



TECHNICAL SPECIFICATION

CONTROL SYSTEM MCONTROL+



valid from Jan 2022



HIGHER PRODUCTIVITY – SIGNIFICANT SAVINGS

Efficient. Fast. Versatile. Accurate. Safe. Reliable.

MOVAX WAY-OF-PILING

INTRODUCTION

Movax Oy, established in 1993, is a Finnish-based, privately-owned world-leading innovator, developer and manufacturer of excavator-mounted piling and foundation equipment with highly advanced automatic control systems and information management solutions.

A TOTAL SOLUTION

Movax Oy focuses solely on solutions for the piling & foundation industry. The comprehensive range of excavator-mounted piling & foundation equipment and customized solutions cover a complete range of piling technologies - including both driven and bored piles.

UNIQUE, VALUE-ADDING TECHNOLOGY

Movax Oy's piling and foundation equipment provide the optimum way-of-working - **MOVAX WAY-OF-PILING™** - when constructing foundations, building retaining walls, both temporary and permanent, cofferdams and when performing trenching and excavation work and soil stabilisation in a wide range of applications.

QUALITY BUILT-TO-LAST

MOVAX is made with high-class materials, equipment and components – and modern, state-of-the-art production technologies and machinery ensuring the highest possible quality of manufacture. Movax Oy's Quality Management Systems is certified on accordance with ISO 9001:2015.

GLOBALLY PROVEN

With almost **30 years of experience** and more than **2500 units delivered** to all over the world and with a clear focus on the piling and foundation industry, MOVAX has a deep understanding and know-how of varying site and soil conditions - and of all kinds of different type of excavators and rail roaders. Movax Oy's experience also covers a wide range of applications ranging from Rail, Road and Civil to Waterways & Piers, Utilities and Environmental & Energy.

GLOBALLY LOCAL CUSTOMER CARE

Movax Oy focuses on superior customer service and support together with a world-wide network of local partners, established in more than 30 countries all over the world, performing trenching and excavation work in a wide range of applications from civil/structural, rail and road to waterways & piers, utilities and environmental.



INNOVATION & CONTINUOUS DEVELOPMENT

Movax Oy is the inventor of the modular, vibratory side grip pile driver technology. Movax Oy's inventions have resulted in numerous patents (50+) and its trademark, MOVAX®, is registered and well known for the quality it represents all over the world.

Movax Oy is strongly committed to continuously develop its products and services in close cooperation with its customers and local partners.



PRODUCTS & SERVICES

MOVAX CONTROL SYSTEM

The MOVAX Control System, **mControl+**, links the carrier (excavator, railroader or equal) with the MOVAX piling equipment and customised solutions. The system controls the auxiliary hydraulics of the excavator which in turn is utilised to control the MOVAX piling equipment, the MOVAX multi-tool piling leaders including the tooling connected to the leader and the MOVAX column stabilisation leader.

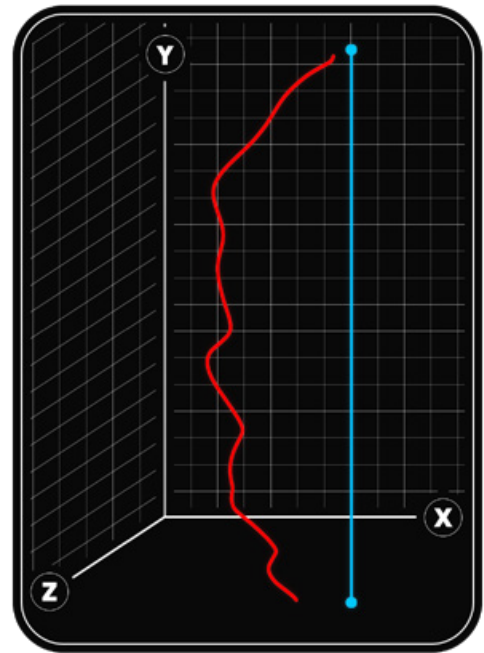
The excavator's auxiliary hydraulics is controlled by the standard auxiliary pilot circuit of the excavator which is controlled by mControl+. The mControl+ control system utilizes inclination and pressure sensors to monitor the operation and the pile driving and stabilisation processes - thus effectively and efficiently assisting the operator in performing all the required control functions and tasks.



Control system for
MOVAX PILING EQUIPMENT & CUSTOMISED SOLUTIONS

FEATURES

- **Advanced MOVAX control system available in two different versions:**
 - Automatic control system with autoT™ tip-control, **mControl+ PRO**
 - Manual control system, **mControl+ LITE**
- **Commanding the standard auxiliary hydraulic circuit of the excavator.**
The excavator's auxiliary pilot circuit is controlled optionally:
 - Hydraulically, with a hydraulic valve block
 - Electronically, with a PWM-module
 - Through a CAN interface
- **Ergonomic and informative user interface**
 - Easy-to-read graphical symbols for different functions
 - User-friendly menus for calibration and performance optimisation
 - Colour display
 - All functions are effortlessly controlled using switches and thumb wheels on the control grips
- **System diagnostics - available directly on the mControl+ display**
 - Available (optional) with connectivity to MOVAX Information Management System, mFleetManagement and mLogbook



