



# **Elevation 1 +**

## Product Manual

Manual Version 1.8.0  
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# Elevation 1+

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# Table of Contents

<b>Part 1</b>	<b>Introduction</b>	<b>4</b>
<b>Part 2</b>	<b>Safety Advice</b>	<b>5</b>
<b>Part 3</b>	<b>Left Side</b>	<b>6</b>
<b>Part 4</b>	<b>Right Side</b>	<b>7</b>
<b>Part 5</b>	<b>Front View</b>	<b>8</b>
<b>Part 6</b>	<b>Specifications</b>	<b>9</b>
<b>Part 7</b>	<b>Cable Specification</b>	<b>10</b>
<b>Part 8</b>	<b>Software</b>	<b>11</b>
<b>Part 9</b>	<b>Menus</b>	<b>12</b>
1	Menu Operation .....	13
2	Fault Conditions .....	14
3	Menu Structure .....	16
<b>Part 10</b>	<b>Position Controller</b>	<b>20</b>
<b>Part 11</b>	<b>Unit Configuration</b>	<b>22</b>
<b>Part 12</b>	<b>Limits</b>	<b>24</b>
1	Setting the Software Travel limits without a computer .....	26
<b>Part 13</b>	<b>Manual and Remote Running</b>	<b>28</b>
<b>Part 14</b>	<b>System Integration</b>	<b>29</b>
1	Elevation 1+ System Diagram Simple .....	30
2	Elevation 1+ Full System Diagram .....	31
<b>Part 15</b>	<b>Replacing an Elevation</b>	<b>32</b>
<b>Part 16</b>	<b>Using an Elevation with RCDs</b>	<b>35</b>
<b>Part 17</b>	<b>Contact Information</b>	<b>36</b>

## 1 Introduction



The Elevation 1+ chain hoist controller allows variable speed running and full positional control of electric chain hoists. Any electric chain hoist that has been converted to the correct specification can be operated by the Elevation 1+.

One significant advantage of converting motors to the Elevation 1+ specification is that they can still be operated using a traditional motor controller without further modifications. This allows the motors to be used with basic controller for pre-show rigging and then be put onto the Elevation control system at a later stage allowing for savings in rental costs to be achieved.

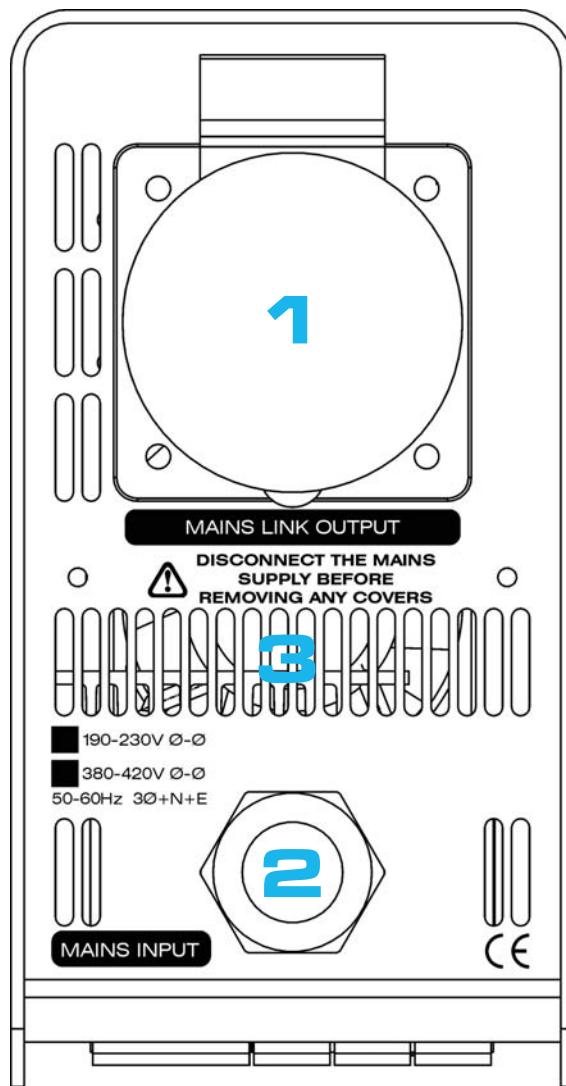
Elevation 1+ is provided in a hard-wearing aluminium case with a multitude of fixing points and options available and uses rugged industry standard connections throughout. Although designed to be operated by an external controller during show conditions the Elevation 1+ has provision for full variable speed manual control on the unit as well as a socket to allow a remote handset to be plugged to give basic running in rigging applications or when a remote means of operating the units is required to offer backup to the main computer controller.

## 2 Safety Advice

**If in doubt about any aspect of moving objects always seek professional advice.  
SAFETY MUST ALWAYS BE THE FIRST PRIORITY!**

- If you are unsure of any aspect of moving loads with the system stop and seek professional advice on the appropriate usage of the system.
- Never run the system without all and emergency stop switches connected and in position. "Cheater" plugs (where supplied) are for the purpose of maintenance and fault-finding only, and should never be used to bypass the emergency stop system during a performance.
- Ensure all operators and maintenance personnel are aware of the location of emergency stop switches.
- Test the emergency stop system daily.
- Never operate hoists without having a clear view of the load or reliable communication with an observer
- If an unexpected move presents a potentially hazardous situation, use the emergency stop button to bring all axes to an immediate stop.
- Use extreme caution when using any limit bypass facilities in the system.
- Carry out a full risk assessment for your particular application.
- Only allow competent personnel to operate the system.

