Table of content

1. General 1
2. Product overview 1
3. Functionality and API commands 2
3.1 Gender detection 2
3.2 Age estimation 3
3.3 Gaze detection 3
4. Installation requirements and guidelines 4
4.1 Connection Diagrams 4
4.2 Hardware integration guidelines 5
5. Settings 6
6. Quick test 8

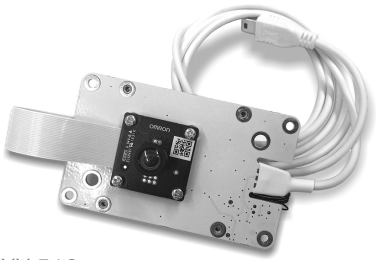
1. General

Nexmosphere's X-Eye Gender sensors detect the gender of a person in front of the sensor and also provide an estimation of the age of this person. This document provides explanation of the available functionalities and instructions on how to install and integrate the sensor into your digital signage installation.

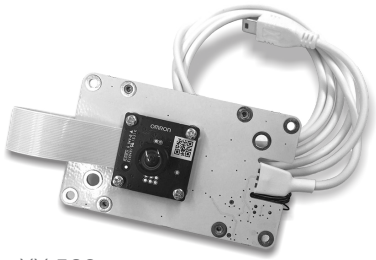
The information in this document is created for users who are familiar with the Nexmosphere API and are able to control a basic setup with a Nexmosphere API controller. If this is not the case yet, please read the general documentation on the Nexmosphere serial API first.

2. Product overview

The X-Eye Gender sensor is available in 2 models:



XY-510



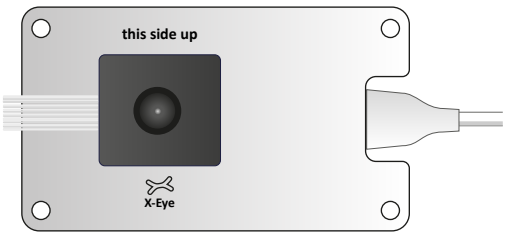
XY-520

Both X-Eye Gender sensors feature the same functionality and will detect the gender and estimate the age of the person in front of the sensor. The detection range and field of view varies between the two models:

	XY-510	XY-520
Gender detection	✔	✔
Age estimation	✔	✔
Field of view Angle	90°	50°
Minimum detection distance	15cm	35cm
Maximum detection distance	120cm	250cm

Nexmosphere
Le Havre 136
5627 SW Eindhoven • The Netherlands
T +31 40 240 7070
E support@nexmosphere.com

The X-Eye Gender sensor has an optical lens which captures the visual image of the person standing in front of it. This image is analyzed real-time by the sensor and the result (gender and age) is provided in the sensor's output. No visual image or video data is stored on the sensor, nor is it possible to retrieve a live video feed from the sensor.



3. Functionalities and API commands

The X-Eye Gender sensors provide the following functionalities:

1. **Gender detection** - detects if a person is Female or Male
2. **Age estimation**- gives an estimation of the person's age range
3. **Gaze indication** - indicates if the person's gaze is directed to the Left, Center or Right

This information is combined into one API message which has the following format:

X001B[*PGCACG*]	P= *Person detection*	**0**= No Person, **1**=Person detected
	G= *Gender detection*	**M**=Male, **F**=Female, **U**=Unidentified
	C= *Confidence level gender*	**X** = Very Low, **L**=Low, **H**=High
	A= *Age range estimation*	value between **0-7**
	C= *Confidence level age*	**X** = Very Low, **L**=Low, **H**=High
	G= *Gaze indication*	**L**=Left, **C**=Center, **R**=Right, **U**=Unidentified

The following sections will cover each of these functionalities in detail. Please note that for each API example in this document, X-talk interface address 001 is used (X001). When the sensor is connected to another X-talk channel, replace the "001" with the applicable X-talk address.

3.1 - Gender detection

When a person is detected, the sensor analyzes real-time if that person is Male or Female. Simultaneously, it also indicates the confidence level of the detected gender. On the right, example API trigger commands are provided. When applying these commands, please consider the following:

- The sensor only detects one person at a time and will always analyze the person closest to the sensor.
- The confidence level thresholds (very low, low and high) can be adjusted. Please see section 5 "Settings", page 7.
- Whether or not the sensor should send an API command when the confidence level on the detected gender is low can be adjusted. Please see section 5 "Settings", page 7.

