



Bardac
drives

User Guide

Optidrive Plus 3^{GV-L}

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For Lifting Applications

AC Variable Speed Drive

0.75 – 160kW (1 – 250HP)



Installation and operating Instructions

Declaration of Conformity:

Invertek Drives Ltd hereby states that the Optidrive Plus 3^{GV-L} product range conforms to the relevant safety provisions of the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC and has been designed and manufactured in accordance with the following harmonised European standards:

EN 61800-5-1: 2003	Adjustable speed electrical power drive systems. Safety requirements. Electrical, thermal and energy.
EN 61800-3 2 nd Ed: 2004	Adjustable speed electrical power drive systems. EMC requirements and specific test methods
EN 55011: 2007	Limits and Methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment (EMC)
EN60529 : 1992	Specifications for degrees of protection provided by enclosures

Electromagnetic Compatibility

All Optidrives are designed with high standards of EMC compliance in mind. All versions suitable for operation on Single Phase 230 volt and Three Phase 400 volt supplies and intended for use within the European Union are fitted with an internal EMC filter. This EMC filter is designed to reduce the conducted emissions back into the supply via the power cables for compliance with harmonised European standards.

It is the responsibility of the installer to ensure that the equipment or system into which the product is incorporated complies with the EMC legislation of the country of use. Within the European Union, equipment into which this product is incorporated must comply with the EMC Directive 2004/108/EC. When using an Optidrive with an internal or optional external filter, compliance with the following EMC Categories, as defined by EN61800-3:2004 can be achieved:

Drive Type / Rating	EMC Category		
	Cat C1	Cat C2	Cat C3
1 Phase, 230 Volt Input ODP-x2xxx	No additional filtering required Use shielded motor cable		
3 Phase, 400 Volt Input ODP-x4xxx	Use External Filter OD-Fx34x Use screened motor cable	No additional filtering required	
Note	For motor cable lengths greater than 100m, an output dv / dt filter must be used (part number OD-OUTFx, please refer to the Invertek Stock Drives Catalogue for further details)		
	For Frame Size 5 and 6 drives, a ferrite ring must be installed on the output motor cable, with all three phases of the motor cable being wrapped one turn around the ferrite ring.		
	Vector Speed and Torque control modes may not operate correctly with long motor cables and output filters. It is recommended to operate in V/F mode only for cable lengths exceeding 50m		

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All Invertek Optidrive Plus 3^{GV} units carry a 2 year warranty against manufacturing defects from the date of manufacture. The manufacturer accepts no liability for any damages caused during or resulting from transport, receipt of delivery, installation or commissioning. The manufacturer also accepts no liability for damages or consequences resulting from inappropriate, negligent or incorrect installation, incorrect adjustment of the operating parameters of the drive, incorrect matching of the drive to the motor, incorrect installation, unacceptable dust, moisture, corrosive substances, excessive vibration or ambient temperatures outside of the design specification.

The local distributor may offer different terms and conditions at their discretion, and in all cases concerning warranty, the local distributor should be contacted first.

The contents of this User Guide are believed to be correct at the time of printing. In the interest of a commitment to a policy of continuous improvement, the manufacturer reserves the right to change the specification of the product or its performance or the contents of the User Guide without notice.

This User Guide is for use with V3.01 Software. It is not compatible with earlier software releases.

User Guide Issue 3.01 04/09

Invertek Drives Ltd adopts a policy of continuous improvement and whilst every effort has been made to provide accurate and up to date information, the information contained in this brochure should be used for guidance purposes only and does not form the part of any contract.

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1. Introduction

1.1. Operation Overview

The Optidrive Plus 3^{GV-L} is designed to provide optimum control in Elevator and Crane Hoist applications, based on the proven platform of the Optidrive Plus 3^{GV} and retaining Invertek's ease of use concept, combined with dedicated parameters and functionality specifically for lifting applications.

Two distinct operating modes are available:-

Elevator Mode

Elevator Mode is specifically designed to control asynchronous motors in Elevator applications with or without a feedback encoder. The Third Generation Sensorless Vector control provides superior torque performance in open loop applications, often meaning that encoders are no longer required in applications where previously they were necessary, providing optimum levelling regardless of elevator load. With up to 200% torque available from starting, and programmable S-Ramps, smooth starting and stopping is easily achieved regardless of carriage load.

- 4 Programmable S- Ramps
- Programmable Motor Contactor Delay and optional control output
- Motor Holding Brake Control with 'Torque Prove'
- Closed Loop Encoder Feedback Option available
- 230 Volt Single Phase UPS Emergency Operation for Carriage Evacuation
- Fault suppression for non-critical trips unless the carriage is stationary





Crane & Hoist Mode

Crane and Hoist Mode builds on the proven ability of Optidrive Plus 3^{GV} in arduous applications, and provides further control and performance benefits with even more simplified commissioning.

- Enhanced Motor Brake Control for improved safety
- Simplified Fast I/O configuration designed for Lifting Applications
- 200% Starting Torque capability
- Adjustable V/F characteristic for conical rotor motors

1.2. Important safety information

Please read the IMPORTANT SAFETY INFORMATION below, and all Warning and Caution information elsewhere.

 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in injury or death.	 CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in damage to property.
 WARNING	<p>This variable speed drive product (Optidrive) is intended for professional incorporation into complete equipment or systems as part of a fixed installation. If installed incorrectly it may present a safety hazard. The Optidrive uses high voltages and currents, carries a high level of stored electrical energy, and is used to control mechanical plant that may cause injury. Close attention is required to system design and electrical installation to avoid hazards in either normal operation or in the event of equipment malfunction.</p> <p>System design, installation, commissioning and maintenance must be carried out only by personnel who have the necessary training and experience. They must carefully read this safety information and the instructions in this Guide and follow all information regarding transport, storage, installation and use of the Optidrive, including the specified environmental limitations.</p> <p>The level of integrity offered by the Optidrive control functions – for example stop/start, forward/reverse and maximum speed, is not sufficient for use in safety-critical applications without independent channels of protection. All applications where malfunction could cause injury or loss of life must be subject to a risk assessment and further protection provided where needed.</p> <p>Within the European Union, all machinery in which this product is used must comply with Directive 98/37/EC, Safety of Machinery. In particular, the machine manufacturer is responsible for providing a main switch and ensuring the electrical equipment complies with EN60204-1.</p> <p>The driven motor can start at power up if the enable input signal is present.</p> <p>The STOP function does not remove potentially lethal high voltages. ISOLATE the drive and wait 10 minutes before starting any work on it.</p> <p>Electric shock hazard! Disconnect and ISOLATE the Optidrive before attempting any work on it. High voltages are present at the terminals and within the drive for up to 10 minutes after disconnection of the electrical supply.</p> <p>Where supply to the drive is through a plug and socket connector, do not disconnect until 10 minutes have elapsed after turning off the supply.</p> <p>Ensure correct earthing connections. The earth cable must be sufficient to carry the maximum supply fault current which normally will be limited by the fuses or MCB. Suitably rated fuses or MCB should be fitted in the mains supply to the drive.</p> <p>Flammable material should not be placed close to the drive</p> <p>Parameter P1-01 can be set to operate the motor at up to 120,000 rpm, hence use this parameter with care.</p> <p>If it is desired to operate the drive at any frequency/speed above the rated speed (P1-09/ P1-10) of the motor, consult the manufacturers of the motor and the driven machine about suitability for over-speed operation.</p>		
 CAUTION	<p>Carefully inspect the Optidrive before installation to ensure it is undamaged</p> <p>The Optidrive Plus 3^{GV} has an Ingress Protection rating of IP20 or IP55 depending on the model. IP20 units must be installed in a suitable enclosure.</p> <p>Optidrives are intended for indoor use only.</p> <p>Do not perform any flash test or voltage withstand test on the Optidrive. Any electrical measurements required should be carried out with the Optidrive disconnected.</p> <p>The entry of conductive or flammable foreign bodies should be prevented</p> <p>Relative humidity must be less than 95% (non-condensing).</p> <p>Ensure that the supply voltage, frequency and no. of phases (1 or 3 phase) correspond to the rating of the Optidrive as delivered.</p> <p>Never connect the mains power supply to the Output terminals U, V, W.</p> <p>Do not install any type of automatic switchgear between the drive and the motor</p> <p>Wherever control cabling is close to power cabling, maintain a minimum separation of 100 mm and arrange crossings at 90 degrees</p> <p>Ensure that all terminals are tightened to the appropriate torque setting</p>		

2. General Information and Ratings

2.1. Drive model numbers

200-240V ±10% - 1 Phase Input					
kW Model Number	kW	HP Model Number	HP	Output Current (A)	Frame Size
ODP-12037-xx	0.37	ODP-12005-USA	0.5	2.3	1
ODP-12075-xx	0.75	ODP-12010-USA	1	4.3	1
ODP-12150-xx	1.5	ODP-12020-USA	2	7	1
ODP-22150-xx	1.5	ODP-22020-USA	2	7	2
ODP-22220-xx	2.2	ODP-22030-USA	3	10.5	2
200-240V ±10% - 3 Phase Input					
kW Model Number	kW	HP Model Number	HP	Output Current (A)	Frame Size
ODP3-22150-xx	1.5	ODP3-22020-USA	2	7	2
ODP3-22220-xx	2.2	ODP3-22030-USA	3	10.5 (9)	2
ODP-32030-xx	3.0	ODP-32040-USA	4	14	3
ODP-32040-xx	4.0	ODP32050-USA	5	18	3
ODP-32055-xx	5.5	ODP-32075-USA	7.5	25 (24)	3
ODP-42075-xx	7.5	ODP-42100-USA	10	39	4
ODP-42110-xx	11	ODP-42150-USA	15	46	4
ODP-42150-xx	15	ODP-42200-USA	20	61	4
ODP-42185-xx	18.5	ODP-42250-USA	25	72	4
ODP-52220-xx	22	ODP-52300-USA	30	90	5
ODP-52300-xx	30	ODP-52400-USA	40	110	5
ODP-52370-xx	37	ODP-52500-USA	50	150	5
ODP-52450-xx	45	ODP-52600-USA	60	180	5
ODP-62055-xx	55	ODP-62075-USA	75	202	6
ODP-62075-xx	75	ODP-62100-USA	100	240	6
ODP-62090-xx	90	ODP-62120-USA	120	300	6
380-480V ±10% - 3 Phase Input					
kW Model Number	kW	HP Model Number	HP	Output Current (A)	Frame Size
ODP-24075-xx	0.75	ODP-24010-USA	1	2.2	2
ODP-24150-xx	1.5	ODP-24020-USA	2	4.1	2
ODP-24220-xx	2.2	ODP-24030-USA	3	5.8	2
ODP-24400-xx	4	ODP-24050-USA	5	9.5	2
ODP-34055-xx	5.5	ODP-34075-USA	7.5	14	3
ODP-34075-xx	7.5	ODP-34100-USA	10	18	3
ODP-34110-xx	11	ODP-34150-USA	15	25 (24)	3
ODP-34150-xx ²	15	ODP-34200-USA ¹	20	30	3
ODP-44185-xx	18.5	ODP-44250-USA	25	39	4
ODP-44220-xx	22	ODP-44300-USA	30	46	4
ODP-44300-xx	30	ODP-44400-USA	40	61	4
ODP-44370-xx	37	ODP-44500-USA	50	72	4
ODP-54450-xx	45	ODP-54600-USA	60	90	5
ODP-54550-xx	55	ODP-54750-USA	75	110	5
ODP-54750-xx	75	ODP-54100-USA	100	150	5
ODP-54900-xx	90	ODP-54120-USA	150	180	5
ODP-64110-xx	110	ODP-64150-USA	160	202	6
ODP64132-xx	132	ODP-64175-USA	200	240	6
ODP-64160-xx	160	ODP-64210-USA	250	300	6

480-525V ±10% 3 Phase Input (Note : Not UL Approved)					
kW Model Number	kW	HP Model Number	HP	Output Current (A)	Frame Size
ODP-55550-xx	55	N/A		90	5
ODP-55750-xx	75	N/A		110	5
ODP-55900-xx	90	N/A		150	5
ODP-65132-xx	132	N/A		202	6
ODP-65160-xx	160	N/A		240	6
ODP-65200-xx	200	N/A		270	6
500-600V ±10% - 3 Phase Input					
kW Model Number	kW	HP Model Number	HP	Output Current (A)	Frame Size
ODP-25075-xx	0.75	ODP-25010-USA	1	1.7	2
ODP-25150-xx	1.5	ODP-25020-USA	2	3.1	2
ODP-25220-xx	2.2	ODP-25030-USA	3	4.1	2
ODP-25370-xx	3.7	ODP-25050-USA	5	6.1	2
ODP-25550-xx	5.5	ODP-25075-USA	7.5	9.0	2
ODP-35075-xx	7.5	ODP-35100-USA	10	14	3
ODP-35110-xx	11	ODP-35150-USA	15	18	3
ODP-35150-xx	15	ODP-35200-USA	20	24	3
ODP-45220-xx	22	ODP-45300-USA	30	39	4
ODP-45300-xx	30	ODP-45400-USA	40	46	4
ODP-45450-xx	45	ODP-45600-USA	60	62	4

Notes

Output current values shown in brackets are the maximum values for UL conformance

An Input line choke must be fitted for all size 2 500 – 600 Volt units

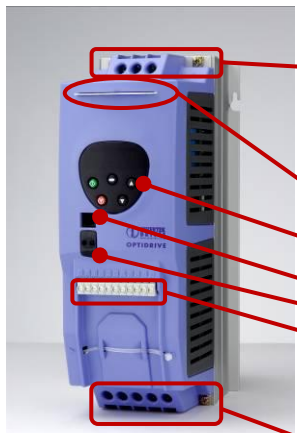
¹ Model not UL Listed

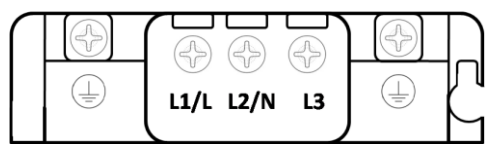

² Model has 110% overload capacity only

3. Mechanical Installation

3.1. Mechanical dimensions and mounting

3.1.1. Frame Size 2




Incoming Power Terminals
Help Card
Keypad & Display – See Section 5.1
RJ11 Connector
Infra Red Interface
Control Terminals – See Section 4.8
Motor & Brake Resistor Connection Terminals


Overall Dimensions


Height	260mm
Width	100mm
Depth	175mm
A	210mm
B	92mm
C	25mm

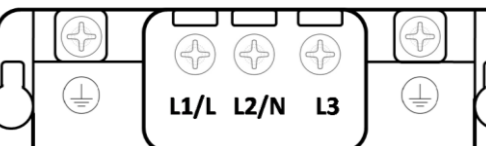

Footprint View

Weight : 2.6Kg

Fixings : 2 x M4 Keyhole slots
Power Terminals Torque Setting : 1Nm

3.1.2. Frame Size 3




Incoming Power Terminals
Help Card
Keypad & Display – See Section 5.1
RJ11 Connector
Infra Red Interface
Control Terminals – See Section 4.8
Motor & Brake Resistor Connection Terminals


Overall Dimensions

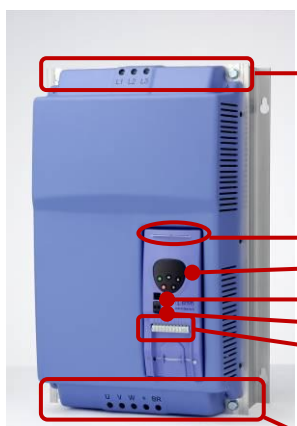
Height	260mm
Width	171mm
Depth	175mm
A	210mm
B	163mm
C	25mm

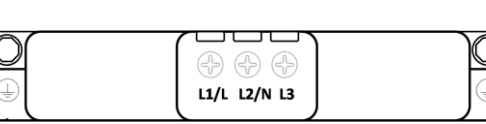

Footprint View

Weight : 5.3Kg

Fixings : 4 x M4 Keyhole slots
Power Terminals Torque Setting : 1Nm

3.1.3. Frame Size 4




Incoming Power Terminals
Help Card
Keypad & Display – See Section 5.1
RJ11 Connector
Infra Red Interface
Control Terminals – See Section 4.8
Motor & Brake Resistor Connection Terminals