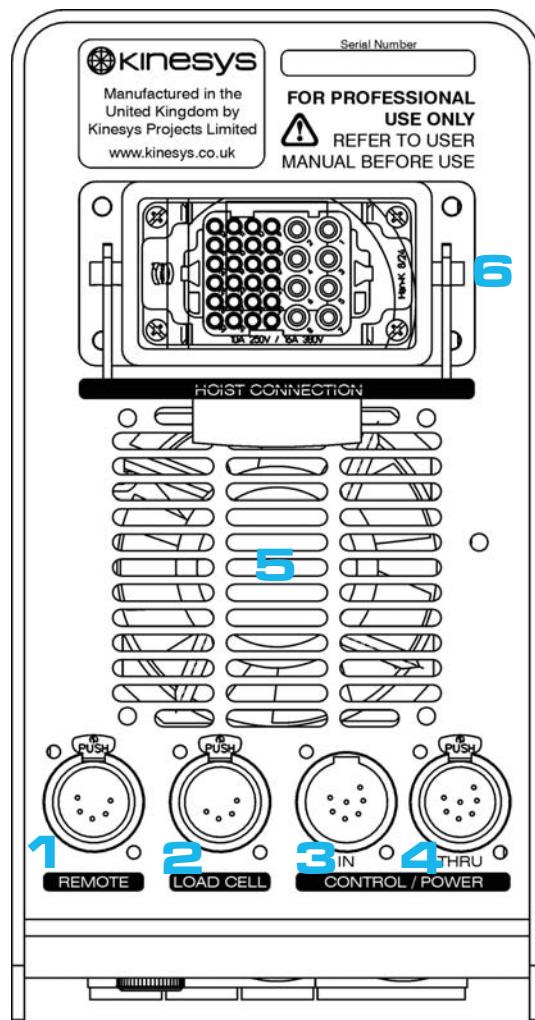
### 3 Left Side



1. **Mains Inlet Gland** - supplied with cable to a 32A 3PN+E plug.
2. **Mains Outlet Connector** - unprotected pass-through.
3. **Air Intake Grilles** - these must not be obstructed or blocked.

## 4 Right Side

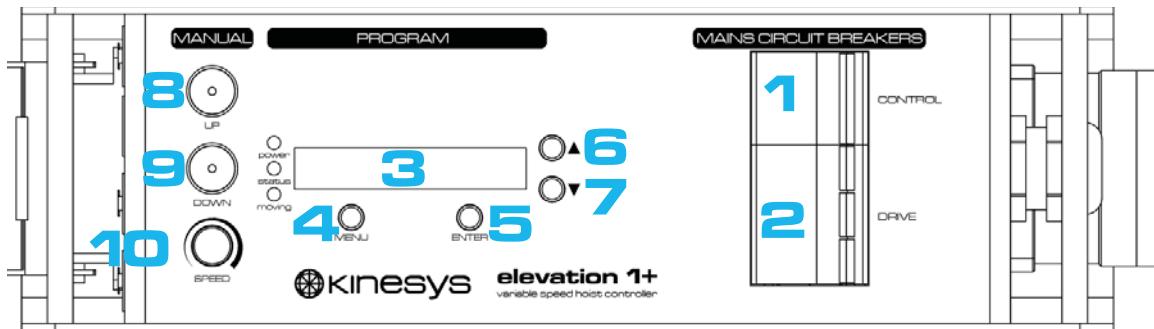
### Right Side



1. **Remote Controller** – this can be used for connecting a fixed or variable speed up/down pendant.
2. **Load Cell** – allows the connection of an external load cell for monitoring the load applied to the motor.
3. **Data/Control In** – data, supply voltage, emergency stop and remote enable are supplied through this connection.
4. **Data/Control Thru** – direct pass-through connection for all the data/control in connections.
5. **Fan Outlet** – this must be kept clear at all times to allow the free flow of air through the unit.
6. **Hoist Connection** – motor, brake and control voltage to the hoist, limit and encoder feedback from the hoist are all provided through this connector.

## 5 Front View

### Front View



1. **Control MCB** – switches the control transformer and electronics. If the unit is linked to others then turning this off may not turn off the electronics as these can be phantom powered by other units. Disconnect the data/control in and thru connectors as well to ensure that the unit is 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 circuit breaker is off.
3. **Menu Display** – displays all the information about the unit status and position as well as allowing viewing and alteration of menu parameters.
4. **Menu Button** – accesses the menu system and navigates backwards through the menu tree once within it. When pressed in conjunction with enter it alternates the unit in and out of manual mode.
5. **Enter Button** – confirms selections within the menu system. When pressed in conjunction with menu it alternates the unit in and out of manual mode.
6. **Menu Up Button** – moves up the current menu items, increments 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, decrements the currently displayed parameter value or when used in conjunction with the up button allows the ultimate limit to be bypassed.
8. **Manual Up Button** – enables the hoist to be run upwards locally without the use of an external controller.
9. **Manual Down Button** – enables the hoist to be run downwards locally without the use of an external controller.
10. **Manual Speed Control** – set the speed of all local manual moves.

