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1. General

The X-Dot Encoder can interface rotary encoders to the Nexmosphere platform. This document provides explanation of the available functionalities and instructions on how to install and integrate the interface 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.

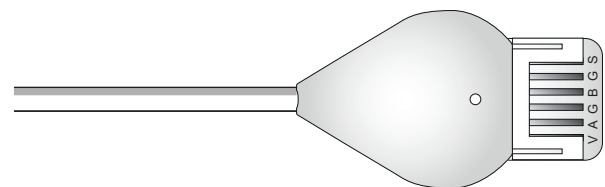
2. Product overview

The X-Dot Encoder interface is available in 1 model:

	XDW-E60
Detect CW and CCW rotation	✓
Pulse count	✓
Push button detection	✓
Supply voltage	5.0 V

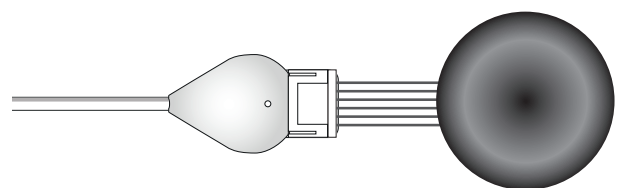


The X-Dot Encoder interface has a 6-pin JST-PHR-6 connector which allows for connecting rotary encoders to the Nexmosphere platform. The rotary encoders offered by Nexmosphere have a matching cable attached to them making it a plug and play accessory option. In case of connecting a 3rd party rotary encoder, the connection is as follows:



From top to bottom:

- **S** button switch input
- **G** ground/common (*for button switch*)
- **B** B channel
- **G** ground/common (*for rotary encoder*)
- **A** A channel
- **G** +5V supply



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3. Functionalities and API commands

The X-Dot Encoder provides the following functionalities:

1. **Detect rotation** - and indicate the rotation direction and rotation value
2. **Absolute value output** - tracks a value between 0-100, which is automatically increased or decreased upon rotation
3. **Detect button presses** - and indicates if it is a single click, double click or long-press

The following section will cover 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 - Detect rotation

When the connected rotary encoder is rotated, per default the X-Dot Encoder interface will output the rotation direction and the number of steps which it has been rotated. This API message has the following format:

X001B[Rd=CW:**]	Clockwise rotation	**= number of steps rotated 00-99
X001B[Rd=CCW:**]	Counterclockwise rotation	**= number of steps rotated 00-99

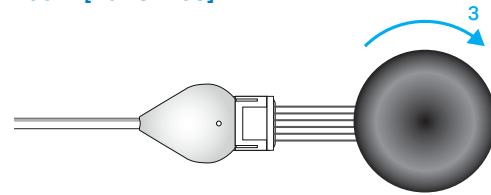
When implementing rotation triggers, please consider:

- Some rotary encoders have detents. These are haptic "clicks" when rotating the encoder. Next to this, each rotary encoder has a "pulses per 360° rotation" value. If the number of detents and pulses are the same, each click will result into 1 step in the API command. If these numbers do not match, the number of steps will be different then the number of noticeable clicks.
- The time interval over which the encoder counts the number of steps is per default set to 4 X-talk scan cycles (~250mS). This interval can be adjusted, please see page 6, settings. If the rotation lasts longer then the set time interval, a second X-talk message is sent.
- When a rotation has ended, a "stop message" is send: **X001B[Rd=STOP]** . The stop message can be deactivated, please see page 6, settings.
- For compatible rotary encoders offered as accessory by Nexmosphere, please see page 5

Example commands

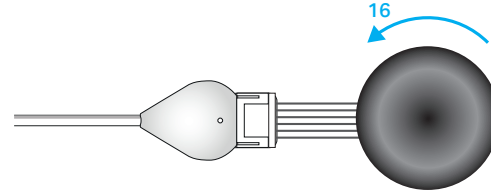
Rotary encoder rotated clockwise 3 steps

X001B[Rd=CW:03]



Rotary encoder rotated counterclockwise 16 steps

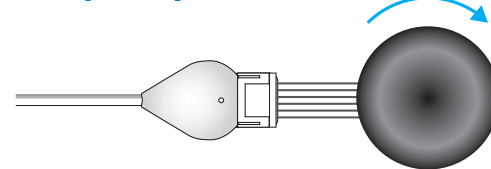
X001B[Rd=CCW:16]



