

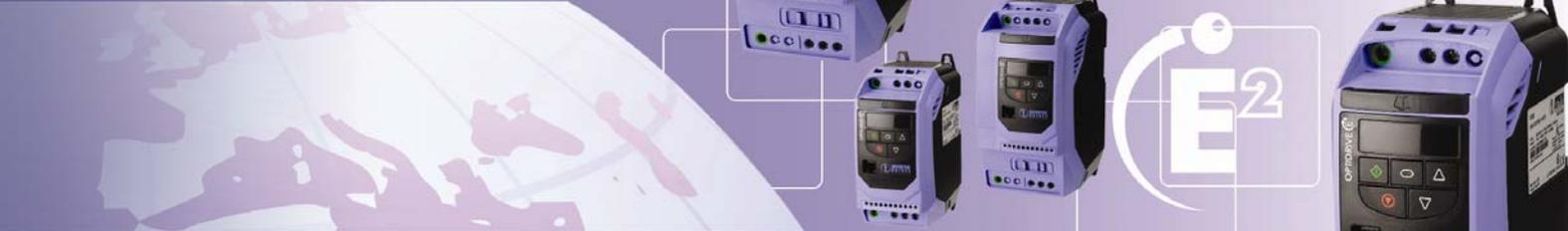
OPTIDRIVE E^2

Easy to use economy drive

AC variable speed drives
0.37 - 7.5kW / 0.5 - 10 HP

PRODUCT DATA





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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.

I. Product Overview



I. Product Overview

OPTIDRIVE E²

Ease of Use

AC variable speed drive
0/37 to 7.5 kW / 0.5 to 10 HP

Rich in features the Optidrive E2 is the most commercially competitive Optidrive in the Optidrive family.

Innovative and compact the Optidrive E2 range combines good looks with robustness, reliability and easy to use performance.

The product is dedicated to low power applications where total costs are ultra-competitive, including:

- Competitive purchase price
- Low installation costs
- Low commissioning costs
- Low technical support costs

Optidrive E2 has only 14 standard parameters to adjust in its basic form, thus Optidrive's legendary ease of use could not be easier or quicker to get started with.

Optidrive E2 can be supplied with or without an internal rfi filter.

Key Features

- kW or HP models available
- Pluggable terminals available
- Single Phase Output Models available (Optidrive E2 Single Phase)
- Customer Display Scaling
- Spin Start
- DC Injection
- Phase Loss
- Fault log analysis with time stamp information
- Motor current and speed indication
- Energy saving using Energy optimisation parameter
- 4 preset speeds with separate fwd/rev control
- Integral EMC filter with disconnect
- Varistor Disconnect
- Remote Keypad (Optiport E2)
- Integral Brake transistor (Sizes 2 & 3)
- Skip Frequency
- Main Dip ride through
- Fast Stop using 2nd deceleration ramp rate
- Automatic sleep mode
- Auto Restart
- Motorised POT
- Rapid parameter copy and commissioning using Optistick, PDA or Smartphone.
- MODBUS RTU control and monitoring as standard
- PI Feedback Controller
- DC paralleling (Sizes 2 & 3)
- kW hour run time
- Rugged 50°C rated ambient temperature rating
- Quick reference help card
- Analog Input Summation
- Motor Thermistor Input



I. Product Overview



E2 Specification Overview

| | | | |
|------------------------------|---|--|----------------------------|
| Output ratings | Overload Capacity | 150% for 60 seconds 175% for 2 seconds | |
| | Frequency | 0...500Hz | |
| Input Ratings | Frequency | 48 - 62Hz | |
| | Voltage | 110 - 115 +/- 10% 1-Phase (0.5 - 1.5HP) | |
| | | 200 - 240 +/- 10% 1-Phase (0.37 - 2.2kW / 0.5 - 3HP) | |
| | | 200 - 240 +/- 10% 3-Phase (0.37 - 3.7kW / 0.5 - 5HP) | |
| | 380 - 480 +/- 10% 3-Phase (0.75 - 7.5kW / 1 - 10HP) | | |
| Ambient Conditions | Temperature | Operating : 0 to 50°C Max; Storage : -40 to +60°C | |
| | Altitude | 0 - 2000m, derate 1% per 100m above 1000m | |
| | Ingress Protection | IP20 & Optional IP55 | |
| Programming | Keypad | Yes | |
| | PDA | Yes | |
| | Smartphone | Yes | |
| Control Specification | Control Method | Voltage Vector | |
| | PWM Frequency | 4...32kHz (effective) | |
| | V/Hz ratio | Linear | |
| | Boost | Yes | |
| | Stop Mode | Coast / Ramp / DC Brake | |
| | Internal Brake transistor | Yes (Sizes 2 and 3). External Resistor required | |
| | Capacity | 100% Drive Rated Power continuously | |
| | Skip Frequency | One point, adjustable frequency band | |
| | Frequency set point control | | 0...10 VDC |
| | | | 4...20mA |
| | | | 0...20mA |
| | | | 20...4mA |
| | | | Digital - Keypad MODBUS |
| | Pre-set speeds | 4 | |
| | PI Control | Yes | |
| Spin Start | Yes | | |
| Acceleration | 0..600 sec | | |
| Deceleration | (2 ramps) 0..3600 sec | | |
| Programmable I/O | Input 1 | Programmable Digital Input | |
| | Input 2 | Programmable Digital Input | |
| | Input 3 | User Selectable Analog / Digital Input | |
| | Input 4 | User Selectable Analog / Digital Input | |
| | Output 1 | Programmable Analog / Digital Output | |
| | Relay 1 | Relay Output (30 VDC 5A, 250 VAC, 6A) | |
| Keypad Display | Operating Display | 6-digit LED showing: Output Frequency, Current, Rpm, and User Scalable values | |
| | Remote mount | Optional Optoport E2 remote mounting keypad | |
| Protective Functions | Inverter Trip | Over voltage | |
| | | Over current | |
| | | Under voltage | |
| | | External trip | |
| | | Motor overload | |
| | | Over temperature | |
| | | Under temperature | |
| | | Short circuited | |
| | Phase Loss | | |
| | Memory | Last 4 Trips stored | |
| Bus communication | MODBUS RTU | Standard | |
| | Profibus DP | via Gateway | |
| | DeviceNet | via Gateway | |
| | RS485 (Optibus) | Standard | |

2. General Information



2. General Information

2.1. Storage Temperature

Storage ambient temperature range
-40 ... 60°C

2.2. Ambient Temperature

Operational ambient temperature range
0 ... 50°C at default switching frequency

2.3. Altitude

Maximum altitude: 2000m.
Derate above 1000m : 1% / 100m

2.4. Humidity

Maximum humidity: 95%, non-condensing

2.5. Protection Rating

Ingress Protection (IP) Rating of IP20. This gives protection of foreign bodies greater than 12mm diameter. No protection against water ingress.

2.6. Supply Phase imbalance

Supply Phase imbalance: 3 % between phases

2.7. Switching Frequency range

Switching Frequency range: 4, 8, 12, 16, 24 & 32 kHz effective switching frequency

2.8. Output Frequency

Output Frequency range: 0-500Hz

2.9. Starts per hour:

Starts per hour:

Power Starts: Average of 20 starts per hour.

Electric Starts: When drive is powered up continuously and the drive enable signal used to control the starting and stopping of the drive; the limit is determined by the drive and motor thermal limits.

2.10. Power up time:

Power up time: 1.5 seconds is the time for the drive to display STOP from initial power on.

2.11. Serial Communications:

The drive has 2 protocols available using RS485 serial communications: Optibus or MODBUS RTU.

| Protocol | Baud | Connectivity |
|------------|----------------|---|
| Optibus | 115kbps | Optoport E2, Optistick Smartphone, PDA |
| MODBUS RTU | 9.6 to 115kbps | Drive to PLC Drive to Fieldbus Gateway |

The desired protocol is selectable in parameter P-36.

If serial communications is lost the drive has selectable times to trip or ramp to stop depending upon application requirements.

2.12. Cables

For recommended cabling and wiring sizing, refer to section 4.3 Rating tables.

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. In some cases the cable size may need to be increased to meet local industrial regulations and codes of practice and to avoid excessive voltage drop.

When a smaller rating motor is attached to the drive the cable size can be decreased provided that drive motor rated current (P-08) is reduced to match the motor.

2.13. Fusing

Protect the drive by using slow-blowing HRC fuses or MCB (Miniature Circuit Breaker) located in the mains supply of the drive.

