

LEAPBOX SYSTEM OVERVIEW





ABOUT BBLEAP

BBLeap is founded by Peter Millenaar, Martijn van Alphen and Hendrikus Kampman. BBLeap stands for BlackBoxLeap, meaning a fully functional Black Box, named the LeapBox. Our purpose is to achieve a big step forward in the development of precision agriculture and eventually empower every grower with the right tool to start Farming On Plant Level.

LeapBox is a precision fluid application system for agricultural spraying purposes. This system will utilize high frequency, high precision PWM-valve technology. The purpose of LeapBox is to greatly improve the spraying quality compared to conventional spraying, as well as to provide a

platform enabling high-resolution precision farming. LeapBox as a stand-alone technology is a major improvement to anyone's spraying quality for full control and good spraying practices. Additionally, BBLeap's LeapBox is a modular system. It can be adjusted to any sprayer or boom width and extended with additional third party technology (sensors, camera systems, etc). As technology develops and the phase of precision farming of the farmer, LeapBox is ready and to grow along.

ABOUT LEAPBOX

LeapBox regulates the application rate based on a fixed pressure, which means that the spray application will always be performed with the optimal droplet size and the correct spray distribution. Moreover, the rate will be turn-compensated and is able to be compensated for boom movement relative to the machine as well (depending on the availability of a boom model or the data required to generate a boom model).

The system is designed for 250 spray positions, which makes it suitable for 60 meter wide booms with 25cm nozzle spacing. Each spray position can have up to 4 valves, for A, B, C, and D spray lines. The system is capable of changing the spray rate per nozzle with a 10 cm interval at 10m/s (36 km/h). At 100Hz 10cm is the minimum interval, at 10Hz (other PWM systems) 100cm is the minimum interval. The desired rate can be fixed over the whole boom, a variable rate for groups of nozzles, a variable rate per nozzle, or a spot spray system (Bilberry, Carbon Bee, Green-eye, Weed-It, and Augmenta).

The system is capable of working at 100Hz (each nozzle). This minimizes the opening and closing time, i.e. the time between the valve being completely open and completely closed. That allows the system to always maintain a large application rate range, even at high speed.

Zero-compromise spraying quality is maintained at low and high driving speed. The very high switching speed of the valves makes this possible, providing stepless rate regulation at low driving speed for each nozzle, from 2% to 98%--with 0% and 100% also available. At high driving speed, the stepless rate regulation range only slightly decreases, providing 15% to 85%--with 0% and 100% still available.