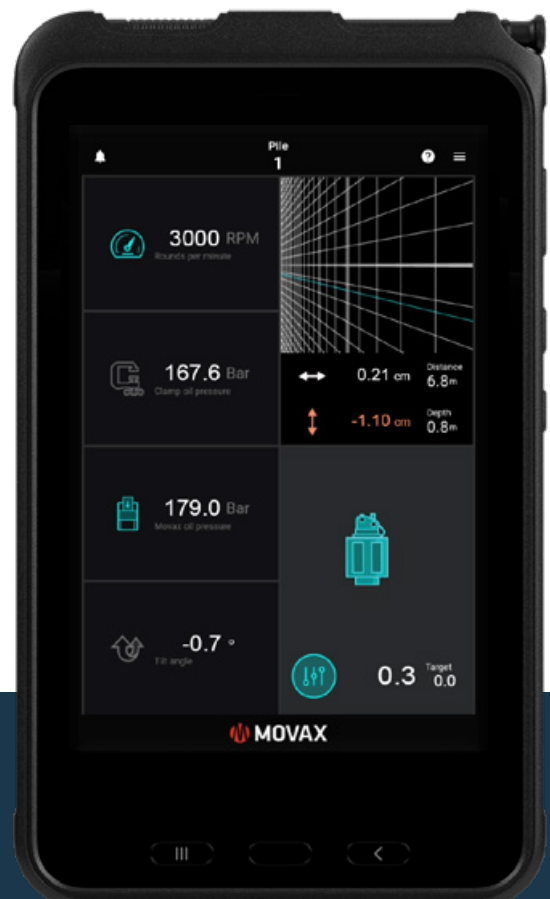
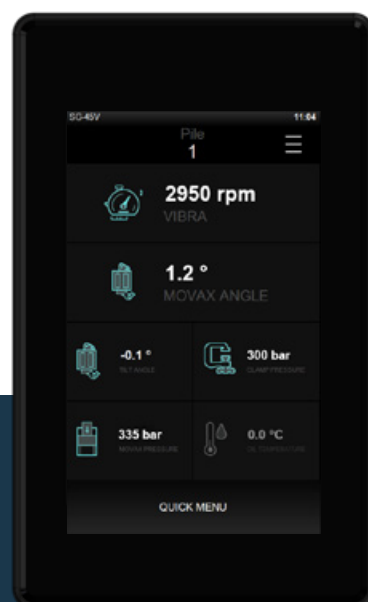
NOTE!

mLogbook requires mControl+ PRO.

The pilot circuit control is dependent on the excavator brand & model (year). For excavators with the CAN interface currently available, please contact Movax Oy.

mControl+ PRO is compatible with all MOVAX piling equipment and customized solutions, including MOVAX multi-tool piling leaders and MOVAX column stabilisation leaders.

mControl+ LITE is utilised to control the MOVAX piling equipment. mControl+ LITE can be upgraded to mControl+ Pro.

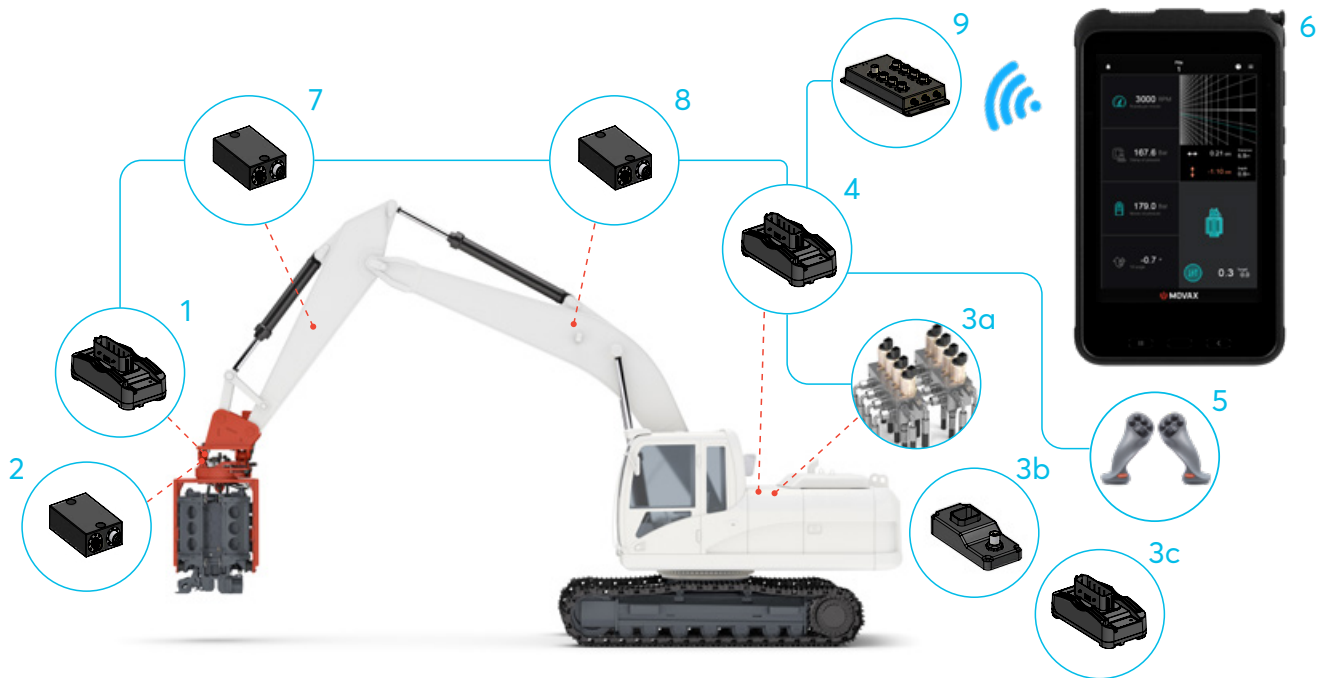


MOVAX CONTROL SYSTEM

mControl+ PRO

mControl+ PRO is a state-of-the-art automatic control system based on advanced 'tip'-control (autoT™) computing technology and angle sensors mounted onto the excavator's boom and stick which utilises either proportional pilot valves, a PWM controller or a CAN pilot circuit/interface for the control of the excavator's auxiliary hydraulics.

