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Kinesys Elevation Drive

Operating & Maintenance Manual
[ORIGINAL]

A variable-speed hoist controller

TAIT accepts no liability for any consequences resulting from inappropriate, negligent, or incorrect use of the equipment.

The contents of this manual are believed to be correct at the time of printing. In a commitment to a policy of continuous development and improvement, TAIT reserves the right to change the specification of the product or its performance, or the contents of this manual, without notice.

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2. Introduction

2.1 Product description

The Elevation Drive is a variable speed electric chain hoist controller capable of controlling electric chain hoists whose motors meet the correct specification. Kinesys Elevation Hoists can only be operated using the Elevation Drive chain hoist controller.

The Elevation Drive has a robust aluminium casing with a wide range of fixing points and uses industry standard connections. Although designed to be operated principally by a console, the Elevation Drive has full variable speed manual controls on the front of the unit.

The Elevation Drive is equipped with custom position controller software that allows a high degree of positional and speed accuracy to be achieved. Several parameters within the software can be altered via the user interface provided by the LED display on the front of the unit. A complete list of menus and parameters is included in this manual. The majority of parameters can also be downloaded to the Elevation Drive allowing for quick initial set-up and alteration of these settings.

The Elevation Drive can be used in conjunction with the Kinesys Array PD-ES Power and E-Stop distribution system in order to achieve SIL 2 compliance and can be connected to a Kinesys Mentor safety controller for SIL 3 compliance.

2.2 Scope and purpose

This manual describes the key features, means of operation and maintenance operations of the Kinesys Elevation. The variants of Elevation Drive covered in this manual are:

- Elevation Drive 1+
- Elevation Drive v2

The equipment described in this manual may only be operated by personnel qualified to do so. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with this and associated equipment.

2.3 Model numbers

This manual applies to the following Elevation Drive models:

Kinesys Part Number	Elevation Drive model
ELE-00-0010	Elevation Drive 1+ 2.2 kW 208 V
ELE-00-0020	Elevation Drive 1+ 2.2 kW 400 V
ELE-00-0030	Elevation Drive 1+ 3.0 kW 208 V
ELE-00-0040	Elevation Drive 1+ 3.0 kW 400 V
ELE-00-0050	Elevation Drive 1+ 4.0 kW 400 V
ELE-00-2001	Elevation Drive v2 3.0 kW 400 V
ELE-00-2002	Elevation Drive v2 3.0 kW 208 V

2.4 Support requests

For support, please use the following contact details:

support@kinesys.com
Tel: +44(0) 20 8481 9850

To resolve your support request as quickly as possible, please provide the following information, if available, when contacting Kinesys:

- Site name, address, machine location details and your contact details.
- As much detail as possible on the behaviour observed, including any unusual changes in behaviour that are different from normal operation and any environmental conditions that may be a factor (e.g. fluctuations in temperature and water damage).
- Details on the behaviour that should have been expected.
- The exact steps required that produce the issue.
- Any solutions to fix the issue that you have already tried.
- Any workarounds that you've found.
- Equipment item numbers and serial numbers, such as those displayed on the identification plates/labels.
- Version numbers of any software being used.
- Any screen shots, photographs or videos of the issue.

3. Safety information

The following symbols are used to indicate specific items which require special attention by the user:

	**Warning: Instructions which relate to safety**
	**Warning: Instructions which relate to safety where there is a particular risk of electric shock**
	**Warning: Instructions which relate to safety where there is a particular overhead risk**
	**Danger: Prohibited actions which are forbidden under all circumstances**
	**Additional important information**

3.1 Safety regulations

The following regulations serve as the basis for assembly, installation, certification and maintenance of automation equipment within the area of the European community. For countries other than those mentioned, local legislation and directives may apply in addition to or in place of the European regulations as stated in this manual.

The manufacturer's guarantee depends on the consideration of these regulations and the operating instructions.

European regulations

2006/42/EC	EC - Machinery Directive
2014/30/EU	EC - Directive relating to electromagnetic compatibility
2014/35/EU	EC - Electrical equipment designed for use within certain voltage limits

BGV accident prevention regulations (Germany only)

DGUV Vorschrift 3 (BGV A1)	Principles of accident prevention
DGUV Vorschrift 3 (BGV A3)	Electrical facilities and equipment
DGUV Vorschrift 52 (BGV D6)	Accident prevention regulation for use in crane systems
DGUV Vorschrift 54 (BGV D8)	Accident prevention regulation for electric winches, lifting and pulling equipment
DGUV Regel 100-500 (BGR 500)	Hoisting accessories
DGUV Grundsatz 309-001 (BGG 905)	Principles for crane inspections

Harmonized regulations	
EN 17206	Machinery for stages and other production areas; Safety requirements and inspections
EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 14492-2	Cranes - Power driven winches and hoists
EN 818-7	Short link chain for lifting purposes; Fine tolerance hoist chain, Grade T
EN ISO 13849-1 & 2 / BS EN 62061	Safety of machinery - Safety-related parts of control systems; General principles for design
EN 60034-1	Rotating electrical machines; Rating and performance
EN 60034-5	Rotating electrical machines; Degrees of protection provided by the integral design of rotating electrical machines
EN 60204-1	Electrical equipment of machines, General requirements
EN 60204-32	Electrical equipment of machines; Requirements for hoisting machines
EN 60529	Degrees of protection provided by enclosures (IP-Code)
EN 60947-1	Low-voltage switchgear and control gear
EN 61000-6-2	Electromagnetic compatibility; Immunity for industrial environments
EN 61000-6-4	Electromagnetic compatibility; Emission standard for industrial environments
EN 82079-1	Preparation of instructions for use - Structuring, content and presentation

Regulations and technical specifications	
FEM 9.511:1986	Rules for the design of series lifting equipment; Classification of mechanisms
FEM 9.683:1995	Series lifting equipment; Selection of hoisting and travelling motors
FEM 9.751:1998	Series lifting equipment; Power driven series hoist mechanisms; Safety
FEM 9.755:1993	Serial hoist units; Measures for achieving safe working periods

3.1.1 EN17206 Use Cases

The Elevation Drive can be used in the following Use Cases.

UC1	No one in hazard zone during moition, statically determinate load, speed < 0.2 m/s
UC2	No one in hazard zone during moition, statically indeterminate load, speed < 0.2 m/s

Following careful planning and risk assessment, the Elevation Drive can be used in the following Use Case.

UC3	Person (s) in hazard zone during motion, single axis

The Elevation Drive must **NOT** be used in the following Use Cases.

UC4	Person (s) in hazard zone during motion, multiple axis
UC5	Moving person (s) suspended, single axis
UC6	Moving person (s) suspended, multiple axis

3.2 Safety warnings

IF IN DOUBT ABOUT ANY ASPECT OF MOVING OBJECTS, ALWAYS SEEK PROFESSIONAL ADVICE BEFORE OPERATION.

Make sure this Operating & Maintenance Manual is always kept in a complete and fully readable condition and that it is always accessible to all operators of the equipment.

Prohibitions of operation

- **Do not install the Kinesys Elevation or do maintenance to the Kinesys Elevation in an area that is accessible to children or other unqualified persons.**
- **Do not use the Kinesys Elevation in an aggressive environment. An aggressive environment is defined as an environment which contains hazardous substances that may degrade the load bearing capacity of the lifting equipment.**
- **Do not use the Elevation Drive in outdoor environments.**
- **Do not use the Kinesys Elevation if it does not appear to be in 100% working order.**
- **Do not modify or attempt to repair the Kinesys Elevation in any way.**
- **Do not connect hoists or other machinery to the Elevation Drive that have not been manufactured or converted by Kinesys to meet the required specifications.**
- **Do not mix and match Elevation Drive 1+ and Elevation Drive v2 controllers in the same system.**

Safety precautions before operation

- **Do a full risk assessment of the location where the Kinesys Elevation and its connected devices are intended to be used.**
- **If used in rigging, the Kinesys Elevation and its connected lifting device must be attached from suitable scaffolds, approved working platforms, or similar safe working positions. Make sure a qualified rigging specialist has assessed that the structure where the Kinesys Elevation, lifting device and attached load are installed can safely support the combined weight of the equipment.**
- **Do not start movement operations until a qualified person has inspected the Kinesys Elevation and all other connected equipment, and confirmed that is in 100% working order.**
- **Software-independent means of stopping movement must be provided, including a hardware emergency stop system that is compliant with all local regulations.**
- **Make sure all machine stop buttons, emergency stop buttons and enabling switches in the system have been tested and are functioning correctly.**
- **Make sure all operators know the locations of the machine stop buttons, emergency stop buttons and enabling switches in the system.**
- **Make sure all attached loads are unobstructed and will not come into contact with other static or moving objects during movement.**

- **Make sure all attached loads are always visible to the operator where possible. If this is not possible, make sure the operator has reliable communication with a person who can clearly see the attached loads.**
- **Make sure all persons in the hazard zone underneath the lifting equipment are aware of the potential for movement.**

Safety instructions during operation

- **If you notice any unexpected or dangerous movement during operation, press the machine stop button on the front panel of the connected Array PD-ES or other venue-wide safety controller to bring all movement to an immediate stop. Note that not all stop buttons in the system necessarily stop the movement an individual lifting device. Alternatively, if an enabling switch is used in the system, then release the enabling switch.**
- **If an enabling switch is used in your system to initiate movement of the connected lifting device, be aware that releasing it may cause movement to stop unexpectedly.**
- **After a stop button has been pressed, the reason for its actuation must be found, and all possible failures in the system removed by trained personnel. The stop button must then be reset before continuing operation. Note that the stop button reset procedure may be different for different devices - refer to individual product manuals for more details.**

Safety instructions during maintenance

- **Maintenance and repairs to the Kinesys Elevation must only be carried out be competent and trained personnel.**
- **Only use original Kinesys parts when replacing components, including all fixings such as nuts, washers and screws.**
- **Do not modify or attempt to repair the Kinesys Elevation in any way other than those described in the maintenance procedures within this manual. If the Kinesys Elevationneeds repair work done beyond what is described in this manual, contact Kinesys to arrange a repair.**
- **Always disconnect the power and remove the load when carrying out maintenance procedures.**
- **Make sure the maintenance area is secure before carrying out maintenance work.**

3.3 Visible damages

If any damage or breakages are detected during operation or during tests, do not operate the Kinesys Elevation until it has been repaired and a qualified person has checked and approved it.

