

XSITE EASY

INSTALLATION MANUAL

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EC Declaration of Conformity FCC Declaration of Conformity

1 INTRODUCTION

This document is the installation manual for the Xsite Easy excavator guidance system. Please read this manual completely, paying special attention to the safety instructions, and make sure you understand all the information in the manual before using the system. Keep the manual available for future reference.

System software version

This manual applies to software version 2.2.

Manufacturer's contact information

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Conformity to EU directives (European Union)

This product is in conformity with EMC (2004/108/EC), RoHS (2002/95/EC), and WEEE (2002/96/EC) directives. This product may not be disposed of together with unsorted household waste - it must be properly recycled according to local regulations.



Conformity to FCC rules (North America)

This product complies with part 15 of the FCC rules.



Disclaimer

The manufacturer does not accept any liability for damages caused by:

- Inappropriate assembly and/or installation
- Non-observance of the instruction manual
- Non-intended and improper use
- Use beyond operation limits
- Use by insufficiently qualified and trained personnel
- Use of unauthorized spare parts and accessories
- Deconstructing and/or rebuilding of the product

Instruction manual

This instruction manual contains basic information to be considered when using and maintaining the product. Observing all security instructions and guidelines given here is indispensable for secure operation. This instruction manual must therefore be read and applied, without fail, by any person assigned with working processes to do with the machine, such as operation, fault finding and maintenance.

This manual is to be considered a part of the product and as such must be passed on to relevant third parties or subsequent owners. It must be permanently kept at the usage site and be available for the operating personnel. Furthermore, general safety regulations, manufacturer's safety regulations and local accident prevention regulations for the area in which the product is being used, must also all be observed.

The product is available with a number of sensor combinations. If your system is not equipped with some of the sensors or other components described in this manual, those sections of the manual are not applicable to you.

We are eager to ensure that this instruction manual is correct and up-to-date. To maintain our technological edge, it may be necessary to undertake modifications to the product and its operation without prior notice. If you are using a newer or older version of the product or software than that described in this manual, the information herein may no longer be applicable. If this is the case, your local dealer will be happy to provide you with a new manual. We do not accept liability for disturbances, failures or damages resulting from the use of an out-of-date manual.

The text and graphics within this manual have been collated with the greatest possible care. However, we will not be held liable for possible errors or consequences arising from them. Should you wish to make suggestions regarding this manual or point out possible errors, please contact your local dealer. We will gladly take your ideas and suggestions into consideration.

Explanation of symbols

Warning notices are marked in this instruction manual with symbols. Under all circumstances observe these notices and proceed carefully to prevent accidents, personal injuries, and material damages.



Indicates a hazardous situation. If not avoided, could result in death, serious injury, or material damages.



Emphasizes useful tips, recommendations and other information for efficient and trouble-free operation.

1.1 Safety instructions

This section outlines all important safety matters concerning the optimal safety of personnel as well as failure-free operation. These instructions shall enable users to recognize potential risks of use and, as far as possible, prevent them in advance. Every user has to understand and observe these instructions.



The product must not be solely relied on for the operation of the machine. The operator must maintain a proper view of the operating area at all times.

Conventional use

The product has been exclusively designed and constructed for conventional use as described here.

- Positioning the bucket of an excavator with the help of gravitation sensors, laser receiver, or other sensors.
- Indication of the position of the measuring point to the user.
- Comparison of the position of the measuring point with various types of reference information.

Any other use not listed here, as well as any application not complying with the technical data, is not considered conventional use.

Improper use

- Non-conventional use
- Exceeding the limit values given on the data sheet
- Use of the product without instructions
- Use of the product beyond the limits of use
- Invalidation of safety equipment
- Removal of indicating or warning labels
- Opening, rebuilding or alteration of the product
- Use of the product in spite of obvious defects or damages
- Use of the product with unauthorized accessories from other manufacturers
- Use of the product at insufficiently secured construction sites

Alteration and rebuilding of the product

To prevent risks and ensure optimal performance, alterations, attachments or rebuilding of the product may not be carried out without the manufacturer's explicit permission.

The foremans's responsibility

The product is used in the industrial sector. The foreman of the product is therefore subject to legal responsibilities for operational safety. In addition to the operational safety instructions in this manual, the relevant safety, accident prevention and environmental protection regulations for the area in which the product is operating must also be observed.