Example commands

*Person detected (**1**), Female (**F**), High confidence on gender (**H**), Age range 4, High confidence on Age, Gaze Center*

X001B[1FH4HC**]**

*Person detected (**1**), Male (**M**), High confidence on gender (**H**), Age range 3, Low confidence on Age, Gaze Right*

X001B[1MH4LR**]**

*Person detected (**1**), Male (**M**), Low confidence on gender (**L**), Age range Unidentified, Gaze Unidentified*

X001B[1ML0XU**]**

*Person detected (**1**), Gender unidentified (**UX**), Age range Unidentified, Gaze Unidentified*

X001B[1UX0XU**]**

*No person detected (**0**), Gender unidentified (**UX**), Age range Unidentified, Gaze Unidentified*

X001B[0UX0XU**]**

Nexmosphere
Le Havre 136
5627 SW Eindhoven • The Netherlands
T +31 40 240 7070
E support@nexmosphere.com

3.2 - Age estimation

When a person is detected, the sensor analyzes real-time in what range the person's age is. There are 7 different age ranges of which the default mapping is as follows:

Range 0 =	age 00 - age 11
Range 1 =	age 12 - age 17
Range 2 =	age 18 - age 24
Range 3 =	age 25 - age 34
Range 4 =	age 35 - age 44
Range 5 =	age 45 - age 54
Range 6 =	age 55 - age 64
Range 7 =	age 65 and older

Simultaneously, it also indicates the confidence level of the estimated age range. On the right, example API trigger commands are provided. When applying these commands, please consider the following:

- There are 4 different age range mappings available. Please see section 5 "Settings", page 7.
- When the age range is unidentified, the age range will be indicated as 0, followed by confidence level X.
- The confidence level thresholds can be adjusted. Please see section 5 "Settings", page 7.
- Whether or not the sensor should send an API command when the confidence level on the detected age is low can be adjusted. Please see section 5 "Settings", page 7.

Example commands

*Person detected (1), Male (M), Low confidence on gender (L), Age range **2**, Low confidence on Age (**L**), Gaze unidentified*
X001B[1ML**2L**U**]**

*Person detected (1), Female (F), High confidence on gender (H), Age range **6**, High confidence on Age (**H**), Gaze Center*
X001B[1FH**6H**C**]**

*Person detected (1), Female (F), High confidence on gender (H), Age range **4**, Low confidence on Age (**L**), Gaze Left*
X001B[1FH**4L**L**]**

*Person detected (1), Male (M), High confidence on gender (H), Age range Unidentified (**0X**), Gaze Unidentified (U)*
X001B[1MH**0X**U**]**

*Person detected (1), Gender unidentified (UX), Age range Unidentified (**0X**), Gaze Unidentified (U)*
X001B[1UX**0X**U**]**

3.3 - Gaze indication

When a person is detected, the sensor analyzes real-time the direction of the person's gaze: Left, Center or Right.

On the right, example API trigger commands are provided. When applying these commands, please consider the following:

- **Default, no API trigger is send when a new gaze direction is detected.** This can be enabled. Please see section 5 "Settings", page 7.
- The sensor determines the gaze direction based on the position and angle of the person's jaw. It does not take the eye direction into account.
- When the gaze direction is unidentified, this will be indicated with an U.

Example commands

*Person detected (1), Male (M), Low confidence on gender (L), Age range 7, High confidence on Age (H), Gaze Left (**L**)*
X001B[1ML7H**L]**

*Person detected (1), Female (H), High confidence on gender (H), Age range 5, Low confidence on Age (L), Gaze Center (**C**)*
X001B[1FH5L**C]**

*Person detected (1), Male (M), High confidence on gender (H), Age range 4, Low confidence on Age (L), Gaze Right (**R**)*
X001B[1MH4L**R]**

*Person detected (1), Female (F), Low confidence on gender (L), Age range unidentified (0X), Gaze Unidentified (**U**)*
X001B[1FL0X**U]**

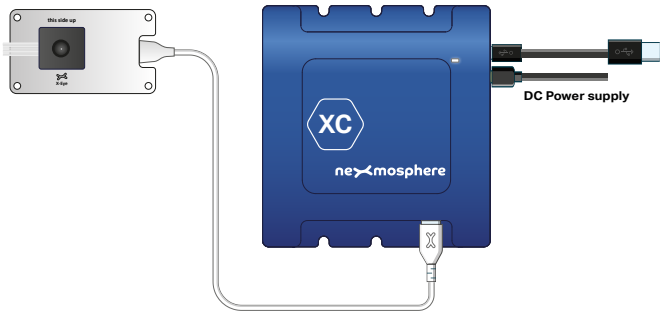
Nexmosphere
Le Havre 136
5627 SW Eindhoven • The Netherlands
T +31 40 240 7070
E support@nexmosphere.com