Fuse type Bussmann KTN-R / KTS-R or equivalent MCB Type B.

For recommended sizes, refer to section 4.3 Rating tables.

2.14. Pluggable terminals

For OEM business and large quantity orders the Optidrive E2 can be modified to have pluggable control terminals.

This is a factory build option and minimum order quantities apply



3. Standards & EMC

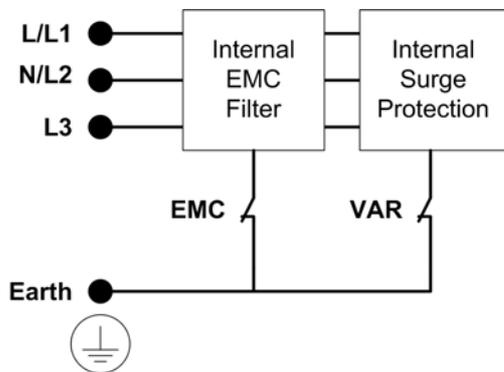
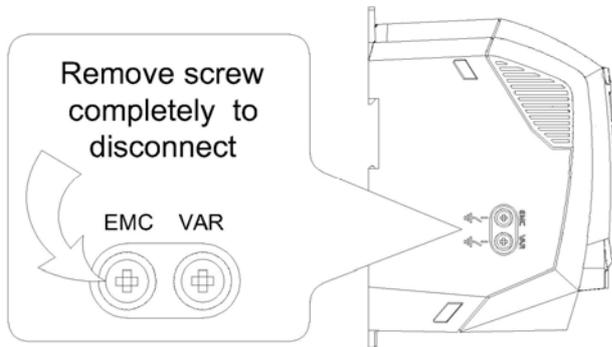


3. Standards & EMC

3.1. Standards

Invertek Drives Ltd hereby states that the Optidrive E2 product range is CE marked for the low voltage directive and conforms to the following harmonised European directives:

| | |
|-------------------------------------|--|
| 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) |



3.2. Internal & External EMC Filters

Optidrive is designed to high standards of EMC and is optionally 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 89/336/EEC, EMC.

For use on domestic supplies, screened motor cable must be used with the screen terminated to earth on both motor and drive sides. The installation must be carried out by qualified installation engineers, observing good wiring practice such as power and signal cable segregation and correct screening techniques to minimise emissions. When installed in this way, the Optidrive with built-in filter has emission levels lower than those defined in EN61800-3 category C2 for 1st environments for screened cable lengths of up to 5m. For cable lengths above 5m, the emission levels may exceed those defined by EN61800-3 cat C2. In this case, further mitigation methods (such as fitting an external filter - Optifilter) must be employed if the emissions limits are to be upheld.

When used on industrial supplies, or 2nd environments, the installation must be carried out by qualified installation engineers, observing good wiring practice such as power and signal cable segregation and correct screening techniques to minimise emissions. The emissions limits defined by EN61800-3 cat C3 (2nd environment) are upheld for screened cable lengths of up to 25m. The cable screen should be connected to earth on both the drive and motor sides.

Disconnecting the EMC filter.

Fully remove the EMC Screw to disconnect the internal EMC filter

Disconnecting the Voltage Surge Protection.

Fully remove the VAR Screw to disconnect the internal voltage surge protection (Varistors).

3. Standards & EMC



External Input Filter - Optifilter

Optifilters are mechanically easy to install and to retrofit and the provision of filter-drive cables significantly reduces electrical wiring time.

A key feature of all Optifilters is the predominant use of high specification inductive components rather than lower cost capacitive components. This substantially improves earth leakage performance and is of particular benefit for medical, domestic and multi-drive system applications where earth leakage breakers will trip less readily.

| Drive Size | Optifilter model | Supply voltage $\pm 10\%$ V | Phases | Output current max A | Earth leakage mA |
|------------|------------------|-----------------------------|--------|----------------------|------------------|
| 1 | OD-F112I | 220-240 | 1 | 16 | <1.6 |
| 1 | OD-F134I | 220-480 | 3 | 6 | <30 |
| 2 | OD-F212I | 220-240 | 1 | 25 | <1.6 |
| 2 | OD-F234I | 220-480 | 3 | 16 | <30 |
| 3 | OD-F334I | 220-480 | 3 | 30 | <30 |



3.3. Input Voltage Surge suppression

The Optidrive product range has input supply voltage surge suppression components fitted to protect the drive from line voltage transients, typically originating from lightning strikes or switching of high power equipment on the same supply.

When carrying out a HiPot (Flash) test on an installation in which the drive is built, the voltage surge suppression components may cause the test to fail.

To accommodate this type of system HiPot test, the voltage surge suppression components can be disconnected by removing the VAR screw as described above.

After completing the HiPot test, the screw should be replaced and the HiPot test repeated. The test should then fail, indicating that the voltage surge suppression components are once again in circuit.

3.4. Earth Leakage

For drives supplied with an internally fitted filter, instructions for removal of the internal EMC filter are given in section 3.2 Internal & External EMC Filters. The earth leakage current level depends upon whether or not the internal EMC filter is fitted.

Invertek recommends that earth leakage circuit breakers (ELCB) / residual current device (RCD) breakers are used when the conditions below are met:

Type A can only be used with single phase drives and will detect AC and pulsating DC fault currents (provided the DC current reaches zero at least once every half cycle)

Type B must be used with three phase drives and will detect AC, pulsating DC and smooth DC fault currents

Type AC should never be used with Optidrive E2.

Up to 2 drives can be used in parallel on the same ELCB with the EMC filter connected (EMC screw fitted). If the EMC screw is removed, the leakage current to earth is less than 3.5mA per drive.

3. Standards & EMC



3.5. INPUT CHOKES (Line Reactors)

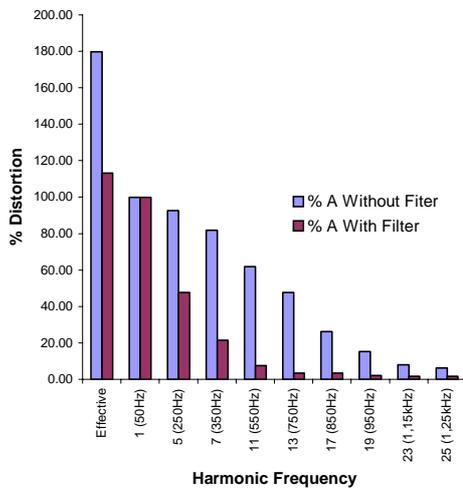
Input chokes (line reactors) are designed to reduce supply harmonic distortion and protect Optidrive against harmful supply disturbances

Most types of drive products create supply harmonic distortion owing to the configuration of the power input circuit. Input chokes are used to reduce the effects of the Optidrive upon supply harmonic distortion (see below).

Input chokes are also used to protect the power input circuits of the Optidrive against voltage spikes which might originate from lightning strikes or other equipment on the same supply. Small power Optidrives are particularly susceptible to this on certain supplies where lightning occurs or if there are other power electronic devices which cause notching on the supply ie welders, dc drives etc.

Input chokes are available for the whole Optidrive E2 product range in IP20 and IP55.

Fourier Analysis of Harmonic Distortion



The graph shows the effect of using an input choke on typical 4kW/ 5HP drive. The 50Hz current is used as a reference and is the current which delivers the useful power to the motor. The reduction in the total effective (RMS) current is clear.

IP20 Rated

| Product Code | Optidrive Size | Rated Voltage (V) | Phase | Rated Current (A) | Inductance / limb (mH) |
|--------------|----------------|-------------------|-------|-------------------|------------------------|
| OD-IL121-IN | Size 1 | < 230V | 1 | 16 | 1.8 |
| OD-IL221-IN | Size 2 | | | 25 | 1.1 |
| OD-IL143-IN | Size 1 | < 500V | 3 | 6 | 4.8 |
| OD-IL243-IN | Size 2 | | | 10 | 2.9 |
| OD-IL343-IN | Size 3 | | | 36 | 0.81 |

IP55 Rated

| Product Code | Optidrive Size | Rated Voltage (V) | Phase | Rated Current (A) | Inductance / limb (mH) |
|------------------|----------------|-------------------|-------|-------------------|------------------------|
| OD-IL121-IN-I55 | Size 1 | < 230V | 1 | 16 | 1.8 |
| OD-IL221-IN-I55 | Size 2 | | | 25 | 1.1 |
| OD-IL143-IN-I55 | Size 1 | < 600V | 3 | 6 | 4.8 |
| OD-IL243-IN-I55 | Size 2 | | | 10 | 2.9 |
| OD-IL343-IN-I55* | Size 3 | | | 36 | 0.81 |

* Maximum 5.5kW / 7.5HP

4. Electrical Ratings



4. Electrical Ratings

This chapter contains information about the Optidrive E2 including how to identify the drive

4.1. Identifying the drive by model number

Each drive can be identified by its model number, as shown in Figure 1 Drive Model Number Format. The model number is on the shipping label and the drive nameplate. The model number includes the drive and any options.