Example commands

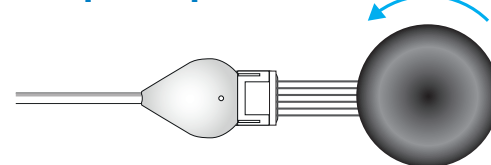
Rotary encoder rotated clockwise

X001B[Rd=CW]



Rotary encoder rotated counterclockwise

X001B[Rd=CCW]



To only receive the rotation direction, without the number of steps, the output mode setting must be adjusted:

X001S[4:1] Incremental mode, direction only

When setting the output to direction only, the API command has the following format:

X001B[Rd=CW]	Clockwise rotation
X001B[Rd=CCW]	Counterclockwise rotation

- This mode will disregard any additional increments which occur in the same X-talk cycle, it does not buffer them. This means for a fast rotation with multiple steps, still only 1 API command is send.

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3.2 - Absolute value output

The output mode of the rotary encoder can be set to provide an absolute number. In this mode, the sensor keeps track of a value between 0 and 100 and increases this value when rotation direction is clockwise and decreases this value when the rotation direction is counterclockwise.

To set the output mode to provide an absolute number, the output mode setting must be adjusted:

X001S [4 : 3] Absolute value output

The API command for absolute value output has the following format:

X001B[Av=*]** ***= absolute value 000-100

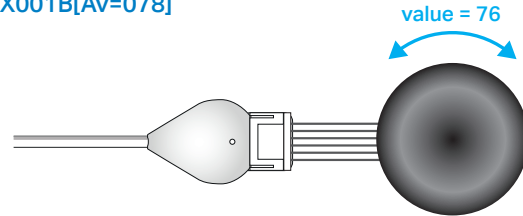
When implementing absolute value triggers, consider the following:

- The scale of the absolute value output can be adjusted, please see page 6, settings.
- Per default, overflow is deactivated for absolute value output. Overflow can be activated, please see page 6, settings.
- The number of increments or decrements per rotation step can be adjusted, please see page 6, settings.

Example commands

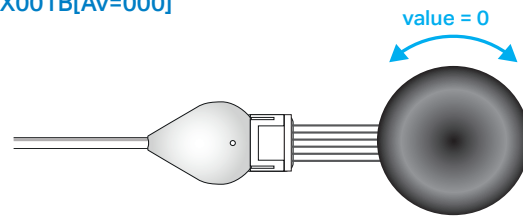
The absolute value is 78

X001B[Av=078]



The absolute value is 0

X001B[Av=000]



The absolute value can manually be adjusted to any value within its rang by sending the following command:

X001B [Av= XXX] (Re)set the absolute value XXX= nr 000-100 (or 255 or 999)

3.3 - Detect button presses

In case the connected rotary encoder also has a push button functionality, the encoder interface can detect if it is pressed or released . This API message has the following format:

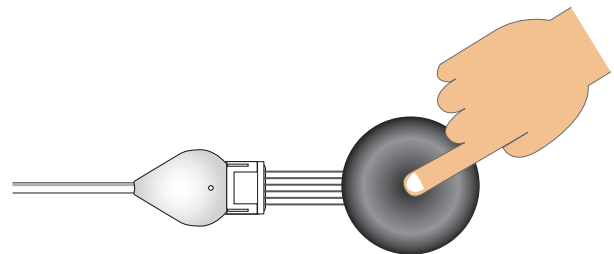
X001B[Bs=PRESSED]
X001B[Bs=RELEASED]

Additionally, the encoder interface also detects the type of click. This API message has the following format:

X001B[Bs=CLICK]
X001B[Bs=DOUBLECLICK]
X001B[Bs=LONGPRESS]

When implementing button triggers, consider the following:

- The output can be adjusted to only provide pressed/ released triggers or only click-type output. Please see page 6, settings.
- The parameters to detect double click and long-press can be adjusted, please see page 6, settings.



Data requests

The absolute value and button status can be requested at any time by sending one of the following API command:

X001B [VALUE?] Request current Absolute value

X001B [BUTTON?] Request current button status (pressed or released)

PRODUCT MANUAL | X-DOT ENCODER INTERFACE

4 - Installation requirements and guidelines

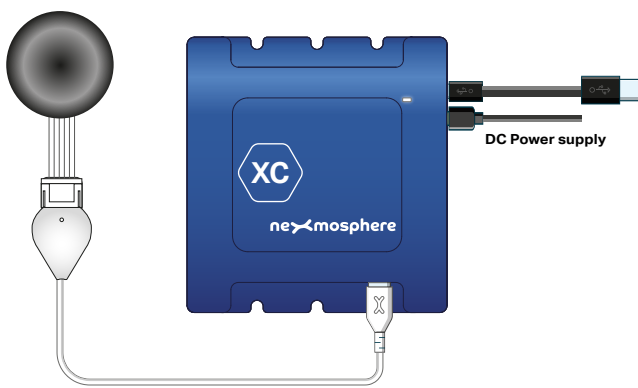
When integrating an X-Dot Encoder interface into your digital signage installation, several installation requirements and guidelines need to be taken into account in order for the sensor to perform optimal and operate stable.