Overall Dimensions

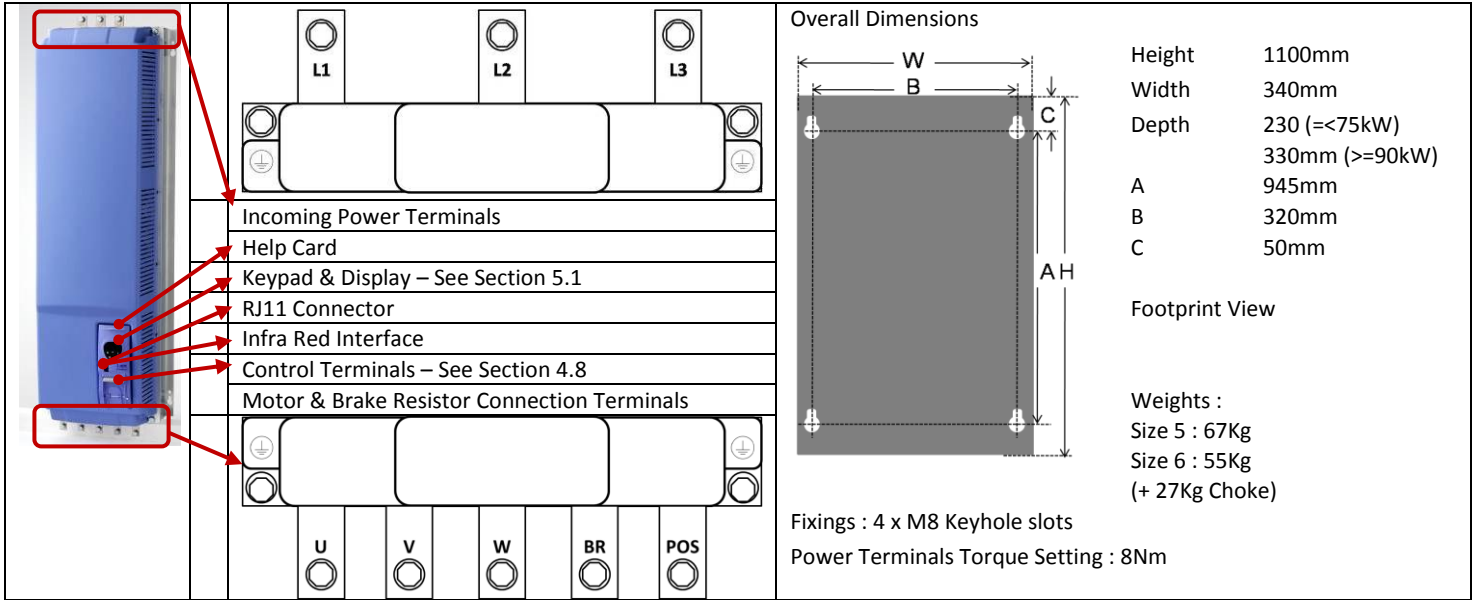
Height	520mm
Width	340mm
Depth	220mm
A	420mm
B	320mm
C	50mm

Footprint View

Weight : 28Kg

Fixings : 4 x M8 Keyhole slots
Power Terminals Torque Setting : 4Nm

3.1.4. Frame Sizes 5 & 6



3.1.5. Frame Size 6 Additional Input Choke

Optidrive Plus Frame Size 6 is supplied complete with an external Input Choke, which must be installed in the supply line to the drive



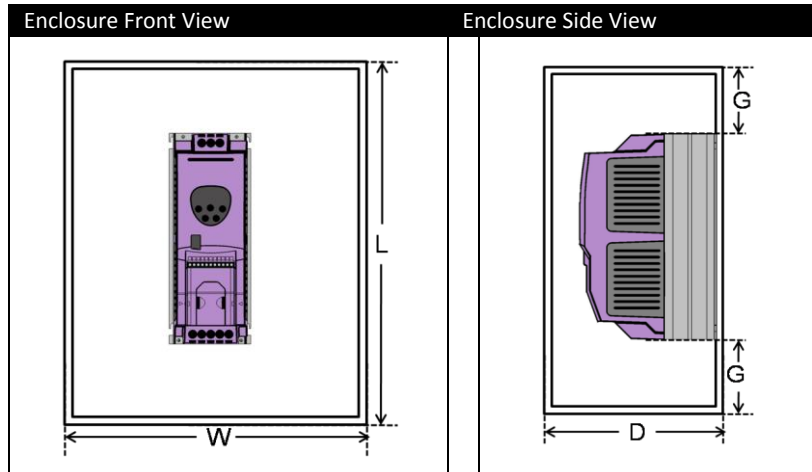
3.2. General

- Store the Optidrive in its box until required. Storage should be clean and dry and within the temperature range -40°C to +60°C
- The Optidrive must be installed in a pollution degree 1 or 2 environment

3.3. Enclosure mounting

For applications that require a higher IP rating than the IP20 offered by the standard drive, the drive must be mounted in a suitable metallic enclosure. The following guidelines should be observed for these applications:

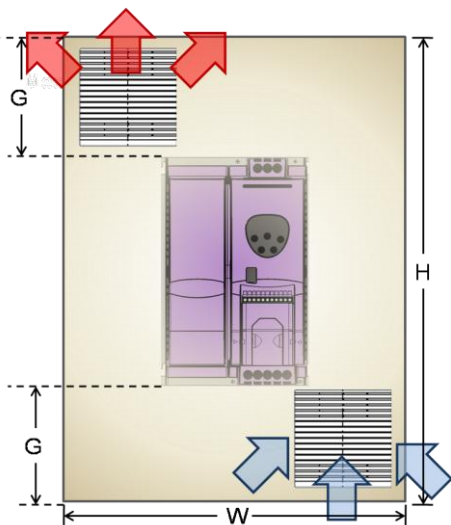
- Carefully inspect the drive prior to commencing to ensure it is undamaged.
- Install the Optidrive on a flat, vertical, flame-resistant, vibration-free mounting. For IP20 Optidrives, install in a suitable enclosure, according to EN60529 if specific Ingress Protection ratings are required.
- Enclosures should be made from a thermally conductive material
- Do not mount flammable material close to the Optidrive
- Where vented enclosures are used, there should be venting above the drive and below the drive to ensure good air circulation. Air should be drawn in below the drive and expelled above the drive.
- In any environments where the conditions require it, the enclosure must be designed to protect the Optidrive against ingress of airborne dust, corrosive gases or liquids, conductive contaminants (such as condensation, carbon dust, and metallic particles) and sprays or splashing water from all directions.
- High moisture, salt or chemical content environments should use a suitably sealed (non-vented) enclosure.



The enclosure design and layout should ensure that the adequate ventilation paths and clearances are left to allow air to circulate through the drive heatsink. Inverterk Drives recommend the following Minimum sizes for drives mounted in non-ventilated metallic enclosures:-

Enclosure Minimum Dimensions					
Drive Power rating	L	W	D	G	
Size 2 1.5kW 230V / 2.2kW 400V	400	300	300	60	
Size 2 2.2kW 230V / 4kW 400V	600	450	300	100	

For drives mounted in free ventilated enclosures of force ventilated enclosures, Inverterk Drives recommend the following minimum sizes and airflow requirements:-






Drive Power Rating	Free-Vented unit			
	L	W	D	G
Size 2 4 kW	600	400	250	100
Size 3 15 kW	800	600	300	150
Size 4 22 kW	1000	600	300	200
Size 4 37 kW	-	-	-	-
Size 5 90 kW	-	-	-	-
Size 6 160 kW	-	-	-	-

Force-vented unit					Air Flow
L	W	D	G		
320	200	200	75	> 45m ³ /h	
400	250	200	100	> 80m ³ /h	
800	500	250	130	> 300m ³ /h	
800	500	250	130	> 300m ³ /h	
1500	600	400	200	> 900m ³ /h	
1600	600	400	250	>1000m ³ /h	

4. Power and Control Connections

4.1. Grounding the Drive

	This manual is intended as a guide for proper installation. Invertek Drives Ltd cannot assume responsibility for the compliance or the non-compliance to any code, national, local or otherwise, for the proper installation of this drive or associated equipment. A hazard of personal injury and/or equipment exists if codes are ignored during installation.
	This drive contains high voltage capacitors that take time to discharge after removal of mains supply. Before working on the drive, ensure isolation of mains supply from line inputs. Wait ten (10) minutes for capacitors to discharge to safe voltage levels. Failure to observe this precaution could result in severe bodily injury or loss of life.
	Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

Grounding Guidelines

The ground terminal of each Optidrive should be individually connected DIRECTLY to the site ground bus bar (through the filter if installed). Optidrive ground connections should not loop from one drive to another, or to, or from any other equipment. Ground loop impedance must confirm to local industrial safety regulations. To meet UL regulations, UL approved ring crimp terminals should be used for all ground wiring connections.

The drive Safety Ground must be connected to system ground. Ground impedance must conform to the requirements of national and local industrial safety regulations and/or electrical codes. The integrity of all ground connections should be checked periodically.

Protective Earth Conductor

The Cross sectional area of the PE Conductor must be at least equal to that of the incoming supply conductor.

Safety Ground

This is the safety ground for the drive that is required by code. One of these points must be connected to adjacent building steel (girder, joist), a floor ground rod, or bus bar. Grounding points must comply with national and local industrial safety regulations and/or electrical codes.

Motor Ground

The motor ground must be connected to one of the ground terminals on the drive.

Ground Fault Monitoring

If a system ground fault monitor is to be used; only Type B devices should be used to avoid nuisance tripping.

Shield Termination (Cable Screen)

The safety ground terminal provides a grounding point for the motor cable shield. The motor cable shield should be connected to this terminal (drive end) and also be connected to the motor frame (motor end). Use a shield terminating or EMI clamp to connect the shield to the safety ground terminal.

When shielded cable is used for control and signal wiring, the shield should be grounded at both ends of the cable.

4.2. Mains Power Supply

- For 1 phase supply power should be connected to L1/L, L2/N.
- For 3 phase supplies power should be connected to L1, L2, and L3. Phase sequence is not important.
- For compliance with CE and C Tick EMC requirements, a symmetrical shielded motor cable is recommended.
- The Optidrive should be connected to a fixed supply using a suitable disconnecting device between the Optidrive and the AC Power Source. The disconnecting device must conform to the local safety code / regulations.
- The cables should be dimensions according to any local codes or regulations. Guideline dimensions are given in section 9.2.
- Suitable fuses to provide wiring protection should be installed in the incoming supply line, according to the data in section 9.2. The fuses must comply with any local codes or regulations in place. In general, IEC type gG or UL type T fuses are suitable. The operating time of the fuses must be below 0.5 seconds.
- Where allowed by local regulations, suitably dimensioned circuit breakers may be utilised in place of fuses. Thermal overload protection is not required, as the Optidrive provides thermal protection for the motor and motor cable. Guideline dimensions are given in section 9.2.
- When the power supply is removed from the drive, a minimum of 30 seconds should be allowed before re-applying the power. A minimum of 5 minutes should be allowed before removing the terminal covers or connection.
- The maximum permissible short circuit current at the Optidrive Power terminals as defined in IEC60439-1 is 100kA.
- For Crane and hoist applications, where the power supply to the drive is via a busbar and brush gear system, Invertek Drives recommends the use of an input AC Input Inductor to ensure reliable operation for all drives that do not have a factory fitted internal inductor.
- An Input Choke should also be installed in the supply line for frame size 1 to 3 Optidrives where any of the following conditions occur:-
 - The incoming supply impedance is low or the fault level / short circuit current is high
 - The supply is prone to dips or brown outs
 - An imbalance exists on the supply (3 phase drives)
 - All installations of Frame Size 2 drives on 575 Volt Supply
- In all other installations, an input choke is recommended to ensure protection of the drive against power supply faults. Part numbers are shown in the table.

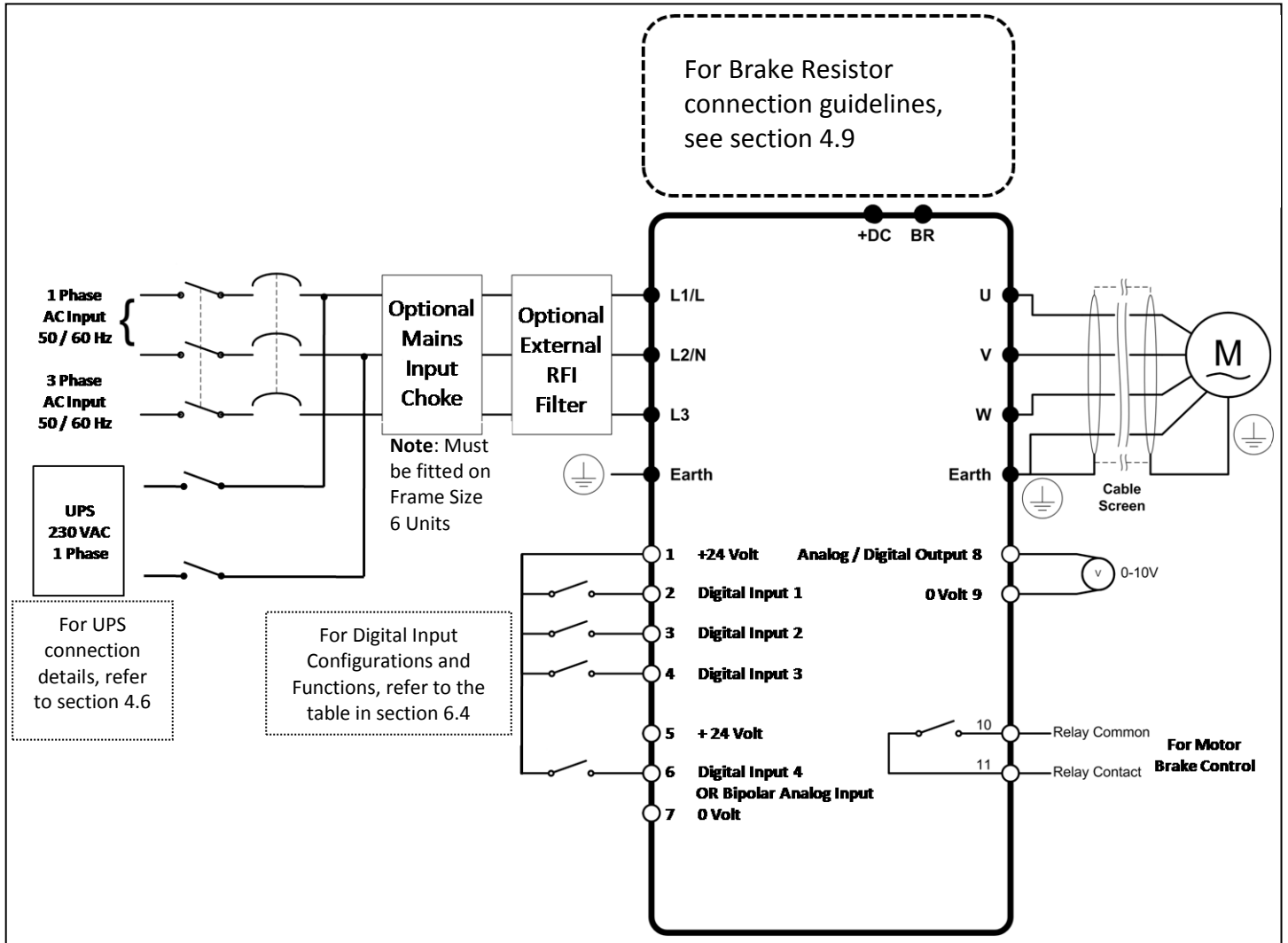
Supply	Frame Size	AC Input Inductor
230 Volt	2	OD-IL221-IN
1 Phase	3	OD-IL321-IN
400 Volt	2	OD-IL-243-IN
3 Phase	3	OD-IL-343-IN

4.3. Wiring Precautions

Connect the Optidrive according to section 4.4 Connection Diagram ensuring that motor terminal box connections are correct. There are two connections in general: Star and Delta. It is essential to ensure that the motor is connected in accordance with the voltage at which it will be operated. For more information, refer to section 4.7 Motor Terminal Box Connections.

It is recommended that the power cabling should be 3-core or 4-core PVC-insulated screened cable, laid in accordance with local industrial regulations and codes of practice.

4.4. Connection Diagram



4.5. Drive and motor connections

For 1 phase supply power should be connected to L1/L, L2/N.

For 3 phase supplies power should be connected to L1, L2, and L3. Phase sequence is not important.

Motor should be connection to U, V, and W

For drives that have a dynamic brake transistor, an optional external braking resistor can be connected to +DC and BR when required. The brake resistor circuit should be protected by a suitable thermal protection circuit, see 4.9 section for details.

4.6. UPS Backup Power Supply Connection (Elevator Applications Only)

For Elevator Applications on Frame Size 2 & 3 drives, an external UPS can be connected to provide a backup power supply in the event of a mains power failure. This allows the Elevator carriage to be moved at low speed to the nearest floor for safe evacuation.

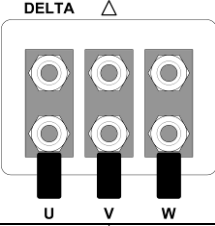
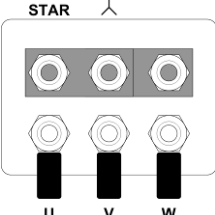
The UPS can be single phase, 230 volt output, and must be connected to the L1 and L2 terminals of the drive. Suitable contactors should be used to isolate the power connections between the mains power supply and the UPS to avoid damaging the UPS.

When operating on the UPS power supply, the maximum carriage speed is automatically limited to prevent over loading the supply. The maximum power consumption is always less than 25% of the drive rated power.

4.7. Motor Terminal Box Connections

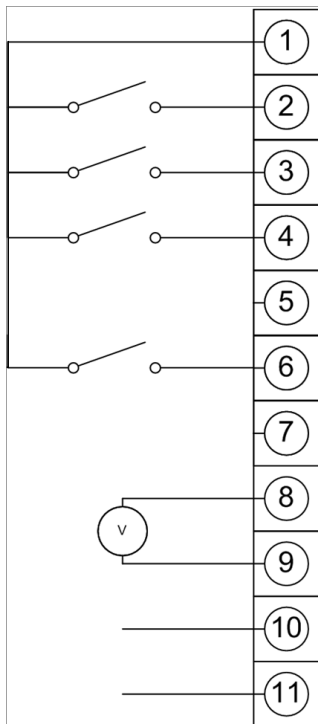
Most general purpose motors are wound for operation on dual voltage supplies. This is indicated on the nameplate of the motor nameplate.