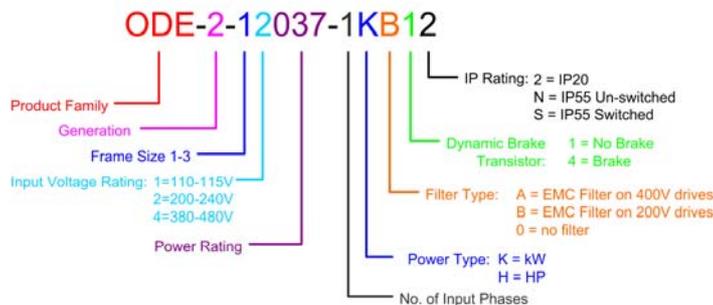


Figure 1 Drive Model Number Format

4.2. Drive model numbers

110-115V ±10% - 1 Phase Input - 3 Phase 230V Output (Voltage Doubler)

| kW Model Number | | kW | HP Model Number | | HP | Output Current (A) | Frame Size |
|-----------------|----------------|----|-----------------|-------------------|-----|--------------------|------------|
| With Filter | Without Filter | | With Filter | Without Filter | | | |
| | | | | ODE-2-11005-1H01* | 0.5 | 2.3 | 1 |
| | | | | ODE-2-11010-1H01* | 1 | 4.3 | 1 |
| | | | | ODE-2-21015-1H04* | 1.5 | 5.8 | 2 |

200-240V ±10% - 1 Phase Input

| kW Model Number | | kW | HP Model Number | | HP | Output Current (A) | Frame Size |
|-------------------|-------------------|------|-------------------|-------------------|-----|--------------------|------------|
| With Filter | Without Filter | | With Filter | Without Filter | | | |
| ODE-2-12037-1KB1* | ODE-2-12037-1K01* | 0.37 | ODE-2-12005-1HB1* | ODE-2-12005-1H01* | 0.5 | 2.3 | 1 |
| ODE-2-12075-1KB1* | ODE-2-12075-1K01* | 0.75 | ODE-2-12010-1HB1* | ODE-2-12010-1H01* | 1 | 4.3 | 1 |
| ODE-2-12150-1KB1* | ODE-2-12150-1K01* | 1.5 | ODE-2-12020-1HB1* | ODE-2-12020-1H01* | 2 | 7 | 1 |
| ODE-2-22150-1KB4* | ODE-2-22150-1K04* | 1.5 | ODE-2-22020-1HB4* | ODE-2-22020-1H04* | 2 | 7 | 2 |
| ODE-2-22220-1KB4* | ODE-2-22220-1K04* | 2.2 | ODE-2-22030-1HB4* | ODE-2-22030-1H04* | 3 | 10.5 | 2 |

200-240V ±10% - 3 Phase Input

| kW Model Number | | kW | HP Model Number | | HP | Output Current (A) | Frame Size |
|-------------------|-------------------|------|-------------------|-------------------|-----|--------------------|------------|
| With Filter | Without Filter | | With Filter | Without Filter | | | |
| | ODE-2-12037-3K01* | 0.37 | | ODE-2-12005-3H01* | 0.5 | 2.3 | 1 |
| | ODE-2-12075-3K01* | 0.75 | | ODE-2-12010-3H01* | 1 | 4.3 | 1 |
| | ODE-2-12150-3K01* | 1.5 | | ODE-2-12020-3H01* | 2 | 7 | 1 |
| ODE-2-22150-3KB4* | ODE-2-22150-3K04* | 1.5 | ODE-2-22020-3HB4* | ODE-2-22020-3H04* | 2 | 7 | 2 |
| ODE-2-22220-3KB4* | ODE-2-22220-3K04* | 2.2 | ODE-2-22030-3HB4* | ODE-2-22030-3H04* | 3 | 10.5 | 2 |
| ODE-2-32040-3KB4* | ODE-2-32040-3K04* | 4.0 | ODE-2-32050-3HB4* | ODE-2-32050-3H04* | 5 | 18 | 3 |

380-480V ±10% - 3 Phase Input

| kW Model Number | | kW | HP Model Number | | HP | Output Current (A) | Frame Size |
|-------------------|-------------------|------|-------------------|-------------------|-----|--------------------|------------|
| With Filter | Without Filter | | With Filter | Without Filter | | | |
| ODE-2-14075-3KA1* | ODE-2-14075-3K01* | 0.75 | ODE-2-14010-3HA1* | ODE-2-14010-3H01* | 1 | 2.2 | 1 |
| ODE-2-14150-3KA1* | ODE-2-14150-3K01* | 1.5 | ODE-2-14020-3HA1* | ODE-2-14020-3H01* | 2 | 4.1 | 1 |
| ODE-2-24150-3KA4* | ODE-2-24150-3K04* | 1.5 | ODE-2-24020-3HA4* | ODE-2-24020-3H04* | 2 | 4.1 | 2 |
| ODE-2-24220-3KA4* | ODE-2-24220-3K04* | 2.2 | ODE-2-24030-3HA4* | ODE-2-24030-3H04* | 3 | 5.8 | 2 |
| ODE-2-24400-3KA4* | ODE-2-24400-3K04* | 4 | ODE-2-24050-3HA4* | ODE-2-24050-3H04* | 5 | 9.5 | 2 |
| ODE-2-34055-3KA4* | ODE-2-34055-3K04* | 5.5 | ODE-2-34075-3HA4* | ODE-2-34075-3H04* | 7.5 | 14 | 3 |
| ODE-2-34075-3KA4* | ODE-2-34075-3K04* | 7.5 | ODE-2-34100-3HA4* | ODE-2-34100-3H04* | 10 | 18 | 3 |

4. Electrical Ratings



4.3. Rating tables

110-115V ±10% - 1 Phase Input - 3 Phase 230V Output (Voltage Doubler)

| kW Model Number (ODE-2-xxxx-yyyy) | kW | HP Model Number (ODE-2-xxxx-yyyy) | HP | Frame Size | Nominal Input Current | 150% Overload Input Current | Fuse or MCB (type B) | Supply Cable Size | Nominal Output Current | 150% Overload Output Current 60 secs | Motor Cable Size | Max Motor Cable Length | Min Brake Resistor Value |
|-----------------------------------|----|-----------------------------------|-----|------------|-----------------------|-----------------------------|----------------------|-------------------|------------------------|--------------------------------------|------------------|------------------------|--------------------------|
| | | | | | Amps | Amps | Amps | mm ² | Amps | Amps | Mm ² | m | Ω |
| - | - | 11005-IH#1# | 0.5 | 1 | 6.7 | 10.1 | 10 | 1.5 | 2.3 | 3.45 | 1.5 | 25 | - |
| - | - | 11010-IH#1# | 1 | 1 | 12.5 | 18.8 | 16 | 1.5 | 4.3 | 6.45 | 1.5 | 25 | - |
| - | - | 21015-IH#4# | 1.5 | 2 | 16.8 | 25.2 | 20 | 2.5 | 5.8 | 8.7 | 1.5 | 100 | 47 |

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

| kW Model Number (ODE-2-xxxx-yyyy) | kW | HP Model Number (ODE-2-xxxx-yyyy) | HP | Frame Size | Nominal Input Current | 150% Overload Input Current | Fuse or MCB (type B) | Supply Cable Size | Nominal Output Current | 150% Overload Output Current 60 secs | Motor Cable Size | Max Motor Cable Length | Min Brake Resistor Value |
|-----------------------------------|------|-----------------------------------|-----|------------|-----------------------|-----------------------------|----------------------|-------------------|------------------------|--------------------------------------|------------------|------------------------|--------------------------|
| | | | | | Amps | Amps | Amps | mm ² | Amps | Amps | mm ² | m | Ω |
| 12037-1K#1# | 0.37 | 12005-IH#1# | 0.5 | 1 | 6.7 | 10.1 | 6 | 1.5 | 2.3 | 3.45 | 1.5 | 25 | - |
| 12075-1K#1# | 0.75 | 12010-IH#1# | 1 | 1 | 12.5 | 18.8 | 10 | 1.5 | 4.3 | 6.45 | 1.5 | 25 | - |
| 12150-1K#1# | 1.5 | 12020-IH#1# | 2 | 1 | 19.3 | 29.0 | 20 | 4 | 7 | 10.5 | 1.5 | 25 | - |
| 22150-1K#4# | 1.5 | 22020-IH#4# | 2 | 2 | 19.3 | 29.0 | 20 | 4 | 7 | 10.5 | 1.5 | 100 | 47 |
| 22220-1K#4# | 2.2 | 22030-IH#4# | 3 | 2 | 28.8 | 43.1 | 32 | 4 | 10.5 | 15.75 | 1.5 | 100 | 47 |

