

# ***XTRA.EV TRANSPONDER***

User Manual

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De Haardt bv  
Marithaime 6  
6662 WD Elst (Gld)  
The Netherlands  
Tel.: +31 481 353 202  
Email: [info@de-haardt.com](mailto:info@de-haardt.com)

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## Safety

All De Haardt's products are designed as supplement to make karting safer, but cannot replace safe track procedures. If equipment fails, the normal operating procedure must still be adequate to safely operate the track.

This document has been written with great care. However, the manufacturer cannot be held responsible, either for any errors occurring in this publication or for their consequences.

## Support

Preferably by email: [support@de-haardt.com](mailto:support@de-haardt.com)

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# 1 Getting started

This manual provides information needed to install, configure and use the Xtra.EV Transponder.

## 1.1 What is in the box



Figure 1 – Xtra.EV Transponder

## 1.2 Additional items

Items that are not included, but may be purchased separately:

| Article No. | Name                  | Description                                                                     |
|-------------|-----------------------|---------------------------------------------------------------------------------|
| 200.631     | Xtra.Transition Cable | For retrofitting old style Xtra.EV Transponder                                  |
| 200.632     | Xtra.Config Plug      | Hardware safety interlock, required for (re)configuring the Xtra.EV Transponder |

## 1.3 Product overview

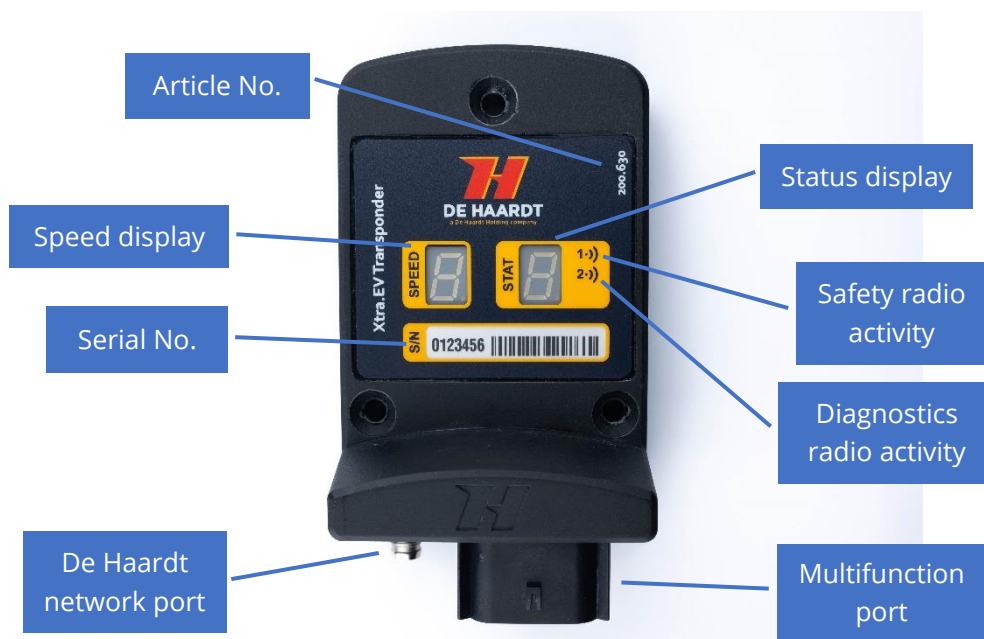


Figure 2 – Product overview

## 2 Installation

### 2.1 Mounting

Transponder is to be fitted on a flat surface with three countersunk M5 bolts and lock-nuts. Surface can be either plastic or metal. Do not overtighten the bolts as enclosure is not allowed to deform. Optionally, if required the fixation may be improved with double sided adhesive tape.

Mount the transponder as high as possible on the kart, preferably with connectors facing downwards. This ensures optimum radio sensitivity all around.

To prevent radio degeneration, it is advisable to maintain a clearance to metal around the transponder internal antennae. These are marked green in the picture below.