3.4 Spare parts

Only original fixing components, spare parts, and accessories listed in manufacturer's spare parts catalogue are acceptable for use. The manufacturer's guarantee is given for those spare parts only. The manufacturer cannot be held responsible for any damages due to the use of non-original parts or accessories.

3.5 Handling and storage

Condensation

The Elevation Drive is designed for indoor use only. If the product has been exposed to temperature fluctuations, for example during transport, there may be risk of condensation which may result in damage. Do not connect the Elevation Drive to a power source immediately. Leave the unit disconnected until the it has reached a safe temperature.

Shocks

Do not shake, knock or drop the Elevation Drive and avoid excessive force when installing and operating the product.

Handling

Do not lift the Elevation Drive by any of its cables or connectors as this may cause damage to the unit and/or the cables; use the transportation handles instead.

Packaging

Where possible, use the original packaging to transport the Elevation Drive. Alternatively, a purpose-made flight case should be used (available separately).

4. Installation and system integration

The Elevation Drive can be used as a standalone unit to control a single chain hoist, but will more commonly be used in conjunction with other Elevation Drive units to control a group of chain hoists. The Elevation system communicates using an RS485 network which allows communications to be linked together easily and reduces the number of cables required.

4.1 Installation location

Warning! The Elevation Drive and all other connected devices may only be installed by personnel qualified to do so. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with this and associated equipment.

Do a full risk assessment of the location where you intend to use the Elevation Drive and connected devices.

The Elevation Drive has four attachment holes on its outer casing onto which doughties, clamps, and other fixings may be attached. The attachment holes have a diameter of 12.77 mm (0.5 in) and are positioned 372 mm (15.65 in) from each other on each side of the casing. Note that unlike some other products the Elevation Drive is not rack mountable. The exact location and securing method of the Elevation Drive is at the discretion of the user.

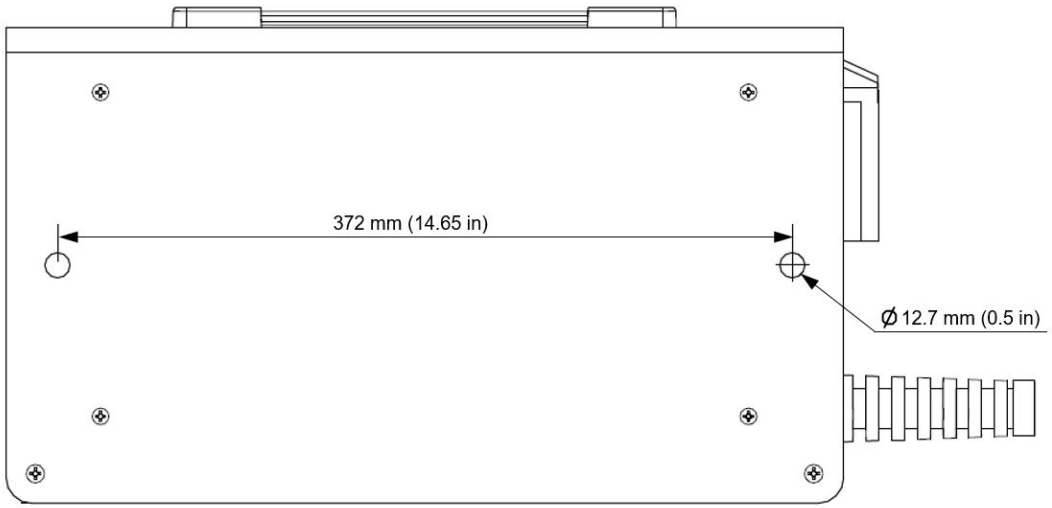

Figure 1. Attachment holes

When considering an installation location, the following conditions must be adhered to:

- The ambient temperature of the location must be between 5°C and 40°C (41°F and 104°F) and the humidity of the environment should not exceed 90%.
- The location must be indoors and not exposed to water. Outdoor use is not permitted.
- There must be adequate space at the sides of the unit to allow the connection of cables.
- There must be adequate space at the sides of the unit to allow for ventilation.

- The front panel of the unit must be easily accessible to allow for the use of the front panel controls.

4.2 Compatible chain hoists and other devices

Warning! Only connect chain hoists to the Elevation Drive that have been converted by Kinesys to meet the correct specifications. If in doubt, contact Kinesys support.

The Kinesys Elevation Hoist is a variable speed chain hoist designed specifically for use with the Elevation Drive controller and is available in 208V and 400V models.

Figure 2. Elevation Hoist

Additionally, Kinesys converts a range of chain hoist models made by other manufacturers to be used in conjunction with the Elevation Drive controller. Some of these manufacturers include CM, Liftket and GIS. If you require more advice on applicable chain hoists that can be used with Elevation Drive, contact the Kinesys sales team at sales@kinesys.com.

Figure 3. Kinesys converted CM Lodestar chain hoist

4.2.1 Beam trolleys

In addition to chain hoists, the Elevation Drive controller can be used to control the motion of various trolleys including the VTE Beam Trolley and LITEC Beam Trolley. For more details on compatible beam trolleys contact the Kinesys sales team at sales@kinesys.com.

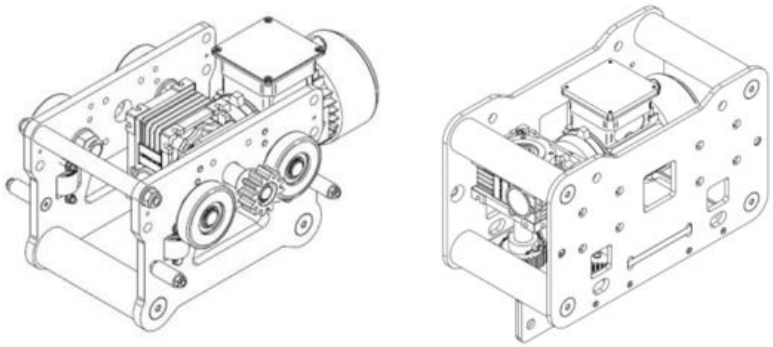

Figure 4. Litec Beam Trolley and Rotator modules

4.3 Compatible user interfaces

When in Manual mode, the Elevation Drive can move its connected chain hoist using the buttons on the front panel. However, for programming moves and entire shows a software package such as Vector, K2 or Navigator must be used. These are available as software packages or installed supplied as part of a console (e.g. Vector Console, K2 Console).

Figure 5. Vector Console and K2 Console

4.4 Additional infrastructure

4.4.1 Array PD-ES

The Elevation Drive must be connected to a Kinesys Array PD-ES Power and E-Stop distribution hub in order to properly distribute power, data communications and E-Stop signals over the RS485 network and to achieve SIL 2 functionality/

Figure 6. Array PD-ES front and rear panels

A maximum of 12 208V Elevation Drive units can be connected to an Array PD-ES. This increases to 24 for 400V units.

For larger systems involving connecting more than the maximum number of Elevation Drive units, it is recommended to use additional Array PD-ES units to distribute the power and data.

Each of the four power connections on the Array PD-ES can supply a current of 32A, meaning that a maximum of six 5A / 400V Elevation Drive units or three 10A / 208V Elevation Drive units can be connected to each one.

4.4.2 Rigger handheld controller

The Rigger is a handheld 8-channel controller designed for use with the Elevation Drive. It feautures an E-Stop, basic up/down switches and enable functionality via a keyswitch.

Figure 7. Rigger handheld controller

4.4.3 Data distributors

Other Kinesys devices such as the Array 485 can also be used to distribute data more effectively over long distances for a more efficient way to connect units and to enhance the E-Stop signal. For systems involving the use of LibraCELL load cells, Kinesys devices such as the LibraPRO load cell distribution hub and Array IP8 8-port Ethernet RJ45 hub may be necessary.

Figure 8. Array 485, LibraPRO, Array IP8

For more details on the operation of the Array PD-ES or any other Kinesys products, refer to the relevant operating manuals.

4.5 Data cable length limits

The following table shows the maximum allowable data cable lengths for different numbers of Elevation Drive units per Array PD-ES, taking into account the voltage drop of the E-Stop circuit.

It is recommended to not exceed a data cable length 250 m. This represents an upper extreme case and would generally not be used in practice in most cases.

Number of Elevation Drive units connected to each 32A connector on the Array PD-ES	Max data cable length (m)	Max data cable length (ft)
1	250	800
2	250	800
3	250	800
4	220	750
5	180	600
6	150	500
7	130	420
8	110	370
9	100	330
10	90	300
11	80	270
12	70	250

4.6 Power cable length limits

The following tables show the maximum power cable lengths permitted for 400V and 208V Elevation Drive units, taking into account the voltage drop inside the power cables of 3.99 ohm / km.

400V:

Number of Elevation Drive units connected to each 32A connector on the Array PD-ES	Max power cable length (m)	Max power cable length (ft)
1	250	800
2	250	800
3	190	630
4	140	470
5	110	380
6	90	310

208V:

Number of Elevation Drive units connected to each 32A connector on the Array PD-ES	Max power cable length (m)	Max power cable length (ft)
1	150	490
2	70	240
3	50	160

4.7 Termination plug

For systems involving a chain of Elevation Drive controllers, a termination plug is recommended to be installed in the final unit in the chain to avoid the effects of pulse signal reflections in RS485 systems. A 7-pin termination plug can be obtained by contacting Kinesys and quoting the part number ELE-98-0090.

