

## Why use the Telemetric Intelligence Monitor (TiM) in the electrical wheelchair?

In the Netherlands thousands of people with mobility limitations use the electrical wheelchair to move from one place to another, both inside and outside their house. Users fully depend on the wheelchair; when it breaks down or system errors occur, they might be in danger or unable to leave their house. Besides reliability, the general quality of the wheelchair, adequate customer service contact and the interaction with the wheelchair are points of attention wheelchair users.

In order to get the full benefits of the wheelchair, its needs to be adjusted to the right settings. For example, when used properly, the tilt adjustment of the wheelchair can lead to less sores, prevents muscle overload and consequently would prevent having to use extra healthcare personnel. However, at this moment, healthcare personnel cannot monitor if their instructions for the wheelchair settings are properly or at all executed. The result might be that patients end up in more discomfort than needed.

Medical supply companies and staff also experience challenges in maintaining the wheelchair or respond adequately to an error. At the moment, there is no insights into causes, frequency or severity of glitches and defects. This is much needed so preventative measures be taken in maintenance or targeted solutions can be offered in case of an emergency.

Both the user, care giving personnel or medical staff would all benefit from more data from the wheelchair. The staff needs more insights into the technical status of the wheelchair so it can act faster or preventatively. More data and information can help the user of the wheelchair to interact with the wheelchair more sustainably so it will be more reliable when used.

To receive this data IVRA Electronics BV, in cooperation with Welzorg, developed the Telemetric intelligence Monitor (TiM) device.



## Telemetric intelligence Monitor Electrical wheelchair (TiM Elro)

De Telemetric intelligence Monitor Electric wheelchair (TiM Elro) by IVRA Electronics BV is a device that collects real time data directly from the electrical wheelchair. This data is transferred to a personalized dashboard. It sends out a signal with the appropriate response action. This can be preventative or in case of an emergency. This system does not only help to save costs by taking preventative measures and pinpoints the exact problem, it also ensures the safety of the person using the wheelchair.

## What is measured by the Elro-TiM?

The TiM Elro retrieves a complete package of information from the wheelchair and sends this once every four hours to the server. The data consists of battery voltage and the charging/discharging cycle of the battery. Additionally, it also measures data surrounding the wheelchair such as temperature and humidity. Even while driving, the TiM Elro measures different variables such as battery power, the position and the distance traveled, acceleration and the angle of the wheelchair. In the wheelchair specifically, the angle of the seat is measured. The TiM Elro also receives the error notifications from the controller and send them, with a time stamp, to the server. All raw data is processed before the TiM Elro transmits it to the dashboard. Through the personalized dashboard the caretaker retrieves all the information.



## What is the data used for?

All the information that the TiM Elro retrieves is essentially used to keep the wheelchair in the most optimal state. This happens in two ways: on the one hand by targeting vehicle maintenance more specifically and efficiently. On the other hand by helping the user of the wheelchair to treat the wheelchair and care for it in the most sustainable way.

The information in the dashboard can be used to do a analysis before maintenance personnel is on location. The server generates targeted signals for e.g. increased cable resistance, a battery imbalance, an increased energy consumption or one of the error signals from the controller in the wheelchair. With this information it can be determined whether early maintenance is needed or what needs to be specifically replaced during regular maintenance.

The dashboard is capable of sending a direct message to the user of the wheelchair e.g. via text or e-mail. Via this message the user can be asked to charge the battery if a deep discharge might take place. The system monitors if any action is taken in the next few days or if a reminder is necessary.

The TiM Elro also provides the possibility to send out a warning signal if it detects a possible accident by which the wheelchair has tilted or if it exits a pre-defined area. Lastly, by measuring the tilt position of the seat, the physiotherapist or caregiver can easily monitor and adjust the seating position of the wheelchair if necessary for the user.

By measuring and transferring the data to the care giving organization, the TiM Elro not only provides the information needed to efficiently maintain the wheelchair but most importantly, offers protection, safety and comfort to its user.