This operational voltage is normally selected when installing the motor by selecting either STAR or DELTA connection. STAR always gives the higher of the two voltage ratings.

Incoming Supply Voltage	Motor Nameplate Voltages		Connection
230	230 / 400	Delta	
400	400 / 690		
400	230 / 400	Star	

4.8. Control terminal connections



Default Connections



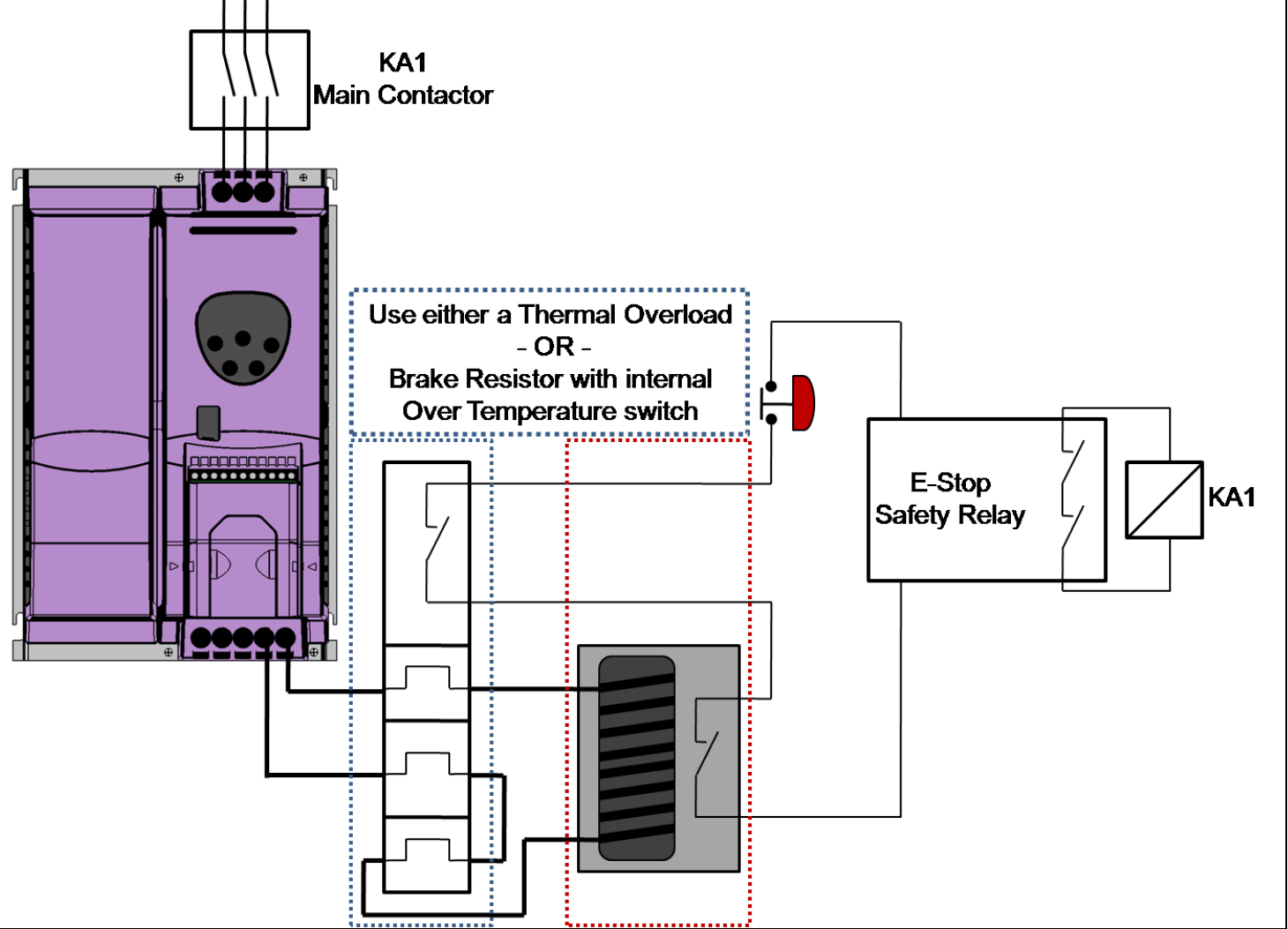
Control Terminal	Signal	Description
1	+24V User Output,	+24V, 100mA user control output
2	Digital Input 1	Positive logic "Logic 1" input voltage range : 8V ... 30V DC "Logic 0" input voltage range : 0V ... 4V DC
3	Digital Input 2 / Digital Output 3	Input : Positive logic "Logic 1" input voltage range : 8V ... 30V DC "Logic 0" input voltage range : 0V ... 4V DC Output : 24V, 10mA Max 'Drive Healthy' Output
4	Digital Input 3 / Analog Input 2	Digital: " Logic 1" input voltage range : 8 to 30V " Logic 0" input voltage range : 0 to 8V Analog: 0 to 10V, 0 to 20mA or 4 to 20mA See Parameter P2-33
5	+24V User Output	+24V, 10mA, 1kΩ minimum load resistance
6	Bipolar analog Input / Digital Input 4	Digital: " Logic 1" input voltage range : 8 to 30V " Logic 0" input voltage range : 0 to 8V Analog: 0 to 24V, 0 to 10V, -10 to + 10V, -24 to +24V See Parameter P2-30
7	0V	User ground, connected terminal 9
8	Analog Output / Digital Output	Analog: 0 to 10V DC, 20mA maximum 4 – 20mA, 20 – 4mA, 0 – 10V, 10 – 0V See Parameter P2-36 Digital: 0 to 24V DC, 20mA maximum
9	0V	User ground connected terminal 7
10	Relay Common	Motor Brake Control Volt Free Contacts 250Vac, 6A / 30Vdc, 5A Max
11	Relay NO Contact	


4.9. Optional Dynamic Brake Resistor Connections

Optidrive Plus 3^{GV-L} units and above have provision to connect an optional dynamic braking resistor. The internal chopper is rated for 100% continuous braking at drive rated power. The minimum resistance value for each drive model shown in section 9.2 must be observed. Connecting a resistance below this value may well result in damage to the drive.

 <p>CAUTION</p>	<p>The Optidrive Plus has internal software monitoring for the brake resistor, to prevent overheating, based on the setting of P2-23 (see section 8.2 for further details). Invertek Drives recommend that the brake resistor be protected by an external thermal protection device, such as a thermal overload or thermistor to prevent overheating of the resistor, and provide enhanced safety.</p>
 <p>WARNING</p>	<p>The Braking resistor connects to the DC Bus terminal connections of the drive, which can carry voltages in excess of 800 Volts DC. Safe installation is of paramount importance.</p>

Dynamic Brake Resistor with Thermal Overload Protection

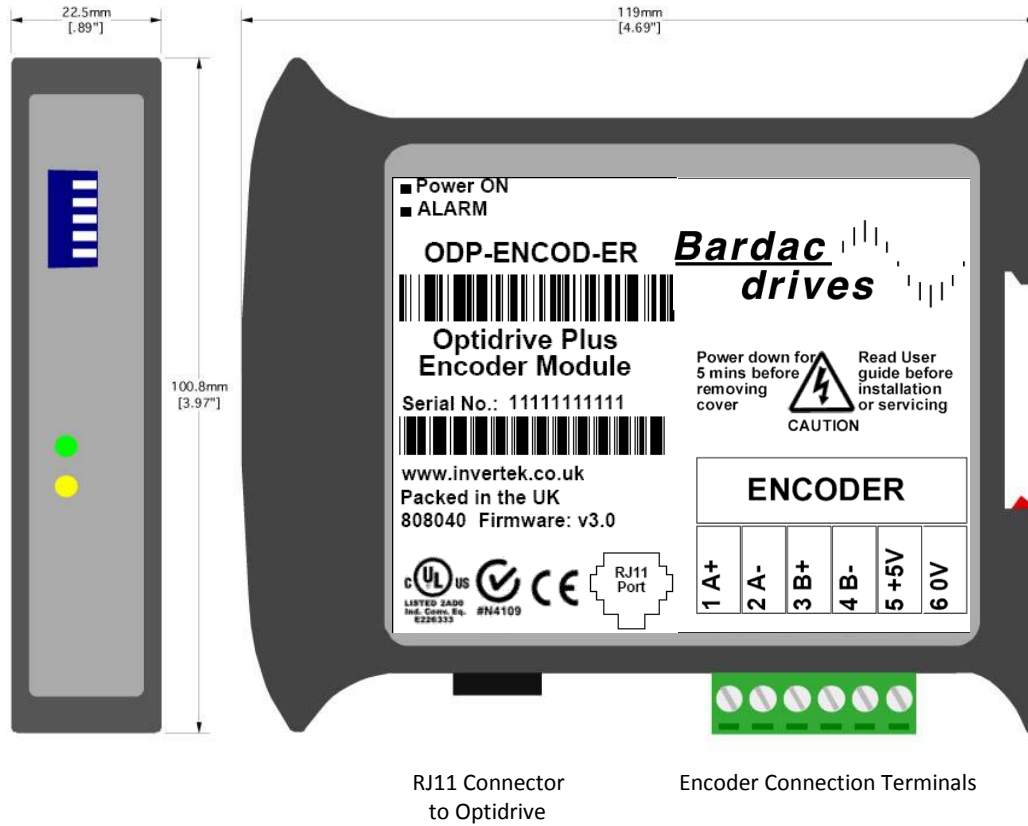


 <p>WARNING</p>	<p>If the brake resistor has an internal thermal protection device with volt free contacts, this can be used. Alternatively, the brake resistor manufacturer may recommend a suitable thermal overload device. The thermal overload protection should be connected to ensure the drive is immediately disabled in the event of a fault, and for best safety practice, this should disable the main overtorque supply to the drive and apply the motor brake.</p>
---------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

4.10. Optional Encoder Feedback Module Connection

An optional encoder feedback module is available, to allow connection of a motor feedback encoder. The encoder feedback module connects to the Optidrive via the RJ11 connector on the front cover, and is supplied with power directly from the Optidrive. Only one Encoder module may be connected to each drive, and multiple drives and encoder modules must **not** be networked to each other. The module can work with either single ended or differential encoders with operating voltages from 5 – 30 volts DC.

Note: For supply voltages greater than 5 volts (e.g. HTL encoders), the encoder must be powered from a separate power supply. For 5 Volt (e.g. TTL) encoders, the internal power supply may be used.



LED Status Indication







The encoder module has 2 LEDs – Green and Yellow.

- The Green LED indicates power
- The Yellow LED indicates a fault condition. This may be a communication fault or encoder wiring fault. The fault code is indicated on the drive display; see section 11.1 for details on fault messages. For transient faults, the LED will remain illuminated for 50ms to ensure that fast transient faults can be observed.










5. Operation

5.1. Managing the keypad

























The drive is configured and its operation monitored via the keypad and display.

	NAVIGATE	Used to display real-time information, to access and exit parameter edit mode and to store parameter changes	
	UP	Used to increase speed in real-time mode or to increase parameter values in parameter edit mode	
	DOWN	Used to decrease speed in real-time mode or to decrease parameter values in parameter edit mode	
	RESET / STOP	Used to reset a tripped drive. When in Keypad mode is used to Stop a running drive.	
	START	When in keypad mode, used to Start a stopped drive or to reverse the direction of rotation if bi-directional keypad mode is enabled	






5.2. Changing Parameters

Procedure	Display shows...
Power on Drive	StoP
Press and hold the  for >2 seconds	P 1-01
Press the  Key	P 1-02
The  and  can be used to select the desired parameter	P 1-03 etc...
Select the required parameter, e.g. P1-02	P 1-02
Press the  button	0.0
Use  the  and keys to adjust the value, e.g. set to 10	10.0
Press the  key	P 1-02
The parameter value is now adjusted and automatically stored. Press the  key for >2 seconds to return to operating mode	StoP


5.3. Advanced Keypad Operation Short Cuts

Function	When Display shows...	Press...	Result	Example
Fast Selection of Parameter Groups Note : Parameter Group Access must be enabled P1-14 = 101	Px-xx	 + 	The next highest Parameter group is selected	Display shows P 1- 10 Press  +  Display shows P 2- 0 1
	Px-xx	 + 	The next lowest Parameter group is selected	Display shows P 2- 26 Press  +  Display shows P 1- 0 1
Select lowest Group Parameter	Px-xx	 + 	The first parameter of a group is selected	Display shows P 1- 10 Press  +  Display shows P 1- 0 1
Set Parameter to minimum value	Any numerical value (Whilst editing a parameter value)	 + 	The parameter is set to the minimum value	When editing P1-01 Display shows 50.0 Press  +  Display shows 0.0
Adjusting individual digits within a parameter value	Any numerical value (Whilst editing a parameter value)	 + 	Individual parameter digits can be adjusted	When editing P1-10 Display shows 0 Press  +  Display shows - 0 Press  Display shows 10 Press  +  Display shows - 10 Press  Display shows 1 10 Etc...

5.4. Reset All Parameters to Factory Default Settings

To reset all drive parameters to factory default settings, press  +  +  +  for >2s. The display shows P-dEF . Press the  button to acknowledge and reset the drive.

5.5. Drive Operating Display

Display	Status	
StoP	Drive mains power applied, but no Enable or Run signal applied	
Autot	Motor Autotune in progress.	
H x.x	Drive running, display shows output frequency (Hz)	Whilst the drive is running, the following displays can be selected by briefly pressing the  button on the drive. Each press of the the button will cycle the display through to the next selection.
A x.x	Drive running, display shows motor current (Amps)	
P x.x	Drive Running, display shows motor power (kW)	
For drive fault code displays, refer to section 11.1 on page 37		

6. Commissioning

6.1. Setting the Motor Parameters

In all applications, to ensure excellent and safe control over the motor and connected load, it is essential to ensure that the Optidrive Plus 3^{GV-L} parameters are adjusted to suit the connected motor. Following this, an autotune **must** be carried out, which allows the drive to measure the data required for vector control from the connected motor. The autotune can be carried out with the motor coupled to the load and the motor holding brake applied.



Whilst the autotune procedure does not rotate the motor shaft, the motor shaft may still turn if the motor holding brake is not applied. It is not normally necessary to uncouple the load from the motor; however the user should ensure that no risk arises from the possible movement of the motor shaft.

Autotune after Factory Reset or from Factory Default Parameters


Following a factory reset (See section 5.4 on page 16) or when a new drive is to be installed, the correct data from the motor nameplate should be entered into the drive parameters as follows:-

Par.	Description	Range	Units	Default	Explanation
P1-07	Motor Rated Voltage	0, 20 to 250 0, 20 to 500 0, 20 to 600	Volts	230 400 (460) 575	Enter the rated (nameplate) voltage of the motor (Volts). Value limited to 250V for low voltage drives.
P1-08	Motor Rated Current	20% -100% of drive rated current	Amps	Drive Rating Dependent	Enter the rated (nameplate) current of the motor.
P1-09	Motor Rated Frequency	25Hz to 120Hz	Hz	50 (60)	Enter the rated (nameplate) frequency of the motor
P1-10	Motor Rated Speed	0 to 7200 rpm	Rpm	0	Enter the rated (nameplate) speed of the motor. This must be the motor Rpm, not the gearbox output Rpm
P1-11	Motor Rated Power Factor	0, 0.50 to 0.99	-	Drive Rating Dependent	Enter the rated (nameplate) power factor of the motor

Providing that P1-08 is adjusted from the factory default setting, the Optidrive will automatically carry out an autotune on the first time the drive run command is applied. During the autotune, the display will show **Auto-t**. The test procedure may take several minutes to complete depending on the motor. Once the autotune is completed, the drive will operate as normal, and no further autotuning will be required unless the motor, motor cables, motor parameters or drive control mode is changed (Parameter P4-01).

User Selected Autotune

The user can program the drive to carry out an autotune if required, as follows:-

- Ensure the motor nameplate values are correctly entered as described above.
- Set P1-14 = 101 to allow access to Parameter Groups 2, 3 and 4
- Set P4-02 = 1 and press the  button.

6.2. Additional Settings for Systems with a Motor Feedback Encoder

Where a motor feedback encoder is to be used, an additional encoder interface module (part number ODP-ENCOD) must be used to interface the signal to the drive. See section 4.10 for encoder module information. The encoder must be mounted to the motor shaft, and the system should be commissioned as follows:-

Par.	Description	Range	Units	Default	Explanation
P1-14	Parameter Access Code	0..30000	-	702	Enables access to the extended drive parameters. Set to 702 to enable access to the encoder configuration parameters.
P6-05	Encoder Feedback Enable	0 : Disabled 1 : Enabled	-	0	Enables or Disables the encoder feedback option. Set to 1 to enable the encoder feedback.
P6-06	Encoder PPR	0..10000	-	0	If P6-06 > 0, this value must be set to the PPR of the connected encoder.
P6-07	Speed Error Trip Level	0..50.0	%	5.0	When an encoder is in use, sets the allowed % speed differential between the drives calculated motor speed and the signal feedback from the encoder. When the threshold is exceeded, the drive trips.