4.8 Elevation system example

The layout below is an example of the connecting elements in an Elevation system. The hoist may not necessarily be an Elevation Hoist in your system but could be a different compatible Kinesys-converted hoist.

If you require any assistance in your specific application please contact Kinesys support or your supplier. For information on the operation of other Kinesys devices within the system such as Elevation Hoist, Array PD-ES, Vector Console, or K2 Console, refer to the relevant product operating manuals.

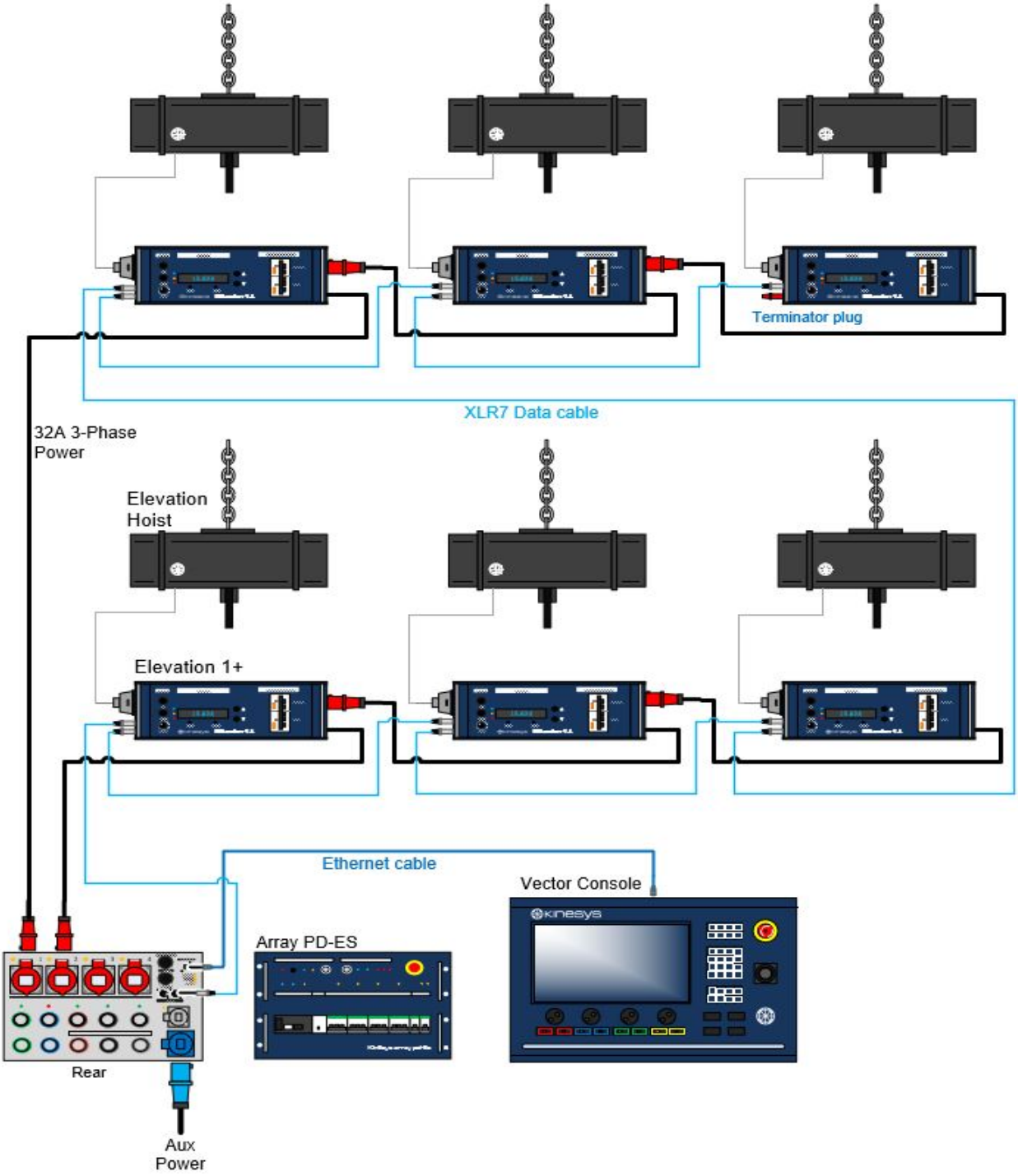

Figure 9. Example Elevation system - SIL2

4.9 Elevation system example with Array 485

Using the Array 485 as a data hub allows chains of Elevation Drive units to be grouped together using separate XLR7 data cables. It may be beneficial to use this system for better cable logistics and fault finding.

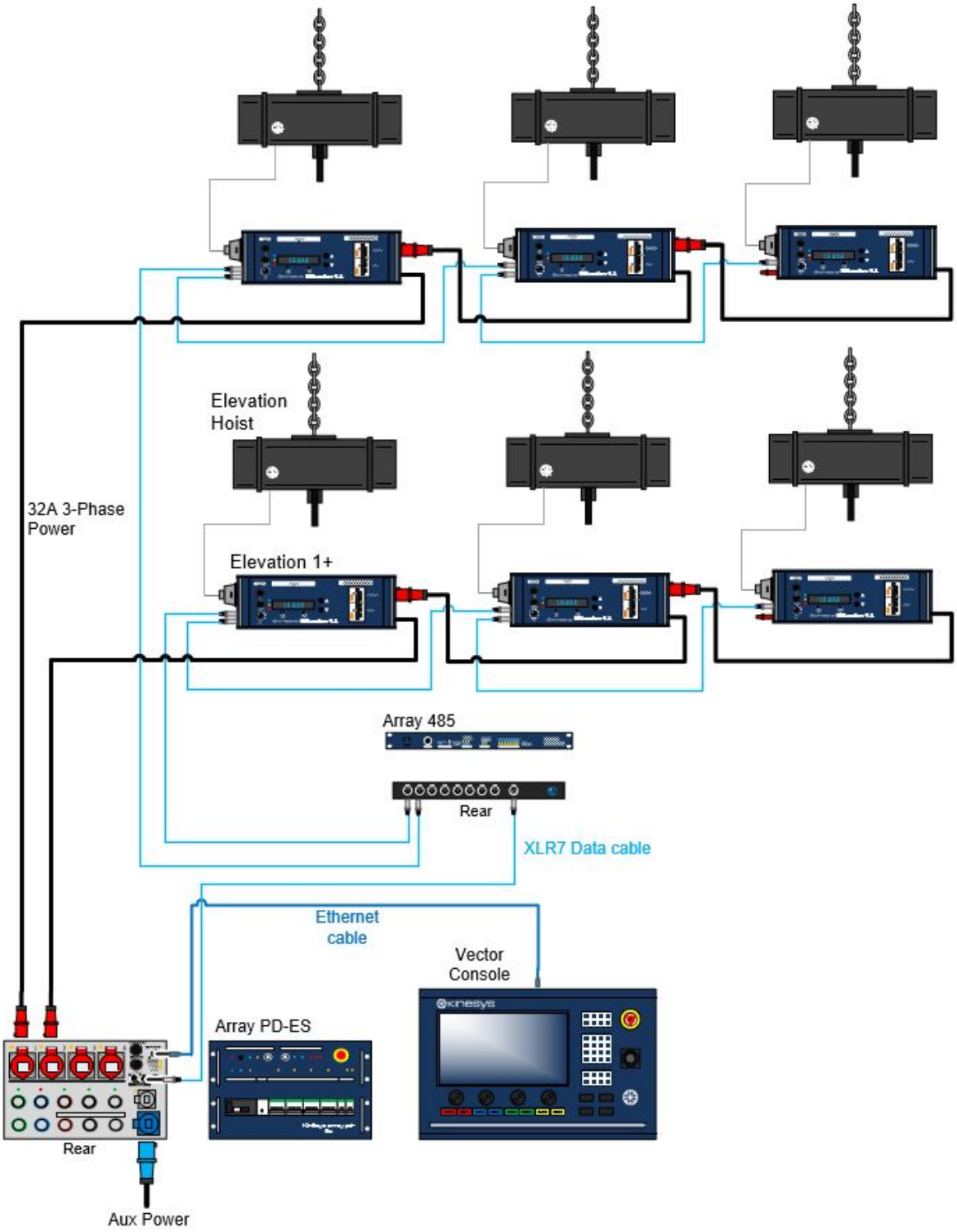

Figure 10. Elevation system with Array 485

4.10 Elevation system example with Mentor

A Kinesys Mentor safety controller allows the Elevation system to achieve SIL 3 compliance. The Mentor comes in a range of models; for more information contact Kinesys or your supplier.