## 6 Specifications

<b>Supply Voltage</b>	208v or 380v 3 phase, neutral and earth.	Unit type preset, not user configurable.
<b>Supply Current</b>	Dependent on motor type	Nominally 5A (10A for 208v)
<b>Ambient Temperature</b>	-10° C to 55° C	
<b>IP rating</b>	Dependant of unit positioning.	All electrical connections and case openings must be protected from water ingress.
<b>Communications</b>	RS485 specification	
<b>Control Signals</b>	0 - 24v d.c.	
<b>Emergency Stop</b>	Single wire 12v system – category 2 rated	
<b>Dimensions</b>	424w x 240h x 130d	Excluding fixing hardware and cable glands
<b>Weight</b>	9.5 Kg	Excluding fixing hardware

## 7 Cable Specification

### Data Cable

**Male Connector:** XLR7M

e.g. Neutrik NC7MX or NC7MX-B

**Female Connector:** XLR7F

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	Emergency Stop (12V)	blue	black (green)	pair 3A
7	Enable (24V)	orange	green	pair 3B

### Power Cable (400V Units)

**Male Connector:** 32A 5-pin plug "Ceeform" type Red 6h earth position

e.g. Walther 230

**Female Connector:** 32A 5-pin coupler "Ceeform" type Red 6h earth position

e.g. Walther 330

**Cable:** 5-core 6mm<sup>2</sup> 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

## 8 Software

The Elevation 1+ controller 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 from the controlling computer allowing rapid initial set-up and alteration of these settings.

## 9 Menus

Four buttons are available to operate the menu system: menu, enter, up and down.

### **Power Up**

The display briefly shows the firmware revision number.

### **Normal Stationary Operation**



Elevation 1+ display showing address 1



Elevation 1+ display showing a position of 5752mm

The display oscillates between showing comms address and position. Position is shown as a right justified number and address has a right justified number but with an A in the left most character. The two displays alternate every two seconds.

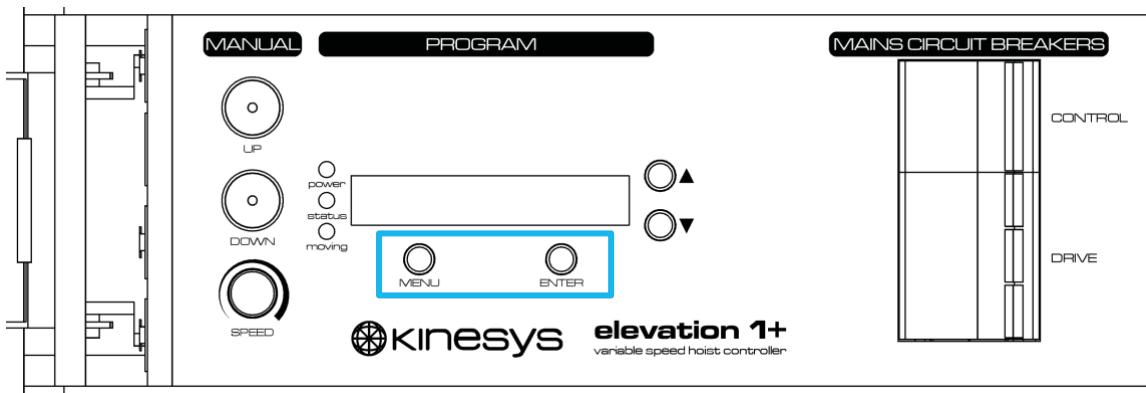
### **Normal Moving Operation**

While the unit is moving the display will only show the position.

### **Manual/Auto operation**

To operate the unit manually press the menu and enter buttons together. The unit will show MANUAL in the display while stationary. Pressing menu and enter again will revert to automatic mode. When this is done AUTO will show in the display for 2 seconds before reverting back to the normal operation outlined above. There is a 2 minute timeout on the manual mode. This timer is reset to 2 minutes every time the unit is run in manual mode. After two minutes of inactivity the unit will revert to automatic mode as if the menu and enter buttons had been pressed.

## 9.1 Menu Operation



Pressing and holding the menu button for two seconds in any mode other than while the unit is moving will allow the user to access the menu structure. There are two menu modes.

### Menu Navigation

Pressing menu from the start display enters the first menu level. Menu up and menu down will move up and down the menu items on the first level. The menu rolls over to the first item after the last one is reached and vice versa. Pressing enter will move into either the selected sub-menu or will show the selected parameter value.

### Parameter Edit

With the parameter value displayed the menu up and menu down buttons will scroll the value shown within the allowable range of values. 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 scroll is variable speed with the speed of value change increasing the longer the button is pressed.

## 9.2 Fault Conditions

If the unit detects a fault condition the display will flash the error code on the display. When the code is not displayed then the display is blank. The following errors codes are possible.