Perfect distribution



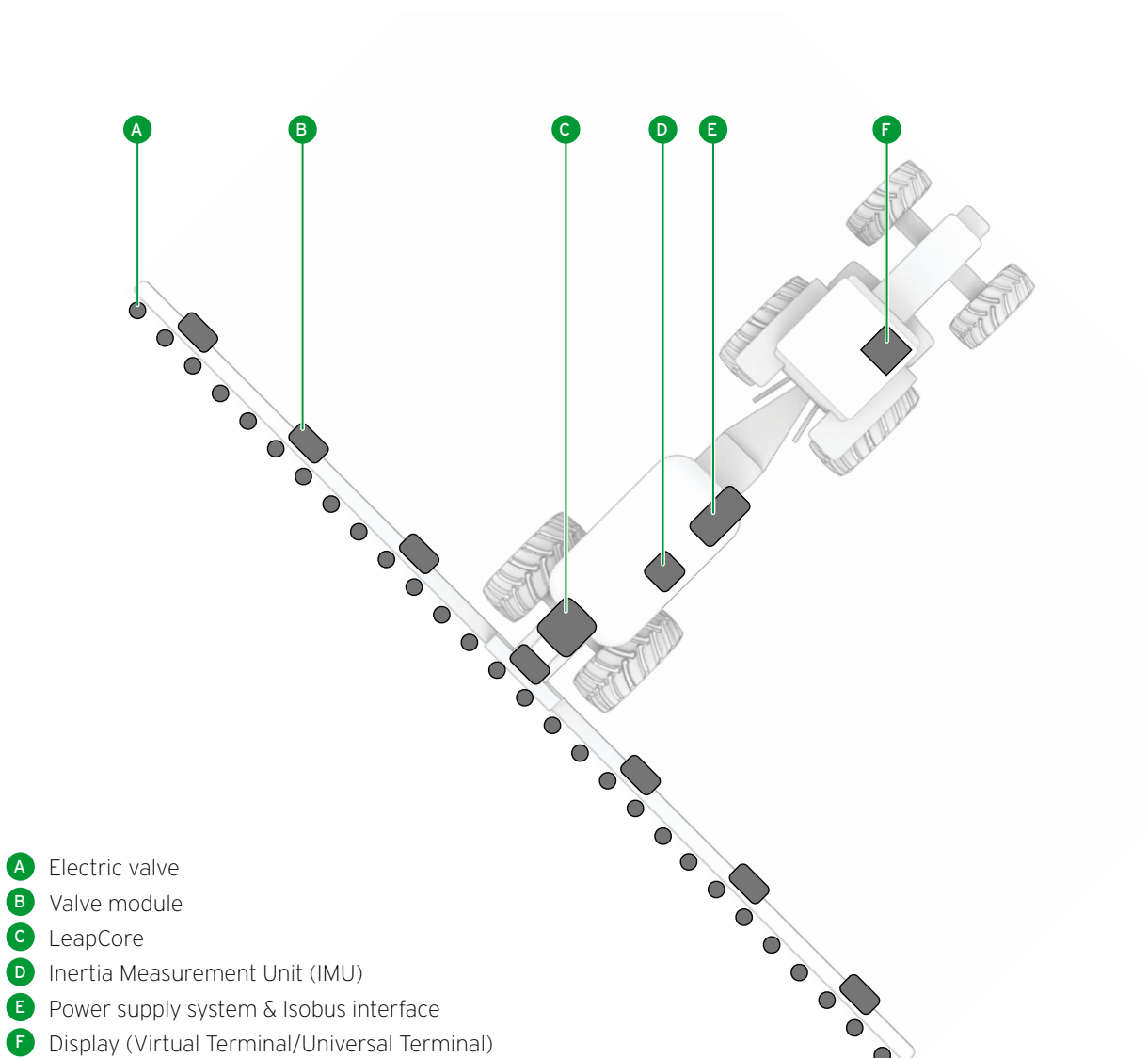
Perfect droplet size



Perfect application rate

SYSTEM ARCHITECTURE

LeapBox can be completely integrated with the existing electronic system of your sprayer, it can also work beside your existing system, using Isobus for the virtual terminal (VT) and task control (TC) for section control and variable rate. LeapBox power supply is provided by the Isobus standard installation. In this document, all LeapBox components will be described. The overview below indicates the position on the machine.



SYSTEM COMPONENTS

Power supply

For a fast opening of the valve a good power supply is required; also full power has to be available at the end of the boom.

LeapBox system has been designed to work on a nominal voltage of 48V to get the maximum valve reaction speed and to guarantee that at the end of the boom enough power is available.

Since common supply voltages for sprayers are 12V (Isobus) or 24V, a step-up DC-DC converter or an alternator with batteries will be required to provide the necessary voltage level. The power required during operation is up to 4W per valve continuous and 7W peak. Depending on the number of valves, a stronger power supply is required.

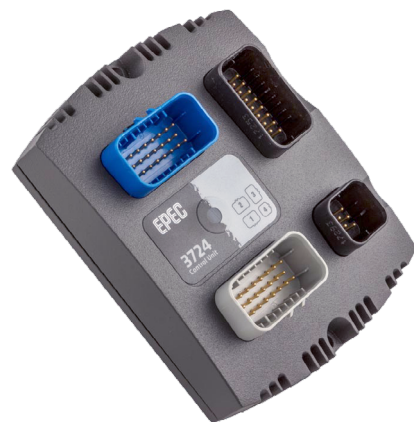


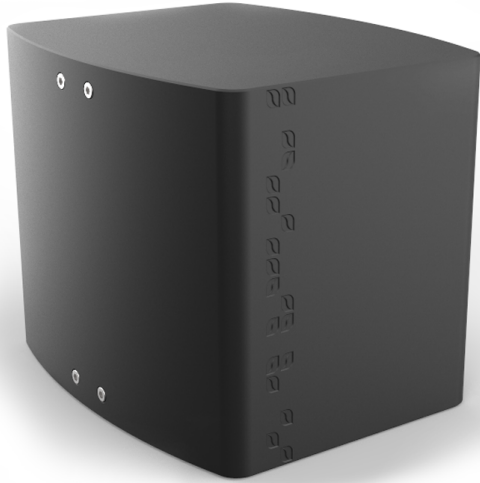
Isobus interface

LeapBox behaves as a machine implement on Isobus. This is achieved by the isobus interface. It is the bridge between the LeapCore and the Isobus standard. The Virtual Terminal (VT) visible on the tractor/gps display is provided by this controller.