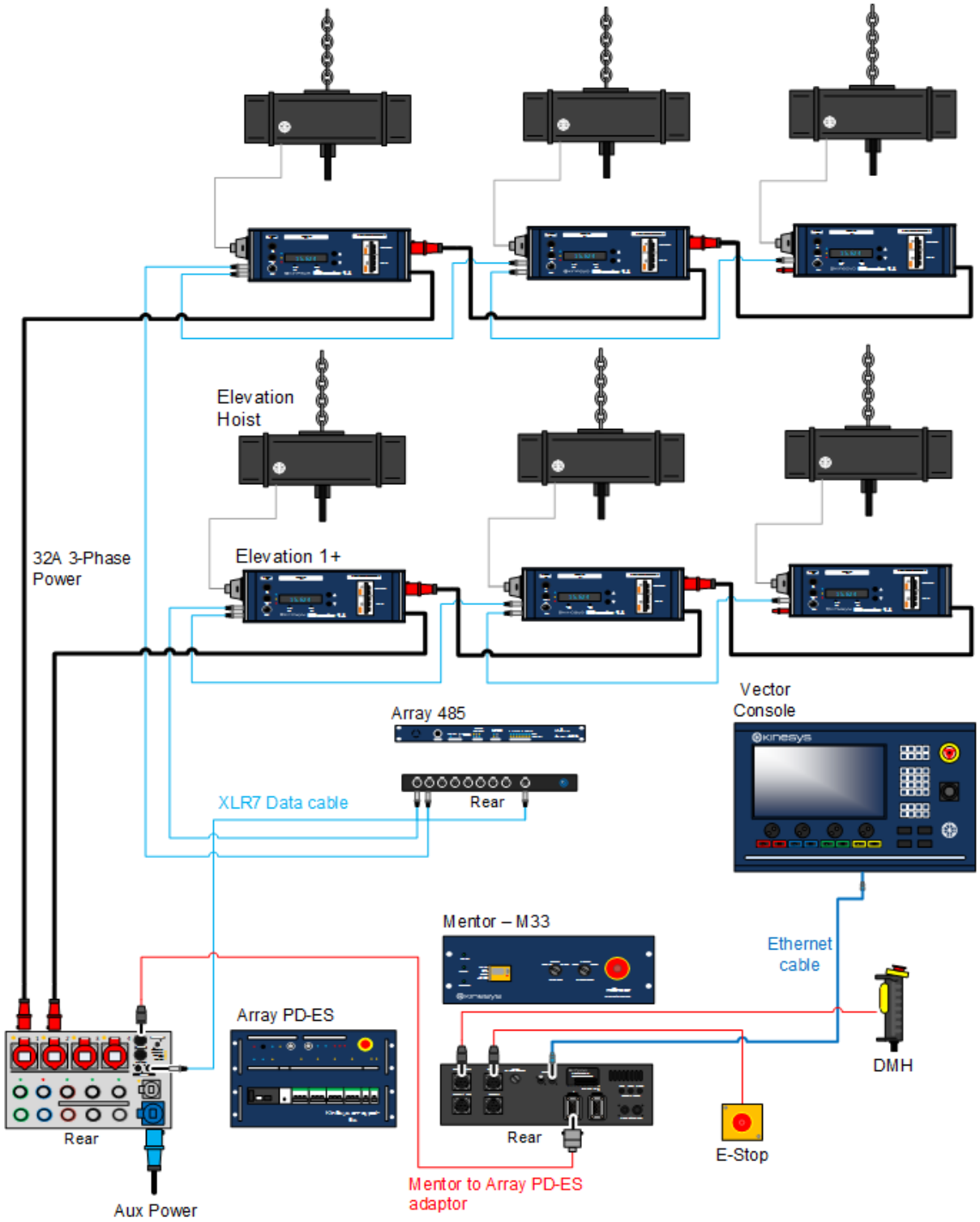

Figure 11. Elevation system with Mentor - SIL3

5. Product overview

5.1 Front panel

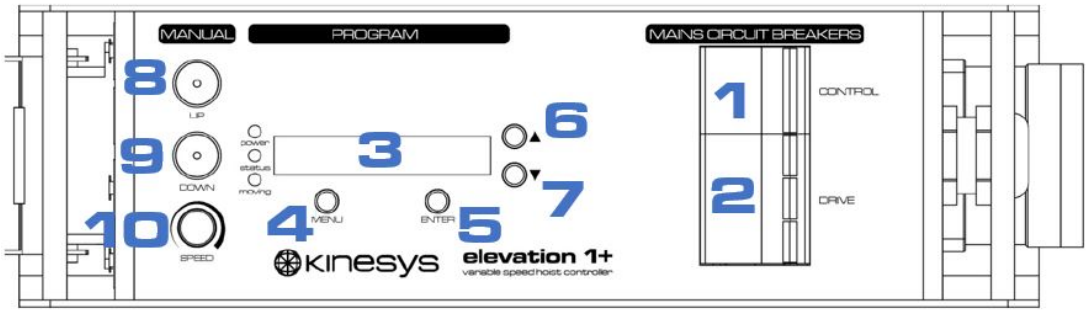

Figure 12. Front panel - Elevation Drive 1+

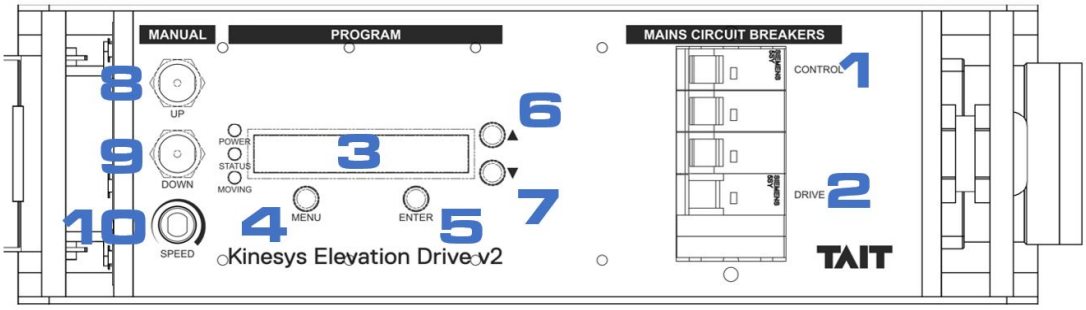

Figure 13. Front panel - Elevation Drive v2

Item #	Description	Notes
1	Control MCB	Switches off the control transformer and electronics. Note that If the unit is linked to other Elevation Drive units, then operating the Control MCB may not turn off the electronics in cases where they are phantom powered. In this situation, disconnect the Data/Control In and Thru connectors as well to ensure that the unit turns off.
2	Drive MCB	Switches power to the drive and brake supply voltage to the hoist. The hoist is safe and cannot be moved if this MCB is off.
3	Menu display	Displays information relating to the unit's status and position as well as allowing the ability to view and alter certain device parameters.
4	Menu button	Accesses the menu system and navigates backwards through the menu tree once in the menu system. When pressed in conjunction with the Enter it button, it toggles the unit in and out of manual mode.
5	Enter button	Confirms selections within the menu system. When pressed in conjunction with menu, it toggles the unit in and out of manual mode.
6	Menu Up button	Moves up the current menu items, increases the currently displayed parameter value, or when used in conjunction with the down button, allows the ultimate limit to be bypassed.
7	Menu Down button	Moves down the current menu items, decreases the currently displayed parameter value, or when used in conjunction with the up button, allows the ultimate limit to be bypassed.

Item #	Description	Notes
8	Manual Up button	Allows the hoist to be run upwards locally without the use of an external controller.
9	Manual Down button	Allows the hoist to be run downwards locally without the use of an external controller.
10	Manual speed controller	Sets the speed of all local manual moves from the Manual Up and Manual Down buttons.

5.2 Left side

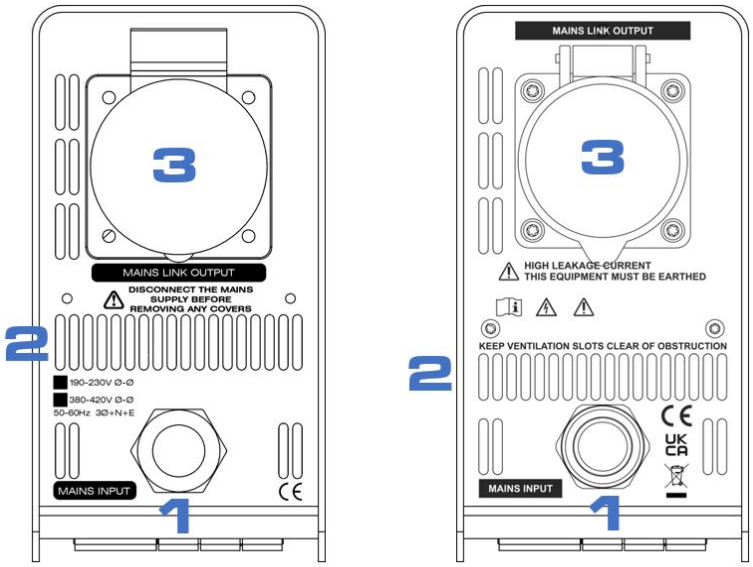

Figure 14. Left side (Elevation Drive 1+ and Elevation Drive v2)

Item #	Description	Notes
1	Mains inlet gland	Supplied with cable to a 32A 3PN+E plug. This must connect to a Kinesys Array PD-ES to guaranteee SIL2 compliance
2	Air intake grilles	These must not be obstructed.
3	Mains outlet connector	Unprotected pass-through.

5.3 Right side

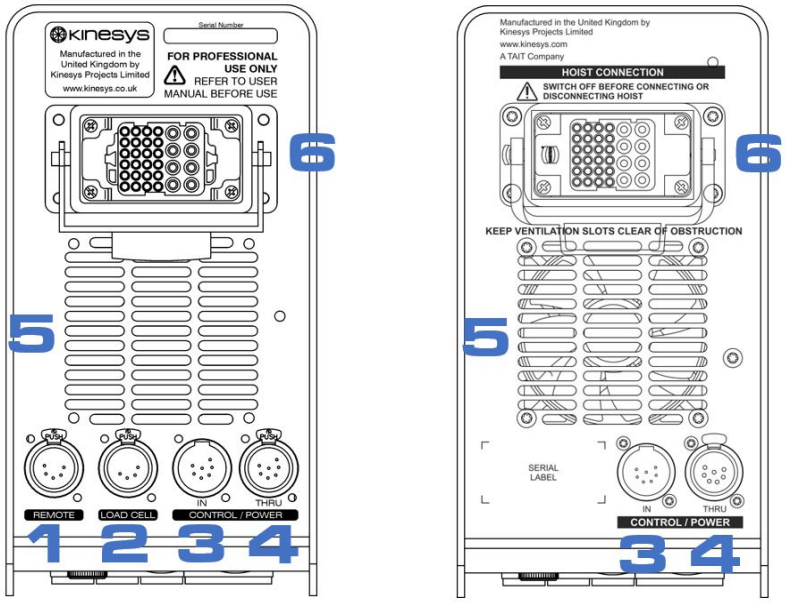

Figure 15. Right side (Elevation Drive 1+ and Elevation Drive v2)

Item #	Description	Notes
1	Remote controller connection (Elevation Drive 1+ only)	Allows the connection of a fixed or variable speed up/down pendant or remote handset.
2	Load cell connection (Elevation Drive 1+ only)	Allows the connection of an external load cell for monitoring the load applied to the motor.
3	Data/Control In connection	Data, supply voltage, emergency stop and remote enable connections are provided through this connector.
4	Data/Control Thru connection	Direct pass-through connection for Data/Control In connections.
5	Fan outlet	This must be kept clear at all times to allow the free flow of air to the unit.
6	Hoist connection	Motor, brake and control voltage connections to the hoist, as well as limit and encoder feedback from the hoist are all provided through this connector. For pinout diagrams see section "Hoist connection cable pinout " on page 48

6. Manual and remote operation

The Elevation Drive has three possible operating modes:

- AUTO - this is the default mode and is used when the Elevation Drive is connected to a console.
- MANUAL - this mode allows the connected hoist to be controlled locally using the directional buttons on the front panel.
- REMOTE (Elevation Drive 1+ only) - this modes allows the use of a remote handset or pendant controller.