	<b>drvcan</b> - Shown when the drive is powered down. The fault indicates a CAN Bus communications failure between the drive and control card.
	<b>drv</b> - Shown when the drive is tripped. The letters drv are followed by the fault code read from the drive e.g. <i>drv012</i> = Earth Fault  If the Elevation shows the letters drv without a Fault code, then the Elevation has been switched to Analogue mode. This mode needs to be turned off, in the setup menu.
	<b>limit</b> - Ultimate limit struck
	<b>upper</b> - Upper over-travel limit struck
	<b>lower</b> - Lower over-travel limit struck
	<b>U Soft</b> - Upper Soft limit reached
	<b>L Soft</b> - Lower Soft limit reached
	<b>OLoad</b> - Overload detected
	<b>ULoad</b> - Underload detected
	<b>OSpeed</b> - Overspeed detected, the motor is traveling faster than demanded
	<b>USpeed</b> - Underspeed detected, the motor is traveling slower than demanded
	<b>Udog</b> - Comms watchdog trip, a status stationary message was received while a move was in progress

	<b>Comms</b> – Communications timeout no comms received in 2 seconds (Shown on display for 15 seconds after timeout occurs, even if comms returns - cleared after 15 seconds)
	Enc 1 - No encoder count detected
	Enc 2 - Encoder reversed
	Emergency Stop Trip
	Unit is resetting
	Running ROM firmware. Firmware update required

### 9.3 Menu Structure

**SE~~U~~UP00**

Setup

Limits	0000E50	0PP8800	HHHH Data	Max Upper Travel
		0808800	HHHH Data	Max Lower Travel
		69P <del>A</del> SS0	0000000	
	Bypass	On	0000000	
			0FF0000	Default
Ultimate Bypass	0000B90	0000000	selectable when ultimate struck	
	Ultimate Bypass	0000000		On
		0FF0000	Default setting	
Default	0E000E0	SP <del>E</del> E800	HHHH Data	mm/s
	Default	0000000	HHHH Data	mm/s/s
		0EE8000	HHHH Data	mm/s/s
		0EE8000	HHHH Data	mm/s/s
Fast	FASE000	0EE8000	HHHH Data	mm/s/s

Clamps	00800000	00000000	SPEED000	HHHH Data
	Max		Speed	
		8888000	Accel	HHHH Data
		8888000	Decel	HHHH Data
	Min	00000000	SPEED000	HHHH Data
			Speed	
		8888000	Accel	HHHH Data
		8888000	Decel	HHHH Data
Offset	00000000	00000000	HHHH Data	
	Up			
	00000000	00000000	HHHH Data	
	Down			
Encoder	00000000	HHHH Data	Encoder Pulses per mm	
Parameters	00000000	00000000	HHHH Data	Proportional Gain
	1			
	00000002	HHHH Data	Integral Gain	
	2			
	00000003	HHHH Data	Derivative Gain	
	3			

	 4	HHHH Data	<i>Min Drive Speed</i>
	 5	HHHH Data	<i>Max Drive Speed</i>
	 6	HHHH Data	<i>Pos Trip Distance</i>
	 7	HHHH Data	
 Analog	 Off	Default	
	 On		
 Display Flip	 Off	Default	
	 On		

 Comms	HHHH Data	<i>Comms Address</i>
 Address		

 Data	HHHH Data	
 Position	HHHH Data	<i>Current Position</i>

 Version	HHHH Data	<i>Software Version</i>
 Product ID	HHHH Data	<i>Product Identification Code</i>
 License	HHHH Data	<i>Product License Code</i>

## 10 Position Controller

The advanced position controller inside the Elevation 1+ unit takes the move profiles that are sent to it by the controller and translates them into movement commands for the internal drive electronics. The control software use 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 crucial to the correct functioning of the unit.

**NOTE: Only adjust these parameters if you are confident of your abilities to tune the system. The Elevation 1+ 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 be sure that the device and load are free and safe to move and that there is physical room to allow for unexpected movement and behaviour.**

### **P1 - Proportional Gain (Default value 25000)**

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

### **P2 - Integral Gain (Default value 1500)**

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

### **P3 - Derivative Gain (Default value 00250)**

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.

### **P4 - Min Speed Output Value To Drive (Default value 50 = 1hz)**

The minimum raw speed value that can be sent to the drive. This value is measured in units of 0.02Hz. Used to set the minimum drive speed required to obtain movement. This value is used with the max speed output parameter to limit the range of the PID loop. The Elevation 1+ Firmware only uses the lower 16 bits as an unsigned integer.

### **P5 - Max Speed Output Value To Drive (Default value 5000 = 100hz)**

The maximum raw speed value that can be sent to the drive. This value is measured in units of 0.02Hz. Used to set the maximum drive speed that may be permitted. This value

is used with the min speed output parameter to limit the range of the PID loop. The Elevation 1+ Firmware only uses the lower 16 bits as an unsigned integer.

### **P6 - Position error trip distance (mm) (Default value 300)**

The PID servo control generates the correct move profile in software which the PID loop attempts to follow as closely as possible. Should the position leading or following error distance exceed this setting an over speed or under speed error will be generated and the move stopped. Firmware only uses the lower 16 bits as an unsigned integer.