### Foutcode Scoot

|  |  |   |   |   |
|--|--|---|---|---|
| <b>TiM laatst actief</b><br>2020-09-08 01:38:01<br># Ontvangst TiM afgelopen 24 uur<br>3 | <b>Foutmelding: Vrijloop</b><br>Datum/Tijd<br>2020-05-28 14:08:38<br>2020-05-28 14:09:23<br>2020-05-28 14:34:39<br>2020-05-28 14:36:08<br>2020-05-29 11:48:26<br>5<br>Totaal | <b>Foutmelding: Neutrale stand</b><br>Datum/Tijd<br>2020-05-29 12:45:00<br>2020-05-29 12:42:40<br>2020-05-29 12:41:22<br>2020-05-29 08:26:20<br>2020-05-28 14:38:49<br>2020-05-28 14:36:58<br>6<br>Totaal | <b>Foutmelding: Acculader aangesloten tijdens wegrijden</b><br>Datum/Tijd<br>2020-05-29 08:57:21<br>1<br>Totaal | <b>Foutmelding: Overige Erros</b><br>Datum/Tijd Overige Erros<br>2020-08-15 12:45:20 Control System in Sleep Mode<br>2020-07-25 13:22:12 Control System in Sleep Mode<br>2020-07-22 13:18:09 Control System in Sleep Mode<br>2020-07-15 13:02:10 Control System in Sleep Mode |
|--|--|---|---|---|

### Staat accu

|  |   |   |  |  |
|--|---|---|--|--|
| <b>Laadfactor Scootmobiel</b><br>1,23<br>Gemiddeld | <b>XLR-Verbinding</b><br>Datum/Tijd Status<br>2020-09-07 07:00:36<br>2020-09-04 11:02:51<br>2020-09-01 10:43:31<br>2020-08-30 10:27:08<br>2020-08-27 10:34:47<br>2020-08-17 12:42:57<br>2020-08-13 09:41:39 | <b>Balans/Onbalans</b><br>Datum/Tijd Verschil in Spanning<br>2020-05-29 08:55:23 0,30<br>2020-07-20 08:49:05 0,08<br>2020-07-27 13:09:16 0,08<br>2020-07-30 09:14:59 0,08<br>2020-08-03 12:25:49 0,08<br>2020-08-13 09:41:39 0,08<br>2020-07-07 07:44:44 0,07 | <b>Laadstroom lader</b><br>Datum/Tijd Max. laadstroom<br>2020-09-07 07:00:36 8,1<br>2020-09-04 11:02:51 8,2<br>2020-09-01 10:43:31 8,1<br>2020-08-30 10:27:08 8,2<br>2020-08-27 10:34:47 8,1<br>2020-08-17 12:42:57 8,2<br>2020-08-13 09:41:39 8,3 | <b>Piekspanning tijdens rit tussen twee laadcycli</b><br>Datum/Tijd Spanning (V) Stroom (A) Afstand (km) Temperatuur (C)<br>2020-09-07 07:00:36 23,9 75 6 21<br>2020-09-04 11:02:51 23,7 68 10 21<br>2020-09-01 10:43:31 24,0 61 9 21<br>2020-08-30 10:27:08 22,0 66 32 20<br>2020-08-27 10:34:47 22,7 65 24 21<br>2020-08-17 12:42:57 23,9 83 8 34<br>2020-08-13 09:41:39 22,8 72 31 36 |
|--|---|---|--|--|

### Gebruik Scoot

|  |   |  |   |   |
|--|---|--|---|---|
| <b>Scootmobiel Gekanteld</b><br>Datum/Tijd<br>2020-05-28 13:59:21<br>1<br>Totaal<br>403,02<br>Totaal gereden kms | <b>Laagspanningswaarschuwing</b><br>Datum/Tijd<br>0<br>Totaal | <b>Lading Volttooid</b><br>Datum/Tijd Max Spanning (V) Max. laadstroom<br>2020-07-21 17:07:32 33,8 8,1<br>2020-07-07 07:44:44 33,7 8,1<br>2020-07-18 09:08:32 33,7 8,2<br>2020-07-29 09:48:22 33,7 8,2<br>2020-07-25 12:24:21 33,6 8,2<br>2020-07-30 09:14:59 33,6 8,2<br>2020-09-07 07:00:36 33,6 8,1 | <b>Ampere uur versus km</b><br>Datum/Tijd Capacity (Ah) Afstand (km)<br>2020-09-07 07:00:36 7,7 6,5<br>2020-09-04 11:02:51 20,7 18,1<br>2020-09-01 10:43:31 14,1 11,7<br>2020-08-30 10:27:08 39,4 33,7<br>2020-08-27 10:34:47 28,8 24,3<br>2020-08-17 12:42:57 11,7 11,7<br>2020-08-13 09:41:39 32,0 33,1 | <b>Bandenspanning</b><br>Datum/Tijd Afstand (km) Energy(Wh)<br>2020-08-30 10:27:08 33,7 967<br>2020-08-13 09:41:39 33,1 796<br>2020-08-03 12:25:49 26,5 695<br>2020-07-20 08:49:05 26,0 656<br>2020-08-10 07:42:45 25,0 658<br>2020-08-27 10:34:47 24,3 711<br>2020-07-30 09:14:59 21,6 579 |
|--|---|--|---|---|