The autoT™-feature of the mControl+ PRO effectively assists the operator in achieving a faster and more efficient, high quality piling installation. The mControl+ PRO also provides valuable information which further assists the operator in achieving a higher production rate and quality. The information also ensures the highest possible availability by providing information protecting the MOVAX piling equipment.



1. MOVAX module (MXM) / 2. MOVAX angle sensor (MXS) / 3. Pilot circuit control a) hydraulic valve block, b) PWM control, c) CAN interface / 4. Excavator module (EXM) / 5. Control grips / 6. mControl+ PRO display / 7. Stick angle sensor / 8. Boom angle sensor.
(In case of two-piece boom one additional sensor is required.) / 9. MIMS module

The mControl+ PRO is installed onto the excavator without making any changes to the original functionality of the excavator whatsoever. mControl+ PRO is utilised to control all MOVAX piling equipment, multi-tool piling leaders and column stabilisation leaders.

FEATURES

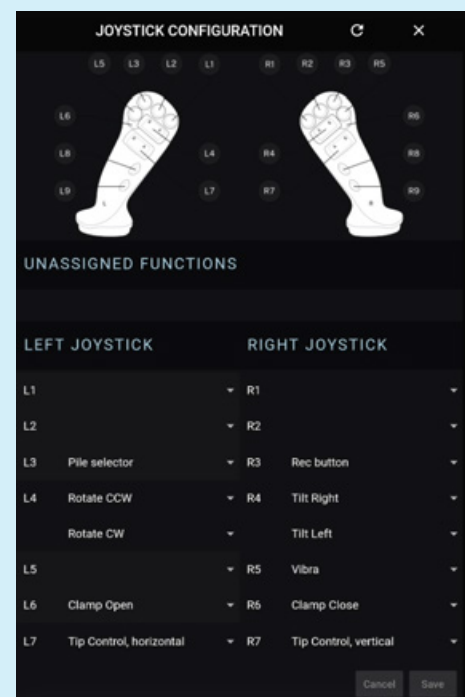
Display

mControl+ PRO is equipped with an independent 8" Android tablet that is used as the control system display. The ergonomic user interface is utilised to monitor and control the MOVAX piling equipment and customised solutions. The display is also utilised, for instance, to input user data related to the pile set criterion (mLogbook) and the angle for raked piles when using autoT™.



Control grips

The ergonomic mControl+ PRO control grips are equipped with multiple rollers and buttons which allow complete operation with a single grip. The control grips include extra buttons and rollers for accommodating functions from the excavator's original handles.



Control modules

mControl+ PRO is equipped with two electronic control modules, one Excavator module (EXM) and MOVAX module (MXM). The excavator cab-mounted EXM controls the excavator's auxiliary hydraulics with either proportional valves, a PWM controller or a CAN bus control circuit. The type of pilot circuit control is dependent on the excavator brand and model. The MXM, installed and delivered with the MOVAX equipment, controls the hydraulic valves on the MOVAX piling equipment, Multi-tool piling leaders and Column stabilisation leaders, and monitors the operation with angle- and pressure sensors.

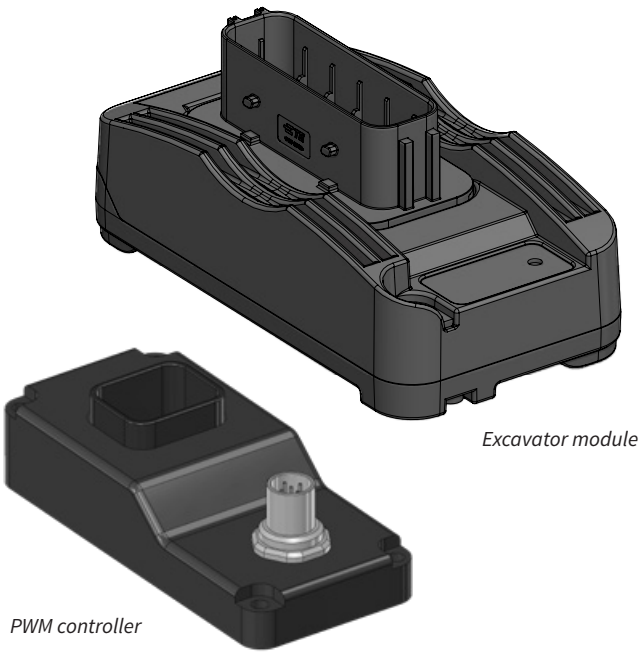
NOTE!

The MOVAX module is always supplied with the MOVAX piling equipment, Multi-tool piling leaders or Column stabilisation leaders.

The MOVAX module is factory installed onto the MOVAX equipment.