4 - Installation requirements and guidelines

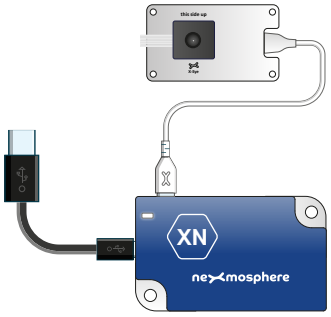
When integrating an X-Eye Gender sensor into your digital signage installation, several installation requirements and guidelines need to be taken into account in order for the sensor to perform optimal and operate stable.

4.1 Connection Diagrams

The X-Eye Gender sensor can be connected to any X-talk interface and is therefore compatible with all Xperience controllers. Make sure the X-Eye Gender sensor is connected to the X-talk interface before powering the Xperience controller. Otherwise, the X-Eye Gender sensor will not be recognized by the Xperience controller and no sensor output will be provided.



Example connection to XC Controller



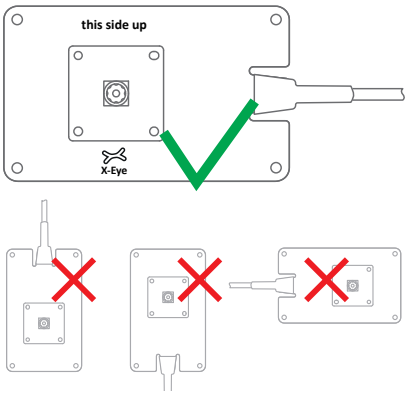
Example connection to XN Controller

4.2 Hardware integration guidelines

Orientation/placement sensor

Install the sensor in the orientation depicted in the illustration on the right. In all other orientations, the sensor will not provide any output.

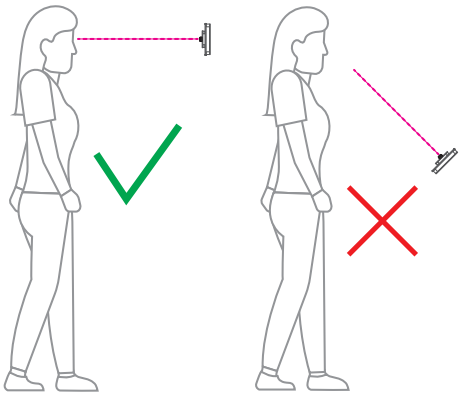
The text "this side up" is placed on the front plane of the sensor as a reminder and help.



Installation height

The sensor performs optimal when installed at eye height or slightly higher. The recommend installation height therefore is **160cm - 180cm**.

Installing the sensor at a lower height and pointing upwards towards a person's face will result into poor performance of the sensor.