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

| kW Model Number (ODE-2-xxxx-yyyy) | kW | HP Model Number (ODE-2-xxxx-yyyy) | HP | Frame Size | Nominal Input Current | 150% Overload Input Current | Fuse or MCB (type B) | Supply Cable Size | Nominal Output Current | 150% Overload Output Current 60 secs | Motor Cable Size | Max Motor Cable Length | Min Brake Resistor Value |
|-----------------------------------|------|-----------------------------------|-----|------------|-----------------------|-----------------------------|----------------------|-------------------|------------------------|--------------------------------------|------------------|------------------------|--------------------------|
| | | | | | Amps | Amps | Amps | mm ² | Amps | Amps | mm ² | m | Ω |
| 12037-3K#1# | 0.37 | 12005-3H#1# | 0.5 | 1 | 3 | 4.5 | 6 | 1.5 | 2.3 | 3.45 | 1.5 | 25 | - |
| 12075-3K#1# | 0.75 | 12010-3H#1# | 1 | 1 | 5.8 | 8.7 | 10 | 1.5 | 4.3 | 6.45 | 1.5 | 25 | - |
| 12150-3K#1# | 1.5 | 12020-3H#1# | 2 | 1 | 9.2 | 13.8 | 16 | 2.5 | 7 | 10.5 | 1.5 | 25 | - |
| 22150-3K#4# | 1.5 | 22020-3H#4# | 2 | 2 | 9.2 | 13.8 | 16 | 2.5 | 7 | 10.5 | 1.5 | 100 | 47 |
| 22220-3K#4# | 2.2 | 22030-3H#4# | 3 | 2 | 13.7 | 20.1 | 20 | 4 | 10.5 | 15.75 | 1.5 | 100 | 47 |
| 32040-3K#4# | 4.0 | 32050-3H#4# | 5 | 3 | 20.7 | 31.3 | 32 | 4 | 18 | 27 | 2.5 | 100 | 47 |

Note: Size 1 3 phase input drives do not have the option for an rfi filter

4. Electrical Ratings



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

| kW Model Number (ODE-2-xxxxx-yyyyy) | kW | HP Model Number (ODE-2-xxxxx-yyyyy) | HP | Frame Size | Nominal Input Current | 150% Overload Input Current | Fuse or MCB (type B) | Supply Cable Size | Nominal Output Current | 150% Overload Output Current 60 secs | Motor Cable Size | Max Motor Cable Length | Min Brake Resistor Value |
|-------------------------------------|------|-------------------------------------|-----|------------|-----------------------|-----------------------------|----------------------|-------------------|------------------------|--------------------------------------|------------------|------------------------|--------------------------|
| | | | | | Amps | Amps | Amps | mm ² | Amps | Amps | mm ² | m | Ω |
| 14075-3K#1# | 0.75 | 14010-3H#1# | 1 | 1 | 2.9 | 4.4 | 5 | 1.5 | 2.2 | 3.3 | 1.5 | 25 | - |
| 14150-3K#1# | 1.5 | 14020-3H#1# | 2 | 1 | 5.4 | 8.1 | 10 | 1.5 | 4.1 | 6.15 | 1.5 | 25 | - |
| 24150-3K#4# | 1.5 | 24020-3H#4# | 2 | 2 | 5.4 | 8.1 | 10 | 1.5 | 4.1 | 6.15 | 1.5 | 100 | 47 |
| 24220-3K#4# | 2.2 | 24030-3H#4# | 3 | 2 | 7.6 | 11.4 | 10 | 1.5 | 5.8 | 8.7 | 1.5 | 100 | 47 |
| 24400-3K#4# | 4 | 24050-3H#4# | 5 | 2 | 12.4 | 18.6 | 16 | 2.5 | 9.5 | 14.25 | 1.5 | 100 | 47 |
| 34055-3K#4# | 5.5 | 34075-3H#4# | 7.5 | 3 | 16.1 | 24.2 | 16 | 2.5 | 14 | 21 | 2.5 | 100 | 22 |
| 34075-3K#4# | 7.5 | 34100-3H#4# | 10 | 3 | 17.3 | 26 | 20 | 4 | 18 | 27 | 2.5 | 100 | 22 |

4.4. Maximum supply ratings for UL compliance:

| Drive rating | Maximum supply voltage | Maximum supply short-circuit current |
|---|------------------------|--------------------------------------|
| 230V ratings: 0.37kW (0.5HP) to 4.0kW (5HP) | 240V rms (AC) | 5kA rms (AC) |
| 400/460V ratings: 0.75kW(1HP) to 7.5kW(10HP) | 500V rms (AC) | 5kA 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.

4. Electrical Ratings



4.5. Switching Frequency Derating

110-115V ±10% - 1 Phase Input - 3 Phase 230V Output (Voltage Doubler)

| kW Rating | HP Rating | Output Current (A) | Frame Size | Max Ambient Temperature (°C) | | | |
|-----------|-----------|--------------------|------------|------------------------------|--------|--------|--------|
| | | | | 8 kHz | 16 kHz | 24 kHz | 32 kHz |
| | 0.5 | 2.3 | 1 | 50 | 50 | 50 | 45 |
| | 1 | 4.3 | 1 | 50 | 50 | 45 | 40 |
| | 1.5 | 5.8 | 2 | 50 | 50 | 45 | 40 |

200-240V ±10% - 1 Phase Input

| kW Rating | HP Rating | Output Current (A) | Frame Size | Max Ambient Temperature (°C) | | | |
|-----------|-----------|--------------------|------------|------------------------------|--------|--------|--------|
| | | | | 8 kHz | 16 kHz | 24 kHz | 32 kHz |
| 0.37 | 0.5 | 2.3 | 1 | 50 | 50 | 50 | 45 |
| 0.75 | 1 | 4.3 | 1 | 50 | 50 | 45 | 40 |
| 1.5 | 2 | 7 | 1 | 50 | 45 | 40 | 35 |
| 1.5 | 2 | 7 | 2 | 50 | 50 | 45 | 40 |
| 2.2 | 3 | 10.5 | 2 | 50 | 45 | 40 | 35 |

200-240V ±10% - 3 Phase Input

| kW Rating | HP Rating | Output Current (A) | Frame Size | Max Ambient Temperature (°C) | | | |
|-----------|-----------|--------------------|------------|------------------------------|--------|--------|--------|
| | | | | 8 kHz | 16 kHz | 24 kHz | 32 kHz |
| 1.5 | 2 | 7 | 2 | 50 | 50 | 45 | 40 |
| 2.2 | 3 | 10.5 | 2 | 50 | 45 | 40 | 35 |
| 4.0 | 5 | 18 | 3 | 50 | 45 | 40 | 35 |