### **P7 - Brake Delay on start(ms x 10) (Default value 0)**

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

## 11 Unit Configuration

Several of the parameters that have to be set up within the Elevation 1+ are dependant on the type of motor in use. The PID control loop parameters are covered earlier in this manual.

The other device specific parameter is the encoder scaling. This 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 0.5506mm. 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 788mm circumference.

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

Distance traveled per pulse =  $788/(1024 \times 4) = 0.19238$ mm.

This would equate to an encoder scale of 19238.

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

The list below shows the required value for different hoists.

Hoist Model	UK Speed	US Speed	Enc Scale >= V5.00
LodeStar LL	8m/min	32ft/min	7590
LodeStar JJ	16m/min	64ft/min	7590
Liftket (Most Models)	20m/min	80ft/min	55060

Note that software versions 4.xx and below used a less accurate encoder scaling based on the distance is measured in mm x 10,000. If you are using V4.xx elevation software or below then divide the encoder scaling by a factor of 10.

Hoist Model	Old Enc Scale <= V4.xx	Enc Scale >= V5.00
LodeStar LL	759	7590

LodeStar JJ	759	7590
Liftket (Most Models)	5506	55060

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.

## 12 Limits

The Elevation 1+ has the capability of monitoring and reacting to three different sets of limit, these are software limits, end of travel limits and over-travel or ultimate limits.

### **Software Limits**

Software or soft limits are positions stored by the software beyond which it will not run the attached hoist. There is an upper and a lower soft limit and these can be set to any value from -65,000 to 65,000. The value of the upper limit must be greater than that of the lower but other than that the values may be set to any position. If target positions greater than the soft limits are requested then the Elevation 1+ will clamp the target to the limit.

#### **Software Limit Override**

When operating from an external computer controller the only way to travel further than the soft limits is to reset the limits to allow a greater range of travel. If running locally in manual mode or if access to the unit is possible then 'limit bypass' can be selected within the menu system which will allow the unit to run through its soft limits. Always ensure that this is reset to OFF afterwards otherwise the soft limits will have no effect on future moves.

### **End of Travel Limits**

These limits are physical limits located within the hoist and are monitored by the internal electronics and software. Hitting an end of travel limit will stop the movement of the hoist immediately and from then on will only allow movement in the opposite direction until the limit has cleared. If a limit is hit the unit will display the limit name on the screen and will report it back to the controlling computer.

#### **End of Travel Limit Override**

End of travel limits cannot be overridden as they still allow movement, it is just limited to the opposite direction. These limits are generally set to protect the physical device by preventing the hook running into the body or the end of the chain running through the hoist. Adjustment of them can only be done by partial disassembly of the hoist.

### **Ultimate Limits**

Ultimate limits are the last line of defence and should only be 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 hit 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 by the controlling computer and a special sequence must be followed in order to allow movement again. An ultimate limit trip will be shown on the menu display on the unit and reported back to the controlling computer.

#### **Ultimate Limit Override**

Due to the severity of hitting 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 computer, at a slow speed off the limit. Once the limit is cleared the ultimate bypass parameter in the menu will automatically clear itself and normal operation can be resumed.

## 12.1 Setting the Software Travel limits without a computer

If an Elevation 1+ needs to have its travel limits set, this can be done from the front panel display in the following way.

Enter the menu mode by pressing and holding the menu button for two seconds. Once in the menu mode there are two modes of operation as described below.

### Menu Navigation

Pressing menu from the start display enters the first menu level. Menu up and menu down will move up and down the menu items on the first level. The menu rolls over to the first item after the last one is reached and vice versa. Pressing enter will move into either the selected sub-menu or will show the selected parameter value.

### Parameter Edit

With the parameter value displayed the menu up and menu down buttons will scroll the value shown within the allowable range of values. 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 scroll is variable speed with the speed of value change increasing the longer the button is pressed.

The three entries that may need changing are the Upper and Lower Travel Limits and the current position. The table below shows their location in the menu structure.

**SEEUP00**

Setup

<b>Limits</b>	<b>UPPER000</b>	HHHH Data	<i>Max Upper Travel Limit (mm)</i>
	<b>LOWER000</b>	HHHH Data	<i>Max Lower Travel Limit (mm)</i>

**DATA000**

Data

<b>Pos00000</b>	HHHH Data	<i>Current Position (mm)</i>
-----------------	-----------	------------------------------

For example if a hoist was run to its lowest position, which was 1000mm off the stage,

the lower limit would be set to 1000mm and the current position would also be set to 1000mm.