4.1 Electrical installation requirements

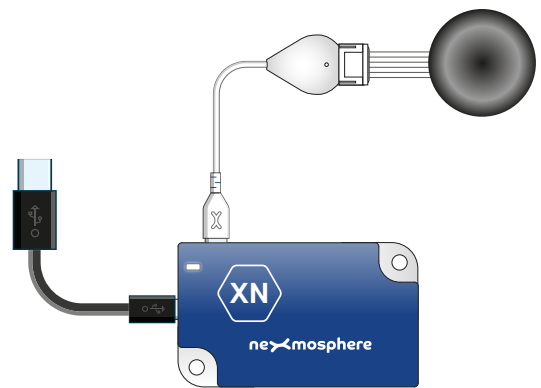
The maximum amount of power which the Output pin can provide is 200mA @ 5V. Please make sure the specifications of a connected 3rd party encoder interface comply.

4.2 Connection Diagrams

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



Example connection to XC Controller



Example connection to XN Controller

Installation of Rotary encoder in panel

Make sure the rotary encoder is firmly installed in a top panel by paying attention to the following specifications and recommendations of your rotary encoder:

- **Mounting hole diameter**
Check and apply the recommended mounting hole diameter of the rotary encoder you are using.
- **Panel thickness**
Check and apply the recommended panel thickness of the rotary encoder you are using. If the panel is too thick, the rotary encoder can't be secured properly.
- **Proper sealing**
Make sure the rotary encoder is properly sealed to the panel, typically this is done with the included nut and washer.
- **Anti-rotation**
Ideally, the rotary encoder is installed with an anti-rotation mechanism on the backside of the panel, properly locking the rotary encoder into place.

4.3 X-Dot Encoder interface - Accessories

Rotary encoders

Nexmosphere offers compatible rotary encoders as an accessory. The part codes are:

Mechanical encoders, 30K rotations:

S-RE121

No detents, 24 pulses, no pushbutton, 22mm black knob
Encoder datasheet ([Bourns PEC11R-4020F-N0024](#))



S-RE171

24 detents, 24 pulses, pushbutton, 60mm black knob
Encoder datasheet ([Bourns PEC11R-4220F-S0024](#))

Optical encoders, 1M rotations:

S-RE541

32 detents, 32 pulses, no pushbutton, 22mm black knob
Encoder datasheet ([Grayhill 62AG11-L0-P](#))



S-RE571

16 detents, 16 pulses pushbutton, 60mm black knob
Encoder datasheet ([Grayhill 62AG22-L5-P](#))

All accessory rotary encoders offered by Nexmosphere come with a 15cm cable assembled onto the encoder with a matching connector for the X-Dot Encoder interface. They can directly be connected to the X-Dot Encoder, making it a plug and play accessory option.

For more detailed information on the rotary encoders and their mechanical specifications, please check the datasheets of the manufacturers by clicking on the datasheet links.

Spare knobs

Each accessory rotary encoder comes with a knob, making it a ready-to-use item. If you want to change the knob size or color, Nexmosphere offers additional spare knobs as an accessory:

- S-RK22B *Black knob, 22mm diameter*
- S-RK60B *Black knob, 60mm diameter*
- S-RK22S *Silver-colored knob, 22mm diameter*
- S-RK60S *Silver-colored knob, 60mm diameter*



5 - Settings

The X-Dot Encoder has multiple settings which determine the behaviour and output of the interface. 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 1: Status LED behaviour

1. LED always on `X001S[1:1]`
2. LED always off `X001S[1:2]`
3. LED on, blink at trigger (default) `X001S[1:3]`
4. LED off, blink at trigger `X001S[1:4]`

Setting 4: Output mode

1. Incremental, without steps `X001S[4:1]`
2. Incremental, with nr of steps (def) `X001S[4:2]`
3. Absolute value output `X001S[4:3]`

For more info, please see section 3, page 2 and 3.