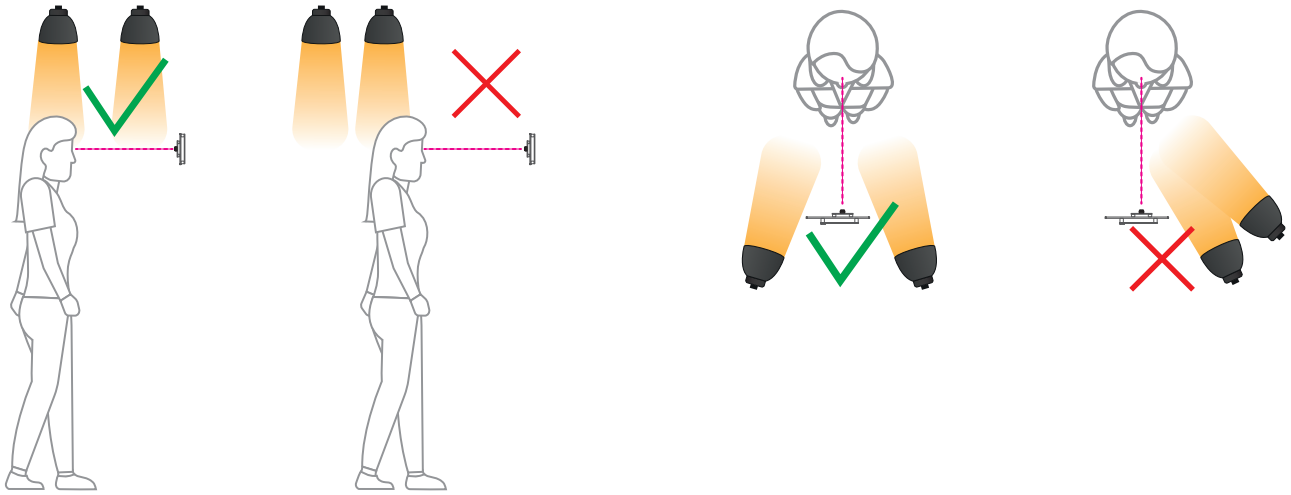


Nexmosphere
Le Havre 136
5627 SW Eindhoven • The Netherlands
T +31 40 240 7070
E support@nexmosphere.com

Light conditions

Make sure the environment in which the sensor is installed is well lit and that enough light is able to hit the face of the person in front of the camera.

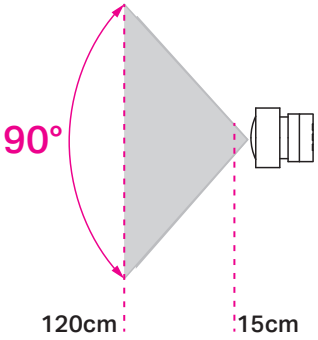
Light coming from an angle which reaches the person's face can cause a shadow on one side of the face which will result into a decrease of the sensor's responsiveness and accuracy. Therefore please make sure that he light sources are evenly spread and that the face of the person in front of the sensor is evenly lit



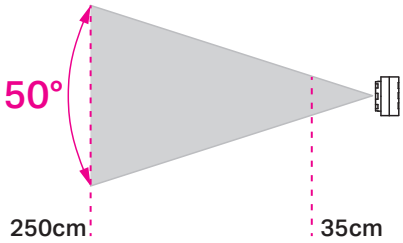
Field of view angle and detection range

When installing the sensor, take the field of view angle into account to make sure the sensor can detect the people which are standing in front of it.

	XY-510	XY-520
Field of view Angle	90°	50°
Min. detection distance	15cm	35cm
Max. detection distance	120cm	250cm



XY-510 detection field top view



XY-520 detection field top view

Panel cut out

The lens of the sensor needs to have a clear view of the person standing in front of it. All other parts of the X-Eye Gender sensor can be hidden behind a panel. In order to do so, a circular cut out for the lens needs to be made. The recommended diameter of the cut out in a 3mm panel is **10mm** for the **XY-510** and **6.5mm** for the **XY-520**. For more information on the mechanical dimension please see the datasheet of the XY-510 and XY-520.

Nexmosphere
Le Havre 136
5627 SW Eindhoven • The Netherlands
T +31 40 240 7070
E support@nexmosphere.com

5 - Settings

The X-Eye Gender sensor has multiple settings which determine the behaviour and output of the sensor. The settings can be adjusted by sending X-talk setting commands via the API. After a power cycle, the settings always return back to default.

Setting 4: Filter level

Set filter level `X001S[4:X]`

X is a value between **1-5** and its default value is **2**. The filter level determines the amount of data samples which need to match before an API command is send. Increasing X can result into a more stable and/or accurate output, but will also decrease the responsiveness of the sensor. Decreasing X can increase the responsiveness of the sensor but will also result into a less stable and less accurate sensor output.

Setting 5: Minimum detection distance

Set minimum detection distance `X001S[5:X]`

X is a value between **1-100** and its default value is **1**. This value determines the minimum detection distance of the sensor. When increasing X, people need to stand further away from the sensor in order to be detected.

Setting 6: Maximum detection distance

Set maximum detection distance `X001S[6:X]`

X is a value between **1-100** and its default value is **100**. This value determines the maximum detection distance of the sensor. When decreasing X, people need to stand closer to the sensor in order to be detected.

Setting 7: Canvas width Left

Set canvas width left `X001S[7:X]`

X is a value between **1-100** and its default value is **1**. This value can be used to change the horizontal range of the visual canvas of the sensor. The canvas is defined as 1-100. When increasing X, the sensor will block an area on the left of its field of view. For example, when setting X to 20, the sensor will only detect people between the horizontal range of 20-100.