Particularly applicable:

- The foreman must make sure he is aware of the current operational safety regulations and, in a risk assessment, be able to detect additional risks caused by the special working conditions at the usage site of the product. These risks must be compiled in the form of written instructions, which must then be kept near to the product and permanently be available for the persons working with it
- The foreman must clearly define the responsibilities of the personnel with regard to the appliance
- The foreman must ensure that the contents of the instruction manual have been fully understood by the operating personnel
- The information in the instruction manual must be observed thoroughly and without exception
- The foreman must ensure that all maintenance, inspection and assembling processes are carried out by qualified, specialized personnel, and that such personnel have fully acquainted themselves with the product and its application by carefully studying the product manuals
- The foreman must inform the manufacturer or the authorized dealer if any safety defects are found or occur during operation

Special risks



Epilepsy warning

Some people are susceptible to epileptic seizures or loss of consciousness when exposed to certain flashing lights or light patterns. Immediately discontinue use and consult your doctor if any of the following symptoms occur while using the product: dizziness, blurred vision, eye or muscle twitches, loss of consciousness, disorientation or any involuntary movement or convulsion.



Risks caused by electric current

When working close to electricity systems (for example overhead powerlines), there is a danger of death due to electric shock. Keep sufficient safety distance to electrical systems.



Moving components

Keep other persons away from the working range of the machine and the tool. Remove objects from the working range of the machine and the tool. Do not interfere with the moving components during operation.



Overhanging machine parts

System components assembled after the machine has left the factory can increase the typical dimensions of the machine. Being unaware of this can lead to injuries and material damages.



Risk of injury caused by malfunction

Uncontrolled machine actions caused by the malfunction of a system component can lead to severe personal injuries or cause material damage within the machine's working range. Ensure that the machine is operated, controlled and inspected by a qualified and experienced operator, who is capable of carrying out emergency measures, such as an emergency stop.



Lacking instruction

Lacking or insufficient instruction can lead to operating errors or incorrect use. This can lead to severe personal injuries, as well as significant material and environmental damage. Observe the manufacturer's safety instructions and the foreman's directives.



Risk of injury caused by insufficient safeguarding

Insufficient safeguarding of the construction site and the location of the component (for example the position of the laser emitter), can lead to hazardous situations on the construction site and surrounding traffic. Ensure sufficient safeguarding of the construction site. Ensure sufficient safeguarding of the locations of each single component. Observe the country-specific safety and accident prevention regulations, as well as the current road traffic regulations.



Risks caused by faulty measurement results

Faulty measurement results due to use of a damaged (for example dropped) product, improper use or alteration to the product can lead to severe material damages. Do not use products showing obvious signs of damage. Before re-using a component that has been dropped, carry out a test measurement to ensure accurate readings.



Risk of injury caused by unreadable signs

In the course of time, labels and symbols on the product can become unrecognisable due to dirt, wear or other damage. Labels and symbols can also get detached. Always keep safety, warning and operation instructions in good enough condition that they can easily be read. Regularly check the adhesiveness of the labels and symbols on the product. Do not remove any labels or symbols from the product.



Risk of injury caused by inappropriate disposal of the product

When burning plastic parts, toxic gases that can cause illnesses are emitted. Dispose the product properly according to the current national country-specific disposal regulations. Careless disposal might also enable unauthorized persons to improperly use the product; in doing so, these persons and/or third parties might be severely injured and also pollute the environment. At all times, protect the product against access by unauthorized persons.

Proceeding in case of danger and accidents

Preventive measures

- Always be prepared for possible accidents or fire
- Keep first-aid equipment (ambulance box, blankets etc.) within reach
- Familiarize all personnel with accident notification and first-aid equipment as well as procedures for alerting the emergency services
- Keep access routes clear for emergency vehicles

In the event of accident, proceed appropriately:

- 1. Immediately shut down the product by switching the power off
- 2. Begin first-aid-measures
- 3. Recover persons out of the hazard zone
- 4. Inform the responsible person at the usage site
- 5. Alert medical assistance and/or the fire brigade
- 6. Ensure that access routes are clear for emergency vehicles

1.2 Product overview

Xsite Easy is a machine guidance system for excavators. Xsite Easy indicates the position of the measuring point compared to a reference level.