380-480V ±10% - 3 Phase Input

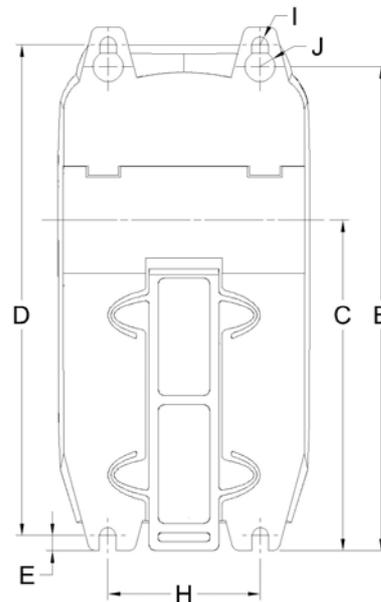
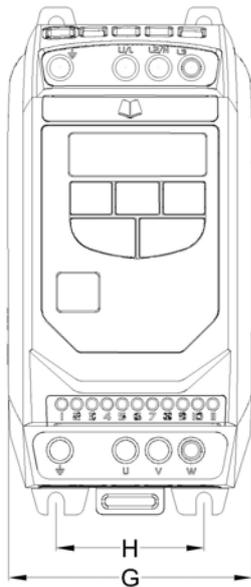
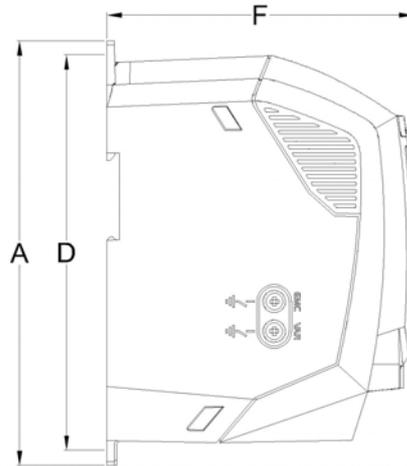
| kW Rating | HP Rating | Output Current (A) | Frame Size | Max Ambient Temperature (°C) | | | |
|-----------|-----------|--------------------|------------|------------------------------|--------|--------|--------|
| | | | | 8 kHz | 16 kHz | 24 kHz | 32 kHz |
| 0.75 | 1 | 2.2 | 1 | 50 | 50 | 45 | 40 |
| 1.5 | 2 | 4.1 | 1 | 50 | 45 | 40 | 35 |
| 1.5 | 2 | 4.1 | 2 | 50 | 50 | 50 | 45 |
| 2.2 | 3 | 5.8 | 2 | 50 | 50 | 45 | 40 |
| 4 | 5 | 9.5 | 2 | 50 | 45 | 40 | 35 |
| 5.5 | 7.5 | 14 | 3 | 50 | 50 | 45 | 40 |
| 7.5 | 10 | 18 | 3 | 50 | 45 | 40 | 35 |

5. Mechanical Installation



5. Mechanical Installation

5.1. Size I - IP20 mechanical dimensions and mounting



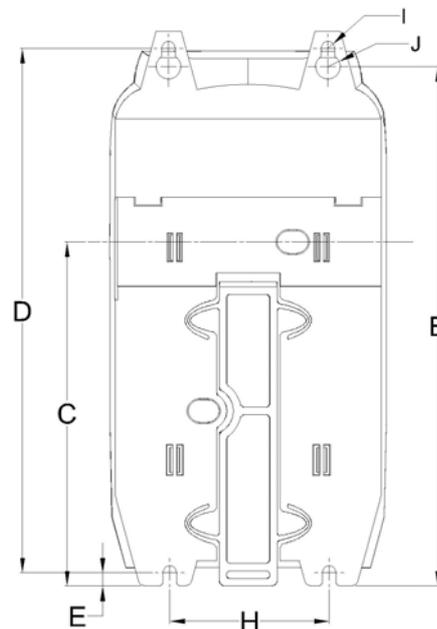
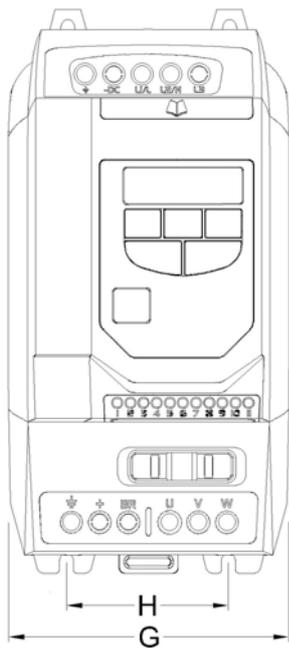
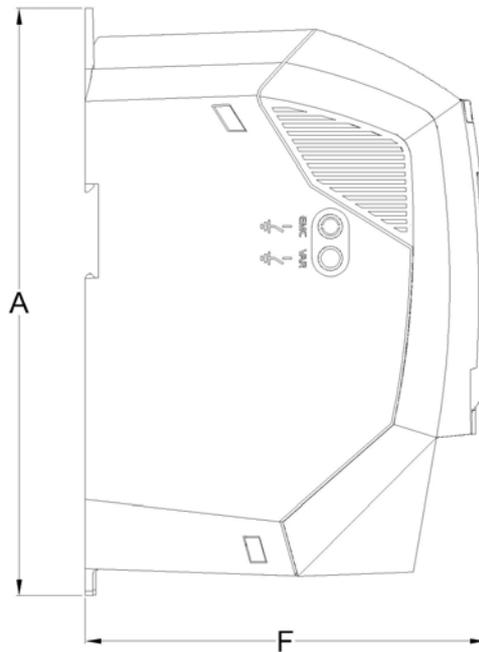
| Drive Size | A | | B | | C | | D | | E | | F | | G | | H | | I Ø | | J Ø | |
|------------|-----|------|-----|------|-----|------|-----|------|----|------|-----|------|----|------|----|------|-----|------|-----|------|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| I | 173 | 6.81 | 160 | 6.30 | 109 | 4.29 | 162 | 6.38 | 5 | 0.20 | 123 | 4.84 | 82 | 3.23 | 50 | 1.97 | 5.5 | 0.22 | 10 | 0.39 |

| Terminals | Torque Settings |
|-----------|-----------------|
| Control | 0.5 Nm |
| Power | 1 Nm |

5. Mechanical Installation



5.2. Size 2 - IP20 mechanical dimensions and mounting



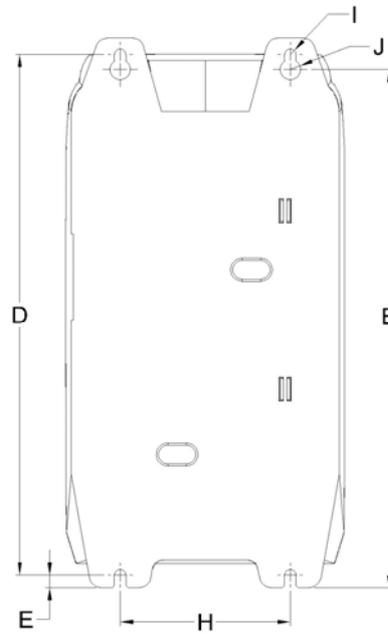
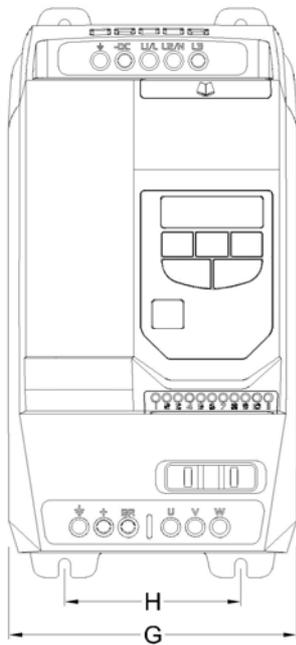
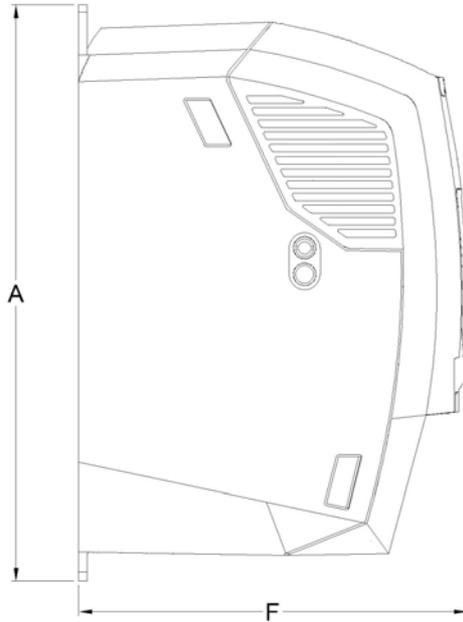
| Drive Size | A | | B | | C | | D | | E | | F | | G | | H | | I Ø | | J Ø | |
|------------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|----|------|-----|------|-----|------|
| | mm | in | mm | in | mm | in | mm | in |
| 2 | 221 | 8.70 | 207 | 8.15 | 137 | 5.39 | 209 | 8.23 | 5.3 | 0.21 | 150 | 5.91 | 109 | 4.29 | 63 | 2.48 | 5.5 | 0.22 | 10 | 0.39 |

| Terminals | Torque Settings |
|-----------|-----------------|
| Control | 0.5 Nm |
| Power | 1 Nm |