Commissioning Guidelines

The drive, encoder module and encoder should be connected as shown in section 4.10 using the supplied RJ11 connection cable. The encoder cable should be screened, ideally with each signal pair individually screened. The screen should be connected to the 0V of the encoder module. After setting the corresponding parameters for operation with the encoder module, a speed and polarity check should be made to ensure that the sign of the feedback signal matches that of the speed reference in the drive.

To carry out this check, refer to the following steps:

Disable the Encoder feedback control by setting P6-05 to zero. Run the drive with a low positive speed, e.g. 10Hz. Monitor the encoder feedback speed in parameter P0-57. If the value in this parameter is positive, the encoder wiring is correct. If the value is negative, the speed feedback is inverted. To correct this, reverse the A and B signals from the encoder.

Varying the drive output speed should then result in the value of P0-57 changing to reflect the change of the actual motor speed. If this is not the case, check the wiring of the whole system.

If the above check is passed, the feedback control function can be enabled by setting P6-05 to 1.

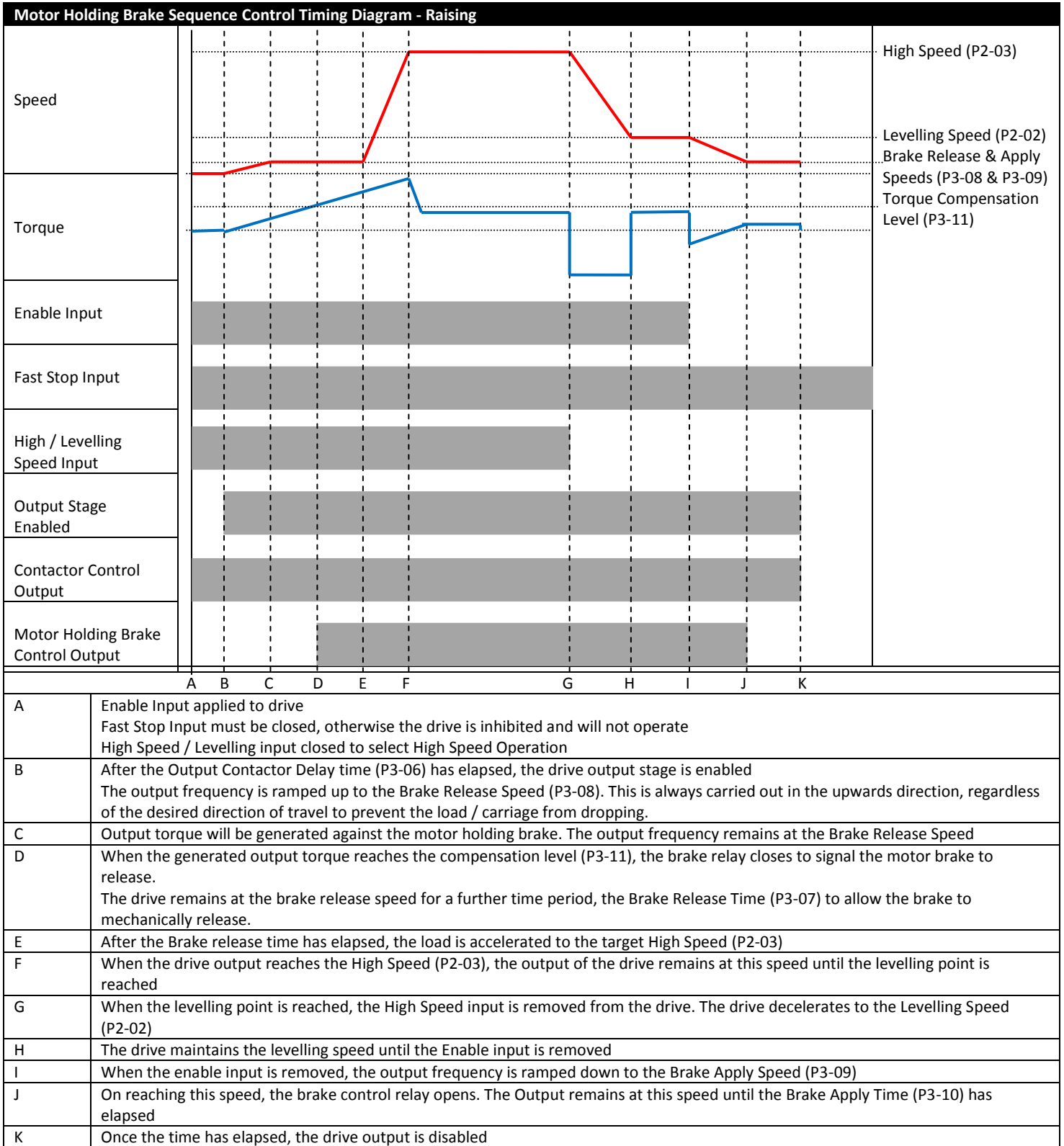
To get the best speed control performance, especially in vector speed control mode (P4-01 = 0), the speed control loop parameters (P4-03, P4-04) will need to be adjusted. Reducing the value of P4-03 (e.g. P4-03 = 300) and increasing the value of P4-04 (e.g. P4-04 = 0.100) will in general give an improved low speed control performance.

6.3. Controlling the Motor Holding Brake

The Optidrive has been designed to control the holding brake on motors where a separate electromechanical brake is fitted. The brake is controlled by the output relay on terminals 10 and 11 – see section 4.5 for details.

Par.	Description	Range	Units	Default	Explanation
P3-07	Brake Release Time Delay	0.0..2.0	seconds	0.2	Sets the delay time allowed for the motor brake to release when starting. This value should be obtained from the motor manufacturer.
P3-08	Brake Release Speed	0.0..20.0	%	0.7	This parameter sets the speed as a percentage of motor base speed (P1-10) or frequency (P1-09) which the drive operates at prior to releasing the motor brake. This speed is necessary in vertical moving applications to ensure that the drive generates a holding torque to prevent the load from dropping. For Vertical moving systems , the default value should not normally require adjustment by the user unless the load has a tendency to drop slightly when the brake is released. In this event, the value should be increased.
P3-09	Brake Apply Speed	0.0..20.0	%	0.0	This parameter sets the speed as a percentage of motor base speed (P1-10) or frequency (P1-09) at which the drive will signal the motor brake to close when stopping. For Vertical moving systems , the default value should not normally require adjustment by the user unless the load has a tendency to drop slightly before the brake has engaged. In this event, the value should be increased.
P3-10	Brake Apply Time	0.0..2.0	seconds	0.3	Sets the time for which the drive will hold at the Brake Apply Speed to allow the motor brake to engage. This value should be obtained from the motor manufacturer.
P3-11	Torque Compensation (Prove) Level	0.0..200.0	%	8.0	In Vector mode, this parameter sets the torque level that must be generated prior to release of the motor brake. The value is set as a percentage of the motor maximum torque. This is used to ensure the motor is connected and torque is generated to prevent the load dropping before releasing the motor holding brake. Note: When using V/F Mode (P4-01 = 1), the torque prove function is not active. V/F mode should be used for Horizontal moving systems only, e.g. Long and Cross Travel. For Vertical Moving Systems: this parameter should be set during commissioning to a suitable value that allows a consistent release of the brake whether the Elevator or Hoist is fully loaded or empty.
P3-12	Torque Test Timeout	0.0..5.0	seconds	0.0	This parameter sets the time for which following a start command, the drive will attempt to apply enough torque to the motor to reach the Torque prove level set in Parameter P3-11. Should the torque level not be reached within the set time, due to a mechanical or other fault, the drive will trip and display ' tor-Lo '

The motor brake control operates according to the following timing diagram:-



6.4. Configuring the Input Terminals

Par.	Description	Range	Units	Default	Explanation
P2-01	Digital input function select	0 to 9	-	0	Defines the function of the Analog and Digital inputs according to the diagrams below.

P2-01 = 0		Open	Closed
	1	+24 Volt Common	
	2	Stop (Disable)	Run Up (Raise)
	3	Stop (Disable)	Run Down (Lower)
	4	Fast Stop	Run Permit
	5	+ 24 Volt	
	6	Preset Speed 1	Preset Speed 2
	7	0 Volts	

P2-01 = 1		Open	Closed
	1	+24 Volt Common	
	2	Stop (Disable)	Run Up (Raise)
	3	Stop (Disable)	Run Down (Lower)
	4	Hold Speed	Increase Speed
	5	+ 24 Volt	
	6	Keypad Speed Ref	Preset Speed 2
	7	0 Volts	

P2-01 = 2		Open	Closed
	1	+24 Volt Common	
	2	Stop (Disable)	Run Up (Raise)
	3	Stop (Disable)	Run Down (Lower)
	4	Fast Stop	Run Permit
	5	+ 24 Volt	
	6	Bipolar Analog Speed Reference	
	7	0 Volts	

P2-01 = 3		Open	Closed
	1	+24 Volt Common	
	2	Stop (Disable)	Run Up (Raise)
	3	Stop (Disable)	Run Down (Lower)
	4	Analog Speed Reference, 4 – 20mA	
	5	+ 24 Volt	
	6	Fast Stop	Run Permit
	7	0 Volts	

P2-01 = 4		Open	Closed	
	1	+24 Volt Common		
	2	Stop (Disable)	Run Up (Raise)	
	3	Stop (Disable)	Run Down (Lower)	
	4	T4	T6	Preset Speed
	5	Open	Open	Preset Speed 1
	6	Closed	Open	Preset Speed 2
	7	Open	Closed	Preset Speed 3
	Closed	Closed	Preset Speed 4	

P2-01 = 5		Open	Closed
	1	+ 24 Volts Common	
	2	Stop (Disable)	Run (Enable)
	3	Forward (Up)	Reverse (Down)
	4	Fast Stop	Run Permit
	5	+ 24 Volts	
	6	Preset Speed 1	Preset Speed 2
	7	0 Volts	

P2-01 = 6		Open	Closed
	1	+ 24 Volt Common	
	2	Stop (Disable)	Run (Enable)
	3	Forward (Up)	Reverse (Down)
	4	Hold Speed	Increase Speed
	5	+ 24 Volts	
	6	Keypad Speed Ref	Preset Speed 2
	7	0 Volt	

P2-01 = 7		Open	Closed
	1	+ 24 Volt Common	
	2	Stop (Disable)	Run (Enable)
	3	Forward (Up)	Reverse (Down)
	4	Fast Stop	Run Permit
	5	+24 Volt	
	6	Bipolar Analog Speed Reference	
	7	0 Volt	

P2-01 = 8		Open	Closed
	1	+ 24 Volt Common	
	2	Stop (Disable)	Run (Enable)
	3	Forward (Up)	Reverse (Down)
	4	Analog Speed Reference, 0 / 4 – 20mA	
	5	+24 Volt	
	6	Fast Stop	Run Permit
	7	0 Volt	

P2-01 = 9		Open	Closed	
	1	+ 24 Volt Common		
	2	Stop (Disable)	Run (Enable)	
	3	Forward (Up)	Reverse (Down)	
	4	T4	T6	Preset Speed
	5	Open	Open	Preset Speed 1
	6	Closed	Open	Preset Speed 2
	7	Open	Closed	Preset Speed 3
	Closed	Closed	Preset Speed 4	

6.5. Configuring the Digital Output


The Digital output on Terminal 8 can be used to provide a signal to a PLC or controller input, or can be used to drive a small relay for other control circuit functions. The output is capable of providing signal to control a contactor installed between the Optidrive and the motor, or to provide a 'torque limit exceeded' signal to warn of a possible overload situation.

Par.	Description	Range	Units	Default	Explanation
P2-11	Analog output / Digital Output 1 Function select	Digital output mode 0 : Drive enabled 1 : Drive healthy 2 : Motor at target speed 3 : Motor Contactor Signal 4 : Motor speed >= limit 5 : Motor torque >= limit 6 : 2 nd Analog Input >= limit Analog Output Mode 7 : Motor speed 8 : Motor torque 9 : Motor power 10 : Motor current		3	Digital Output Mode. Logic 1 = +24V DC 0 : Logic 1 when the drive is enabled (Running) 1: Logic 1 When no Fault condition exists on the drive 2 : Logic 1 when the motor speed matches the setpoint speed 3 : Logic 1 when the drive is enabled, to allow a contactor to be installed between the Optidrive and the motor Options 4 to 6 : the Digital output is enabled using the level set in P2-12h and P2-12L Analog Output Mode 7 : Motor Speed, 0 to 10V = 0 to P-01 8 : Motor torque, 0 to 10V = 0 to 200% of motor rated torque 9 : Motor power, 0 to 10V = 0 to 150% of drive rated power 10 : Motor Current, 0 to 10V = 0 to 200% of P1-08
P2-12h	Digital Output Control High Limit	Speed : 0 to 100 Torque : 0 to 200	%	100	With P2-11 = 4 to 6, Digital Output 1 is set to Logic 1 (+24V DC) when the value set in P2-12h is exceeded, and returns to Logic 0 (0V) when the selected value reduces below the limit set in P2-12L.
P2-12L	Digital Output Control Low Limit	Speed : 0 to P2-12h Torque : 0 to P2-12h	%	0	
P3-06	Output Contactor Delay Time	0.0..5.0	seconds	0.2	Sets a delay time between the enable signal being applied to the Optidrive and the Optidrive energising the motor. This allows a contactor to be installed between the Optidrive and the motor

For Motor contactor control, set P2-11 = 3 and set P3-06 to the delay time required for the contacts to close. When the Enable (Run) signal is applied to the Optidrive, the drive will signal the contactor to close, and then wait for the delay time set in P3-06 before applying torque to the motor.

For an external Torque Limit warning signal, set P2-11 = 5, then set the required torque limit, as a percentage of motor rated torque in P2-12h. P2-12L should be set to a value slightly lower than P2-12h, e.g. P2-12h = 105%, P2-12L = 100%. The digital output will switch on when the torque level exceeds the value set in P2-12h, and will switch off when the torque falls below the value set in P2-12L.

6.6. Programming Drive Ramps and Speed Limits

Par.	Description	Range	Units	Default	Explanation
P1-01	Maximum Frequency / Speed	0..120 0..7200	Hz Rpm	50 (60)	Maximum speed limit – Hz or Rpm.
P1-02	Minimum Frequency / Speed	0..P1-01	Hz Rpm	2	Minimum speed limit – Hz or Rpm.
	When P1-10 is set to the correct value of motor Rpm from the motor nameplate, P1-01 and P1-02 will display in Rpm as opposed to Hz. Inverter Drives do not recommend increasing P1-01 beyond the motor rated speed, unless the system has been mechanically designed for operation above motor base speed, and the motor develops sufficient torque at the increased speed to control the load. Inverter Drives do not recommend operating below 2Hz or 4% of motor rated speed unless a feedback encoder is installed and utilised, or the mechanical system is such that the load cannot back drive the connected motor, e.g. a worm drive gearbox is in use.				
P1-03	Acceleration Ramp Time	0 to 600	seconds	2	Acceleration ramp time from 0 to base speed (P-1-09) in seconds
P1-04	Deceleration Ramp Time	0 to 600	seconds	2	Deceleration ramp time from base speed (P1-09) to standstill in seconds. When set to zero, fastest possible ramp time without trip is activated
P1-05	Fast Deceleration Ramp Time	0..30	seconds	0	When using a setting of P2-01 with Digital Input 3 (Terminal 4) programmed for 'Fast Stop' function, this parameter sets the deceleration ramp time from base speed (P1-09) to standstill in seconds. This input overrides the normal ramp down time and all other inputs on the drive. When set to zero, the Optidrive immediately disables the output and applies the motor brake if the input signal is removed.
P3-02	S-Ramp 1 Duration	0.0..5.0	seconds	0.0	Initial Acceleration S-Ramp. See diagrams in section 6
P3-03	S-Ramp 2 Duration	0.0..5.0	seconds	0.0	Final Acceleration S-Ramp. See diagram in section 6
P3-04	S-Ramp 3 Duration	0.0..5.0	seconds	0.0	Initial Deceleration S-Ramp. See diagram in section 6
P3-05	S-Ramp 4 Duration	0.0..5.0	seconds	0.0	Final Deceleration S-Ramp. See diagram in section 6

7. Simple Commissioning Examples

7.1. Elevator Commissioning – Simple Elevator Applications

This method of commissioning is suitable for:-

- Elevators using worm drive gearboxes with or without encoder feedback
- Elevators using direct drive or geared drive where the load can back-drive the motor **only with an encoder fitted.**

The default operating mode for the drive is Elevator mode. This can be adjusted using Parameter P3-01 for either Elevator Mode or Hoist Mode. The principle difference between these two modes is how the drive behaves during fault conditions. In Elevator mode, where ever possible, if a fault occurs, the fault message is suppressed and the drive continues to operate until the enable signal is removed and the motor has been brought to a controlled stop.