Angle sensors

mControl+ PRO system provides highly accurate angle and distance information under extreme vibration conditions. The measurement is based on next-gen 360° angle sensors. These sensors are also equipped with gyroscope to provide maximal accuracy.

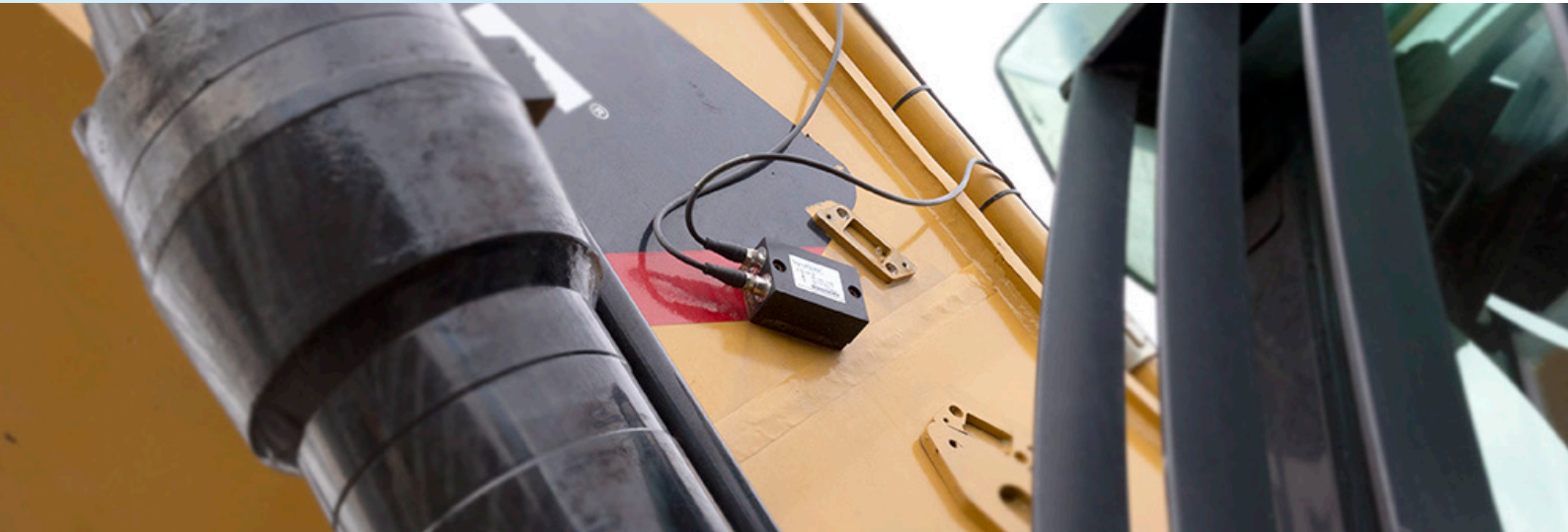


OPTIONS

mControl+ PRO is available with the following options:

| | |
|---------------|--|
| Information | Additional sensor(s) for excavators with a two-piece boom Software licenses for mFleetManagement and mLogbook |
| Control grips | Ergonomic control grips with 3-rollers |

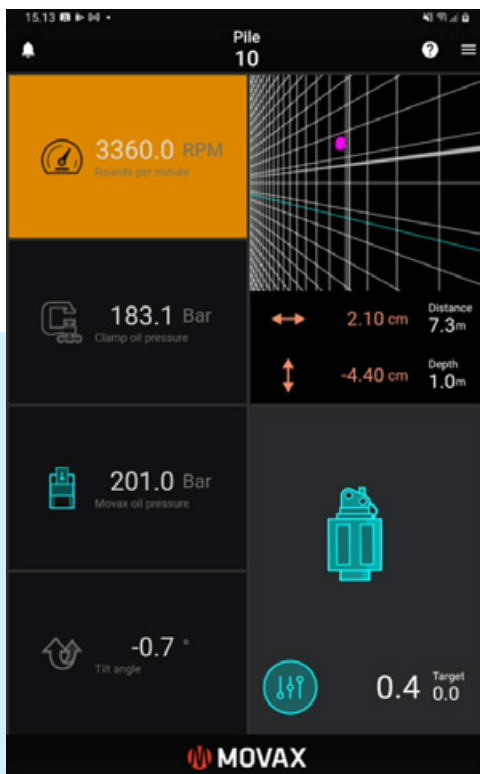
Update kits are available to connect existing MOVAX side grip pile drivers and piling hammers to mControl+ PRO.



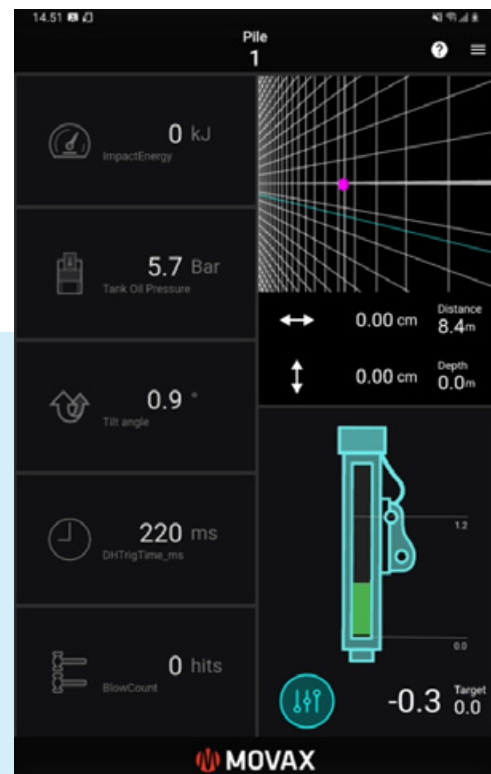
INFORMATION

mControl+ PRO provides comprehensive and essential information about the operation of the MOVAX piling equipment, Multi-tool piling leaders and Column stabilisation leaders and the piling process allowing the operator to monitor and optimize the operation for the best possible overall performance.