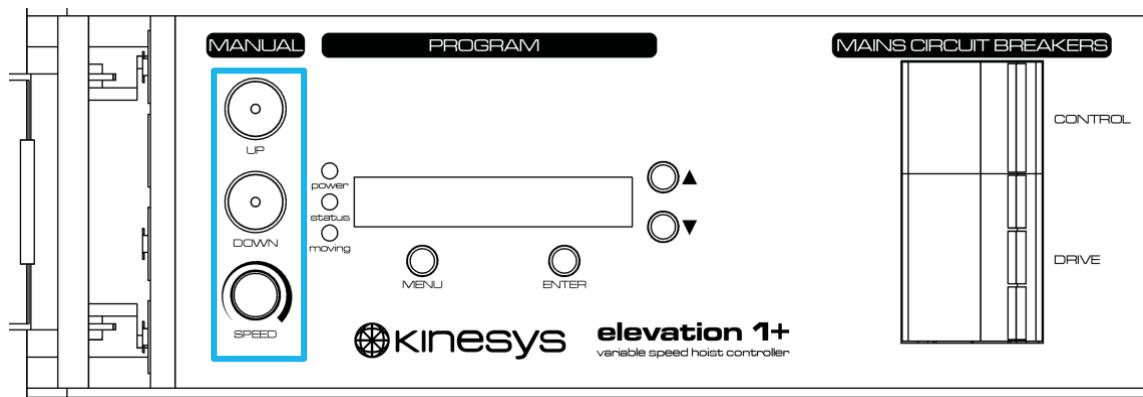
The hoist would then be taken out of menu mode so it could be run (This is achieved by pressing the menu button repeatedly until the menu mode is exited). The hoist could then be run to its highest position and the position noted (lets say this is 6278mm off the stage). The Elevation is again put into menu mode and the new value of 6278mm is set for the upper limit.

It should be noted that an Elevation may have old limits programmed into it and these may cause movement to stop before the desired position is reached. In this case the existing limits would need to be opened out.

## 13 Manual and Remote Running

In addition to being controlled by an external computer Elevation 1+ units can be controlled locally by both on-board controls or by connecting a remote pendant controller. The methods are known as manual and remote running respectively.

### Manual Running



At the left hand end of the front display panel on the Elevation 1+ are two buttons and a rotary speed control. These controls allow the hoist to be moved at variable speed directly from the unit. While the Elevation 1+ is in manual running mode run commands from the controlling computer will be ignored.

To enter manual mode press the menu and enter buttons together. The display will change to show the word 'manual' and the indicators in the up and down manual running buttons will illuminate. To move the hoist ensure the speed control is set to its slowest speed (turn the knob fully anti-clockwise) and then press and hold either up or down depending on the desired direction. Slowly increase the speed until the desired running speed has been reached. To stop movement, either release the run button which will stop the device with a quick ramp or return the speed control to zero and then release the button which will offer a more gradual ramp down. In all cases the unit will not allow the hoist to be run further than its soft limits unless they have been overridden. Once manual running is completed return the unit to automatic mode by pressing the menu and enter buttons together. The word 'auto' will be displayed and computer running will then be possible again. The unit will time out of manual mode after two minutes of inactivity.