The system contains the following components by default (Figure 1):

- 1. Display unit
- 2. Connection box for LED display
- 3. Gravitation sensors for bucket, dipper stick, main boom, and frame

The system can be expanded by adding the following optional accessories (Figure 1):

- Tilt bucket sensor
- Dual block boom sensor
- Laser receiver
- LED display



1.3 Handling of the system

The display is not completely waterproof. If the display or other components are taken away from the construction machine, a carrying case should be used. Make sure that the components are clean and dry before placing them in the carrying case. Also make sure that the carrying case is clean and dry.

1.4 Transportation and storage

When taking the equipment to the usage site or carrying it in the field, always ensure that the product is transported in secured, suitable containers. Never transport the product loosely in a vehicle. Knocks and hits can severely harm the functioning of the product. In case of transportation by railway, plane or ship, always use the original packaging, transport containers and transport boxes. The packaging protects the product against hits and vibration.

Only store the product in well aired, dry rooms. During storage, protect it against dampness, and use the original packaging whenever possible. Avoid strong fluctuations in temperature during storage. Water condensation can form gradually, harming the functioning of the product.

1.5 Support and maintenance

Maintenance services are provided by the manufacturer or authorised dealer. The installation and servicing of the product should only be carried out by trained and qualified personnel.



For safety reasons, only representatives of the manufacturer are allowed to open the housings.

2 INSTALLATION OF COMPONENTS

The chapters below provide information about installation of the components

2.1 Components inside the cabin

When mounting the displays, notice the following precautions:

- Display should be mounted so that it is easily reachable by the operator.
- Display should not block the view outside.
- Display should not block the view to machine's integrated display.
- Display should not prevent the front window from opening.
- Display should not restrict moving of operator's seat.
- Display should not restrict access to the steering wheel or joysticks.

Attach the Xsite Easy display and the XD2 LED display to the front or side window by suction cups (Figure 2). Before attaching the suction cup, make sure that the window is clean (use for example isopropyl alcohol if needed) and warm (warm it up carefully if needed).



Figure 2. Example of the mounting place of the Xsite Easy display and the XD2 LED display

Mount the XD2 connection box for example behind the operator's seat by screws or tape (Velcro, Dual lock). Make sure that all cables can reach to the connection box and that the connection box does not restrict moving of operator's seat. Make sure that the plastic covers of the cabin can be detached without unmounting the connection box.

2.2 Inclination sensors and laser receiver

Inclination sensors are mounted on the moving parts of the excavator. Sensors are labeled with the following identification numbers (Figure 3):

- 101. Bucket sensor
- 102. Stick sensor
- 103. Main boom sensor
- 104. Not used
- 105. Frame sensor
- 106. Extra boom sensor (if excavator is equipped with dual block boom)
- 107. Tilt bucket sensor (optional)



Figure 3. Sensor IDs

It is possible to change the sensor ID with a PC software provided by Novatron. For example if replacing a broken sensor with a new one, the ID of the new sensor must be the same as the ID of the broken sensor.

It is not needed to align the sensors with the boom lines (the line between two pivot points). Software calibration corrects the deviation from the boom line. However, some sensors require more precise mounting than others.

Sensors are mounted in the following order:

- 1. Tilt bucket sensor (optional)
- 2. Bucket sensor
- 3. Stick sensor
- 4. Main boom sensor
- 5. Extra boom sensor (optional)
- 6. Frame sensor

The sensors should be mounted where the cable from the previous sensor ends in order to avoid loose cable on the boom. If the bucket is very greasy, install the tilt bucket sensor last to avoid staining of the cabin during the rest of the installation procedure.

In most cases sensors are mounted by using bolts. However, some machine manufacturers do not accept drilling of the boom. In those cases, sensors are attached to mounting plates by screws. Mounting plates are welded on the boom.

There are three measurement axes in the sensor (Figure 4).



Figure 4. Measurement axes

Sensors can be mounted to several different positions (Figure 5). Not all mounting orientations are possible for all sensors. See chapters 2.2.1 - 2.2.5 for details.



Figure 5. Mounting orientations (arrow points forward)

2.2.1 Tilt bucket sensor



Movements of the bucket and bucket accessories have to be checked before installing the sensor or sensor cables. Movements of the cable have to be checked after the installation.