mControl+ PRO includes the hardware required for the connectivity to the MOVAX Information Management System and the necessary sensors for a mono-boom excavator - also as required for the MOVAX mLogbook documentation and reporting tool. The same sensors are utilised to for instance provide information about the 'refusal'.



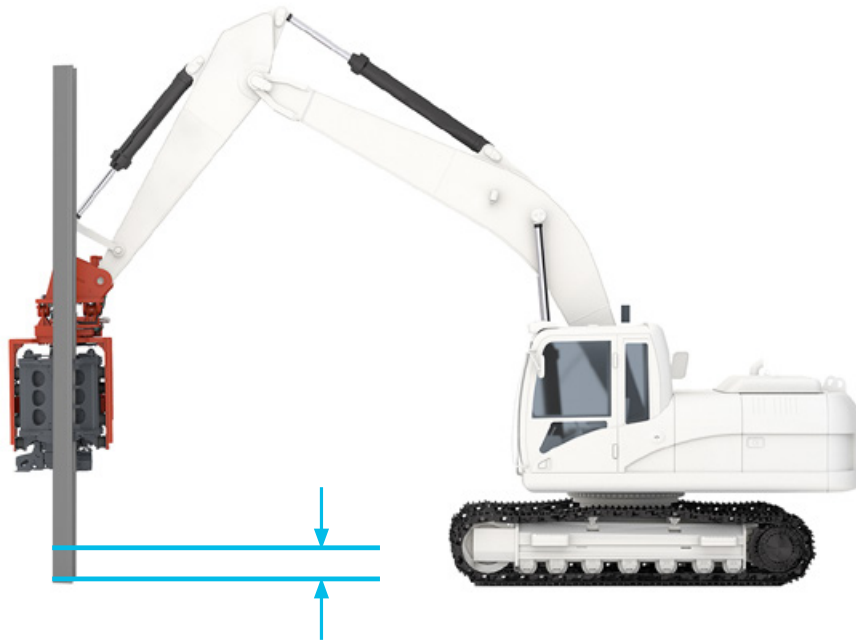
mControl+ PRO, main screen with SG, overvibration warning



mControl+ PRO, main screen with DH piling hammer

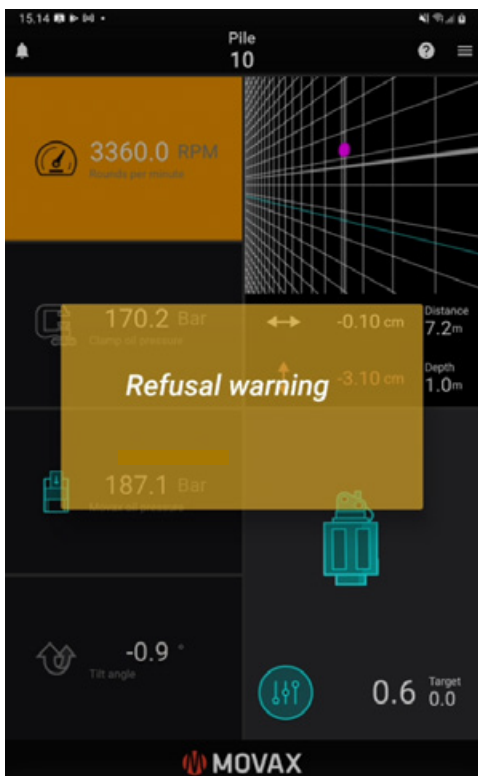
Refusal

mControl+ PRO is designed to secure the maximum availability of the MOVAX side grip vibratory pile drivers and piling hammers. The mControl+ PRO REFUSAL™ -feature assists the operator by displaying a clear and visible warning when the refusal is reached during the pile driving process thus protecting the MOVAX piling equipment.

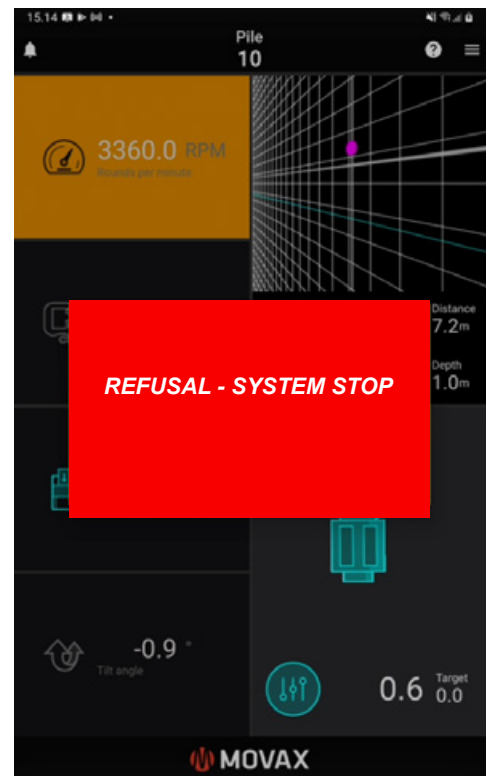


REFUSAL

< 250 mm/4min OR < 1 mm/s (SG)
< 5mm with 30 blows at full stroke (DH)