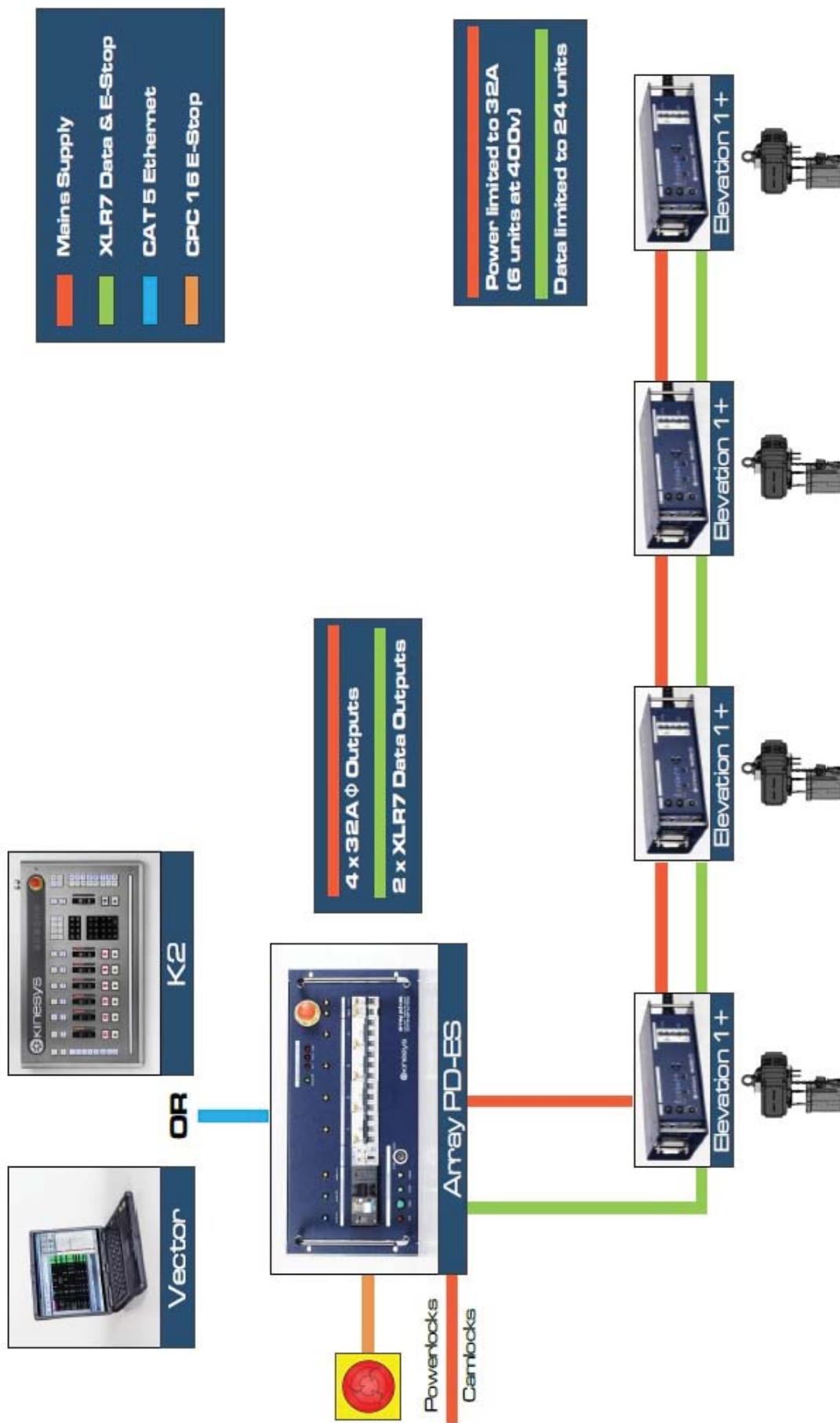
### Remote Running

Remote running is a feature that allows the Elevation 1+ to be operated remotely by a LodeStar 'pickle' or other similar pendant controller. It allows the hoist to be run up and 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 buttons on the pendant are pressed and released and the buttons must be held during the entire movement of the hoist.