5. Mechanical Installation



5.3. Size 3- IP20 mechanical dimensions and mounting



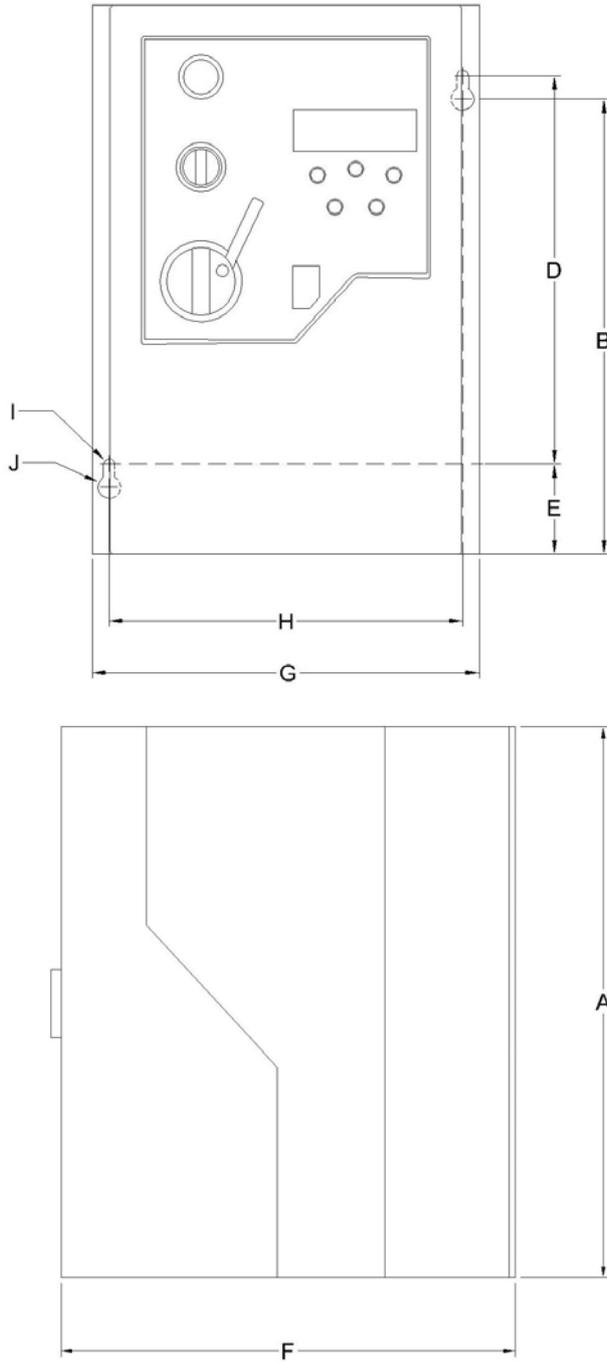
| Drive Size | A | | B | | C | | D | | E | | F | | G | | H | | I Ø | | J Ø | |
|------------|-----|-------|-----|------|----|----|-----|------|----|------|-----|------|-----|------|----|------|-----|------|-----|------|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| 3 | 261 | 10.28 | 246 | 9.69 | - | - | 247 | 9.72 | 6 | 0.24 | 175 | 6.89 | 131 | 5.16 | 80 | 3.15 | 5.5 | 0.22 | 10 | 0.39 |

| Terminals | Torque Settings |
|-----------|-----------------|
| Control | 0.5 Nm |
| Power | 1 Nm |

5. Mechanical Installation



5.4. Size I- IP55/NEMA 12 mechanical dimensions and mounting



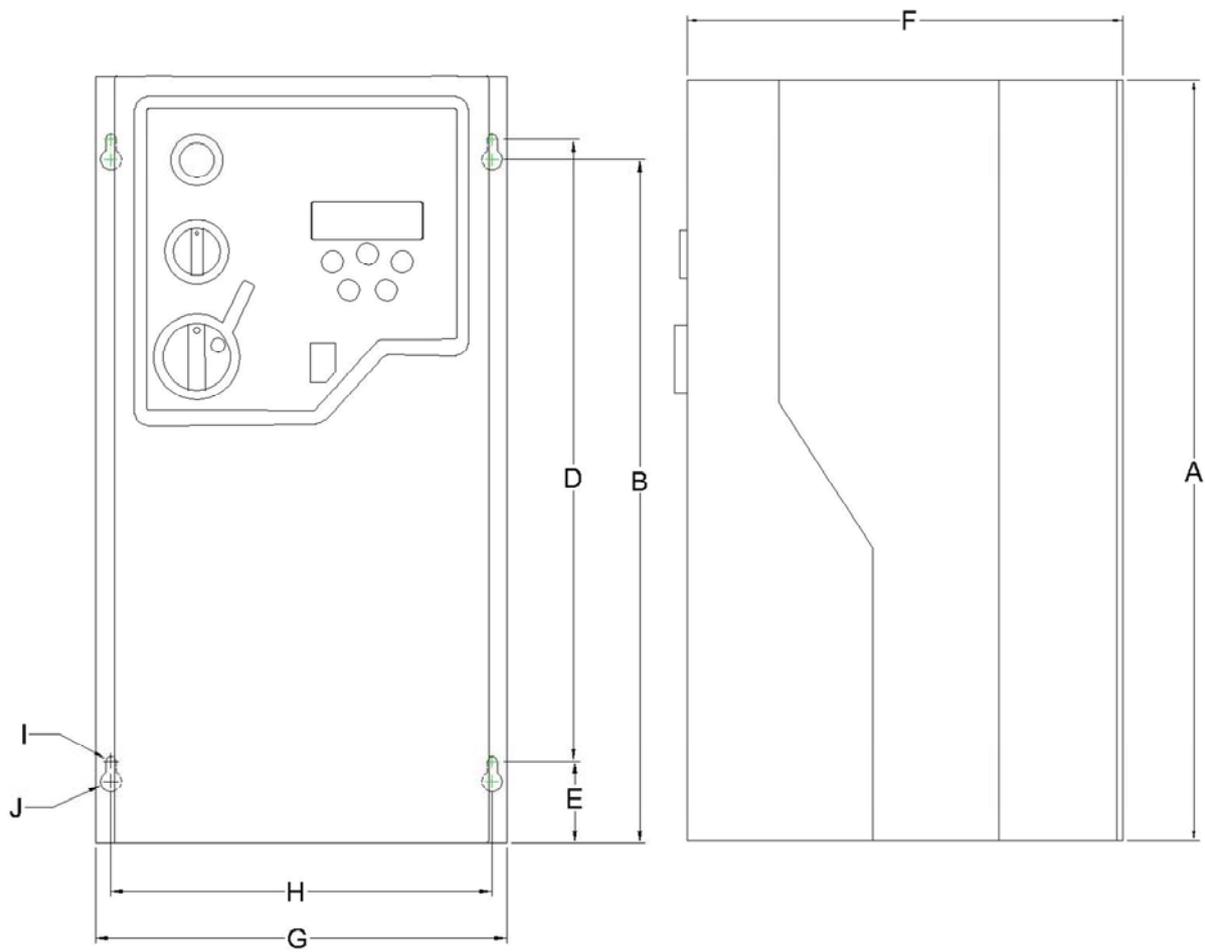
| Drive Size | A | | B | | C | | D | | E | | F | | G | | H | | I Ø | | J Ø | |
|------------|-----|------|-----|------|----|----|-----|------|----|------|-----|------|-----|------|-----|------|-----|------|-----|------|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| I | 200 | 7.87 | 166 | 6.54 | - | - | 141 | 5.55 | 33 | 1.30 | 162 | 6.38 | 140 | 5.51 | 128 | 5.04 | 4.2 | 0.17 | 8.4 | 0.33 |

| Terminals | Torque Settings |
|-----------|-----------------|
| Control | 0.5 Nm |
| Power | 1 Nm |