Many existing elevators utilise a worm drive gearbox, which is designed so that the load cannot drive the motor, making the system inherently safe from a mechanical perspective. With this mechanical design, the elevator can easily be accelerated and brought to a complete standstill, with no requirement to hold the load whilst the brake is released. These systems typically require a high speed (usually the motor rated speed) and a levelling speed, used to position the lift when stopping at a floor. S-Ramps are used internally within the drive to provide smooth, jerk free starting and stopping.

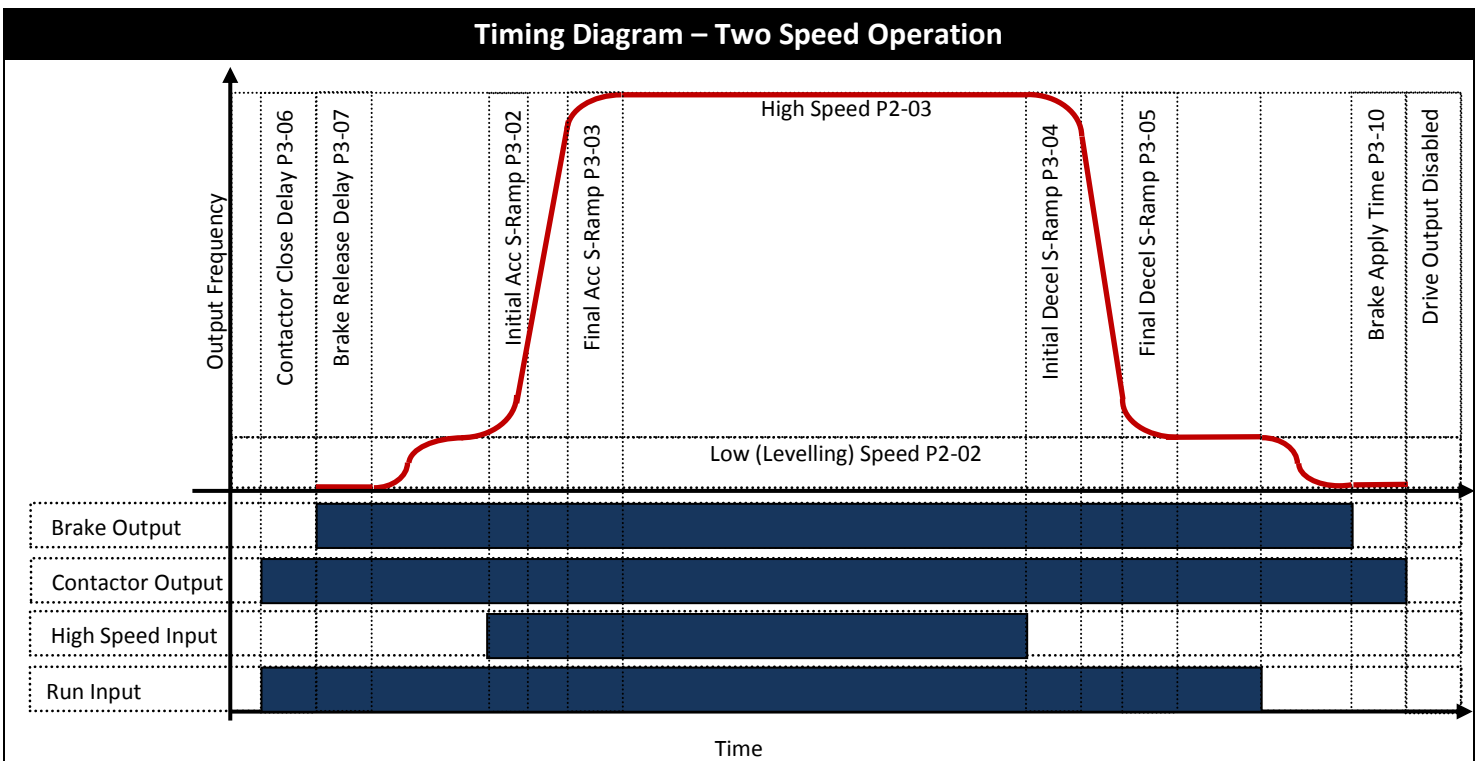
The table below shows a simple timing diagram and some example parameter settings. These will need adjusting to match the actual application in use. Since the mechanical design prevents the carriage rolling back on start up, the torque prove level can be set to a low value, and the minimum frequency (P1-02) reduced to 0Hz to allow smooth starting and stopping.

The motor mechanical brake requires time to release and apply when starting and stopping. The Optidrive allows a delay time before beginning to accelerate the load, to allow the brake to physically release, and this time should be entered into parameter P3-07. Ideally, the motor manufacturer should be consulted for the correct value, or the time can be determined through testing. If the value of P3-07 is too low, it may cause a jerk on starting, as the brake is released after the drive has started to attempt to move the load. In this event, increase the setting in small steps until the jerk is removed. Due to the mechanical design of the system, the Brake Apply Delay (P3-10) can be set to the minimum value.

In some systems, an electrical contactor is fitted between the Optidrive and the controlled motor. To prevent damage to the Optidrive, this contactor should be controlled using the contactor output signal from the Optidrive, and the Output Contactor Delay parameter (P3-06) set to allow time for the motor contacts to physically close. Contactor manufacturer should be consulted for a closing time on the contacts, and P3-06 should be set to a value **greater** than this, e.g. for a closing time of 0.2 seconds, set P3-06 = at least 0.3 seconds. If the closing time is set too short, it may result in the Optidrive tripping as the contactor closes, in which case P3-06 should be increased.

By setting a value in the Torque Prove Level (P3-09), the Optidrive ensures that the motor is connected and safe to operate prior to releasing the mechanical brake. This ensures that if, for example, the motor contactor does not close, the motor holding brake is not released.

Timing Diagram – Two Speed Operation



The diagram above shows the timing diagram for two speed Simple Elevator Operation.

Parameter Settings Example		
P1-01	Maximum Speed / Frequency	Motor Base Speed (typically 1500 Rpm)
P1-02	Minimum Speed / Frequency	1 – 60 Rpm
P1-03	Acceleration Time	Approx 2 - 5 Seconds
P1-04	Deceleration Time	Approx 2 Seconds
P1-05	Fast Deceleration Time	0 Seconds
P2-01	Digital Input Configuration	0
P2-02	Low (Levelling Speed)	Approx 2 – 5Hz
P2-03	High Speed	50 (60)Hz – Motor Rated Frequency
P2-11	Digital Output Function	3 – Motor Contactor Control
P3-01	Operating Mode	1 Elevator Mode
P3-02	S Ramp 1	Approx 0.5 - 1 Second
P3-03	S Ramp 2	Approx 0.5 - 1 Second
P3-04	S Ramp 3	Approx 0.5 - 1 Second
P3-05	S Ramp 4	Approx 0.5 - 1 Second
P3-06	Output Contactor Delay	Contactor Manufacturers Recommendation (If installed)
P3-07	Brake Release Delay	Motor Manufacturers Recommendation
P3-08	Brake Release Speed	1 – 60 Rpm
P3-09	Brake Apply Speed	1 – 60 Rpm
P3-10	Brake Apply Delay	Motor Manufacturers Recommendation
P3-11	Torque Prove Level	Approx 2 – 3%
P3-12	Torque Prove Timeout	5 Seconds
P6-05	Encoder Feedback Enable	Note : Only required for systems with a feedback encoder fitted 1 if encoder fitted To match connected encoder
P6-06	Encoder ppr	
P6-09	Overload Timeout	Approx 1 – 3 seconds

7.2. Elevator Commissioning – Gearless Systems or non-worm drive systems without encoder

Where the Optidrive is installed on an elevator or hoist system that utilises a mechanical design which allows the load to drive the motor, special care must be taken to ensure that the load cannot be dropped during operation. These systems require more careful commissioning and testing to ensure safe operation. If no feedback encoder is fitted to the connected motor, the drive should not be allowed to operate below 4% of the rated motor speed, e.g. with a 4 pole, 1500 Rpm motor, do not attempt to operate below 60 Rpm.

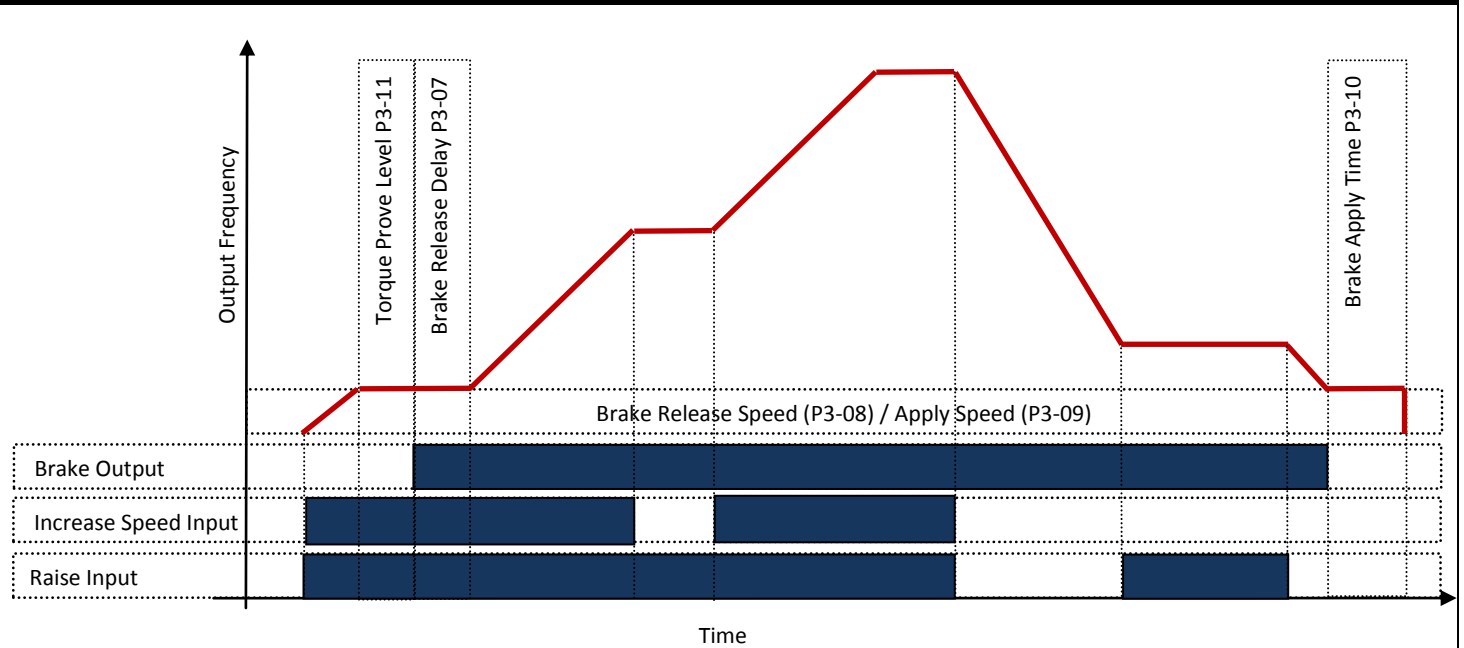
7.3. Example Terminal Configuration for Elevator Applications

Control Terminal Wiring	Terminal	Function
	1	Common
Closed – Drive raises carriage. Open – Drive ramps to stop	2	Raise/ Enable Up
Closed – Drive Lowers Carriage. Open – Drive ramps to stop	3	Lower / Enable Down
Closed – Normal drive operation. Open – Drive output disabled, motor brake	4	Fast Stop / Run Permit
	5	
Open – Speed set in P2-02. Closed – Speed set in P2-03	6	Low / High Speed
	7	
Where a contactor is fitted between the Optidrive and the Motor, this can be controlled externally or by using the signal on terminals 8 & 9. An external relay will be required, or optionally the Invertek 2ROUT option can be used.	8	24 Volt DC Output (Optional Contactor Control)
	9	
The Motor Brake must be controlled via the relay on terminals 10 & 11	10	Motor Brake Control Relay
	11	

7.4. Hoist Mode Operation

Timing Diagram & Parameters

Timing Diagram – Variable Speed Operation



The diagram above shows the timing diagram for variable speed operation in hoist mode.

Parameter Settings Example



P1-01	Maximum Frequency	50Hz
P1-02	Minimum Frequency	2Hz
P1-03	Acceleration Time	5 Seconds
P1-04	Deceleration Time	2 Seconds
P2-01	Digital Input Configuration	1
P2-11	Digital Output Function	5 – Motor Torque Level (Overload Warning)
P2-12h	Digital Output Switch on Level	Approx 100% dependent hoist capacity
P2-12l	Digital Output Switch Off Level	Approx 5% below P2-12h
P3-06	Output Contactor Delay	0 seconds
P3-01	Operating Mode	1 Hoist Mode
P3-02	S Ramp 1	0 seconds
P3-03	S Ramp 2	0 seconds
P3-04	S Ramp 3	0 seconds
P3-05	S Ramp 4	0 seconds
P3-07	Brake Release Delay	Motor Manufacturers Recommendation
P3-08	Brake Release Speed	0.7 – 4%
P3-09	Brake Apply Speed	4 – 10% (Motor & Control Mode Dependent)
P3-10	Brake Apply Delay	Motor Manufacturers Recommendation
P3-11	Torque Prove Level	2 - 15%
P6-05	Encoder Feedback Enable	Note : Only required for systems with a feedback encoder fitted
P6-06	Encoder ppr	
P6-09	Overload Timeout	Approx 1 – 3 seconds

7.5. Example Terminal Configuration for Hoists

Control Terminal Wiring	Terminal	Function
	1	Common
Closed – Raises hoist. Open – Drive ramps to stop	2	Raise/ Enable Up
Closed – Lowers Hoist. Open – Drive ramps to stop	3	Lower / Enable Down
Digital Inputs 1 or 2 must be closed for Digital Input 3 to function	4	Hold / Increase Speed
Closed – Hoist Accelerates. Open – Hoist Maintains current speed	5	
	6	
	7	
Where a contactor is fitted between the Optidrive and the Motor, this can be controlled externally or by using the signal on terminals 8 & 9. An external relay will be required, or optionally the Invertek 2ROUT option can be used.	8	Motor Brake Control Relay
	9	
	10	
	11	
The Motor Brake must be controlled via the relay on terminals 10 & 11		

8. Parameter List


8.1. Parameter Group 1 – Basic Parameters

Par.	Description	Range	Units	Default	Explanation
P1-01	Maximum Frequency / Speed	P1-02..120 P1-02..7200	Hz Rpm	50 (60)	Maximum speed limit – Hz or Rpm.
P1-02	Minimum Frequency / Speed	0..P1-01	Hz Rpm	2.0	Minimum speed limit – Hz or Rpm.
 WARNING	When P1-10 is set to the correct value of motor Rpm from the motor nameplate, P1-01 and P1-02 will display in Rpm as opposed to Hz. Invertek Drives do not recommend increasing P1-01 beyond the motor rated speed, unless the system has been mechanically designed for operation above motor base speed, and the motor develops sufficient torque at the increased speed to control the load. Invertek Drives do not recommend operating below 2Hz or 4% of motor rated speed unless a feedback encoder is installed and utilised, or the mechanical system is such that the load cannot back drive the connected motor, e.g. a worm drive gearbox is in use.				
P1-03	Acceleration Ramp Time	0 to 600	seconds	2.0	Acceleration ramp time from 0 to base speed (P1-09) in seconds
P1-04	Deceleration Ramp Time	0 to 600	seconds	2.0	Deceleration ramp time from base speed (P1-09) to standstill in seconds. When set to zero, fastest possible ramp time without trip is activated
P1-05	Fast Deceleration Ramp Time	0..30	seconds	0.0	When using a setting of P2-01 with Digital Input 3 (Terminal 4) programmed for 'Fast Stop' function, this parameter sets the deceleration ramp time from base speed (P1-09) to standstill in seconds. This input overrides the normal ramp down time and all other inputs on the drive. When set to zero, the Optidrive immediately disables the output and applies the motor brake if the input signal is removed.
P1-06	Reserved		-	-	No Function
P1-07	Motor Rated Voltage	0, 20 to 250 0, 20 to 500 0, 20 to 600	Volts	230 400 (460) 575	When commissioning, enter the rated (nameplate) voltage of the motor (Volts). Value limited to 250V for low voltage drives.
P1-08	Motor Rated Current	20% -100% of drive rated current	Amps	Drive Rating Dependent	When commissioning, enter the rated (nameplate) current of the motor.
P1-09	Motor Rated Frequency	25Hz to 120Hz	Hz	50 (60)	When commissioning, enter the rated (nameplate) frequency of the motor
P1-10	Motor Rated Speed	0 to 7200 rpm	Rpm	0	When commissioning, enter the rated (nameplate) speed of the motor.
P1-11	Motor Rated Power Factor	0, 0.50 to 0.99	-	Drive Rating Dependent	When commissioning, enter the rated (nameplate) power factor of the motor
 WARNING	Parameters P1-07, P1-08, P1-09, P1-10 and P1-11 must all be entered exactly as per the motor nameplate settings and an Autotune successfully completed (see section 6.1) prior to operating the drive.				
P1-12	Reserved		-	-	No Function
P1-13	Trip log	Last four trips stored	-	Read only	Previous 4 trips stored in order of occurrence, with the most recent first. Press UP or DOWN to step through all four. The most recent trip is always displayed first. UV trip is only stored once.
P1-14	Extended menu access	Code 0 to 30000	-	101	Set to "101" (default) for extended menu access. Change code in P2-37 to prevent unauthorised access to the Extended Parameter Set