Figure 3 - Transponder antennae

### 2.2 Connectors

The Xtra.EV Transponder features two connectors. A De Haardt network connector and a 12-pole multi-function port.

#### 2.2.1 De Haardt network connector

Used for communication with other De Haardt products.  
Mates with the De Haardt network cable.



Figure 4 - De Haardt network cable



Warning. If this connector is not used, keep it covered with a protective cap. This cap is preinstalled at the factory.

## 2.2.2 Multifunction port

This port mates with the Molex MX120G female automotive connector.

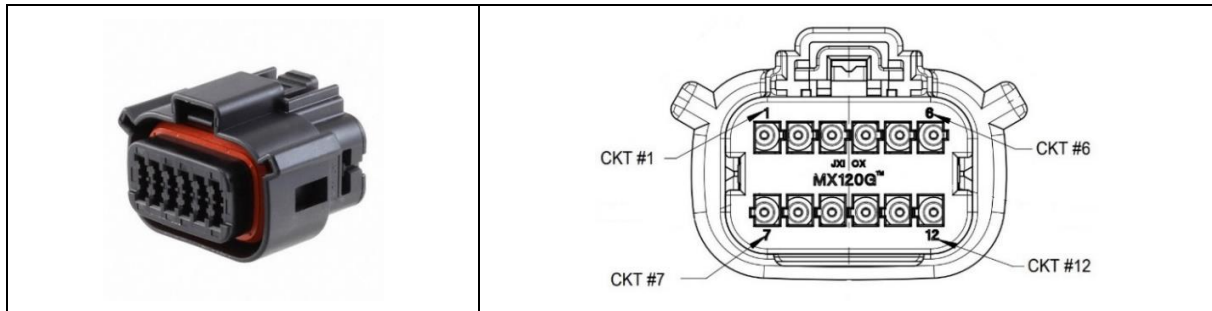


Figure 5 – Multifunction connector

| Pin | Function                    | Recommended wire color |
|-----|-----------------------------|------------------------|
| 1   | Battery +                   | Red                    |
| 2   | Digital output 3            | Green                  |
| 3   | Digital output 2            | Green                  |
| 4   | Digital input 2             | Yellow                 |
| 5   | Digital input 4 or output 4 | Yellow or Green        |
| 6   | Digital IO return (0V) [*]  | Black                  |
| 7   | Battery – (0V) [*]          | Black                  |
| 8   | Digital output 1            | Green                  |
| 9   | Digital input 1             | Yellow                 |
| 10  | Digital input 3             | Yellow                 |
| 11  | CAN data low                | White                  |
| 12  | CAN data high               | Blue                   |

[\*] Use separate connections for Battery– and Digital IO return

### Cable assembly parts

| Part No.   | Manufacturer | Description                                |
|------------|--------------|--------------------------------------------|
| 36792-1201 | Molex        | Female crimp connector housing             |
| 36799-0002 | Molex        | Crimp terminal female 22-20 AWG tin plated |
| 36804-0001 | Molex        | Cavity plug for sealing voided circuits    |

Cable assembly parts are obtainable through Digi-key and RS-components amongst others.



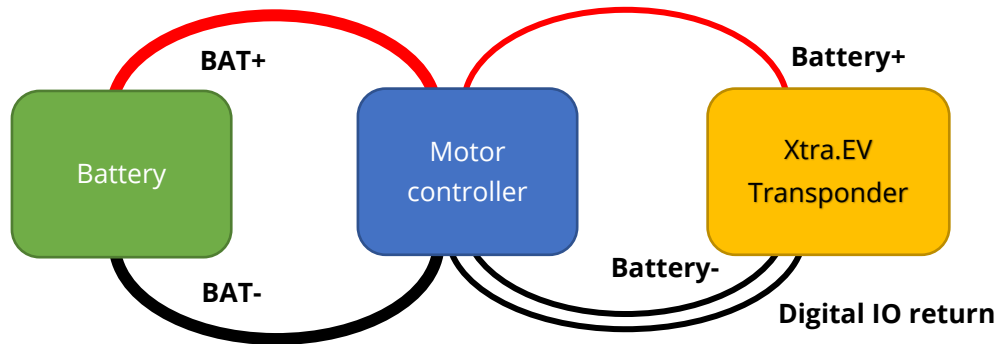
**Warning!** Always install cavity plugs at unused connector positions. Otherwise, ingress protection cannot be guaranteed.