Setting 5: Time interval for counting number of steps

Number of X-talk scan cycle `X001S[5:X]`

X is a value between **1-8** and its default value is **4**. This setting sets the length of the time interval over which the number of steps in a rotation are counted. The shorter the time interval, the more API commands which will be send during a rotation. An X-talk cycle lasts between 50-80mS, depending on the number and type of sensors which are connected to a controller.

Setting 6: Stop message

1. Activate stop message (default) `X001S[6:1]`
2. Deactivate stop message `X001S[6:2]`

When a rotation has ended, a "stop message" is automatically sent. This setting can activate or deactivate this functionality.

Setting 7: Match pulses with detents

Increments/decrements per pulse `X001S[7:X]`

X is a value between **1-10** and its default value is **1**. This setting specifies the number of increments or decrements per pulse (rotation step). In case the number of detents and pulses per rotation on an encoder are different, this setting can be used to match the number of pulses with the number of detents.

Setting 8: Count resolution for absolute value mode

Required pulses per increment `X001S[8:X]`

X is a value between **1-100** and its default value is **1**. This setting determines the resolution at which the absolute value is incremented or decremented per rotation step. The higher this setting, the slower the absolute value will increment or decrement with a rotation.

Setting 9: Scale for absolute value output

1. 000-100 (default) `X001S[9:1]`
2. 000-255 `X001S[9:2]`
3. 000-999 `X001S[9:3]`

This setting determines the resolution scale of the absolute value output mode.

Setting 10: Overflow for absolute value output

1. No overflow (default) `X001S[10:1]`
2. Enable `X001S[10:2]`

Per default, there is no overflow for absolute value output. When the highest end of the absolute value scale is reached (for example 100), it will not increment any further, even if a clockwise rotation is detected. Similarly, when the lowest end is reached (0), it will not decrement any further, even if a counterclockwise rotation is detected.

When overflow is enabled and the highest value is reached, a clockwise rotation will result into the absolute value jumping ("overflowing") to 0, and incrementing further from that point depending on the number of rotation steps. Similarly, when the lowest end is reached (0), it will jump "overflow" to the highest value.

Setting 11: Button output mode

1. All events (default) `X001S[11:1]`
2. Only pressed/released `X001S[11:2]`
3. Only click type `X001S[11:3]`

For more info, please see section 3, page 3.

Setting 12: Max release duration for Double click

Maximum release duration `X001S[12:X]`

X is a value between **1-100** and its default value is **30**. It specifies the maximum time (*in steps of 10ms*) between two clicks, for them to be seen as a double click, instead of two individual clicks.

Setting 13: Long press duration

Minimum hold duration `X001S[13:X]`

X is a value between **1-100** and its default value is **6**. It specifies the minimum time (*in steps of 50ms*) a button press needs to be hold, for it to be seen as a "long press". Shorter button presses are considered "Clicks" or can become "Double clicks".

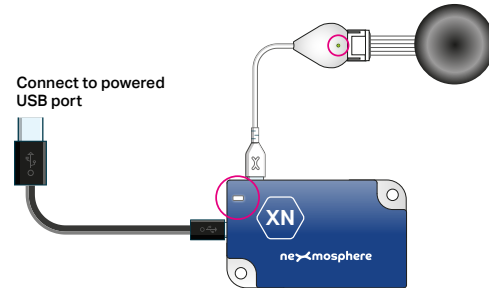
6. Quick test

In order to test if the X-Dot Encoder interface is installed correctly, please follow the test procedure below:

Step 1 - Setup

First, connect a rotary encoder to the X-Dot Encoder interface. Secondly, connect the X-Dot Encoder to an Xperience controller and power the Xperience controller.

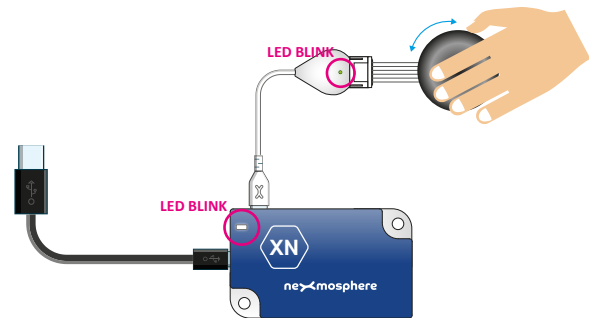
The green status LED of the X-Dot Encoder interface should go on. The status LED of the controller will start to blink and once power-up is completed will be lit continuously



Step 2 - Test

Rotate the rotary encoder.

Both the green status LED of the sensor and the status LED of the controller should blink.



In case any of the steps above does 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.