NOTE Default parameter values for Horse Power rated drives are shown in brackets

Following a factory reset, or when installing a drive for the first time, only Group 1 Parameter access is available. To allow access to Parameters Groups 0, 2, 3 and 4, Parameters P1-14 and P2-37 must contain the same value. The factory set value for P2-37 = 101

8.2. Parameter Group 2 - Extended parameters

Par.	Description	Range	Units	Default	Explanation
P2-01	Digital input function select	0 to 9	-	0	Defines the function of the Analog and Digital inputs. See section 6.4 for more information.
P2-02	Preset Speed 1	-P1-01 to P1-01	Hz	5	Sets jog / preset speed 1
P2-03	Preset Speed 2	-P1-01 to P1-01	Hz	10	Sets jog / preset speed 2
P2-04	Preset Speed 3	-P1-01 to P1-01	Hz	25	Sets jog / preset speed 3
P2-05	Preset Speed 4	-P1-01 to P1-01	Hz	P1-09	Sets jog / preset speed 4
P2-06	Reserved		-	-	No Function
P2-07	Reserved		-	-	No Function
P2-08	Reserved		-	-	No Function
P2-09	Reserved		-	-	No Function
P2-10	Reserved		-	-	No Function
P2-11	Analog output / Digital Output 1 Function select	Digital output mode 0 : Drive enabled 1 : Drive healthy 2 : Motor at target speed 3 : Motor Contactor Signal 4 : Motor speed >= limit 5 : Motor torque >= limit 6 : 2 nd Analog Input >= limit Analog Output Mode 7 : Motor speed 8 : Motor torque 9 : Motor power 10 : Motor current		3	Digital Output Mode. Logic 1 = +24V DC 0 : Logic 1 when the drive is enabled (Running) 1: Logic 1 When no Fault condition exists on the drive 2 : Logic 1 when the motor speed matches the setpoint speed 3 : Logic 1 when the drive is enabled, to allow a contactor to be installed between the Optidrive and the motor Options 4 to 6 : the Digital output is enabled using the level set in P2-12h and P2-12L Analog Output Mode 7 : Motor Speed, 0 to 10V = 0 to P-01 8 : Motor torque, 0 to 10V = 0 to 200% of motor rated torque 9 : Motor power, 0 to 10V = 0 to 150% of drive rated power 10 : Motor Current, 0 to 10V = 0 to 200% of P1-08
P2-12h	Digital Output Control High Limit	0 to 200	%	100	With P2-11 = 4 to 6, Digital Output 1 is set to Logic 1 (+24V DC) when the value set in P2-12h is exceeded, and returns to Logic 0 (0V) when the selected value reduces below the limit set in P2-12L
P2-12L	Digital Output Control Low Limit	0 to P2-12h	%	100	
P2-13	Reserved		-	-	No Function
P2-14	Reserved		-	-	No Function
P2-15	Reserved		-	-	No Function
P2-16	Reserved		-	-	No Function
P2-17	Start Mode Select	<i>Ed9E-r</i> <i>Auto-0</i> <i>Auto-1 to 5</i>	-	<i>Ed9E-r</i>	Edge-r: Following Power on or reset, the drive will not start if Digital Input 1 remains closed. The Input must be closed following a power on or reset to start the drive. Auto-0: Following a Power On or Reset, the drive will automatically start if Digital Input 1 is closed. Auto 1 to 5: Following a Fault, the drive will make up to 5 attempts to restart at 20 second intervals. The drive must be powered down to reset the counter
	Incorrect setting of P2-17 can cause the drive to automatically start when mains power is applied if the drive enable / run signal is present.				
P2-18	Reserved		-	-	No Function
P2-19	Digital Speed Reference Start Mode	0 : Minimum Speed 1 : Previous Speed 2 : Preset Speed 1		0	Sets the start frequency used by the Keypad Speed Reference.
P2-20	Reserved		-	-	No Function
P2-21	Display Scaling Factor	0.000 to 30.000	-	0.000	Disabled if P2-21 is set to 0. If P2-21 is set >0, the variable selected in P2-22 is multiplied by the factor entered in P2-21, and displayed whilst the drive is running
P2-22	Display Scaling Source	0 : 2 nd Analog Input 1 : Motor Speed 2 : Motor Torque 3 : Motor Current	-	0	

Par.	Description	Range	Units	Default	Explanation
P2-23	Brake Circuit Enable	0 : Disabled 1: Enabled, Low Duty 2: Enabled, High Duty 3 : Enabled, No Protection	-	2	Enables the internal brake chopper on Size 2 and above drives. Settings 1 and 2 provide software monitoring of the braking power consumption. Setting 3 disables the protection, and externally monitoring must be used. It is recommended to use external protection even with settings 1 and 2, see section 4.9.
P2-24	Effective Switching Frequency	4 to 16 / 24 / 32 / Auto Drive Power Rating Dependent	kHz	16 8 4	Effective power stage switching frequency. Higher frequencies reduce the audible 'ringing' noise from the motor, and improve the output current waveform, at the expense of increased drive losses
P2-25	Reserved				No Function
P2-26	Reserved		-	-	No Function
P2-27	Drive Communication Address	0: Disabled 1 to 63	-	1	Sets the communication address for the drive when connected on an Optibus Network
P2-28	Reserved		-	-	No Function
P2-29	Reserved		-	-	No Function
P2-30	Bipolar analog input format	U 0-24 = 0 - 24V DC U 0- 10 = 0 - 10V DC - 10 - 10 = -10 to + 10V DC -24 -24 = -24 to + 24V DC	-	U 0-24	Configures the analog input signal to match the reference connected to terminal 6. Only voltage signals can be directly connected, mA reference signals require an external 500R resistor connection.
P2-31	Bipolar analog input scaling	0 to 500.0	%	100.0	Scales the analog input by this factor, e.g. if P2-30 is set for 0 – 10V, and the scaling factor is set to 200.0%, a 5 volt input will result in the drive running at maximum speed (P1-01)
P2-32	Bipolar analog input offset	-500.0 to 500.0	%	0.0	Sets an offset, as a percentage of the full scale range of the input, which is applied to the analog input signal
P2-33	2 nd analog input format	d 0-24 = Digital U 0- 10 = 0 to 10V DC A 4-20 = 4 to 20mA AO-20 = 0 to 20mA	-	d 0-24	Selects the format for the 2 nd analog input Selecting d 0-24 sets the input up as a digital input.
P2-34	2 nd analog input scaling	0 to 500.0	%	100.0	Scales the 2 nd analog input by the factor set in this parameter
P2-35	Reserved		-	-	No Function
P2-36	Analog output format	U 0- 10 = 0 to 10V A 4-20 = 4 to 20mA U 10-0 = 10 to 0V A 20-4 = 20 to 4mA	-	U 0- 10	Selects the analog output signal format
P2-37	Extended menu access code	0 to 9999	-	101	Defines the access code which must be entered in P1-14 to access parameter groups above Group 1
P2-38	Parameter Lock	0 : Unlocked 1 : Locked	-	0	When locked, all parameter changes are prevented
P2-39	Hours Run Counter	0 to 99999	Hours	Read Only	Indicates the number of hours for which the drive has run
P2-40	Drive Type / Rating	N/A	-	Read Only	Read only parameter, showing the drive type and power rating

8.3. Parameter Group 3 – Application Specific Parameters

Par.	Description	Range	Units	Default	Explanation
P3-01	Operating Mode	0 : Hoist 1 : Elevator	-	1	Selects the operating mode of the Optidrive In Elevator mode : The following faults will not cause the drive to trip whilst the motor is being driven :- <ul style="list-style-type: none"> • Input Phase Loss • Input Phase Imbalance • Motor Thermal Overload The drive will continue to drive the motor without tripping until a normal stop occurs, and will then only trip when an attempt is made to restart the drive if the fault still exists. In Hoist Mode , any fault will cause the drive to immediately disable the output stage and apply the motor brake
P3-02	S-Ramp 1 Duration	0.0..5.0	seconds	0.0	Initial Acceleration S-Ramp. See diagrams in section 6
P3-03	S-Ramp 2 Duration	0.0..5.0	seconds	0.0	Final Acceleration S-Ramp. See diagram in section 6
P3-04	S-Ramp 3 Duration	0.0..5.0	seconds	0.0	Initial Deceleration S-Ramp. See diagram in section 6
P3-05	S-Ramp 4 Duration	0.0..5.0	seconds	0.0	Final Deceleration S-Ramp. See diagram in section 6
P3-06	Output Contactor Delay Time	0.0..5.0	seconds	0.2	Sets a delay time between the enable signal being applied to the Optidrive and the Optidrive energising the motor. This allows a contactor to be installed between the Optidrive and the motor
P3-07	Brake Release Delay	0.0..2.0	seconds	0.2	Sets the delay time allowed for the motor brake to release when starting.
P3-08	Brake Release Speed	0.0..20.0	%	0.7	Sets the speed as a percentage of motor base speed (P1-10) or frequency (P1-09) at which the drive will run prior to releasing the motor brake
P3-09	Brake Apply Speed	0.0..20.0	%	0.7	Sets the speed as a percentage of motor base speed (P1-10) or frequency (P1-09) at which the drive will signal the motor brake to apply
P3-10	Brake Apply Delay	0.0..2.0	seconds	0.3	Sets the time for which the drive will hold at the Brake Apply / Release speed to allow the motor brake to engage. For Vertical Hoist / Elevator Applications this value should not be set below the brake operating time specified by the motor manufacturer, minimum 0.1 secs.
P3-11	Torque Prove Level	0.0..100.0	%	12.0	Active in Vector Mode only (P4-01=0) , sets the torque level, in % of maximum available that must be generated prior to release of the motor brake. This is used to ensure the motor is connected and torque generated to prevent the load dropping on release of the brake. In V/F Mode, the torque prove is not active, and this is recommended for Horizontal moving applications only.
P3-12	Torque Prove Timeout	0.0..5.0	seconds	0.0	This parameter sets the time for which following a start command, the drive will attempt to apply enough torque to the motor to reach the Torque prove level set in Parameter P3-11. Should the torque level not be reached within the set time, due to a mechanical or other fault, the drive will trip and display ' tor-Lo '
Note	See Section 6 for further information on configuring and operating the drive in hoist and elevator applications				

8.4. Parameter Group 4 – High Performance Motor Control

Par.	Description	Range	Units	Default	Explanation
P4-01	Control Mode	0 : Vector Speed Control 1 : V/f Speed Control	-	0	Selects the motor control method. An autotune must be performed following a change, see section 6.1
P4-02	Motor parameter autotune	0 : Disabled 1 : Enabled	-	0	When set to 1, the drive immediately carries out a non-rotating autotune to measure the motor parameters for optimum control and efficiency
P4-03	Speed controller proportional gain	1 to 4096	-	300	Sets the proportional gain value for the speed controller. Too high a value may cause overshoot when accelerating to setpoint speed, or instability of the motor output speed.
P4-04	Speed controller integral time	0.010 to 1.000	seconds	0.050	Sets the integral time for the speed controller. Smaller values provide a faster response in reaction to motor load changes, at the risk of introducing instability
P4-05	Reserved		-	-	
P4-06	Reserved		-	-	
P4-07	Reserved		-	-	
P4-08	Reserved		-	-	
P4-09	V/F characteristic adjustment frequency	0 to P1-09	Hz	0.0	When operating in V/f mode (P4-01 = 1), sets a frequency point at which the voltage applied in P4-10 is applied to the motor. Care must be taken to avoid overheating and damaging the motor when using this feature
P4-10	V/F characteristic adjustment voltage	0 to P1-07	-	0	In conjunction with P4-09, in V/f mode (P4-01 = 2), sets the voltage applied to the motor at the adjustment frequency set in P4-09



Incorrect adjustment of parameters in menu group 4 can cause unexpected behaviour of the motor and any connected machinery. It is recommended that these parameters are only adjusted by experienced users.

8.5. Parameter Group 5 – Motor Parameters

Incorrect adjustment of parameters in menu group 5 can cause unexpected behaviour of the motor and any connected machinery. In general, these parameters should NOT be adjusted by the user, and it is recommended that these parameters are only adjusted by experienced users.

Par.	Description	Range	Units	Default	Explanation
P5-01	Motor Stator resistance (Rs)	Drive dependent	Ω	-	During an autotune, the drive measures / calculates these parameters to optimise the motor control performance. The values can be adjusted by the user, however this may have a negative effect on the motor behaviour, or give unexpected results, and this is not recommended.
P5-02	Motor Rotor resistance (Rr)	Drive dependent	Ω	-	
P5-03	Stator inductance (Ls)	Drive dependent	-	-	
P5-04	Magnetising current (Id rms)	10% to 80% of motor rated current	A	-	
P5-05	Leakage coefficient (sigma)	0.025 to 0.250	-	-	
P5-06	Electrical Frequency Trim P-Gain	0.0 to 100.0	%	10.0	Sets the P gain for the internal PI control loop used to trim the electrical frequency applied to the motor in order to optimise the open loop vector speed regulation. In general, a larger P-Gain value will make the controller more responsive, at the risk of increased instability. In general, changes to this parameter are not required.
P5-07	Quick Rs measurement Enable	0: Disable 1: Enable	-	1	Enables the quick RS measurement process, whereby the motor stator resistance is measured on each enable of the drive. This allows the drive to compensate for changes in motor temperature.
P5-08	Electrical Frequency Trim I-Time	0.0..100.0	ms	10	Sets the I time for the internal PI control loop used to trim the electrical frequency applied to the motor in order to optimise the open loop vector speed regulation. In general, a smaller I time value will make the controller more responsive, at the risk of increased instability. In general, changes to this parameter are not required.



Incorrect adjustment of parameters in menu group 5 can cause unexpected behaviour of the motor and any connected machinery. In general, these parameters should **NOT** be adjusted by the user, and it is recommended that these parameters are only adjusted by experienced users.

Par.	Description	Range	Units	Default	Explanation
P5-09	Over voltage current limit	0 to 100% of motor rated current.	%	0	This parameter is only valid in vector speed control mode. This parameter will come into function once the drive DC bus voltage increase over certain limit. This voltage limit is set internally just below the over voltage trip level. This parameter will effectively limit the output torque current in order to prevent large current going back to the drive, which may cause over voltage trip. A small value in this parameter will limit the motor control torque once drive DC bus over this control level. A higher value may cause big distortion on the motor current, which may cause an aggressive behaviour of the motor.
P5-10	Re-generation current limit	0 to 200% of motor rated current	%	0	This parameter defines the control current limit when motor in regenerating mode. The value in this parameter represents the percentage value of motor rated current that is defined in P1-08. The current limit that defined in this parameter will override the normal torque producing current limit when motor goes into regeneration mode. Too high a value may cause big motor current distortion and the motor may behaviour aggressively once motor goes into regeneration mode. The output torque of the motor may reduce during regeneration if the value in this parameter is too small.
P5-11	Pulse width limitation	0...500 (Time = value *16.67ns)	Ms		This parameter is used to limit the minimum output pulse width, which can be used for long cable applications. Increasing the value of this parameter will reduce the risk of over-current trips on long motor cables, but will also reduce the maximum available output motor voltage for a given input voltage.
P5-12	V/F mode magnetising period	0...2000ms	ms		This parameter is used to set up a minimum delay time for the magnetising current control in V/F mode when drive run signal is given. Too small a value may cause the drive to trip on over-current if the acceleration ramp is very short.