6.1 Manual mode operation

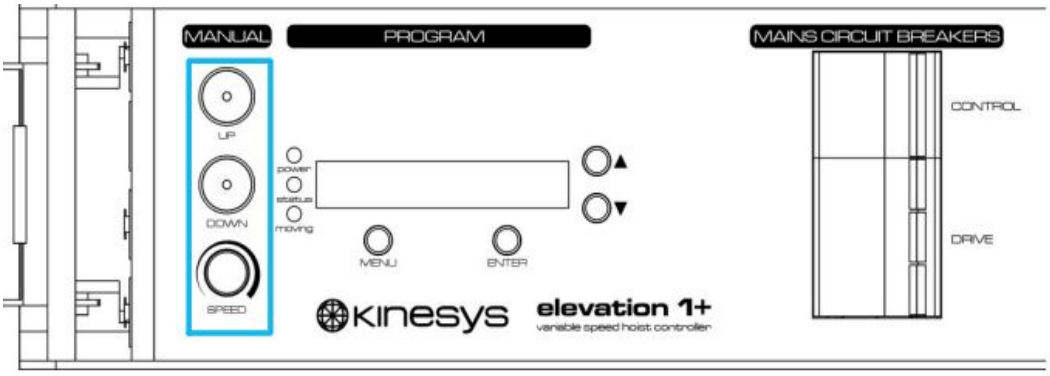

Figure 16. Manual operation buttons

To the left of the menu display there are two buttons and a rotary speed control. These controls allow the hoist to be moved at a variable speed directly from the unit. When the unit is running in Manual mode, any commands from the connected console are bypassed.

Before entering Manual mode, note the following conditions:

- Make sure an emergency stop button has not been pressed. If the unit is in an emergency stop state then manual mode will not work.
- If the Elevation Drive is operating as a single unit (e.g. a workshop environment), rather than as part of a chain, a cheater plug must be installed to the connector where a data/E-Stop cable would normally be installed. This makes the system operate as if an E-Stop system is connected, allowing Manual mode to be used. To obtain the correct cheater plug, contact Kinesys and quote the part number ELE-98-0100.

Warning! Once in Manual mode, the front panel controls will take precedence and the controls of the connected console will become disabled.

To enter Manual mode press and hold the Menu and Enter buttons together. The display will change to the word 'Manual' and the indicators in the Up and Down manual buttons will illuminate. To move the connected hoist make sure the speed control is set to its slowest speed by turning the dial fully anti-clockwise and then press and hold either the Up or Down button depending on the desired direction of travel. Slowly turn the dial clockwise until the desired speed is reached.

To stop movement either release the Up or Down button, which will stop the hoist in a quick ramp, or return the speed dial to zero and then release the button, which will stop the device more gradually.

Once Manual operation is complete, return the unit to Auto mode by pressing and holding the Menu and Enter buttons together. The word 'Auto' will be displayed and operation of the unit will revert to the console.

Note that the unit will time out of Manual mode and return to Auto mode after two minutes of inactivity.

6.2 Remote mode operation (Elevation Drive 1+ only)

Remote operation is a feature that allows the Elevation Drive to be operated by a remote handset or pendant controller. To enter remote mode, connect the handset or pendant to the 'Remote' connection on the right side of the unit. Unlike manual mode, a message is not shown on the display to indicate this mode is active. Once connected, the hoist can be run up an down between its limits at a speed determined by the default speed setting within the unit.

The hoist is ramped up and down when the run button on the handset or pendant is pressed. The button must be held during the entire movement of the hoist. Movement is stopped whenever the button is released.

7. Limits

The Elevation Drive has the capability of monitoring and reacting to three different types of limit: software limits, end of travel limits and ultimate limits.

7.1 Software limits

Software or soft limits are positions stored inside the Elevation Drive beyond which the hoist will not run. There is an upper and lower soft limit and these can be set to any value from -65000 to 65000 mm. Settings may be changed on the front panel display or on the console. If target positions greater than the soft limits are requested then the Elevation Drive will clamp the target to the limit.

If operating from a Vector Console, the only way to travel past the soft limits is to reset the limits to allow a greater range of travel. If running locally in Manual mode then ‘limit bypass’ can be selected within the menu system which allows the unit to run beyond its soft limits. Always make sure that this setting is reset to Off afterwards, otherwise the original soft limits will have no effect on future moves. Refer to section "Menu operation" on the facing page for details on how to change the upper and lower software limits.

7.2 End of travel limits

These limits are physical limits located within the hoist and are monitored by the internal electronics. Reaching an end of travel limit will stop the movement of the hoist immediately and from then on only movement in the opposition direction is allowed until the limit has cleared. If a limit is reached, the unit will display the name and report it back to console. End of travel limits cannot be overridden. These limits are generally set to protect the physical device by preventing the hook of the hoist running into the body or the chain running through the hoist. Adjustment of these limits can only be done by disassembly of the hoist, which is not recommended.

7.3 Ultimate limits

Ultimate limits are the last line of defence and are only reached if both software and end of travel limits have not been set correctly or have failed. The ultimate limits, if fitted, are located within the hoist and are monitored by both software and hardware. If an ultimate limit is reached then a safety chain of relays will be broken, which will engage the brake immediately and disable the internal drive electronics. Movement will be prevented in either direction. Ultimate limits cannot be overridden within the console or the front panel controls and a special sequence must be followed in order to allow movement again. The fault condition 'Limit' will be shown on the display and the issue will also be reported back to the console.

Due to the severity off reaching an ultimate limit both a software and hardware bypass is necessary to allow movement of the hoist again. Within the menu system the parameter ‘Ult By’ must be selected and set to On. Once this has been done, both the menu up and menu down buttons must be pressed and held together. This allows a ultimate bypass relay to be operated which will in turn allow movement. The device should be moved, either manually or from the console, at a slow speed away from the limit. Once the limit is cleared, the ultimate bypass parameter in the menu will automatically clear itself and normal operation can be resumed.

8. Menu operation

8.1 Display overview

Four buttons are available to operate the menu system: Menu, Enter, Menu Up and Menu Down. The Menu Up and Menu Down buttons are those with the up and down arrows to the right of the display and are not to be confused with the Manual Up and Down buttons to the left of the display.

On power up - the display briefly shows the firmware revision number.

During normal stationary operation - the display alternates between showing the comms address and position in mm. Position is shown as a right justified number and the address has a right justified number but with an 'A' in the left most character. The two displays alternate every two seconds.

Figure 17. Display showing comms address

Figure 18. Display showing current position

During normal moving operation - the display will show the position only.

8.2 Menu operation

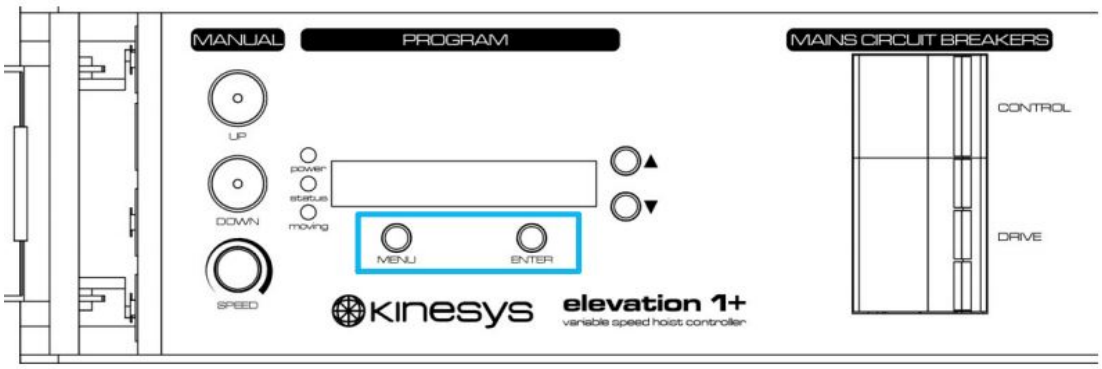

Figure 19. Menu and Enter buttons

To access the menu structure, pressing and hold the Menu button for two seconds while the unit is not moving. Once in the menu structure, a period of inactivity of two minutes will revert to the default display.

8.2.1 Navigating through sub-menus

Pressing and holding Menu from the start display enters the first menu level. Pressing the Menu Up and Menu Down buttons will cycle through menus in this first level (Limits, Comms and Data). Press Enter to go into the sub-menus and press Menu to return to previous sub-menus. Use the Menu Up and Menu Down buttons again to cycle through different options within each sub-menu.