Setting 8: Canvas width Right

Set canvas width right `X001S[8:X]`

X is a value between **1-100** and its default value is **100**. This value can be used to change the horizontal range of the visual canvas of the sensor. The canvas is defined as 1-100. When decreasing X, the sensor will block an area on the right of its field of view. For example, when setting X to 90, the sensor will only detect people between the horizontal range of 1-90.

Setting 9: Canvas height Top

Set canvas height top `X001S[9:X]`

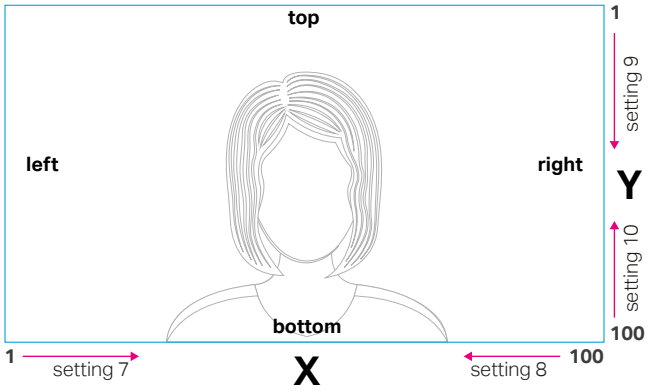
X is a value between **1-100** and its default value is **1**. This value can be used to change the vertical range of the visual canvas of the sensor. The canvas is defined as 1-100. When increasing X, the sensor will block an area on the topside of its field of view. For example, when setting X to 15, the sensor will only detect people between the vertical range of 15-100.

Setting 10: Canvas height Bottom

Set canvas height bottom `X001S[10:X]`

X is a value between **1-100** and its default value is **100**. This value can be used to change the vertical range of the visual canvas of the sensor. The canvas is defined as 1-100. When decreasing X, the sensor will block an area on the bottom side of its field of view. For example, when setting X to 70, the sensor will only detect people between the vertical range of 1-70.

Visual canvas - sensor view



more settings on page 7

Nexmosphere
Le Havre 136
5627 SW Eindhoven • The Netherlands
T +31 40 240 7070
E support@nexmosphere.com

Setting 12: Gender confidence level "Low"

Set gender confidence level low `X001S[12:X]`

X is a value between **1-100** and its default value is **10**. This level determines the threshold for the sensor to qualify the detected gender as confidence level "low" (L). Increasing X will result into the sensor having to be more confident on the detected Gender before qualifying the confidence level as "low" (L). Decreasing X will result into the sensor having to be less confident on the detected Gender before qualifying the confidence level as "low" (L).

Setting 13: Gender confidence level "High"

Set gender confidence level high `X001S[13:X]`

X is a value between **1-100** and its default value is **50**. This level determines the threshold for the sensor to qualify the detected gender as confidence level "high" (H). Increasing X will result into the sensor having to be more confident on the detected Gender before qualifying the confidence level as "high" (H). Decreasing X will result into the sensor having to be less confident on the detected Gender before qualifying the confidence level as "high" (H).

Setting 14: Trigger at low confidence level Gender

1. No trigger at low confidence `X001S[14:1]`
2. Yes, trigger at low conf. (def) `X001S[14:2]`

When disabling (1), the sensor will not send an API message when the detected Gender changes and the confidence level of the detected gender is "low" (L).

Setting 15: Select Age Range mapping

1. Age range mapping 1 (default) `X001S[15:1]`
2. Age range mapping 2 `X001S[15:2]`
3. Age range mapping 3 `X001S[15:3]`
4. Age range mapping 4 `X001S[15:4]`

The age range mapping are as follows:

	1 (def)	2	3	4
Age range 0	0-11	0-9	0-11	0-11
Age range 1	12-17	10-19	12-17	12-19
Age range 2	18-24	20-29	18-24	20-29
Age range 3	25-34	30-39	25-29	30-39
Age range 4	35-44	40-49	30-34	40-44
Age range 5	45-54	50-59	35-39	45-54
Age range 6	55-64	60-69	40-44	55-59
Age range 7	>=65	>=70	45-54	60-64
Age range 8	N/A	N/A	55-64	65-69
Age range 9	N/A	N/A	>=65	>=70

Setting 16: Age confidence level "Low"

Set age confidence level low `X001S[16:X]`

X is a value between **1-100** and its default value is **10**. This level determines the threshold for the sensor to qualify the age estimation as confidence level "low" (L). Increasing X will result into the sensor having to be more confident on the age estimation in order to qualify the confidence level as "low" (L). Decreasing X will result into the sensor having to be less confident on the age estimation before qualifying the confidence level as "low" (L).