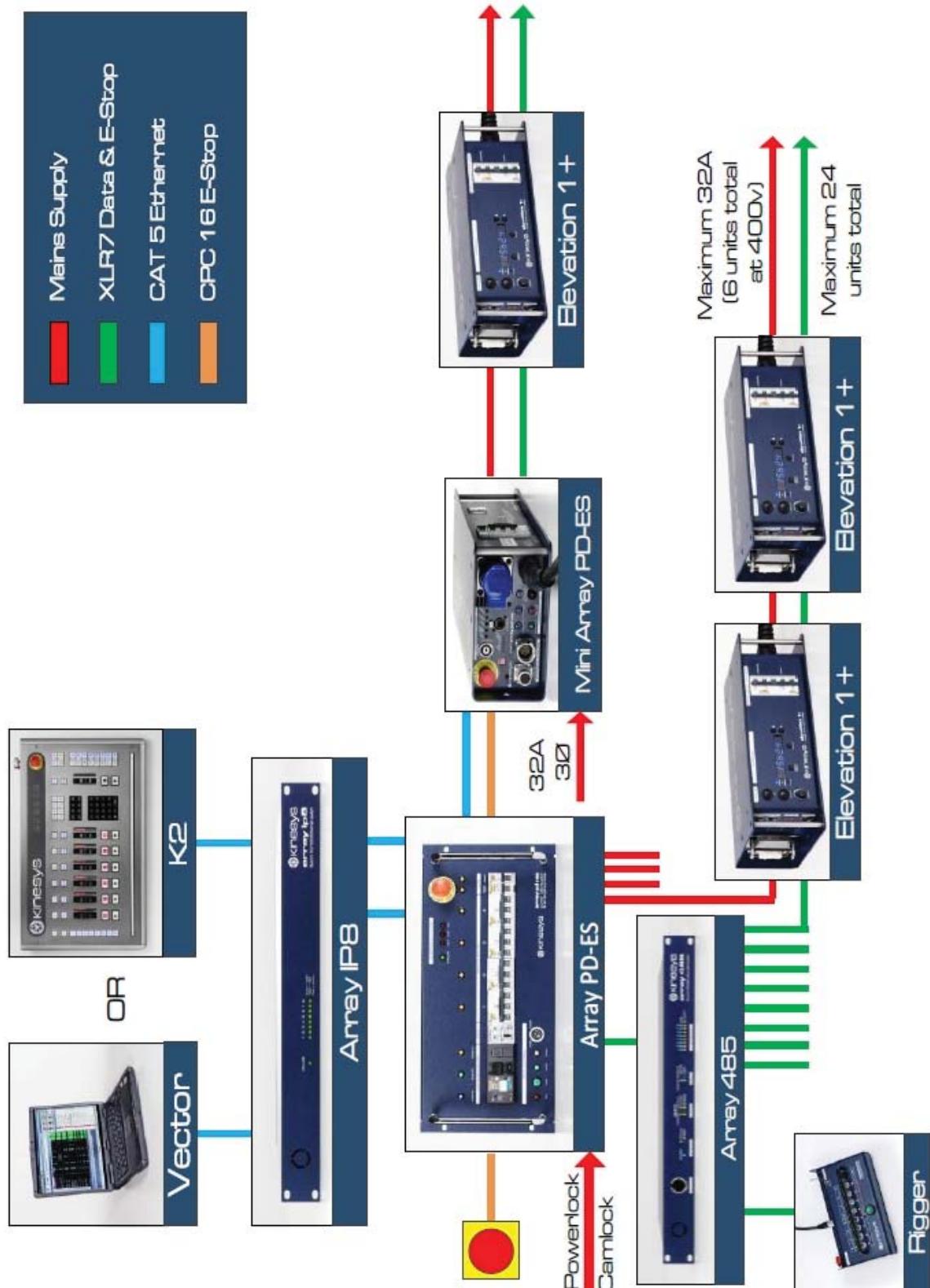
## 14 System Integration

Although it can work in isolation the Elevation 1+ is designed to operate as part of a network of units all controlled by a single computer. Elevations communicate with the control computer via an RS485 network which allows the units to be linked together using a communications bus system. They can also have their power connections linked together. This results in only a small number of cables needing run from the location of the Elevation 1+ units to where the power and the control computer are situated. The computer connects to the Elevation 1+ units using an Ethernet connection and the network translation between Ethernet and RS485 is done by a Transform 485 unit which is either supplied as a stand-alone unit or is integrated into the power distribution rack to create a very compact control solution.

## 14.1 Elevation 1+ System Diagram Simple



## 14.2 Elevation 1+ Full System Diagram



## 15 Replacing an Elevation

If an installed Elevation 1+ needs to be replaced, the following settings should be copied from the original Elevation 1+ to the new unit. They are shown below in a table to help locate them in the menu structure.

Setup			
Limits	0000850	UPPER000	HHHH Data <i>Max Upper Travel</i>
		Lower	0808000 HHHH Data <i>Max Lower Travel</i>
Comms			
Address	Addr000	HHHH Data	Comms Address
Data			
Position	Posn000	HHHH Data	Current Position

It is a good idea to note down these settings down for all the Elevation 1+ controllers in an installation so you are prepared if one needs to be replaced.

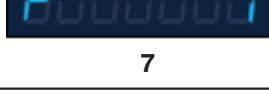
The one parameter that you will not be able to record in preparation is the current position. This should be entered into the replacement Elevation 1+ if the hoist being controlled is at a known position or its position can be estimated from the position of other hoists in the system.

The following parameters are normally the same for all Elevation 1+ controllers connected to the same type of motor within an installation. Their values should be checked on the replacement controller.

56808000

Setup

88808000 Default	56808000 Speed	HHHH Data	mm/s
	88808000 Accel	HHHH Data	mm/s/s
	88808000 Decel	HHHH Data	mm/s/s
FA580000 Fast	88808000 Decel	HHHH Data	mm/s/s
80808050 Clamps	FAH00000 Max	56808000 Speed	HHHH Data
		88808000 Accel	HHHH Data
		88808000 Decel	HHHH Data
	80800000 Min	56808000 Speed	HHHH Data
		88808000 Accel	HHHH Data
		88808000 Decel	HHHH Data
88808000 Offset	08000000 Up	HHHH Data	

		HHHH Data	
	HHHH Data	<i>Encoder Pulses per mm</i>	
		HHHH Data	<i>Proportional Gain</i>
		HHHH Data	<i>Integral Gain</i>
		HHHH Data	<i>Derivative Gain</i>
		HHHH Data	<i>Min Drive Speed</i>
		HHHH Data	<i>Max Drive Speed</i>
		HHHH Data	<i>Pos Trip Distance</i>
		HHHH Data	

## 16 Using an Elevation with RCDs

The Kinesys Elevation 1+ 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, radio equipment etc. 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 60-300mA, which will be more than sufficient to trip the 30mA RCD (Residual Current Device) fitted to many house rigging supplies within Europe. A single Elevation 1+ 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, video screen power supplies etc. will also have a inherent earth leakage due to internal RFI filters nuisance tripping may increase when other equipment is turned on.

RCDs are set at a default level of 30mA 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 30mA higher than the system's base leakage current - this will overcome the problem of nuisance tripping and yet still provide a degree of personnel protection. Kinesys have addressed this issue by providing an adjustable RCD within the Array PD-ES power distribution. The adjustable RCD should be set to a point approximately 30mA higher than the point at which a full system trips on powerup - 100mA would be a good starting point. The time delay should always be set to minimum (30ms).

To set the RCD to 100mA the second DIP switch should be set to the " $I\Delta \times 0,1$ " position; set the top left potentiometer to 1 to set a trip current of 100mA. Make sure the fourth DIP switch is in the "tx1" position and the right hand potentiometer is turned fully counterclockwise to set a minimum time delay of 30mS.

In any large power distribution system, for example a venue power supply which is distributed to various departments such as lighting, automation, sound etc., 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 departments.

## 17 Contact Information

If you would like to get in touch with Kinesys then please use any of the following methods.

Email: [info@kinesys.co.uk](mailto:info@kinesys.co.uk)  
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United Kingdom

Google Map Link: <http://www.google.co.uk/maps?q=tw122ht>

### Feedback

We are always keen to hear feedback from the users of Kinesys products. If you have a feature request, any comments about the documentation or just want to say hello, please get in touch.

In the unlikely event that this product has not performed to the high standards that we work to and our users expect then please let us know as soon as possible.

To leave feedback please email [feedback@kinesys.co.uk](mailto:feedback@kinesys.co.uk) or call us on +44 (0)20 8481 9850.

If you require technical support please contact us either at +44 (0)20 8481 9850 or [support@kinesys.co.uk](mailto:support@kinesys.co.uk)