**Caution!**  
The multifunction cable length must not exceed 3 meters.

## 2.3 Power cable routing

The Xtra.EV Transponder communicates with the motor controller through digital IO lines. For proper communication it is important that there is no voltage difference between motor controller and shutdown transponder BAT- connections. Therefore, don't tie the Xtra.EV Transponder directly to the battery, but via the motor controller instead.



*Figure 6 – Power cable routing*

## 2.4 Digital outputs

The Xtra.EV Transponders features 4 digital outputs. Wire these to the motor controller digital inputs. Locate these digital inputs with the motor controller datasheet. If less connections are needed then remaining outputs can be left unconnected.

## 2.5 Boost switch

The Xtra.EV Transponder features a boost function that is controlled through an external switch. If boost is required, then tie a switch between digital input 3 (connector pin 10) and digital IO return (connector pin 6). See the Xtra.Remote Control Use Manual for further information.

## 2.6 Charge lock

The Xtra.EV Transponder monitors digital input 1 (connector pin 9) for a charge signal. If present, it disables all digital outputs thus forcing the motor controller in a safe state. Digital input 1 is normally configured high-level-active and accepts up to 60V.

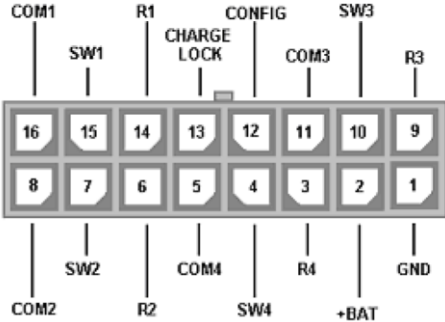
## 2.7 Xtra.Transition cable

To ease retrofitting old-style Xtra.EV Transponders, De Haardt offers an Xtra.Transition cable. Attach this cable in between the old-style wiring harness and the Xtra.EV Transponder.



Figure 7 – Xtra.Transition cable

| Xtra.EV transponder |                        | ↔ | Old harness |     |
|---------------------|------------------------|---|-------------|-----|
| Pin                 | Signal name            |   | Signal name | Pin |
| 1                   | Battery +              |   | BAT+        | 2   |
| 2                   | Digital output 3       |   | SW3         | 10  |
| 3                   | Digital output 2       |   | SW2         | 7   |
| 4                   | Digital input 2        |   | CONFIG      | 12  |
| 5                   | Digital output 4       |   | SW4         | 4   |
| 6                   | Digital IO return (0V) |   | BAT-        | 1   |
| 7                   | Battery - (0V) [*]     |   | BAT-        | 1   |
| 8                   | Digital output 1       |   | SW1         | 15  |
| 9                   | Digital input 1        |   | CHARGE LOCK | 13  |
| 10                  | Digital input 3        |   | BOOST       | 14  |





Warning! It should be noted that old-style wiring harnesses may have inconsistencies. Sometimes the SW and COM wires are swapped. For correct operation, ensure that SW pins are wired correctly.

## 3 Operation

### 3.1 Typical setup

The Xtra.EV Transponder interfaces most popular motor controllers to the De Haardt safety system.