8.2.2 Editing parameters

When an editable parameter is displayed, pressing the Menu Up and Menu Down buttons will scroll through the allowable range of values for that parameter. Pressing Menu will return to the previous sub-menu and the value will remain unchanged. Pressing Enter will save the new value and return to the previous sub-menu. The longer the Menu Up or Menu Down button is held, the faster the display will cycle through the value range. Note that some parameters have a binary setting of either On or Off rather than a range of values.

8.3 Fault conditions

If the unit detects a fault condition, an error code will flash on the display. If the error is not rectified the, error code will be shown on the default display in addition to the comms address and position. If more than one error is present, the most recently detected error will be the one displayed. The following error codes are possible:

Fault display	Description
	**Drvcan** - shown when the drive is powered down. The fault indicates a CAN Bus communications failure between the drive and control card.
	**Drv** - shown when the drive is tripped. The letters drv are followed by the fault code read from the drive e.g. drv012 = earth fault. If the display shows the letters drv without a fault code, then it means the unit has been switched to Analog mode. This mode needs to turned off in the setup menu.
	**Limit** - an ultimate limit has been reached.
	**Upper** - an upper overall travel limit has been reached.
	**Lower** - a lower overall travel limit has been reached.
	**U soft** - an upper software limit has been reached.

Fault display	Description
	**L soft** - a lower software limit has been reached.
	**OLoad** - an overload has been detected.
	**ULoad** - an underload has been detected.
	**Ospeed** - overspeed detected. The motor is travelling faster than expected.
	**USpeed** - underspeed detected. The motor is travelling slower than expected.
	**Udog** - commns watchdog trip. A status stationary message was received while a move was in progress.
	**Comms** - communictions timeout if no communications received in 2 seconds. Shown on the display for 15 seconds after timeout occurs, even if comms returns - clears after 15 seconds.
	**Enc 1** - no encoder count detected.
	**Enc 2** - encoder reversed.
	**EStop** - emergency stop trip.
	**Reset** - the unit is resetting.
	**Firm** - a firmware update is required.
	**Code** - licence code is missing.
	**NoPosn** - invalid stored position, manual referencing required.

Fault display	Description
	**OHeat** - overheat switch activated.
	**Dis** - enable input is not present (overwritten by E-Stop).

8.4 Menu structure

The menu structure is divided into three main sections: Setup, Comms, and Data. For details on how to use the buttons to navigate the menu structure, refer to "Menu operation" on page 29.

The types and order of sub-menus is different depending on the version number of the unit's firmware. This section describes the menu and sub-menu structure in both pre and post v8 versions.

8.5 Setup sub-menus (before v8)

1st level	2nd level	3rd level	4th level
 **Limits**	 **Upper** Max upper travel	 Edit value	
	 **Ultimate Bypass**	 **On** Selectable when ultimate limit reached	
		 **Off** Default setting	
	 **Bypass**	 **On**	
			

1st level	2nd level	3rd level	4th level
		Off Default setting	
	 **Lower** Max lower travel	 Edit value	
 **Default**	 **Speed** mm/s	 Edit value	
	 **Acceleration** mm/s/s	 Edit value	
	 **Deceleration** mm/s/s	 Edit value	
 **Fast**	 **Deceleration** mm/s/s	 Edit value	This is the value used for E-Stop deceleration.
 **Clamps**	 **Max**	 **Speed** mm/s	 Edit value
		 **Acceleration** mm/s/s	 Edit value
			

1st level	2nd level	3rd level	4th level
		Deceleration mm/s/s	Edit value
		 **Speed** mm/s	 Edit value
	 **Min**	 **Acceleration** mm/s/s	 Edit value
		 **Deceleration** mm/s/s	 Edit value
	 **Up** mm	 Edit value	
 **Offset**	 **Down** mm	 Edit value	
 **Encoder** Encoder pulses per mm	 Edit value		
 **Profile** **No function**			
			Refer to "Editing parameters" on page 41 for details on

1st level	2nd level	3rd level	4th level
Paremeters	**1** Proportional gain	Edit value	each parameter.
	 **2** Integral gain	 Edit value	
	 **3** Derivative gain	 Edit value	
	 **4** Min drive speed	 Edit value	
	 **5** Max drive speed	 Edit value	
	 **6** Pos. trip distance	 Edit value Default value 300	
	 **7** Brake delay	 Edit value Defaul value 0	
 **Analog**	 **Off** Default setting	On = Lenze 8200 mode, Off = Analogue output mode.	
			

1st level	2nd level	3rd level	4th level
	On		
 **Display flip**	 **Off** Default setting	When selected to On, flips the display 180 degrees.	
	 **On**		

8.6 Setup sub-menus (v8 and later)

1st level	2nd level	3rd level	4th level
 **Limits**	 **Upper** Max upper travel	 Edit value	
	 **Ultimate Bypass**	 **On** Selectable when ultimate limit reached	
		 **Off** Default setting	
	 **Bypass**	 **On**	
		 **Off**	

1st level	2nd level	3rd level	4th level
		Default setting	
	 **Lower** Max lower travel	 Edit value	
 **Invert**	 **Off** Default setting	When selected to On, inverts all positional parameters including upper and lower limits.	
	 **On**		
 **Display flip**	 **Off** Default setting	When selected to On, flips the display 180 degrees.	
	 **On**		
 **Analogue**	 **Off** Default setting	On = Lenze 8200 mode, Off = Analogue output mode.	
	 **On**		
 **Drive Parameter**	 Edit value 1 - 1050	These are used to change the drive parameters. **Warning! Do not alter these settings unless instructed to do so by Kinesys.**	
 **Paremeters**	 Edit value	Refer to "Editing parameters" on page 41 for details on each parameter.	

1st level	2nd level	3rd level	4th level
	100 - 626		
 **Encoder** Encoder pulses per mm	 Edit value		
 **Clamps**	 **Max**	 **Speed** mm/s	 Edit value
		 **Acceleration** mm/s/s	 Edit value
		 **Deceleration** mm/s/s	 Edit value
	 **Min**	 **Speed** mm/s	 Edit value
		 **Acceleration** mm/s/s	 Edit value
		 **Deceleration** mm/s/s	 Edit value
 **Fast**	 **Deceleration**	 Edit value	This is the value used for E-Stop deceleration.

1st level	2nd level	3rd level	4th level
	mm/s/s		
 **Default**	 **Speed** mm/s	 Edit value	
	 **Acceleration** mm/s/s	 Edit value	

8.7 Data sub-menus (before v8)

1st level	2nd level	3rd level	4th level
 **Position** mm	Data		
 **Version**	Data		
 **Product ID**	Data		
 **License**	Data		

8.8 Data sub-menus (v8 and later)

1st level	2nd level	3rd level	4th level
	Data		

1st level	2nd level	3rd level	4th level
Position mm			
 **License**	Data		
 **Product ID**	Data		
 **Version**	Data		
 **Loadcell**	Data		

8.9 Comms sub-menu

Comms only has one sub-menu, which is used for changing the comms address of the unit:

1st level	2nd level	3rd level	4th level
 **Address**	 Edit value		

9. Editing parameters

Editing parameters is possible by navigating to the Setup menu and then the Parameters sub-menu. For details how to access and navigate the menu structure, refer to "Menu operation" on page 29.

Firmware versions lower than v8 have seven editable parameters ranging from P1 to P7. These are all motion control parameters.

Firmware versions v8 and higher have a wider range of editable parameters from 100 to 626. These contain the original seven motion control parameters as well as additional parameters which are explained in more detail in section "Editable parameters for versions v8 and above" on the next page.

9.1 Motion control parameters

The advanced position controller inside the Elevation Driver takes the move profile sent by the user and translates the signal into movement commands for the internal drive electronics. The control software uses a closed loop ‘PID’ system to regulate the speed and position of the hoist at any given moment. The Proportional, Integral and Derivative (PID) sections of the control loop each have a unique effect on the accuracy and smoothness of the final motion and consequently the tuning of these parameters can be important to the correct functioning of the unit.

Warning! Only adjust these parameters if you are confident of your abilities to tune the system. The Elevation Drive is supplied with a default set of parameters which are designed to work in the vast majority of situations and environments. When tuning the drive make sure that the device and load are safe to move and that there is enough room to allow for unexpected movement and behaviour.

9.1.1 Proportional gain (P1 / 600)

The proportional gain in the system creates an output that is proportional to the position following an error (the difference between its current location and expected location). This gain is not affected by speed or ramps and provides the majority of the feedback required to keep the system working correctly.

Default value = 25000

9.1.2 Integral gain (P2 / 601)

The integral gain creates an output that is proportional to the sum of errors that have occurred during the system operation. Its purpose is to reduce small steady-state position errors. Integral gain ensures that the desired speed is as accurate as possible and applies most during the cruise phase of a move profile.

Default value = 1500

9.1.3 Derivative gain (P3 / 602)

The derivative gain is a function of the measured velocity and improves the high frequency closed loop response. Derivative gain is the most volatile of the three settings. Its effect is most pronounced during the acceleration and deceleration phases of a move profile. An incorrect value for this setting can lead to instability during movement and potentially erratic behaviour.

Default value = 00250

9.1.4 Min speed output to drive (P4 / 622)

This value is used to set the minimum drive speed required to obtain movement. It is used in conjunction with the Max speed output to limit the range of the PID loop.

Default value = 50 = 1 Hz

9.1.5 Max speed output to drive (P5 / 621)

This value is used to set the maximum drive speed that may be permitted. It is used in conjunction with the Main speed output to limit the range of the PID loop.

Default value = 5000 = 100 Hz

9.1.6 Position error trip distance (P6 / 620)

The PID servo control generates the correct move profile in software which the PID loop attempts to follow as closely as possible. If the expected position following an error exceed this setting, an overspeed or underspeed error will be generated and the move will be stopped.