IMU

The IMU (Inertia Measurement Unit) is a high precision 3 axis gyroscope and 3 axis accelerometer, calibrated over the complete temperature range. For a complete system, with turn and yaw compensation.





LeapCore including ECU & power separation

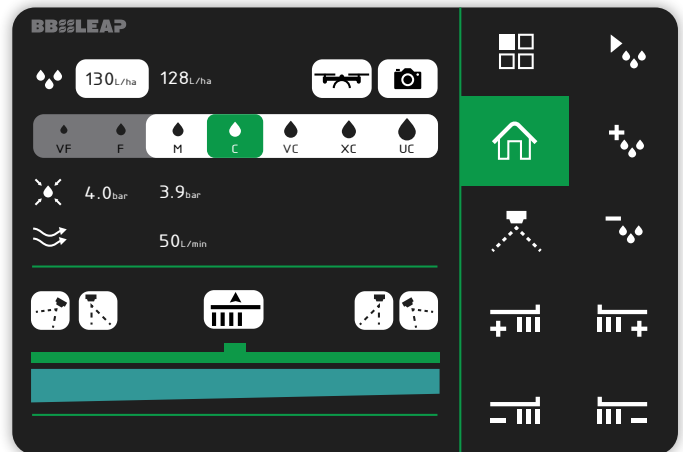
Real-time yaw and turn compensation is required for an accurate spray application. A substantial number of calculations need to be done. Moreover, very fast communication with the valve modules is required and the valves need to react very fast to the required changes.

The LeapBox ECU provides a great deal of calculation power and very fast communication with each valve module. Input from the existing sprayer will be combined with extra sensors to calculate the yaw (optional) and turn compensation. The left and right side of the boom will each have one (or two for booms with more than 100 nozzles) dedicated high-speed CAN-Bus to update the spray rate for each valve at high intervals.

The ECU is equipped with a 4G modem and WiFi. This enables the system to be diagnosed and updated remotely. A WiFi user interface is also available for easy installation of LeapBox on the sprayer.

Virtual Terminal (VT) / Universal Terminal

Operating LeapBox as easy as possible, that is the goal of the VT. Just select your desired droplet size and application rate and you are ready to go. No worries about pressure, speed, cornering etcetera. LeapBox takes care of it.



Valve modules

Accurate spraying means having the right droplet size, the right distribution, and the right spray rate at all times. The valve driver is a crucial part to achieve this. The valves must open and close in an extremely short time, but also in such a way that the valve has a long lifespan.

The valve driver uses a high current pulse to move the plunger in the shortest time possible, and slows the plunger before it is completely open to avoid unnecessary strain. It also has a broad input voltage range, is very reliable, can handle voltage fluctuations, has excellent diagnostics and the firmware can be updated on all modules at once and remotely.



Electric valves

Speed, reliability and resistance to many different chemicals are key for the valves.

BBLeap works with a partner company to provide specialized, high frequency, high precision PWM valves. The complete valve is made of high-grade stainless steel, also the plunger and the seals are suitable for a broad range of chemicals. The valves have already proven themselves to last very long and to be unaffected by chemicals.

Boom cables

LeapBox system uses IP69K rated connectors on the boom. BBLeap works with its partner companies to provide cables fitted with high-quality connectors. This ensures all components to be UV resistant and resistant to commonly used chemicals for agricultural spraying.

All cables have injection molded connectors for maximum reliability.



WHAT TO EXPECT?



Quotation

Are you ready to take the Leap? Configure LeapBox according to your sprayer specifications and your wished to get a quotation.



Order confirmation

The deal is real. You will receive your order confirmation and pro forma by e-mail.



Intake and acouting

Let's get technical! We are going to make LeapBox a perfect fit to your tractor and sprayer. We need some details and take some measurements. We will contact you to plan the intake.



Manufacturing and installation

We start the custom production of LeapBox. This usually takes 3 - 6 weeks, also depending on your preference.



Enjoy spraying

Putting your sprayer to work becomes a true pleasure! Insert your desired droplet size and application rate and you are ready for take-off.



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