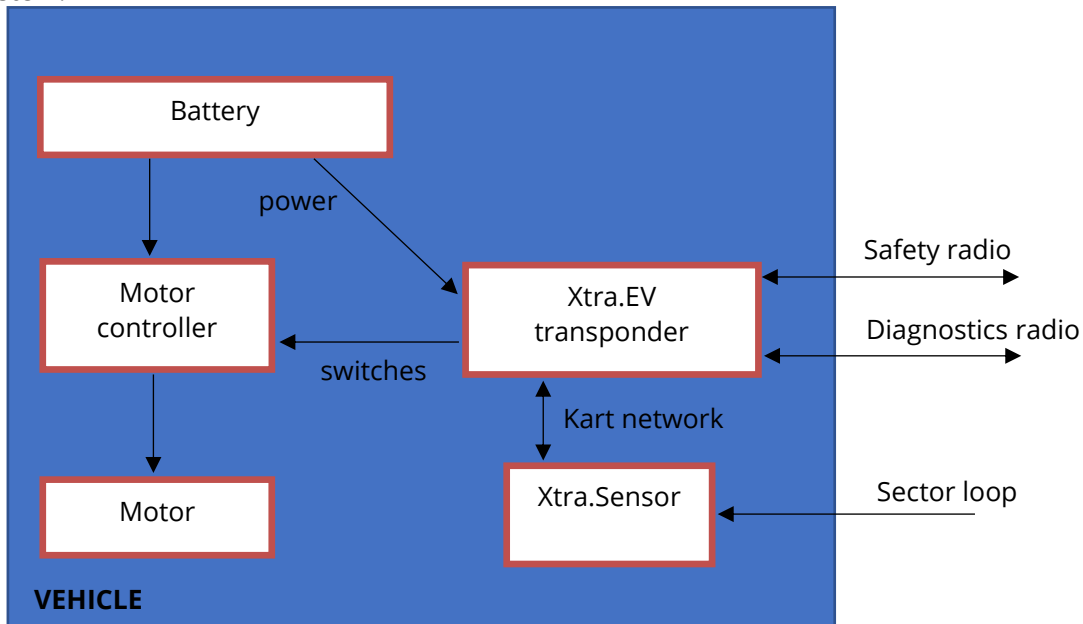


Figure 8 – Typical go-kart configuration

### 3.2 Speed control

The Xtra.EV transponder instructs the motor controller speed and torque through up to four digital switches. Depending on the speed button pressed on the Xtra.Remote Control, switches will open or close as defined in the user-programmable switch-table.

### 3.3 Displays

The displays show actual system status.

| Display | Character | Description                                                   |
|---------|-----------|---------------------------------------------------------------|
| SPEED   | 0-8       | Actual speed limit                                            |
| SPEED   | [         | Configuration mode (Xtra.Config Plug), drive disabled         |
| SPEED   | E         | Error (hardware), transponder may not operate correctly       |
| SPEED   | P         | Programming firmware                                          |
| SPEED   | -         | Main power not connected, drive disabled                      |
| STAT    | 0-8       | Product type, shown briefly at power-up (Xtra.EV = 2)         |
| STAT    | ≡         | Activity indicators: safety radio, diagnostics radio, CAN bus |

### 3.4 Sector system

Additional features like sector control and lap-timing may be installed separately by fitting the Xtra.Sensor to the De Haardt network port. More information about these features and configuration is available in the Xtra.Sensor, Xtra.Beacon and Xtra.Black Box user Manuals.

## 4 Configuration

### 4.1 Configuration tools

Configuration of the Xtra.EV Transponder is done through the Xtra.Remote Control and / or Xtra.Config Tool software. See the appropriate manuals for further information.

| Parameter            | Xtra.Remote Control | Xtra.Config Tool |
|----------------------|---------------------|------------------|
| Kart number          | ✓                   | ✓                |
| Group numbers        | ✓                   | ✓                |
| Track configuration  | ✓                   | ✓                |
| Startup speed limit  | ✓                   | ✓                |
| Input 1 polarity     |                     | ✓                |
| Switch-table         | ✓                   | ✓                |
| Output configuration |                     | ✓                |

### 4.2 Startup speed limit

The maximum allowed speed at startup. Range 0 – 8.

### 4.3 Input 1 polarity

The polarity of digital input 1 can be modified if needed. The factory default is “Active high”.