Default value = 300 mm

9.1.7 Brake delay on start (P7 / 610)

This is the amount of time that the brake is delayed on start. This gives the drive time to build up current to hold the load. This value needs to be set to a value other than 0 only for very fast acting brakes.

Default value = 0 (ms x 10)

9.2 Editable parameters for versions v8 and above

Firmware versions v8 and above have a wider range of editable parameters ranging from 100 to 626.

Parameter	Description	Notes
Addressing		
100	Address	Target address from 1 - 65535
System		
210	Display state	0 = Normal 1 = Auto blank

Parameter	Description	Notes
		2 = Flipped 3 = Flipped, auto blank
211	Analogue	0 = Lenze 8200 mode 1 = Analogue output mode
Positioning		
300	Upper soft limit	
301	Lower soft limit	
302	Limit bypass	1 = Bypass soft limits
310	Underload and overload bypass	1 = Bypass underload and overload inputs
Encoder		
400	Encoder scaling	
Generic motion		
500	Max speed	
501	Defaul speed	
502	Min speed	
510	Max acceleration	
511	Default accerlation	Used for jog acceleration / deceleration
512	Min acceleration	
520	Max deceleration	
521	Default decerelation	
522	Min deceleration	
523	Fas deceleration	Used for E-Stop deceleration
Device specific motion		
600	Proportional gain	Pre v8 equivalent = P1
601	Integral gain	Pre v8 equivalent = P2
602	Derviative gain	Pre v8 equivalent = P3
610	Brake delay on start	Pre v8 equivalent = P7
620	Position error trip distance	Pre v8 equivalent = P6
621	Max speed output to drive	Pre v8 equivalent = P5
622	Min speed output to drive	Pre v8 equivalent = P4
625	Max wrong direction movement before ENC2 error	(Valid range 0 – 250). The number of mm an axis is allowed to move in the wrong direction before movement is halted. The default value is 0mm.
626	No movement trip time x 10 ms	(Valid range 1 – 250) If no positional change is detected for value x 10 ms, an ENC1

Parameter	Description	Notes
		fault is declared. The default value is 160 (1.6 seconds). Lowering this value will clamp the PID runaway faster in the event of an encoder failure.

10. Unit configuration

Several of the parameters that have to be set up within the Elevation Drive are dependent on the type of motor in use. Motion control parameters are covered in more detail in section "Motion control parameters" on page 41.

10.1 Encoder scaling

Encoder scaling converts the number of encoder pulses derived from the hoist to physical distance travelled in millimetres. The encoder scaling is defined as the distance travelled per encoder pulse edge. This distance is measured in mm x 100,000. The number of encoder pulse edges per encoder revolution is 4 x the number of encoder pulses per revolution (A 100 pulse encoder will produce 400 encoder pulse edges per revolution).

As an example, an encoder scaling of 55060 means the encoder produces a pulse edge every 0.5506 mm. If the encoder scaling value is incorrect, the result may either be no movement from the hoist or it may overshoot or fail to reach its target position as well as running at incorrect speeds.

An example encoder calculation is shown below for a winch with a 1024 pulse encoder connected directly to a drum of 788 mm circumference:

Distance traveled per encoder edge (mm) = Drum Circ / (Encoder Pulses x 4).

Distance traveled per pulse = 788/(1024x4) = 0.19238 mm.

This would equate to an encoder scale of 19238.

When determining the encoder scaling of a particular hoist, if the Elevation Drive shows a position change smaller than the actual position travelled then the encoder scaling needs to be increased.

To change the encoder scaling, navigate to the Encoder sub-menu in the Setup menu. For more details, refer to section "Menu operation" on page 29.

The list below shows the required value for different hoists. Software versions v4.xx and earlier use a less accurate encoder scaling. If the unit has a software version of v4.xx or earlier then encoder scaling must be divided by 10.

Hoist Model	**UK Speed**	**US Speed**	**Enc Scale < = v4.xx**	**Enc Scale > v5.00**
Lodestar LL	8 m/min	32 ft/min	759	7590
Lodestar JJ	16 m/min	64 ft/min	759	7590
Liftket (most models)	20 m/min	80 ft/min	5506	55060

10.2 Other parameters

Two other parameters that can effect the operation of the hoist are the boost setting and the switching frequency of the inverter. These are factory set to a value of 45000 for the boost and 20000 for the switching frequency. These values only need to be modified if instructed to by Kinesys. They can be set by accessing drive parameters 16 (boost) and 18 (switching frequency) in Vector or K2.

11. Cable specifications

11.1 Data cable

Male connector: XLR7M e.g. Neutrik NC7MX or NC7MX-B

Female connector: Neutrik e.g. Neutrik NC7FX or NC7FX-B

Note: alternative manufacturer's connectors may have different pin configurations - check compatibility with Neutrik parts before use.

Cable: 3-pair 22AWG with overall shield 100/120 ohm nominal impedance e.g. TMB “ProPlex” PC226T (for portable / touring use) Alpha 6213C (for installation use).

Cable colour code:

Pin	Function	Colour (PC226T)	Colour (6213C)	Pair
1	Data ground	shield	shield	shield
2	Data -	black	black (red)	pair 1A
3	Data +	white	red	pair 1B
4	24V DC	red	black (white)	pair 2A
5	0V	green	white	pair 2B
6	E-Stop (12V)	blue	black (green)	pair 3A
7	Enable (24V)	orange	green	pair 3B

11.2 Power cable

Male connector: 32A 5-pin plug “Ceeform” type Red 6h earth position .g. Walther 230

Female connector: 32A 5-pin coupler “Ceeform” type Red 6h earth position e.g. Walther 330

Cable: 5-core 6mm² 400V/700V rated (H07) e.g. Lapp Cable 1600 1313 (H07RN-F) for portable use

Cable colour code:

Pin	Function	Colour
E	Earth	green/yellow
L1/R	Live 1	brown
L2/S	Live 2	black
L3/T	Live 3	grey
N	Neutral	blue

12. Hoist connection cable pinout

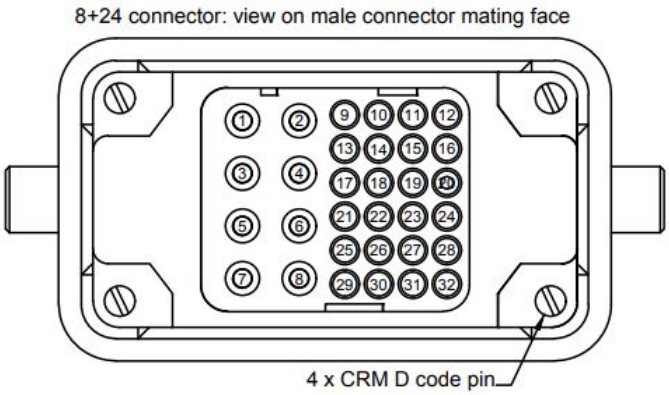

Figure 20. Extension cable male connector

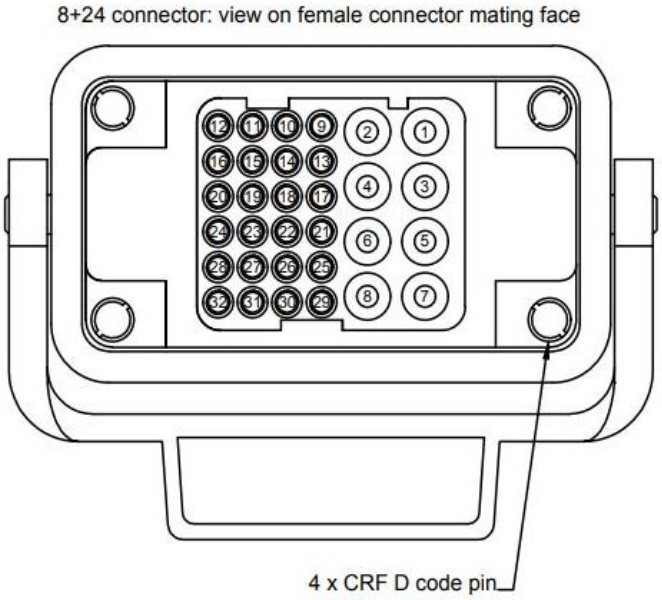

Figure 21. Extension cable female connector

Pin	Function	Colour
1	Earth	green/yellow
2	Motor L1	brown
3	Motor L2	black
4	Motor L3	grey
5	Aux L1	black
6	Aux L2	black
7	Aux N	black
8	Reserved	brown/red
9	AC Power	black
10	Ultimates Common	violet
11	Ultimates Out	grey/pink
12	Top / Overload Common	red/blue

Pin	Function	Colour
13	Top Limit Out	white/green
14	Overload Out	brown/green
15	Bottom / Underload Common	white/yellow
16	Bottom Limit Out	yellow/brown
17	Underload Out	white/grey
18	Reserved	grey/brown
19	Brake 1	white/pink
20	Load Cell	yellow
21	Brake 2	pink/brown
22	Up Contactor	white/blue
23	Down Contactor	brown/blue
24	Fixed Speed Select	white/red
25	Encoder Screen	drain
26	Encoder 0V	white
27	Encoder 5V	green
28	Encoder 24V	brown
29	Encoder A	grey
30	Encoder /A	pink
31	Encoder B	blue
32	Encoder /B	red

13. Using an Elevation with RCD

The Kinesys Elevation is designed to comply with European legislation for variable speed drives, which require that an RFI (Radio Frequency Interference) filter is included to prevent the noise generated by the drive from interfering with nearby computer systems and radio equipment. The inverter drive within the Elevation 1+ is an independently manufactured product widely available within Europe and the US which incorporates the filtering required to comply with the European EMC (ElectroMagnetic Compatibility) directive 89/336/EEC. One of the consequences of including such a filter is a small current leakage to ground within each Elevation 1+.