The moving part of the cable has to be covered by a shield. Shielded cable from the bucket sensor has to be connected with one or more fasteners. Mount the first fastener approximately 15 cm from the sensor.

Tilt bucket sensor can be mounted on a tilt rotator, tilting quick coupler or tilting bucket.

Possible mounting orientations for the tilt bucket sensor are

- A1: left side, measurement axis A pointing forward
- B1: on the top, measurement axis A pointing forward
- B2: on the top, measurement axis A pointing right when looking from the cabin
- B3: on the top, measurement axis A pointing backward
- B4: on the top, measurement axis A pointing left when looking from the cabin (Figures 8 and 9)
- C1: right side, measurement axis A pointing forward
- D1: at the bottom, measurement axis A pointing forward
- D2: at the bottom, measurement axis A pointing left when looking from the cabin (Figure 7)
- D4: at the bottom, measurement axis A pointing right when looking from the cabin



If possible, mount the sensor in a safe place. A shield (for example out of steel) can be made for the sensor, if needed.



For an easy access to the sensor connector, it should be close to the hydraulic hose connectors of the tilt rotator.



Always align the tilt bucket sensor either with the boom line or so that is forms a 90° angle with the boom (Figure 6). Deviation of $\pm 1^{\circ}$ can be tolerated. However, the smaller the deviation, the better the measurement result.



Figure 6. Alignment of the tilt bucket sensor



Figure 7. Tilt bucket sensor on the tilting part of the tilt rotator, inside the cover plate (mounting orientation D2). Mounting place depends on the manufacturer of the tilt rotator. In this example the sensor is mounted upside down.



Figure 8. Tilt bucket sensor on a tilting quick coupler (mounting orientation B4)



Figure 9. Tilt bucket sensor on a tilting bucket (mounting orientation B4)

2.2.2 Bucket sensor



Movements of the bucket and bucket accessories have to be checked before installing the sensor or sensor cables. Movements of the cable have to be checked after the installation.



The moving part of the cable has to be covered by a shield. Shielded cable from the bucket sensor has to be connected with one or more fasteners. Mount the first fastener approximately 15 cm from the sensor.

Bucket sensor can be installed on quick coupler or linkage.

Possible mounting orientations for quick coupler installation are

- A1: left side, measurement axis A pointing to the bucket tip (Figure 10)
- B1: on the top, measurement axis A pointing to the bucket tip
- B4: on the top, measurement axis A pointing left when looking from the cabin
- C1: right side, measurement axis A pointing to the bucket tip

When installing the sensor on the quick coupler, it is not necessary to align the sensor exactly with the line from the bucket pin to the bucket tip (Figure 10). Bucket calibration corrects the deviation from the line. However, the deviation should be as small as possible. Note that when changing the bucket, the deviation also changes.



Figure 10. Installation on the inner or outer surface of the quick coupler (mounting orientation A1)

Possible mounting orientations for linkage installation are

- A1: left side, measurement axis A pointing forward (Figure 11)
- B1: on the top, measurement axis A pointing forward
- C1: right side, measurement axis A pointing forward

When installing the sensor on the linkage, align the sensor with the line between the linkage pins within an accuracy of $\pm 10^{\circ}$.



Figure 11. Installation on the inner or outer surface of the linkage (mounting orientation A1)

2.2.3 Laser receiver

Laser receiver is mounted connectors pointing downwards on the left side of the stick aligned exactly with the line between the stick pin and the bucket pin (Figure 12). Laser receiver should be mounted in a sheltered place if possible. Laser receiver should be mounted on the lower part of the stick, so that it is not needed to lift the transmitter unnecessarily high.



Figure 12.Laser receiver

2.2.4 Stick, main boom, and extra boom sensors

Possible mounting orientations for the stick, main boom, and extra boom sensors are

- A1: left side, measurement axis A pointing to the bucket (Figure 13)
- C1: right side, measurement axis A pointing to the bucket
- C3: right side, measurement axis A pointing to the cabin

If the boom consists of two parts the extra boom is the part that is closer to the cabin.

Align the sensor with the boom line within an accuracy of $\pm 10^{\circ}$. The sensor should be mounted in a sheltered place if possible. To avoid harmful accelerations, the sensor should be mounted as close to stick/boom pin as possible.



