

Battery data is transmitted via CANopen

Thorvald is a module-based robot design. The modules are designed to work in greenhouse, tunnel, open field, and orchard applications.

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From left to right: a three-wheeled version, a low, narrow version for greenhouses, a differential drive version, a tall phenotyping version, a general-purpose version (Source: Saga Robotics)

Thorvald is an autonomous modular robot that can be configured for most agricultural environments. It can perform tasks such as light treatment for disease management, picking fruits and vegetables, phenotyping, in-field transportation, cutting grass for forage production, spraying and data collection/crop prediction.

The mechanical components of the Thorvald robot platform by Saga Robotics (Norway) can be assembled to feature 60-cm to 200-cm width. The dimension of the aluminum pipes is 40 mm. The wiring inside the pipes supports a 150-cm maximum length. The robot is delivered with pipes for 100 cm x 160 cm. If suspensions are added, this will add to the minimum length with 24 cm.

Batteries with 70 Ah power the autonomous driving robots. A charger is included, but automatic charging is not yet available. The batteries are connected to the CANopen network as well as other devices such as the SDC2160 motion controllers by Roboteq. The control system is based on the ROS robot operating system, which supports CANopen communication. ROS runs under Linux Ubuntu.

By default, all battery enclosure modules are designed to serve three other modules with motor power and CAN communication. Battery enclosure modules can be fitted with emergency stop buttons for cutting the contactor on the motor power bus. Resetting a pressed emergency stop button is not enough to restore motor power. For this, the robot must receive a command to re-engage the motor bus-contactor.

The main battery enclosure module holds the robot's main computer and a custom circuit board for managing power circuits, as well as for power-up and shutdown of the robot. The module serves as a connection point for the robot's CANopen network, which is used for communicating with motor controllers.

The steering module also houses a two-channel motor controller, which connects to the robot's CANopen network and controls the module's own motor and the motor of the connected drive module. The output shaft of the steering module is programmed to allow ± 180 -degree rotation, which means that several configurations using this module can drive both forward and sideways with high maneuverability. The steering module can be connected directly to the robot's frame or optionally to a suspension module.

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