8.6. Application Specific Parameters

Par.	Description	Range	Units	Default	Explanation
P6-01	Firmware upgrade enable	0 : Disable 1 : I/O En 2 : DSP En	-	0	Enables the Application Macro loading / firmware upgrade process, refer to the Optidrive Plus Advanced User Guide for details.
P6-02	Thermal management enable	0 : Disable 1 : Enable	-	0	When set to 1, the drive will automatically reduce the output switching frequency with increasing heatsink temperature, to reduce the risk of an over temperature trip.
P6-03	Auto-reset delay time	1s...60	s	20	Sets the delay time allowed between consecutive reset attempts when Auto Reset is enabled (see P2-17)
P6-04	User relay speed hysteresis band	0.0 ... 25.0	%	0.3	This parameter defines a band around zero speed as a percentage of P1-09. When P2-11 or P2-13 = 2 or 3, output frequencies below this value are treated as 'zero speed'. This function is used to prevent "chatter" on the output if the operating speed coincides with the level at which the digital / relay output changes state. E.g. if P2-13 = 3, P1-01 = 50Hz and P6-04 = 5%, the relay contacts close above 2.5Hz
P6-05	Encoder Feedback Enable	0 ... 1	-	0 (Disabled)	Enables the Encoder Feedback Option
P6-06	Encoder PPR	0.. 10000	-	0	Sets the number of Pulses Per Revolution for the encoder
P6-07	Encoder Speed Error Limit	0 ... 50	%	5.0	This parameter defines the allowed speed error between the encoder feedback and the Optidrive's own estimated rotor speed. When set to zero, the protection is disabled.
P6-08	Low Frequency Torque Boost	0 to 100	%	0	This parameter boosts the level or torque that the motor can deliver at low frequency (<=25%) by increasing the magnetising current. If this parameter is set to 100%, the value of the magnetising current is doubled. This parameter is usually set to zero, meaning that the nominal motor torque (with nominal magnetising current) will be available.
P6-09	Torque Limit Timeout	0.0 : Disabled 0.1 to 25.0	seconds	0.0	Sets a time limit after which the drive will trip if operating continuously on the torque limit for this time period. When set to zero, this trip is disabled. The torque limit is fixed at 200% of motor rated torque.
P6-10	Brake Chopper Duty Cycle when Under Temperature	0...20.0	%	2.0	This parameter defines the duty cycle applied to the brake chopper whilst the drive is in an under temperature trip state. A Brake resistor can be mounted to the drive heat sink, and used to warm the drive until the correct operating temperature is reached. This parameter should be used with extreme care, as incorrect adjustment may result in exceeding the rated power capacity of the resistor. External thermal protection for the resistor should always be used to avoid this risk – see section 4.9
P6-11	Reserved		-	-	No Function
P6-12	Reserved		-	-	No Function

8.7. Parameter Group 0 – Monitoring Parameters (Read Only)

Par.	Description	Display range	Units	Explanation
P0-01	Bipolar analog input value	0 to 100	%	100% = max input voltage
P0-02	2nd Analog input value	0 to 100	%	100% = max input voltage
P0-03	Pre Ramp Speed Reference	-P1-09 to P1-09	Hz / Rpm	100% = P1-09
P0-04	Digital speed reference	-P1-01 to P1-01	Hz / Rpm	Digital speed reference
P0-05	Torque controller reference	0 to 200	%	Torque reference setpoint
P0-06	Reserved			
P0-07	Reserved			
P0-08	Reserved			
P0-09	Reserved			
P0-10	Reserved			
P0-11	Reserved			
P0-12	Reserved			
P0-13	Output Torque	0 to 200	%	100% = motor rated torque
P0-14	Magnetising current	Drive dependent	A	Motor rms magnetising current
P0-15	Rotor Current	Drive dependent	A	Rotor rms current
P0-16	Field Strength	0 to 100	%	Magnetic field strength
P0-17	Stator resistance	Drive dependent	Ohms	Phase to phase stator resistance
P0-18	Stator Inductance	Drive dependent	H	Stator inductance
P0-19	Rotor resistance	Drive dependent	Ohm	Calculated rotor resistance
P0-20	DC Bus Voltage	0 to 1000	Volts	Internal DC Bus voltage
P0-21	Drive Temperature	0 to 120	°C	Measured heatsink temperature
P0-22	Supply voltage L1 – L2	Drive dependent	Volts	Phase to phase supply voltage
P0-23	Supply voltage L2 – L3	Drive dependent	Volts	Phase to phase supply voltage
P0-24	Supply voltage L3 – L1	Drive dependent	Volts	Phase to phase supply voltage
P0-25	Estimated rotor speed	Drive dependent	Hz / Rpm	In vector mode, estimated speed of motor
P0-26	kWh meter	0 to 999.9	kWh	Cumulative energy consumption
P0-27	MWh meter	0 to 60,000	MWh	Cumulative energy consumption
P0-28	Software ID – IO Processor	Drive dependent	-	Version number & checksum
P0-29	Software ID – Motor Control	Drive dependent	-	Version number & checksum
P0-30	Drive serial number	Drive dependent	-	Unique drive serial number
P0-31	Drive serial number #2			
P0-32	DSP bootloader version	E.g. " 1.00"		
P0-33	Measured Cos phi	E.g. 0.78		
P0-34	Comms error count (DSP)	0 ... 65535		
P0-35	Configuration register value	Internal value		
P0-36	Digital input status	Internal value		
P0-37	Analog out internal value	Internal value		
P0-38	Current Phase U offset	Internal value		
P0-39	Current Phase U ref	Internal value		
P0-40	Current Phase V offset	Internal value		
P0-41	Current Phase V ref	Internal value		
P0-42	Brake resistor max on time	Time in milliseconds		
P0-43	Brake resistor duty cycle	Internal value		
P0-44	Uq internal ref value	Internal value		
P0-45	Ud internal ref value	Internal value		
P0-46	Reserved			
P0-47	Calculated slip speed value	Internal value (V/F mode only)		
P0-48	Reserved			
P0-49	Rated Iq internal value	Internal value		
P0-50	Motor voltage	V ph-ph (rms)		
P0-51	Switching frequency internal	Internal value		
P0-52	Speed hysteresis value	Internal value		
P0-53	PID DC bus feedback value	0..4096		
P0-54	Modbus comms error	0 ... 65535		
P0-55	Modbus speed reference	Internal value		
P0-56	Reserved			
P0-57	Encoder Speed	-P1-091 to P1-01		Displays the speed feedback from a connected encoder.
P0-58	Speed jump zone	Internal value		
P0-59	Modbus write command data value	Register dependent		
P0-60	Motor control loop ID	0 ... 65535		

9. Technical data

9.1. Environmental

Operational ambient temperature range	: -10 ... 50°C, Frost and condensation free
Storage ambient temperature range	: -40 ... 60°C
Maximum altitude	: 2000m. Derate above 1000m : 1% / 100m
Maximum humidity	: 95%, non-condensing

9.2. Rating tables

NOTE	Values shown in brackets are the maximum for UL applications
	For cUL compliance, fuse type Bussmann KTN-R / KTS-R or equivalent must be used
	All 480 – 525 volt rated units are NOT UL listed

200-240V ±10% - 1 Phase Input – 3 Phase Output

Model	kW	Model	HP	Frame Size	Nominal Input Current	Fuse or MCB (type B)	Supply Cable Size	Nominal Output Current	150% Output Current 60 secs	Motor Cable Size	Max Motor Cable Length	Min Brake Res Value
					Amps	Amps	mm²	Amps	Amps	mm²	m	Ω
ODP-22150	1.5	ODP-22020-USA	2	2	19.3	20	4	7	10.5	1.5	100	33
ODP-22220	2.2	ODP-22030-USA	3	2	28.8	32	6	10.5	15.75	1.5	100	22

200-240V ±10% - 3 Phase Input – 3 Phase Output

Model	kW	Model	HP	Frame Size	Nominal Input Current	Fuse or MCB (type B)	Supply Cable Size	Nominal Output Current	150% Output Current 60 secs	Motor Cable Size	Max Motor Cable Length	Min Brake Res Value
					Amps	Amps	mm²	Amps	Amps	mm²	m	Ω
ODP3-22150	1.5	ODP3-22020-USA	2	2	9.2	16	2.5	7	10.5	1.5	100	33
ODP3-22220	2.2	ODP-22030-USA	3	2	13.7	20	4	10.5 (9)	15.75 (13.5)	1.5	100	22
ODP-32030	3	ODP-32040-USA	4	3	16.1	20	4	14	21	1.5	100	15
ODP-32040	4	ODP-32050-USA	5	3	17.3	32	6	18	27	1.5	100	15
ODP-32055	5.5	ODP-32075-USA	7.5	3	25	40	6	25 (24)	37.5 (36)	2.5	100	15
ODP-42075	7.5	ODP-42100-USA	10	4	46.6	50	10	39	57	2.5	100	6
ODP-42110	11	ODP-42150-USA	15	4	54.1	63	16	46	69	4	100	6
ODP-42150	15	ODP-42200-USA	20	4	69.6	80	25	61	90.5	10	100	6
ODP-42185	18.5	ODP-42250-USA	25	4	76.9	80	25	72	54	10	100	6
ODP-52220	22	ODP-52300-USA	30	5	92.3	100	35	90	67.5	16	100	3
ODP-52300	30	ODP-52400-USA	40	5	116.9	125	50	110	82.5	16	100	3
ODP-52370	37	ODP-52500-USA	50	5	150.2	160	70	150	112.5	25	100	3
ODP-52450	45	ODP-52600-USA	60	5	176.5	200	90	180	135	25	100	3
ODP-62055	55	ODP-62075-USA	75	6	217.2	250	120	202	151.5	35	100	3
ODP-62075	75	ODP-62100-USA	100	6	255.7	315	120	240	180	55	100	3
ODP-62090	90	ODP-62120-USA	120	6	302.4	315	170	300	225	70	100	3

380-480V ±10% - 3 Phase Input – 3 Phase Output

Model	kW	Model	HP	Frame Size	Nominal Input Current	Fuse or MCB (type B)	Supply Cable Size	Nominal Output Current	150% Output Current 60 secs	Motor Cable Size	Max Motor Cable Length	Min Brake Res Value
					Amps	Amps	mm²	Amps	Amps	mm²	m	Ω
ODP-24075	0.75	ODP-24010-USA	1	2	2.9	6	1	2.2	3.3	1	50	47
ODP-24150	1.5	ODP24020-USA	2	2	5.4	6	1	4.1	6.2	1	100	47
ODP-24220	2.2	ODP-24030-USA	3	2	7.6	10	1.5	5.8	8.5	1.5	100	47
ODP-24400	4	ODP-24050-USA	5	2	12.4	16	2.5	9.5	14.3	1.5	100	33
ODP-34055	5.5	ODP34075-USA	7.5	3	16.1	20	2.5	14	21	2.5	100	22
ODP-34075	7.5	ODP-34100-USA	10	3	17.3	20	4	18	27	2.5	100	22
ODP-34110	11	ODP-34150-USA	15	3	25	25	4	25 (24)	37.5 (36)	4	100	22
ODP-34150	15	ODP-34200-USA	20	3	32.9	32	6	30	45	6	100	22
ODP-44185	18.5	ODP-44250-USA	25	4	46.6	50	10	39	58.5	10	100	12
ODP-44220	22	ODP-44300-USA	30	4	54.1	63	16	46	69	10	100	12
ODP-44300	30	ODP-44400-USA	40	4	69.6	80	25	61	91.5	16	100	12
ODP-44370	37	ODP-44500-USA	50	4	76.9	80	25	72	108	16	100	12
ODP-54450	45	ODP-54600-USA	60	5	92.3	100	35	90	135	25	100	6
ODP-54550	55	ODP-54750-USA	75	5	116.9	125	50	110	165	35	100	6
ODP-54750	75	ODP-54100-USA	100	5	150.2	160	70	150	225	55	100	6
ODP-54900	90	ODP-54120-USA	150	5	176.5	200	90	180	270	70	100	6
ODP-64110	110	ODP-64150-USA	160	6	217.2	250	120	202	303	90	100	6
ODP-64132	132	ODP-64175-USA	200	6	255.7	315	120	240	360	120	100	6
ODP-64160	160	ODP-64210-USA	250	6	302.4	315	170	300	450	170	100	6

480-525V ±10% - 3 Phase Input – 3 Phase Output

Model (kW)	kW	Model (HP)	HP	Frame Size	Nominal Input Current	Fuse or MCB (type B)	Supply Cable Size	Nominal Output Current	150% Output Current 60 secs	Motor Cable Size	Max Motor Cable Length	Min Brake Res Value
					Amps	Amps	mm²	Amps	Amps	mm²	m	Ω
ODP-55550	55	N/A	75	5	92.3	100	35	90	135	25	100	6
ODP-55750	75		100	5	116.9	125	50	110	165	35	100	6
ODP-55900	90		120	5	150.2	160	70	150	225	55	100	6
ODP-65132	132		175	6	217.2	250	120	202	303	90	100	6
ODP-65160	160		210	6	255.7	315	120	240	360	120	100	6
ODP-65200	200		250	6	290	315	170	270	405	170	100	6
NOTE	480 – 525 volt rated units are NOT UL listed											

500-600V ±10% - 3 Phase Input – 3 Phase Output

Model (kW)	kW	Model (HP)	HP	Frame Size	Nominal Input Current	Fuse or MCB (type B)	Supply Cable Size	Nominal Output Current	150% Output Current 60 secs	Motor Cable Size	Max Motor Cable Length	Min Brake Res Value
					Amps	Amps	mm²	Amps	Amps	mm²	m	Ω
ODP-25075	0.75	ODP-25010-USA	1	2	2.2	3	1	1.7	2.6	1	50	47
ODP-25150	1.5	ODP-25020-USA	2	2	4.1	6	1	3.1	4.7	1	100	47
ODP-25220	2.2	ODP-25030-USA	3	2	5.4	6	1	4.1	6.2	1	100	47
ODP-25370	3.7	ODP-25050-USA	5	2	7.6	10	1.5	6.1	9.2	1.5	100	47
ODP-25550	5.5	ODP-25075-USA	7.5	2	11.7	16	2.5	9	13.5	2.5	100	47
ODP-35075	7.5	ODP-35100-USA	10	3	16.1	20	2.5	14	21	2.5	100	22
ODP-35110	11	ODP-35150-USA	15	3	17.3	20	4	18	27	2.5	100	22
ODP-35150	15	ODP-35200-USA	20	3	24.1	25	4	24	36	4	100	22
ODP-45220	22	ODP-45300-USA	30	4	46.6	63	10	39	58.5	10	100	12
ODP-45300	30	ODP-45400-USA	40	4	54.1	63	16	46	69	10	100	12
ODP-45450	45	ODP-45600-USA	60	4	69.6	80	25	62	93	16	100	12

9.3. Maximum supply ratings for UL compliance:

Drive rating	Maximum supply voltage	Maximum supply short-circuit current
230V ratings 0.37kW (0.5HP) to 18.5kW (25HP)	240V rms (AC)	5kA rms (AC)
230V ratings 22kW (30HP) to 90kW (120HP)	240V rms (AC)	10kA rms (AC)
400/460V/600V ratings 0.75kW (1.0HP) to 37kW (50HP)	500V/600V rms (AC)	5kA rms (AC)
400/460V/600V ratings 45kW (60HP) to 132kW (175HP)	500V/600V rms (AC)	10kA rms (AC)
400/460V/600V ratings 160kW (210HP)	500V/600V rms (AC)	18kA rms (AC)

All the drives in the above table are suitable for use on a circuit capable of delivering not more than the above specified maximum short-circuit Amperes symmetrical with the specified maximum supply voltage.

9.4. Recommended Maintenance

Under normal operating conditions, Optidrives are maintenance free, however regular inspection and maintenance will ensure the best possible service life is obtained. The list below provides some recommendations for Optidrives installed in a typical control room environment. Installations which are subject to high ambient temperatures or other conditions may require additional and more frequent maintenance.

- Check the drive heatsink and cooling channels are clean and free from dust on a regular basis – at least every 6 months. Dusty environments will require more frequent inspection.
- For panel mounted drives, regularly check and replace any cooling fans and filters fitted to the panel.
- After 3 years / 20,000 hours operation, the Optidrives' internal heatsink cooling fans (where fitted) should be regularly monitored to ensure they are fully operational.
- After 3 – 5 years / 40,000 hours operation, replace the Optidrive cooling fans.
- Control Panel fans should be replaced based on the manufacturer's recommendation.

10. High Voltage Input Option

An option is available to allow the Optidrive Plus 3GV-L to be connected to either 110 volt or 230 volt AC control signals without the need for external relays. This can simplify installation when replacing existing equipment. The details are shown below.



Part Numbers

110 Volt Version : OPT-LOGIP-11

230 Volt Version : OPT-LOGIP-23

Important Safety Information



Indicates a potentially hazardous situation which, if not avoided, could result in injury or death.



Indicates a potentially hazardous situation which, if not avoided, could result in damage to property.

All Optidrive products and options are intended for professional incorporation into complete equipment or systems. If installed incorrectly they may present a safety hazard. Optidrives and Options may use high voltages and currents, may carry high levels of stored electrical energy, and may be used to control mechanical plant that could cause injury. Close attention should be paid to system design and electrical installation to avoid hazards in either normal operation or in the event of equipment malfunction. System design, installation, commissioning and maintenance must be carried out only by personnel who have the necessary training and experience. They must carefully read this safety information and the instructions in this Guide and follow all information regarding transport, storage, installation and use of the Optidrive, including the specified environmental limitations.



Optidrives and Options should be installed only by qualified electrical persons and in accordance with local and national regulations and codes of practice. The Optidrive has an Ingress Protection rating of IP20. For higher IP ratings, use a suitable enclosure. Electric shock hazard! Disconnect and ISOLATE the Optidrive before attempting any work on it. High voltages are present at the terminals and within the drive for up to 10 minutes after disconnection of the electrical supply. Where supply to the drive is through a plug and socket connector, do not disconnect until 10 minutes have elapsed after turning off the supply

Specification

Input Voltage (AC)	OPT-LOGIP-11 : 100 – 120 + / - 10%
Ambient Temperature	OPT-LOGIP-23 : 200 – 240 + / - 10%
Approvals	Operating : 0 to 50C
	Storage : -40 to + 60C
	IP00, UL94V-0

Description

This Option Module is designed for use with the Optidrive Plus 3^{GV-L} range of drives, to allow the digital inputs of the drive to be controlled directly from a 110 Volt or 230 Volt control supply without the need for interfacing relays.

There are two versions of the module, a 110 Volt version for voltages ranging from 100 – 120 VAC, and a 230 volt version for voltages ranging from 200 – 240VAC.