5. Mechanical Installation



5.5. Size 2- IP55/NEMA 12 mechanical dimensions and mounting



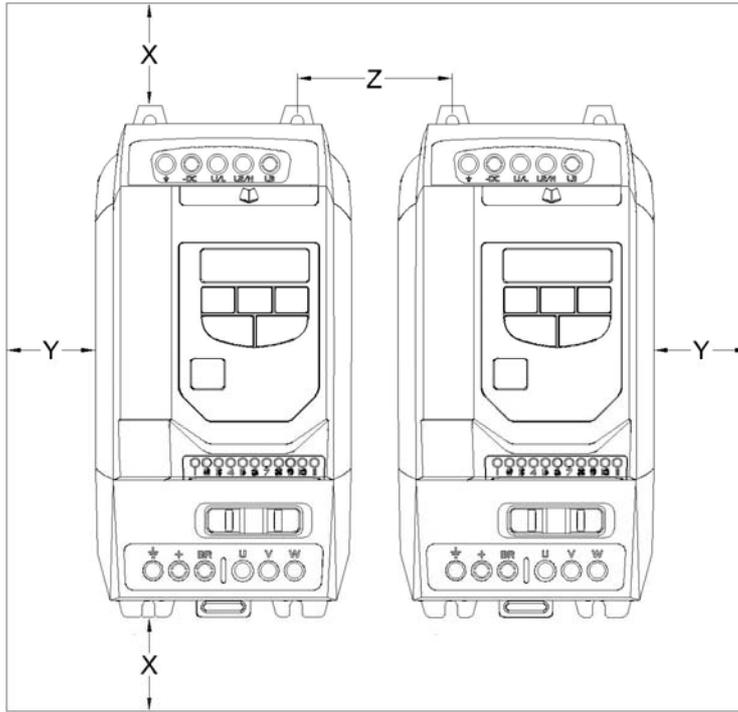
| Drive Size | A | | B | | C | | D | | E | | F | | G | | H | | I Ø | | J Ø | |
|------------|-----|-------|-----|-------|----|----|-----|------|----|------|-----|------|-----|------|-----|------|-----|------|-----|------|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| 2 | 310 | 12.20 | 276 | 10.87 | - | - | 251 | 9.88 | 33 | 1.30 | 176 | 6.93 | 164 | 6.46 | 153 | 6.02 | 4.2 | 0.17 | 8.4 | 0.33 |

| Terminals | Torque Settings |
|-----------|-----------------|
| Control | 0.5 Nm |
| Power | 1 Nm |

5. Mechanical Installation



5.6. IP20 Mounting Clearances



| Drive Size | X Above/Below | | Y Either Side | | Z Between | | Recommended airflow CFM (ft ³ /min) |
|------------|------------------|------|------------------|------|--------------|------|--|
| | mm | in | mm | in | mm | in | |
| 1 | 50 | 1.97 | 50 | 1.97 | 33 | 1.30 | 11 |
| 2 | 75 | 2.95 | 50 | 1.97 | 46 | 1.81 | 11 |
| 3 | 100 | 3.94 | 50 | 1.97 | 52 | 2.05 | 26 |

Note: Dimension Z assumes that the drives are mounted side-by-side with no clearance.

Typical drive heat losses are 3% of operating load conditions.

Above are guidelines only and the maximum operating ambient temperature of the drive **MUST** be maintained at all times. Please see section 4.5 Switching Frequency Derating for maximum ambient temperatures.

5.7. IP20 - DIN Rail Mounting

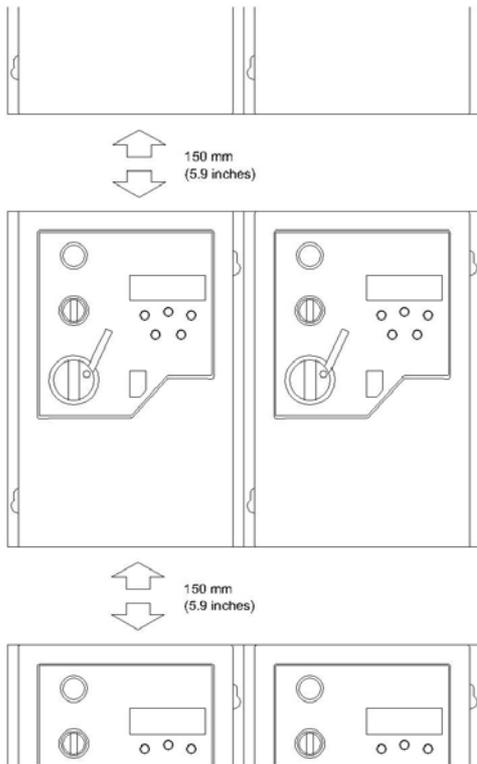
Size 1 & 2 drives are designed to be mounted onto DIN rail.



5. Mechanical Installation



5.8. IP55/NEMA 12 Mounting Clearances

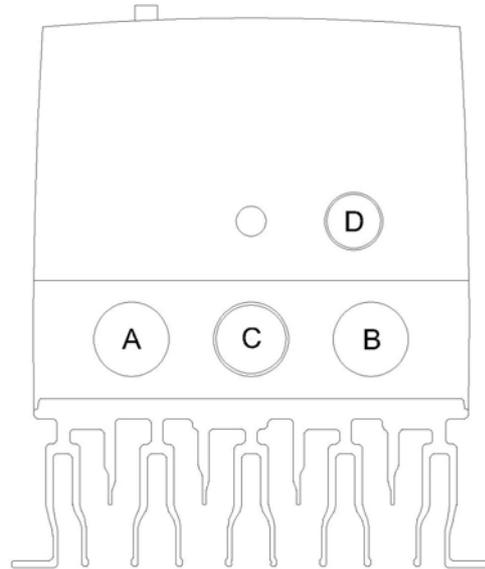


The IP55 / NEMA 12 Optidrives can be installed side-by-side with their heatsink flanges touching. This gives adequate ventilation space between drives.

If the IP55 Optidrive is to be installed above another drive or any other heat-producing device, the minimum vertical spacing is 150mm (5.9 inches)

Note: The IP55/NEMA 12 drive is intended for INDOOR USE ONLY

5.9. IP55/NEMA 12 Gland Sizes



Any Metal conduit used **MUST** be earth bonded by means of suitable earthing washer or gland adaptor.

Lock Off:

On the switched models the main power isolator switch can be locked in the 'Off' position using a 20mm standard shackle padlock (not supplied).

Gland Hole Sizes:

| Frame Size | Input (A) & Output (B) Power (∅) | Centred Knockout (C) (∅) | Terminal Cover Knockout (D) (∅) |
|------------|----------------------------------|--------------------------|---------------------------------|
| 1 | (22mm) | (22mm) | (17mm) |
| 2 | (25mm) | (22mm) | (17mm) |

Recommended Gland Type:

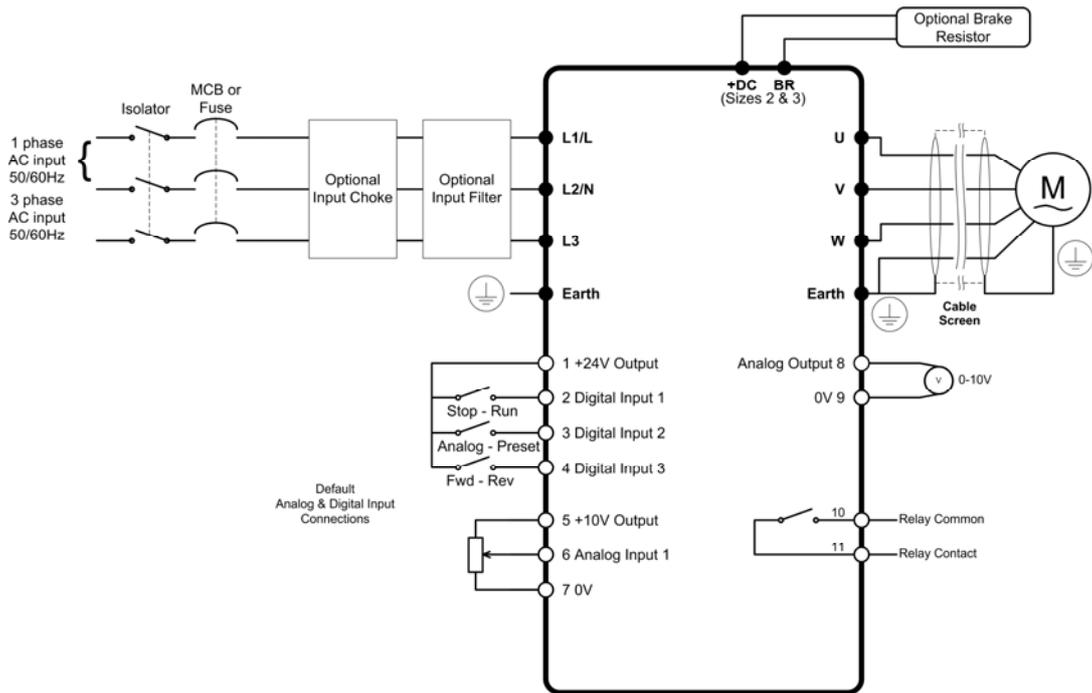
| SkinTop UL approved (UL94-V0) Type I2/IP55 non-metallic cable gland or non-rigid conduit | | | |
|--|----------------------------------|--------------------------|---------------------------------|
| Frame Size | Input (A) & Output (B) Power (∅) | Centred Knockout (C) (∅) | Terminal Cover Knockout (D) (∅) |
| 1 | PG13.5 / M20 | PG13.5 / M20 | PG9 / M16 |
| 2 | PG16 / M25 | PG13.5 / M20 | PG9 / M16 |