The total ground leakage for a typical Elevation system may be in the region of 60-300 mA, which could trip the 30 mA RCD (Residual Current Device) fitted to many house rigging supplies within Europe. A single Elevation Drive controller may also trip a sensitive RCD on power-up due to the charging of the internal capacitors - this is a common situation when using any variable speed drive. As most moving lights and video screen power supplies will also have an inherent earth leakage due to internal RFI filters, tripping may increase when other equipment is turned on.

RCDs are set at a default level of 30 mA as this has been found to be the point at which an RCD will trip before a current high enough to cause physiological damage will flow through the human body in the event of accidental contact - refer to IEC publication 479 "Effects of currents passing through the human body" for further information. Where a system has an inherent leakage, some protection may still be provided by setting the RCD at a level approximately 30 mA higher than the system's base leakage current - this will overcome the problem of nuisance tripping but still provide a degree of personal protection.

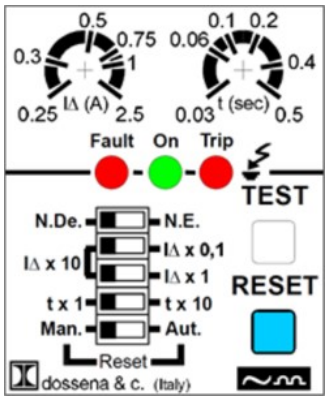

Figure 22. Array PD-ES adjustable RCD

Kinesys have addressed this issue by providing an adjustable RCD within the Array PD-ES power distribution system. The adjustable RCD should be set to a point approximately 30 mA higher than the point at which a full system trips on power up - 100 mA would is a recommended starting point. The time delay should always be set to a minimum (30 ms). Refer to the Array PD-ES operating manual for details on how to adjust the RCD.

In any large power distribution system, the ideal situation is for each service to be protected by its own RCD, set to provide the required level of protection. An overall RCD on the generator or incoming supply should be set to a current value higher than any of the downstream devices, and should also incorporate a time delay. With this system, a fault on a final circuit such as a hoist controller or video screen will still result in disconnection of the final supply but will not cause disruption to other devices.

14. Product specifications

Feature	Specification	Notes
Supply voltage	208V or 400V, 3-phase, neutral and earth.	
Supply current	5A for 400V, 10A for 208V	
Communications network	RS485 specification	
Control signals	0 - 24V DC	
Emergency stop system	Single wire 12V system - Category 2 rated	
Operating temperature range	-10° C to 55° C	
Ingress Protection (IP) rating	IP40	Protected from tools and small wires greater than 1 mm
Product dimensions	424 mm x 241 mm x 126 mm	Excluding fixing hardware, handle and cable glands
Weight	9.5 kg (20.9 lbs)	Excluding fixing hardware

14.1 Product dimensions

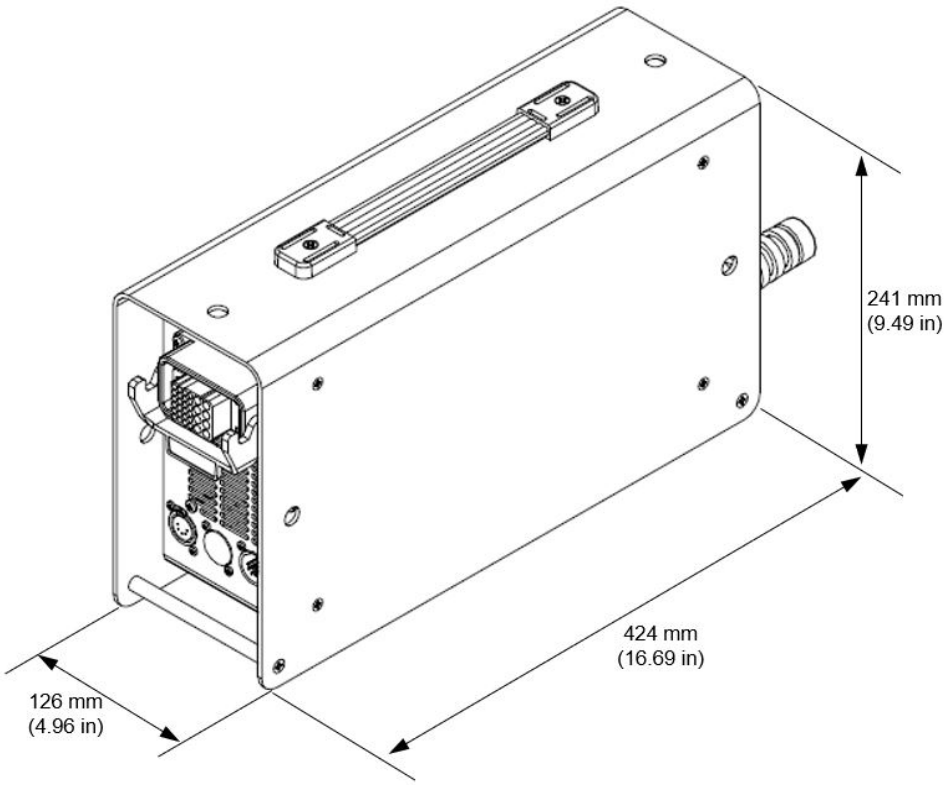

Figure 23. Product dimensions

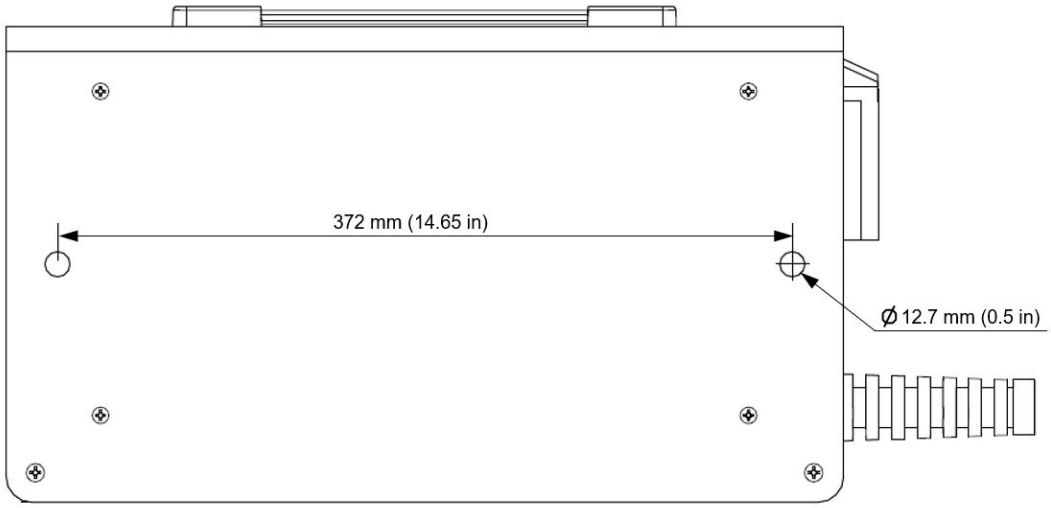

Figure 24. Attachment hole dimensions

15. Service & End of Life

15.1 Replacing an Elevation Drive

In the unlikely event that an Elevation Drive is not working correctly and needs to be replaced with a new one, the following settings must be copied from the original unit and entered into the new unit:

- Setup → Limits → Upper / Lower
- Comms → Address
- Data → Position

For more information on how to access these settings in the menu structure refer to "Menu operation" on page 29.

It is recommended to note down these settings for all Elevation Drive units in the Elevation system in order to be prepared if one needs to be replaced.

The one parameter that you will not be able to record in preparation is the current position. This should be entered into the replacement Elevation Drive if the hoist being controlled is at a known position or its position can be estimated from the position of other hoists in the system.

15.2 Product disposal

In the event of a product being considered beyond economic repair it should be disposed of with care and in line with local legislation on disposal of Waste Electrical and Electronic Equipment (WEEE).

In Europe WEEE shall be disposed of in accordance with European Union Directive 2012/19/EU.

In most regions of the world, similar legislation exists to ensure that WEEE is handled separately to maximise reuse of materials and avoidance of landfill.

16. Declaration of Conformity

ORIGINAL

EC Declaration of Conformity

Manufacturer:	Kinesys Projects Limited
of the address:	Unit 2 Kempton Gate, Oldfield Road, Hampton, Middlesex, TW12 2AF, UK
in accordance with the following EC directives:	**Low Voltage Directive 2014/35/EU** **EMC Directive 2014/30/EU**
declares that the product:	**Kinesys Elevation Drive V2**
with part number:	**ELE-00-2001**

is in conformity with the applicable requirements of the following harmonised standards:

EN 60204-32	**Safety of machinery. Electrical equipment of machines. Requirements for hoisting machines.**
EN 61000-6-2	**Electromagnetic compatibility (EMC). Generic standards. Immunity for industrial environments.**
EN 61000-6-4	**Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments.**

The manufacturer hereby declares that the products named above have been designed to comply with the relevant sections of the above referenced standards. The units comply with all applicable essential requirements of the directives.

In the EU the party authorised to compile the technical file is:
TAIT Netherlands B.V.
Weesperplein 4a, 1018 XA Amsterdam, The Netherlands
In the UK the party authorised to compile the technical file is:
Kinesys Projects Ltd.
Unit 2 Kempton Gate, Oldfield Road, Hampton,
Middlesex, TW12 2AF, UK

Equipment referred to in this Declaration of Conformity was first manufactured in 2022.

D Weatherhead
Managing Director
Hampton, November 2024

The attention of the specifier, purchaser, installer, or user is drawn to special measures and limitations to use which must be observed when these products are taken into service to maintain compliance with the above directives. Details of these special measures and limitations to use are available on request and are also contained in the product manuals.

Kinesys Projects Ltd.
TAIT Technologies UK Ltd.
Unit 5 Langthwaite Road, Langthwaite Grange Ind Estate, South Kirkby, Pontefract, West Yorkshire, UK, WF9 3AP

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