### 4.4 Output configuration

The output driver must be configured to match the motor controller digital inputs. Listed below are some popular controllers. If your controller is not mentioned, please consult its datasheet to see if digital inputs are active-low or active-high. Default output configuration is “Active-low”. On request, Xtra.EV Transponders can be purchased preset to “Active-high” instead.

| Motor controller      | Motor controller inputs                   | Output config |
|-----------------------|-------------------------------------------|---------------|
| Sevcon Gen-4          | Active low (internal pull-up resistor)    | 5             |
| Curtis F4, 1232, 1234 | Active high (internal pull-down resistor) | 3             |

## 5 Technical specifications

### 5.1 Dimensions and mass

|                                            |               | Units |
|--------------------------------------------|---------------|-------|
| External size (Width x Length x Thickness) | 66 x 118 x 39 | mm    |
| Weight                                     | 230           | g     |

### 5.2 Environmental

|                                                     | Min | Typ. | Max | Unit |
|-----------------------------------------------------|-----|------|-----|------|
| Temperature range for operation                     | -10 |      | 55  | °C   |
| Temperature range for storage and transport         | -20 |      | 70  | °C   |
| Relative humidity range for operation and transport | 20  |      | 80  | %    |
| Ingress Protection rating                           |     | 57   |     | IP   |

### 5.3 Input power

|                         | Min | Typ. | Max | Unit |
|-------------------------|-----|------|-----|------|
| Power dissipation       |     | 1    | 10  | W    |
| Input current           |     |      | 250 | mA   |
| Input voltage range [*] | 11  | 48   | 60  | V    |

[\*] De Haardt cannot guarantee safe operation beyond 60V

### 5.4 Digital outputs

The Xtra.EV Transponder features four digital outputs and four digital inputs. Input number 4 is shared with output number 4 on the multifunction connector.

Digital outputs sink to ground, source 12V or float to high-impedance state. Behavior can be changed with the Xtra.Config Tool software.

|                                                             | Min  | Typ. | Max  | Unit |
|-------------------------------------------------------------|------|------|------|------|
| Number of outputs                                           | 3    |      | 4    | V    |
| Output low – voltage [**]                                   |      | 0.3  |      | V    |
| Output low – sink current (per channel)                     |      |      | 2    | A    |
| Output high – voltage [**]                                  | 11.5 | 12.2 | 12.5 | V    |
| Output high – source current (total for all channels) [***] |      |      | 0.5  | A    |
| Output floating – clamping voltage (rev. 6, 2018)           |      | 28   |      | V    |
| Output floating – clamping voltage (rev. 7, 2020)           |      | 36   |      | V    |
| Output floating – max allowed voltage (rev. 8, 2022)        |      | 60   |      | V    |

[\*\*] Depends on output current

[\*\*\*] Maximum output current will be lower when powered from batteries under 30V

### 5.5 Digital inputs

All digital inputs are low-level sensitive. This means that sinking a digital input to ground activates it. Deactivation is done by floating or sourcing to 9V or higher. Inactive digital inputs are pulled up to 12V internally. Digital input number 1 can optionally be configured as high-level sensitive.

Behavior can be changed with the Xtra.Config Tool software.

|                                             | Min | Typ. | Max | Unit |
|---------------------------------------------|-----|------|-----|------|
| Number of inputs                            | 3   |      | 4   | V    |
| Input 1, 2, 3 voltage range                 | -1  |      | 70  | V    |
| Input 4 voltage range (rev. 6, 2018)        | -1  |      | 28  | V    |
| Input 4 voltage range (rev. 7, 2020)        | -1  |      | 36  | V    |
| Input 4 voltage range (rev. 8, 2022)        | -1  |      | 60  | V    |
| Pull-up voltage                             |     | 12.2 |     | V    |
| Threshold low-level sensitive input         | 3   | 5.2  |     | V    |
| Threshold high-level sensitive input [****] |     | 7.7  | 9   | V    |

[\*\*\*\*] Only input 1 can be configured high-level sensitive