Figure 13. Stick sensor (mounting orientation A1)



It is not allowed to mount the main boom or extra boom sensor on the narrowing part of the boom (Figure 14).



Figure 14. Main boom and extra boom sensor



Check the movements of the cable after installation.

2.2.5 Frame sensor

Possible mounting orientations for the frame sensor are

- A1: left side, measurement axis A pointing to the bucket
- B1: on the top, measurement axis A pointing to the bucket (Figure 15)
- C1: right side, measurement axis A pointing to the bucket

Frame sensor should be aligned exactly with the boom centre line. Maximum acceptable deviation from the line is $\pm 1^{\circ}$. However, the smaller the deviation, the better the measurement result.

Best mounting position is on the top of the machine and very near to the rotation centre of the machine. When mounting on the top of the machine, ensure that cover plates are not vibrating with engine revolutions. Optional mounting positions are engine area floor or cabin floor as long as the cabin is tilting along the frame of the machine.



Figure 15. Frame sensor, mounting orientation B1

2.3 Finalizing the installation

Take the cables from devices that are mounted outside the cabin into the cabin through one inlet. The cables can be taken into the cabin for example by using one of the following options:

- Holes underneath the bottom cover
- Lamp cable holes
- Pedal holes



Do not drill any holes to the cabin! The cabin is considered as safety equipment.

2.3.1 Power cord

Xsite Easy system requires 24 VDC input voltage. Power supply should be able to provide 1 A at 24 V.



Install 12 V to 24 V converter to machines with 12 V battery.

Remove the fuse from the fuse holder before installing the power cord. The fuse will be put back after all components and cables have been installed.

Connect plus (red) to the main power switch of the machine (Figure 16). Alternatively connect plus (red) straight to the battery output (Figure 17). Connect ground (yellow) to the machine chassis.



Figure 16. Wiring diagram, plus to machine's main power switch, ground to machine chassis



Figure 17. Wiring diagram, plus to machine's battery, ground to machine chassis

After the power cord has been connected to a power supply, connect the other end to the display.



Xsite Easy power cable must be always equipped with a fuse.

3 INSTALLATION DATA

Lengths must be measured precisely with 1 mm accuracy unless otherwise stated. Measure the lengths and write them down.

Machine coordinates (X, Y, Z) are explained in Figure 18.



Figure 18. X, Y and Z coordinates of the machine

3.1 Bucket lengths

Measure bucket length from the centre point of the lowest stick pin to the bucket tip (Figure 19). Measure left bucket width and right bucket width. If tilting bucket is used, measure also quick coupler value. **NOTE**! If tilting bucket is not used do not take measure from tilting coupler.



Figure 19. Bucket measures: 1) Bucket length, 2) Left width, 3) Right width, 4) Quick coupler

3.2 Linkage lengths

Linkage lengths are measured if the bucket sensor has been mounted on the linkage (Figure 20). Linkage parameters are measured from the centre points of the pins.



Figure 20. Linkage lengths

3.3 Laser receiver lengths

Measure X offset, Y offset and Z offset.

X offset is measured from the centre line of the laser receiver to the centre line of the stick. X offset can be calculated by measuring the thickness of the stick, dividing the measure by two and adding 70 mm to the value. Value is negative, because laser receiver is mounted on the left side of the stick (Figure 21).

Y offset is measured from the stick/boom pin to the upmost photodiode of the laser receiver. Value is positive, if the photodiode is on the left side of the pin (Figure 21).

If the laser receiver has not been mounted on the line between the bucket pin and the stick pin, Z offset has to be measured from the pin line to the centre line of the laser receiver. Value is positive, if the laser receiver is above the boom line (Figure 21).





3.4 Boom lengths

Measure stick and main boom lengths (Figure 22). Measure extra boom length, if the boom consists of 2 parts. Extra boom is the part that is closer to the cabin. Lengths are measured from the centre points of the pins.



Figure 22. Boom lengths: 1) Stick, 2) Main boom, 3) Extra boom

3.5 Rotation centre point offsets

Measure X offset and Y offset (Figure 23). Lengths are measured from the boom pin to the rotating centre point of the machine.



Before measuring, make sure that you have identified the rotating centre point of the machine. The rotating motor can be easily misinterpret as the rotating centre point.