mControl+ PRO, main screen with SG, refusal warning



mControl+ PRO, main screen with refusal system stop

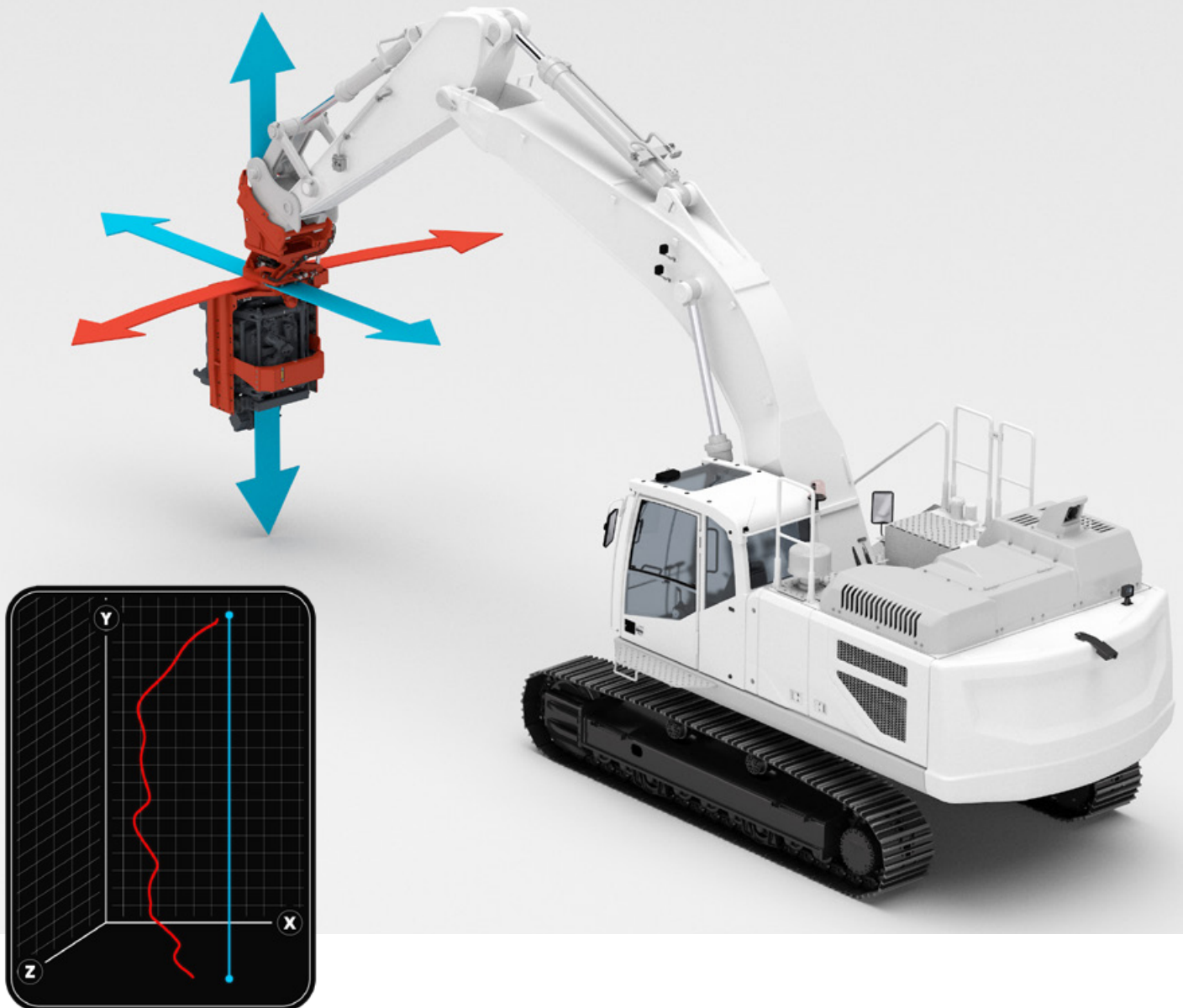
AUTOMATIC CONTROL - autoT™

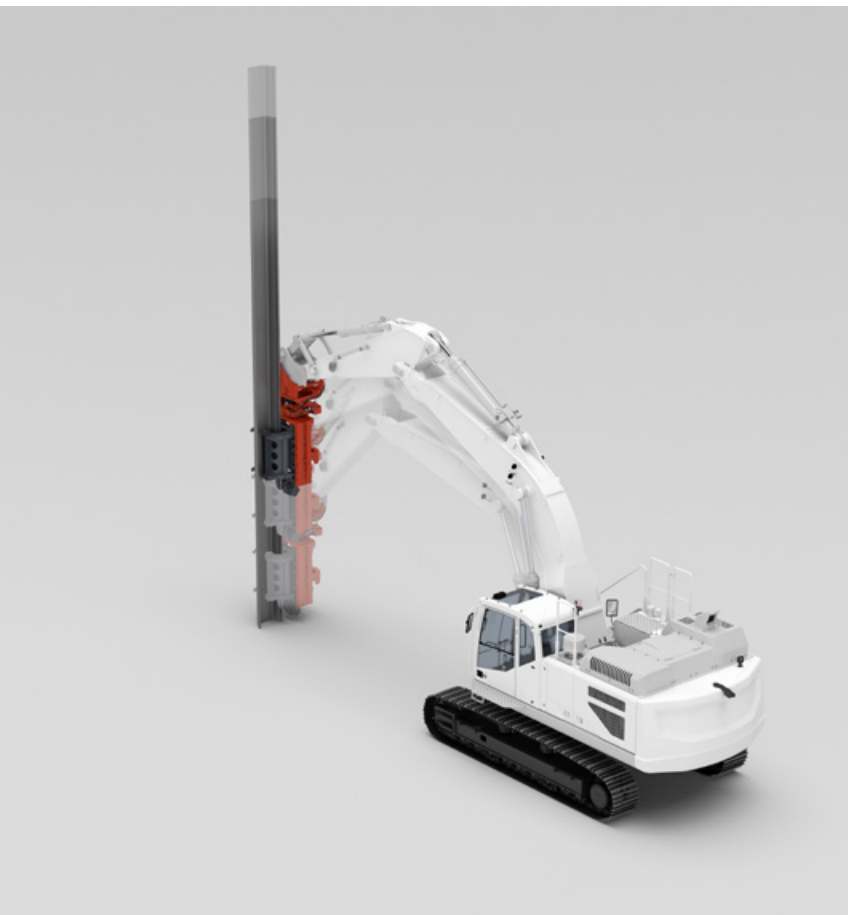
mControl+ PRO is equipped with the advanced, state-of-the-art autoT™ control feature assisting the operator in achieving a faster and more precise piling process and ultimately resulting in higher production rates and increased quality of installation. autoT™ is available for MOVAX side grip pile drivers and piling hammers.

MOVAX mControl+ PRO autoT™-tip control uses the power of computing, pre-programming and sensors in such a manner that a single action by the operator affects multiple movements at the same time. The basic functionality