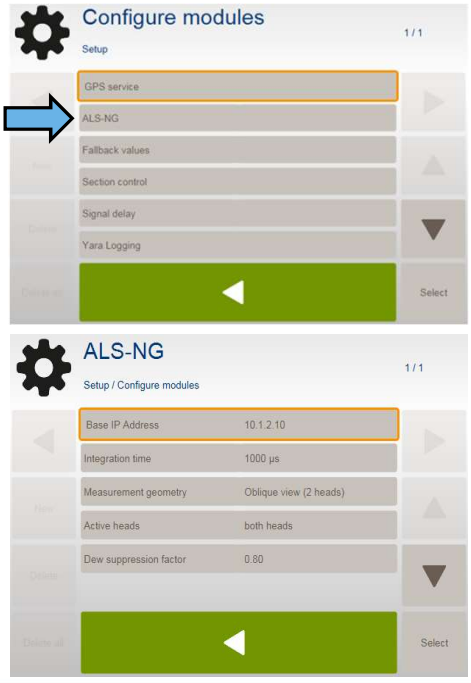
ALS 2 specific Software Settings

- Go to ***Setup***, change ***User level*** to ***Advanced***, select your ***Language*** and ***Data directory***
- Go to ***Setup***, ***Select modules*** and select your ***Sensor*** *(ALS-NG, will be renamed to ALS2)*



Configure Modules – N-Sensor (ALS 2)

- Select ***Setup***, then ***Configure modules***… and ***ALS 2 (ALS-NG)***
- ***Base IP Address***: 10.1.2.10 Do not change it !
- ***Integration time***:
  - usually 1000µs for oblique view
  - 500 µs for nadir view of 1.5 m above canopy (but needs to be checked)
  - 250 µs for nadir view below 1.5 above canopy and below (but needs to be checked)



Configure Modules – N-Sensor (ALS 2)

- ***Measurement Geometry***:
  - ***Oblique View (2 heads), Nadir view (multiple heads)***
- ***Active heads*** dependent on *Measurement Geometry*
  - ***Oblique View***: *both heads; left* or *right head only*
  - ***Nadir View***: *2 heads (1 left, 1 right)…8 heads (4 left, 4 right), 1 head (left or right),*
- Only disable one of the heads for inspection purposes (e.g. if one of the heads seems to have a malfunction)
- Press the *Back* ◀ button repeatedly to return to the work screen
- ***Dew suppression factor***: 0.8, should not be changed!

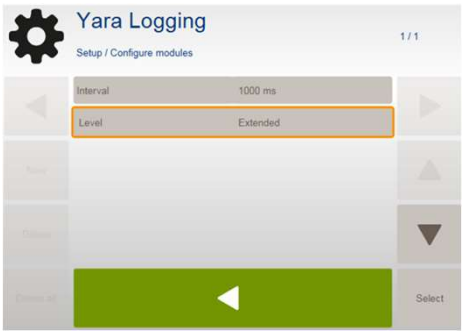
Now connection to the N-Sensor should be available!

- ALS-NG heads come fully factory-calibrated, no further calibration procedure is required

Configure Modules – Setup

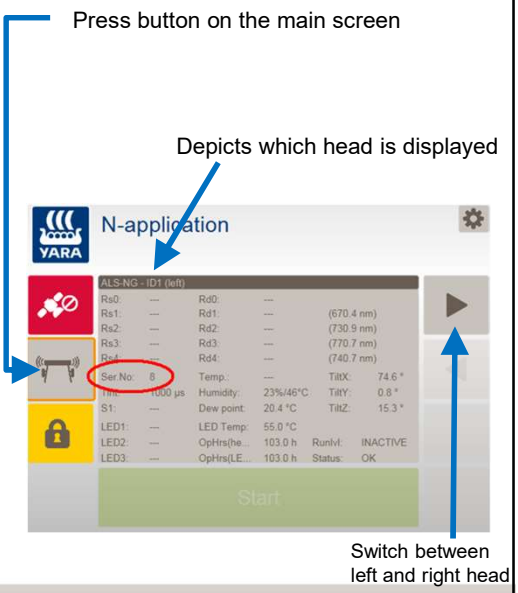
More settings for the ALS 2:

- ***Fallback values***: This menu does not need to be touched
- ***Section control***: Check that ***Enable section control*** is set to ***No***
- ***Signal delay***: Enter the signal delay for the spreader/sprayer.
- ***Yara Logging***:
  - ***Interval*** *1000 ms*
  - ***Level*** *Normal*



Diagnosis Screen (1)

- ***Rs0 … Rd4***: N-Sensor raw data from the individual channels of the system
  - values in the left column (…s) should always be higher or equal to the corresponding values in the right column (…d)
  - values should not exceed 60.000
- ***TInt***: Integration time
- ***Series no.***: Serial number
- ***S1***: Sensor value currently generated by the selected head. Typical readings for WW should be between 0 (no crop) and values around 20 (low crop density, early growth stages) and 80 (dense canopy, later growth stages)



Diagnosis Screen (2)

- ***LED Temp***.: The actual temperature (in °C) of the LED
  - LED temperature should be roughly around 50 °C.
- ***Humidity***: shows Temperature (in °C) and relative humidity (in %) measured in the humidity sensor inside the sensing head
  - A high humidity may indicate that the silicon cartridge is full and needs replacement
  - If the sensor is operated at that condition, in particular at low ambient temperatures, water may condense on the optics and lead to faulty readings
- ***Dewpoint***: To prevent condensation of air humidity inside the sensing head
  - dew point temperature must be below the ambient air temperature
  - If the dew point temperature rises above approx. 0 °C this may indicate that the desiccant cartridge needs replacement