Figure 23. Rotation centre point offsets

4 CALIBRATION



Sensors are equipped with internal heating. When excavator is used at cold environment, it takes time for the sensors to warm up and provide good accuracy. The amount of time needed after turning ON the system and before starting the work (to ensure accurate measurement results) is shown in Table 1.

Table 1. Needed time to warm up the sensors in cold environment.

Temperature	Heating time
-20°C	~20 minutes
-10°C	~10 minutes
-5°C	~5 minutes

To access the calibration settings, press the "Main menu" button for 3 seconds. Then press the "Down arrow" and "0.0" buttons simultaneously for 3 seconds. New items ("Frame", "Boom", "Bucket sensor" and "Equipment") will appear below the "Info" item.

Up to 3 machines can be calibrated in one Xsite Easy display unit. Select machine that will be calibrated in "Installation settings" \rightarrow "Choose machine".

To complete the calibration, at least the following tasks should be done in "Installation settings":

- Frame sensor calibration
- Boom calibrations
- Bucket mount calibration

4.1 Frame sensor calibration

Go to "Installation settings" \rightarrow "Frame".

Wizard guides you through the following steps

- 1. Select sensor mounting orientation.
- 2. Enter X offset
- 3. Enter Y offset
- 4. Align the excavator frame with the tracks by slewing the machine. Press "0.0" to calibrate when aligned.
- 5. Slew the excavator 180 degrees and align the frame with the tracks on the opposite direction. Press "0.0" to calibrate when machine is correctly aligned.
- 6. Save correction to sensor by pressing "0.0".
- 7. Test that pitch and roll of the frame are near zero when the machine is on flat surface.

Exit wizard by pressing the "Bucket" button and accept changes by choosing "Yes" with the "0.0" button.

4.2 Stick sensor calibration

When doing the stick calibration, every step has to be done accurately. Make sure that the steps are done in the correct order.

Go to "Installation settings" \rightarrow "Boom" \rightarrow "Stick".

- 1. Enter stick length (Figure 24). Length is the distance between pins.
- 2. Slew machine roll to near zero. If roll value is too big, text "Turn!" is shown on the screen.
- Align stick horizontally (Figure 25). When at least one of the numbers are on black background, press "0.0" to calibrate. Do not move the boom while the calibration is in progress. NOTE! When step 3 has been completed, text "Done" will appear on the screen.
- 4. Align stick vertically (Figure 26). When at least one of the numbers are on black background, press "0.0" to calibrate. Do not move the boom while the calibration is in progress. **NOTE!** When step 4 has been completed, text "Done" will appear on the screen.
- 5. Set mounting orientation. Xsite Easy recognizes the mounting orientation automatically based on steps 3 and 4. If the mounting orientation is wrong, consider doing steps 3 and 4 again or choose correct orientation from the list by using the "0.0" button.
- Move stick to an angle that is between 30...60 degrees (Figure 28). Bucket should be placed on the ground so that the stick is not sinking slowly down. Press "0.0" to calibrate. When calibration position is set, do not move the machine or the boom until you have done steps 7, 8 and 9. NOTE! When step 6 has been completed, text "Done" will appear on the screen.

- 7. Measure calibration height (Figure 27). Height is easiest to measure by using a point laser. Insert the laser on the same level with the lower pin of the stick and measure vertical distance from the upper pin of the stick to the laser beam.
- 8. Measure calibration distance (Figure 29). Distance can be measured by using a plumb line or a point laser. Insert the plumb line to the upper pin of the stick and measure horizontal distance from the plumb line to the lower pin of the stick. If measurement of the calibration distance is difficult, value can be left to 0.000 m and the calibration wizard calculates the distance automatically.
- 9. Save correction to sensor by pressing "0.0". If both height and distance have been set in steps 7 and 8, the maximum error can be seen on the screen. If the error is bigger than 0.01 m, steps 6, 7 and 8 should be done again.
- 10. Evaluate the calibration values. Values in the top row are length scaled vectors X, Y and Z. Values in the middle row are pitch, yaw and roll in degrees and the values in the bottom row are G force components from the sensor.

Exit the stick calibration by pressing the "Bucket" button and accept the changes by choosing "Yes" with the "0.0" button.