of the autoT™ makes the MOVAX side grip pile driver or MOVAX piling hammer travel in a straight line by taking over demanding parts of the excavator's boom control.

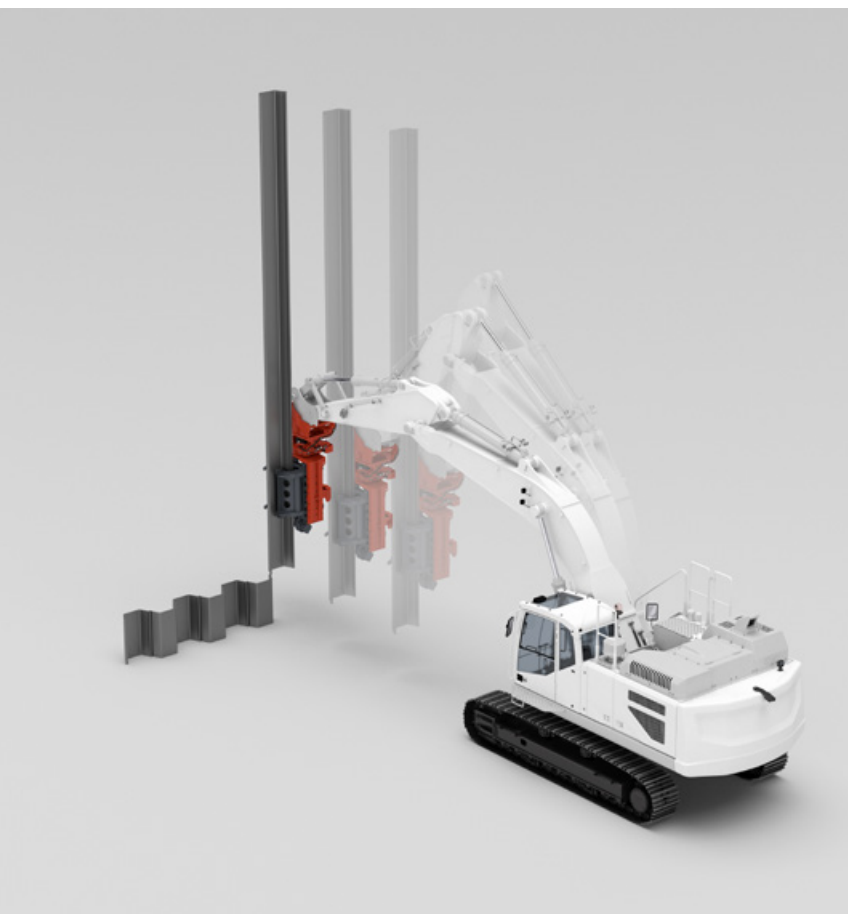
The mControl+ PRO tip autoT™-control feature, which makes the MOVAX side grip pile driver or MOVAX piling hammer travel vertically in a straight line, can principally be divided into two parts: Vertical Tip Control [Y-AXIS] and Horizontal Tip Control [X-AXIS].

The autoT™ functionality itself is based on angle sensors mounted onto the carrier's boom and stick, and the MOVAX side grip pile driver or piling hammer, and proportional pilot control of the excavator's auxiliary hydraulics.





Vertical movement with a stationary excavator.