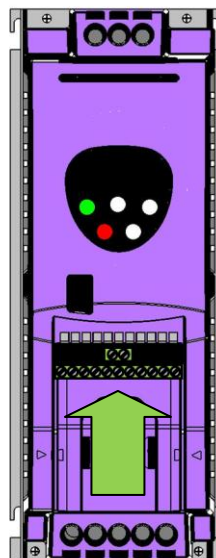
The existing analog input on the Optidrive Plus 3^{GV-L} can still be used, by connecting the analog signal input on terminal 6, or alternatively a fourth 110 / 230VAC digital input can be connected via the removable plug.

All other inputs and outputs to the drive are not affected.

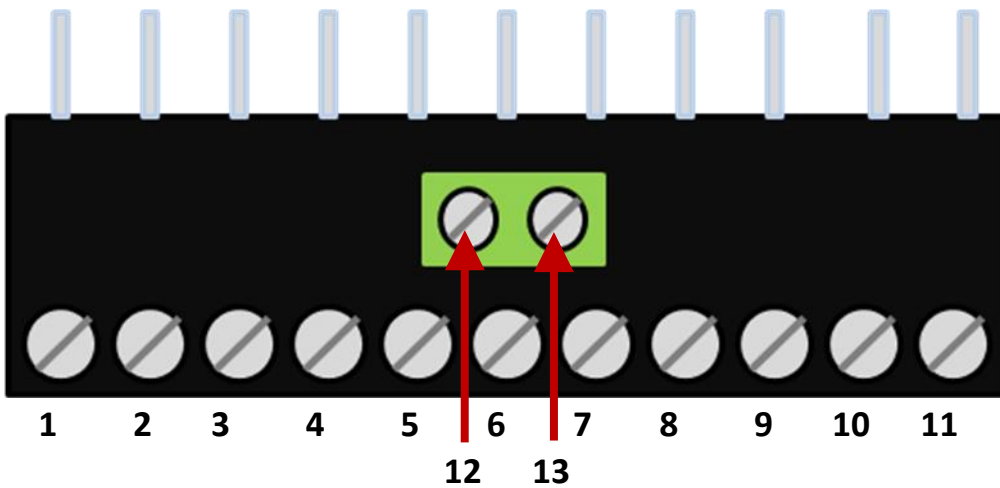
Installation

Install the Option onto the Optidrive by inserting the row of 11 pins into the terminal connector of the Optidrive, ensuring that the terminals are tightened.

If the Option is being used with Frame Size 1 Optidrive, care should be taken to support the Option when the terminal screws of the Option are being tightened or loosened.



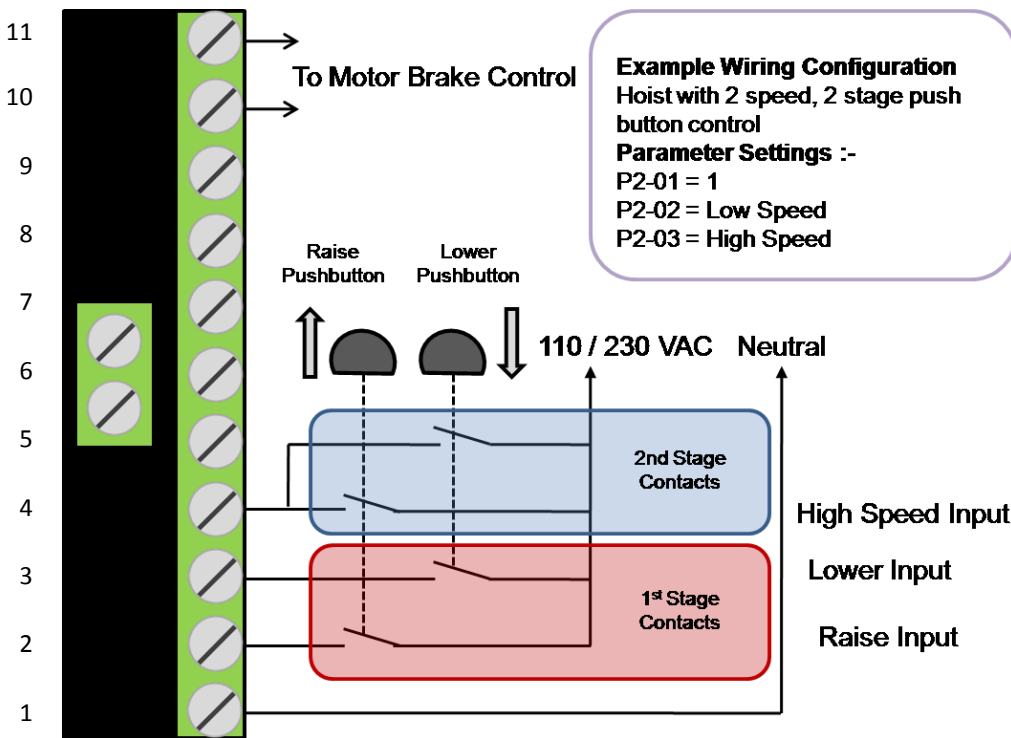
Option Module Control Terminals



- Terminal 1 Neutral Must **not** be connected to 0 volts
- Terminal 2 Digital input 1 80 to 250VAC, 68kΩ impedance
- Terminal 3 Digital input 2 80 to 250VAC, 68kΩ impedance
- Terminal 4 Digital input 3 80 to 250VAC, 68kΩ impedance
- Terminals 5 to 11 Connect as standard directly to drive
- Terminal 12 Neutral Not to be connected to 0 volts
- Terminal 13 Digital input 4 80 to 250VAC, 68kΩ impedance

The digital input terminals are optically isolated from the remaining terminals and the drive terminals.

Example Configuration



Operation

Applications requiring 3 digital inputs and 1 analog input:

The analog input is connected to terminal 6 of the Option Module and this connects straight to the Optidrive's analog input and works as standard.

Applications requiring 4 digital inputs:

The drive needs to be set up for 4 digital inputs, see the table in section 6.4

The 4th digital input is activated by either

- applying 0 to 10 volts to terminal 6
- OR
- applying 110 / 220VAC to terminal 13

Terminals 1 and 12 are connected internally together and must **not** be connected to 0 volts.

Unintentionally setting up the drive incorrectly or applying both the analog and the digital input will not damage the Optidrive.



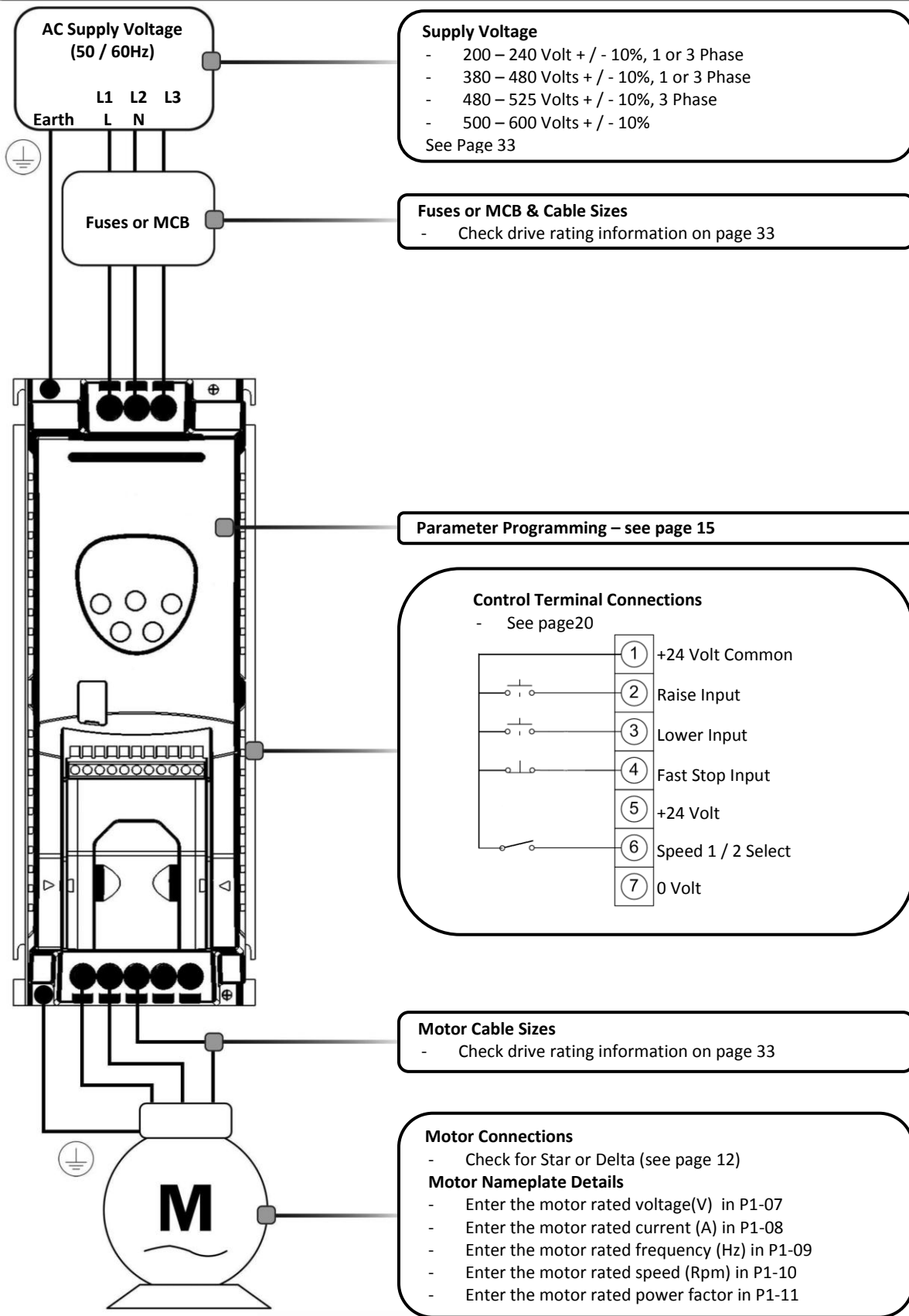
11. Troubleshooting

11.1. Fault messages

Fault Code	Description	Corrective Action
P-dEF	Factory Default parameters have been loaded	Press STOP key, drive is ready to configure for particular application
0-1 h0-1	Instantaneous over current on drive output. Excess load on the motor. Over temperature on the drive heatsink	If the fault occurs immediately when enabling the drive, disconnect the motor cable from the output terminals of the drive and restart the drive. If the fault re-occurs with no motor connected, contact your local Invertek Sales Partner. If the drive runs correctly with not motor connected, check the motor, motor cable and any connections or junction boxes for phase – phase and phase – earth short circuits. Wherever possible, motors and connection cables should be checked with a high voltage insulation tester (Megga) prior to connection to the drive. Ensure that no switching devices, such as contactors or local isolators are switching during operation of the drive. Check the motor cable length does not exceed the specified maximum Ensure the motor nameplate parameters are correctly entered, P1-07, P1-08, P1-09. If operating in Vector mode (P4-01 – 0 or 1), also check the motor power factor in P4-05. Ensure an autotune has been successfully completed for the connected motor. Check the load mechanically for a jam or stalled condition, or shock loads. Increase the ramp up time in P1-03. If operating in Vector mode (P4-01 – 0 or 1), reduce the speed loop gain in P4-03
I- t- tP	Drive has tripped on overload after delivering >100% of value in P1-08 for a period of time.	Check to see when the decimal points are flashing (drive in overload) and either increase acceleration rate or reduce the load. Check motor cable length is within spec. Ensure the motor nameplate parameters are correctly entered, P1-07, P1-08, and P1-09. If operating in Vector mode (P4-01 – 0 or 1), also check the motor power factor in P4-05. Ensure an autotune has been successfully completed for the connected motor. Check the load mechanically to ensure it is free, and no jams, blockages or other mechanical faults exist
0I- b	Brake channel over current	Over current in the brake resistor circuit. Check the cabling to the brake resistor. Check the brake resistor value. Ensure minimum resistance values form the rating tables are observed.
0L-br	Brake resistor overload	Brake resistor overload. Increase deceleration time, reduce load inertia or add further brake resistors in parallel, observing the minimum resistance value for the drive in use.
P5- tP	Fast over current trip	Check wiring to motor, look for ph-ph or ph-Earth short circuit. Check drive ambient temp, additional space or cooling needed? Check drive is not forced into overload.
0_Uo It	Over voltage on DC bus	Supply problem, or increase decel ramp time P-04.
U_Uo It	Under voltage on DC bus	This occurs routinely when power is switched off. If it occurs during running, check power supply voltage.
0-t	Heatsink over temperature	Check drive ambient temp. Additional space or cooling required.
U-t	Under temperature	Trip occurs when ambient temperature is less than 0°C. Temperature must be raised over 0°C in order to start the drive.
t h-FLt	Faulty thermistor on heatsink.	Refer to your IDL Authorised Distributor.
E- tP	External trip (on digital Input 3)	E-trip requested on digital input 3. Normally closed contact has opened for some reason. If motor thermistor is connected check if the motor is too hot.
4-20 F	4-20mA Signal Lost	The reference signal on analog input 2 (Terminal 4) has dropped below the minimum threshold of 3mA. Check the signal source and wiring to the Optidrive terminals.
5C- tP	Comms loss trip	Check communication link between drive and external devices. Make sure each drive in the network has its unique address.
P-L0SS	Input phase loss trip	Drive intended for use with a 3 phase supply has lost one input phase.
Ph-I b	Phase Imbalance	Mains incoming supply voltage has an imbalance of >3% for over 30 seconds. Check incoming supply and fuses
dRAA-F	Internal memory fault.	Parameters not saved, defaults reloaded. Try again. If problem recurs, refer to your local Invertek Sales Partner.
AL-F01	Autotune Failed	Measured motor stator resistance varies between phases. Ensure the motor is correctly connected and free from faults. Check the windings for correct resistance and balance.
AL-F02		Measured motor stator resistance is too large. Ensure the motor is correctly connected and free from faults. Check that the power rating corresponds to the power rating of the connected drive.
AL-F03		Measured motor inductance is too low. Ensure the motor is correctly connected and free from faults.
AL-F04		Measured motor inductance is too large. Ensure the motor is correctly connected and free from faults. Check that the power rating corresponds to the power rating of the connected drive.
AL-F05		Measured motor parameters are not convergent. Ensure the motor is correctly connected and free from faults. Check that the power rating corresponds to the power rating of the connected drive.

Fault Code	Description	Corrective Action
Enc-01	Encoder Feedback Faults (Only visible when an encoder module is connected and enabled)	Speed Feedback Error – The measured encoder speed exceeds the calculated motor speed
Enc-02		Reserved
Enc-03		Incorrect Encoder PPR count set in P3-09
Enc-04		Motor Rated Speed (P1-10) outside allowed range
Enc-05		Internal Calculation Error
Enc-06		Encoder Channel A Fault
Enc-07		Encoder Channel B Fault
Enc-08		Encoder Channels A & B Fault
Enc-09		Motor Base Frequency (P1-09) outside allowed range
tor-lo	Insufficient Motor Torque generated during 'Torque Prove'	<p>The torque generated by the motor during the torque prove phase of the drive operation, prior to releasing the motor brake has not reached the level set in parameter P3-11 within the time limit allowed in P3-12.</p> <p>Check the motor and all connecting cables</p> <p>Check the operation of the motor holding brake</p> <p>Increase P3-12</p> <p>Reduce P3-11 only if it is safe to do so, ensuring the value used allows reliable operation of the system with no risk of the motor brake being released prior to sufficient holding torque being generated by the motor.</p>
tor-ol	Maximum Torque Limit Exceeded	<p>The torque generated by the motor has reached the maximum allowed 200% level for the time period set in P6-09.</p> <p>Reduce the load on the motor.</p> <p>Ensure the motor holding brake is correctly releasing, and not causing excess friction during operation.</p> <p>Ensure the motor nameplate parameters have been correctly entered into the relevant drive parameters, and that an autotune has successfully completed.</p>

Optidrive Plus 3^{GV-L} Easy Start-Up Guide



AC Supply Voltage (50 / 60Hz)

L1 L2 L3
Earth L N

Supply Voltage

- 200 – 240 Volt + / - 10%, 1 or 3 Phase
- 380 – 480 Volts + / - 10%, 1 or 3 Phase
- 480 – 525 Volts + / - 10%, 3 Phase
- 500 – 600 Volts + / - 10%

See Page 33

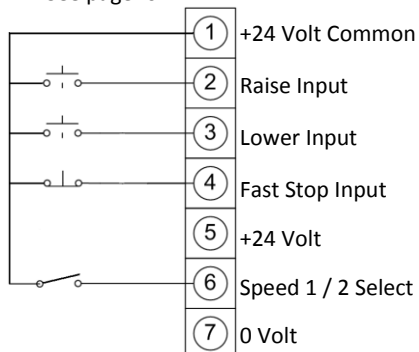
Fuses or MCB & Cable Sizes

- Check drive rating information on page 33

Parameter Programming – see page 15

Control Terminal Connections

- See page 20



Motor Cable Sizes

- Check drive rating information on page 33

Motor Connections

- Check for Star or Delta (see page 12)

Motor Nameplate Details

- Enter the motor rated voltage(V) in P1-07
- Enter the motor rated current (A) in P1-08
- Enter the motor rated frequency (Hz) in P1-09
- Enter the motor rated speed (Rpm) in P1-10
- Enter the motor rated power factor in P1-11



Bardac
drives