Figure 24. Stick length



Figure 25. Stick horizontally



Figure 26. Stick vertically



Figure 27. Calibration angle



Figure 28. Calibration height



Figure 29. Calibration distance

4.3 Main boom sensor calibration



When calibrating a machine that has an extra boom, extra boom sensor has to be calibrated before main boom sensor.

When performing the boom calibration, every step has to be done accurately. Make sure that the steps are done in the correct order.

Go to "Installation settings" \rightarrow "Boom" \rightarrow "Main boom".

- 1. Enter boom length. Length is the distance between pins.
- 2. Slew machine roll to near zero. If roll value is too big, text "Turn!" is shown on the screen.
- 3. Align boom horizontally. Press "0.0" to calibrate. Do not move the boom while the calibration is in progress. **NOTE!** When step 3 has been completed, text "Done" will appear on the screen.
- 4. Align boom vertically. If boom can not be turned to full 90 degree angle, turn it as up as possible. Press "0.0" to calibrate. Do not move the boom while the calibration is in progress. **NOTE!** When step 4 has been completed, text "Done" will appear on the screen.
- 5. Set mounting orientation. Xsite Easy recognizes the mounting orientation automatically based on steps 3 and 4. If the mounting orientation is wrong, consider doing steps 3 and 4 again or choose correct orientation from the list by using the "0.0" button.
- 6. Move boom to an angle that is close to 45 degrees. If the boom is too high from the ground to do measurements of steps 7 and 8, the angle can be smaller. Regardless, the angle should be at least 20 degrees. Bucket should be placed on the ground so that the boom is not sinking slowly down. Press "0.0" to calibrate. When the calibration position is set, do not move the machine or the boom until you have done steps 7, 8 and 9. **NOTE!** When step 6 has been completed, text "Done" will appear on the screen.
- 7. Measure calibration height. Height is easiest to measure by using a point laser. Insert the laser on the same level with the lower pin of the boom and measure vertical distance from the upper pin of the boom to the laser beam.
- 8. Measure calibration distance. Distance can be measured by using a plumb line or a point laser. Insert the plumb line to the upper pin of the boom and measure horizontal distance from the plumb line to the lower pin of the boom. If measuring of the calibration distance is difficult, value can be left to 0.000 m and the calibration wizard calculates the distance automatically.
- 9. Save correction to sensor by pressing "0.0". If both height and distance have been set in steps 7 and 8, the maximum error can be seen on the screen. If the error is bigger than 0.01 m, steps 6, 7 and 8 should be done again.
- 10. Evaluate the calibration values. Values in the top row are length scaled vectors X, Y and Z. Values in the middle row are pitch, yaw and roll in degrees and the values in the bottom row are G force components from the sensor.

Exit the boom calibration by pressing the "Bucket" button and accept the changes by choosing "Yes" with the "0.0" button.

4.4 Extra boom sensor calibration



When calibrating a machine that has an extra boom the sensor of the extra boom has to be calibrated before main boom sensor.

Calibration of the extra boom sensor is done in the same way as calibration of the main boom sensor.

4.5 Boom line accuracy test

After calibrating the stick and boom sensors, test the boom line accuracy.

Create a new bucket with lengths of 0 m. Go to "Main menu" \rightarrow "Buckets" \rightarrow "<New bucket>" \rightarrow "Blank values" \rightarrow "Measures" and make sure that all bucket lengths are 0.000 m. If wanted, the bucket can be given a descriptive name. Exit to the measurement screen and save settings.

Set up a point laser and attach a calibration magnet on the centre point of the lowest pin of the stick.

Move stick and boom so that the laser beam hits the bolt in the calibration magnet (Figure 30). Zero the reading by pressing the "0.0" button. Move stick and boom to different positions and check the accuracy for all positions (at least reach stick and boom as far from the cabin as possible and take them as close to the cabin as possible).

If accuracy is good (tolerance ± 1 cm), proceed to the bucket mount calibration. If accuracy is worse than ± 1 cm, calibrate stick and boom sensors again.



Figure 30. Boom line accuracy check

4.6 Bucket mount calibration

Go to "Installation settings" \rightarrow "Bucket sensor" \rightarrow "Mounting place". Select the correct mounting place from the list and exit by pressing the "Bucket" button.