Horizontal movement with a stationary excavator.

autoT™ - automatic control, Y-AXIS

The operator can pilot the boom assembly of the excavator in both directions, up and down, with a single control grip roller command – with a horizontally constant distance position, and the MOVAX side grip pile driver or MOVAX piling hammer parallel to the pile at all times.

The speed of the action can be adjusted fly-by with the proportional roller when the movement occurs.

Highly accurate calibrations can be done in the mControl+Pro application, based on operator preference.

The autoT™ -feature is used when driving or extracting piles with the MOVAX Side grip pile driver, or to change the position of the MOVAX side grip pile driver along the pile for the purpose of re-gripping the pile.

autoT™ - automatic control, X-AXIS

The operator can pilot the boom assembly of the excavator in both directions, forward and backwards, with a single control grip roller command – with a horizontally constant distance position, and the MOVAX side grip pile driver or MOVAX piling hammer parallel to the pile at all times.

The speed of the action can be adjusted fly-by with proportional roller when the movement occurs.

Highly accurate calibrations can be done in mControl+Pro application, based on operator preference.

The autoT™ -feature is used when accurate and steady horizontal movement is required – a particularly good example is sheet pile pitching: Guiding the pile into the lock insert is faster when the MOVAX side grip pile driver and the pile are in zero level and the MOVAX side grip pile driver motion only happens in the X-axis of the coordinate system.



MOVAX CONTROL SYSTEM

mControl+ LITE

The **mControl+ LITE** is a state-of-the-art control system which utilises either proportional pilot valves, a PWM controller or a CAN pilot circuit/interface for the control of the excavator's auxiliary hydraulics.

The mControl+ LITE is installed onto the excavator without making any changes to the original functionality of the excavator whatsoever. mControl+ LITE is utilised to control all MOVAX piling equipment, including side grip pile drivers, piling hammers, piling drills and manipulators.

mControl+ LITE provides basic information about the operation thus assisting the operator in the piling process.



1. MOVAX module (MXM) / 2. MOVAX angle sensor (MXS) / 3. Pilot circuit control a) hydraulic valve block, b) PWM control c) CAN interface / 4. Excavator module (EXM) / 5. Control grips / 6. mControl+ LITE display

The mControl+ LITE is installed onto the excavator without making any changes to the original functionality of the excavator whatsoever. mControl+ LITE is utilised to control all MOVAX piling equipment, including side grip pile drivers, piling hammers, piling drills and manipulators.

FEATURES

Display

The mControl+ LITE is equipped with an independent 5" display.

Control grips

The mControl+ LITE is equipped with ergonomic control grips with multiple rollers and buttons which allow complete operation with a single grip. The control grips include extra buttons and rollers for accommodating functions from the excavator's original handles.

Control modules

mControl+ LITE is equipped with two electronic control modules, one Excavator module (EXM) and one MOVAX module (MXM). The excavator cab-mounted EXM controls the excavator's auxiliary hydraulics with either proportional valves, a PWM controller or a CAN bus control circuit. The type of pilot circuit control is dependent on the excavator brand and model. The MXM, installed and delivered with the MOVAX equipment, controls the hydraulic valves on the MOVAX piling equipment, Multi-tool piling leaders and Column stabilisation leaders, and monitors the operation with angle- and pressure sensors.

NOTE!

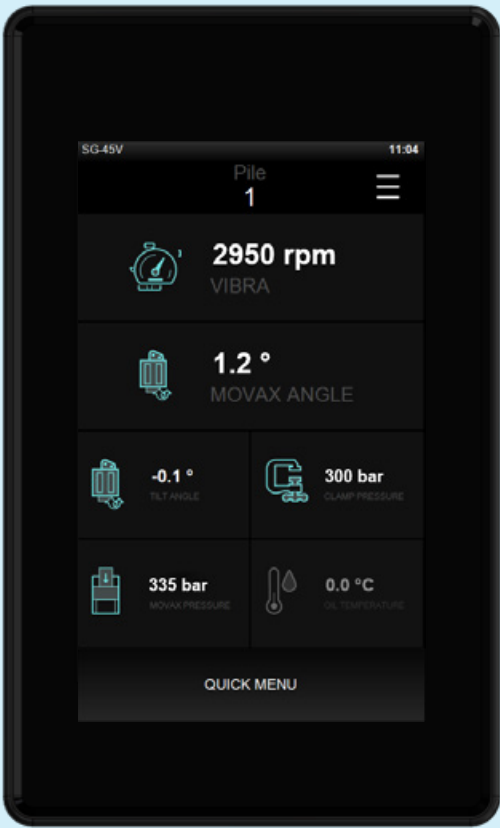
MOVAX piling equipment are always supplied with the MOVAX module factory installed.

OPTIONS

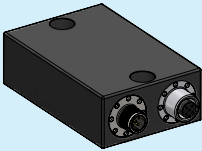
mControl+ LITE is available with the following options:

| | |
|------------------------------|---|
| Information | Software licenses for mFleetManagement |
| Control grips | Ergonomic control grips with 3-rollers |
| autoT™ -automatic control | Upgrade kit for upgrading the mControl+ LITE to mControl+ PRO |

Update kits are available to connect existing MOVAX side grip pile drivers and piling hammers to mControl+ LITE.



Control grips



Angle sensor



PWM module



HIGHER PRODUCTIVITY - SIGNIFICANT SAVINGS

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