Setting 17: Age confidence level "High"

Set age confidence level high `X001S[17:X]`

X is a value between **1-100** and its default value is **50**. This level determines the threshold for the sensor to qualify the age estimation as confidence level "high" (H). Increasing X will result into the sensor having to be more confident on the age estimation in order to qualify the confidence level as "high" (H). Decreasing X will result into the sensor having to be less confident on the age estimation before qualifying the confidence level as "high" (H).

Setting 18: Trigger at low confidence level Age estimate

1. No trigger at low confidence `X001S[18:1]`
2. Yes, trigger at low conf. (def) `X001S[18:2]`

When disabling (1), the sensor will not send an API message when the age estimation changes and the confidence level of the age estimation is "low" (L).

Setting 19: Trigger at change of Gaze direction

1. Yes, trigger at gaze change `X001S[18:1]`
2. No trigger at gaze change (def) `X001S[18:2]`

Default, the sensor does not send an API message when the detected gaze direction changes. When enabling (1), the sensor will send an API message when the gaze direction changes.

Nexmosphere
Le Havre 136
5627 SW Eindhoven • The Netherlands
T +31 40 240 7070
E support@nexmosphere.com

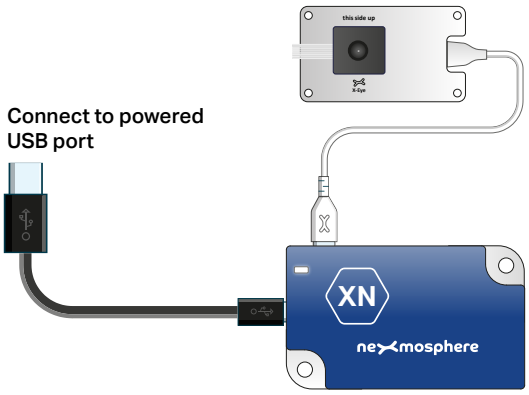
6. Quick test

In order to test if the X-Eye Gender sensor is installed correctly, please follow the test procedure below:

Step 1 - Setup

First, connect the X-Eye Gender sensor to an Xperience controller. Secondly, power the Xperience controller.

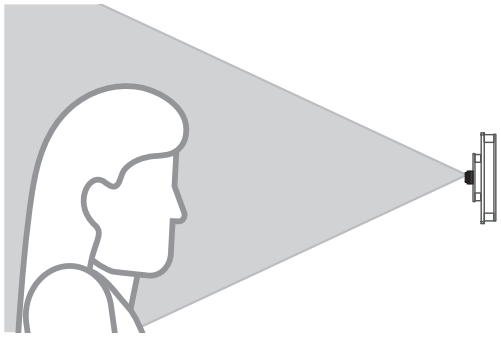
The green status LED of the X-Eye Gender sensor should go on. The status LED of the controller will start to blink and once power-up is completed will be lit continuously

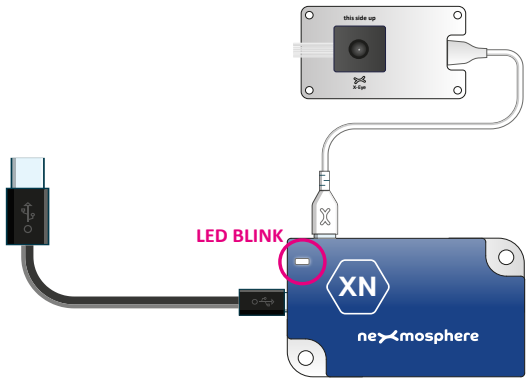


Step 2 - Test detection

Stand in front of the sensor with you face directed towards the sensor's lens.

The status LED of the controller should blink.





In case any of the 2 steps above do not provide the expected result, please check the installation guidelines in this document.

For a full test we recommend to connect the setup to a mediaplayer or PC and test all API commands listed in this document (see section 3, page 2-3). For more information on how to setup a test for your controller, please see the Quick Start Guide of the Xperience controller you are using. These are available on nexmosphere.com/support-documentation

Please contact support@nexmosphere.com for any support questions you may have.

Nexmosphere
Le Havre 136
5627 SW Eindhoven • The Netherlands
T +31 40 240 7070
E support@nexmosphere.com