4.6.1 Quick coupler

Go to "Installation settings" \rightarrow "Bucket sensor" \rightarrow "Calibration".

- 1. Slew machine roll to near zero. If roll value is too big, text "Turn!" is shown on the screen.
- 2. Turn the bucket down. Press the "0.0" button to calibrate. **NOTE!** When step 2 has been completed, text "Done" will appear on the screen.
- 3. Turn the bucket up/forward. Press the "0.0" button to calibrate. **NOTE!** When step 3 has been completed, text "Done" will appear on the screen.
- 4. Set mounting orientation. Xsite Easy recognizes the mounting orientation automatically based on steps 2 and 3. If the mounting orientation is wrong, consider doing steps 2 and 3 again or choose correct orientation from the list by using "0.0" button.
- 5. Save correction to sensor by pressing the "0.0" button.
- 6. Calibrated sensor roll can be tested by turning the bucket to different positions and checking that the roll value is near zero.

Exit the quick coupler calibration by pressing the "Bucket" button and accept the changes by choosing "Yes" with the "0.0" button.

4.6.2 Linkage

Go to "Installation settings" \rightarrow "Bucket sensor" \rightarrow "Linkage measures".

Set values P9–P13 (see chapter 3.2). Exit by pressing the "Bucket" button and accept the changes by choosing "Yes" with the "0.0" button.

Go to "Installation settings" \rightarrow "Bucket sensor" \rightarrow "Calibration".

- 1. Slew machine roll to near zero. If roll value is too big, text "Turn!" is shown on the screen.
- 2. Align linkage part P13 horizontally by using a point laser or spirit level. **NOTE!** When step 2 has been completed, text "Done" will appear on the screen.
- 3. Turn linkage part P13 up. Press the "0.0" button to calibrate. **NOTE!** When step 3 has been completed, text "Done" will appear on the screen.
- 4. Set mounting orientation. Xsite Easy recognizes the mounting orientation automatically based on steps 2 and 3. If the mounting orientation is wrong, consider doing steps 2 and 3 again or choose correct orientation from the list by using "0.0" button.
- 5. Save correction to sensor by pressing the "0.0" button.
- 6. Calibrated sensor roll can be tested by turning the bucket to different positions and checking that the roll value is near zero.

Exit the linkage calibration by pressing the "Bucket" button and accept the changes by choosing "Yes" with the "0.0" button.

4.7 Finalizing the calibration

After a successful machine calibration and boom line accuracy test, buckets should be calibrated.

Please see the Xsite Easy user manual for instructions on how to calibrate buckets and tilting buckets. User manual also provides instructions on how to check the accuracy after bucket calibration and tilt bucket calibration.

EC Declaration of Conformity

Document no: EDI 3-EC-002

We, the undersigned,

Manufacturer:	Novatron Oy
Address:	Myllyhaantie 6 E, 33960 Pirkkala, Finland
Phone number:	+358-3-357 2600
Fax number:	+358-3-357 2677

certify and declare under our sole responsibility that the following equipment,

Name:	Easy Dig / Xsite EASY
Components:	100012 Easy Dig v3 display / 100022 Xsite EASY v3 display
	130192 G1 sensor
	100008 EL2 laser receiver
	100065 XD2 LED display
	140102 XD2 connection box

is in conformity with the requirements of EMC directive 2004/108/EC. The following standards have been applied: EN 13309:2010, ISO 7637-2:2004.

Place of issue:	Pirkkala, Finland
Date of issue:	12 March 2013

Jukka Tervahauta Managing Director Novatron Oy

FCC Declaration of Conformity

Document no: EDV3-FCC-002

We, the undersigned,

Manufacturer:	Novatron Oy
Address:	Myllyhaantie 6 E, 33960 Pirkkala, Finland
Phone number:	+358-3-357 2600
Fax number:	+358-3-357 2677

certify and declare under our sole responsibility that the following equipment,

Trade names:	Easy Dig / Xsite EASY
Model numbers:	100012 Easy Dig v3 display / 100022 Xsite EASY v3 display
	130192 G1 sensor
	100008 EL2 laser receiver
	100065 XD2 LED display
	140102 XD2 connection box

complies with part 15 of the FCC rules.

Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Place of issue: Date of issue: Pirkkala, Finland 12 March 2013

Jukka Tervahauta Managing Director Novatron Oy