6. Power Wiring



6. Power Wiring

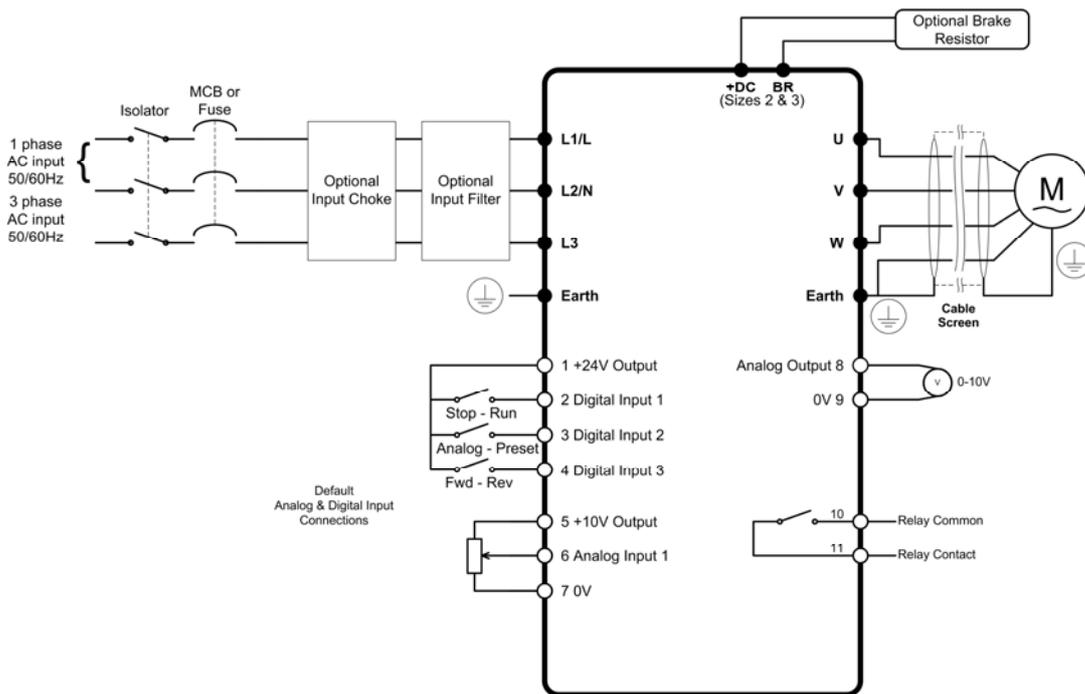
6.1. IP20 Connection Diagram



6. Power Wiring



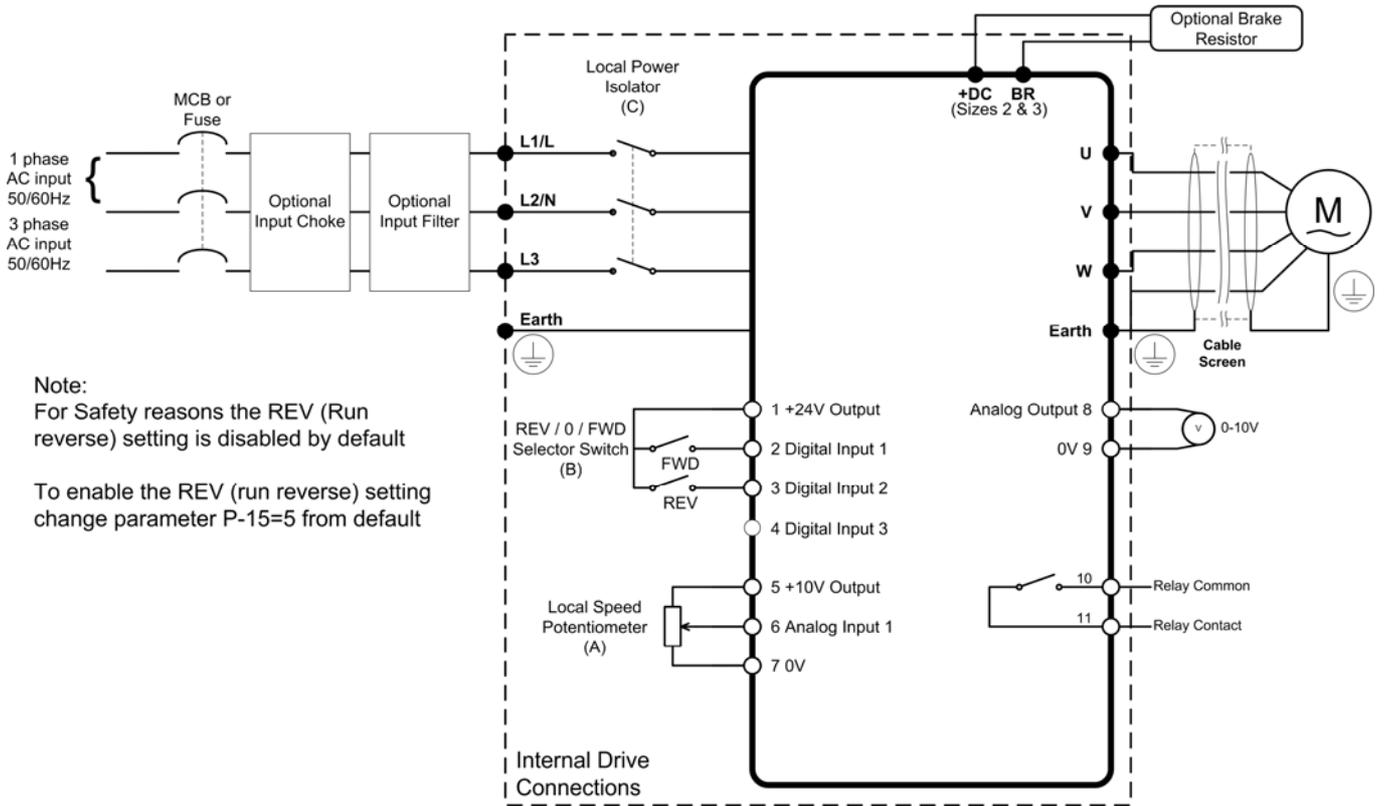
6.2. IP55 / NEMA 12 Non-Switched Connection Diagram



6. Power Wiring



6.3. IP55 / NEMA 12 Switched Connection Diagram



6. Power Wiring



6.4. 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, L3. Phase sequence is not important.

The motor should be connected to U, V, W

For drives that have a dynamic brake transistor an optional external braking resistor will need be connected to +DC and BR. The brake resistor circuit should be protected by a suitable thermal protection circuit. See section 12.2 Optibrake – Dynamic Braking Resistors for further in formation.

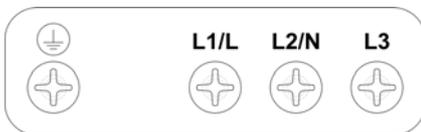
+DC and –DC connections can be used for DC Bus paralleling applications

The –DC, +DC and BR connections are blanked off by plastic tabs when sent from the factory. The plastic tabs can be removed if/when required.

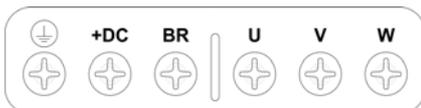
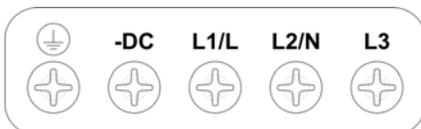
Further information can be found in the Advanced User Guide.

6.4.1. IP20 Drives

Size 1 Connections

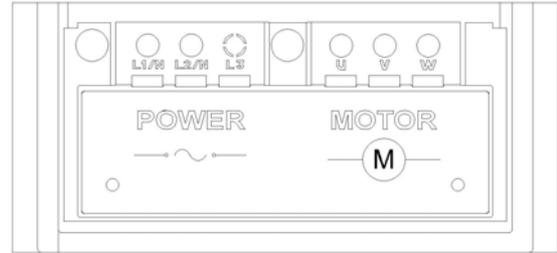


Size 2 & 3 Connections

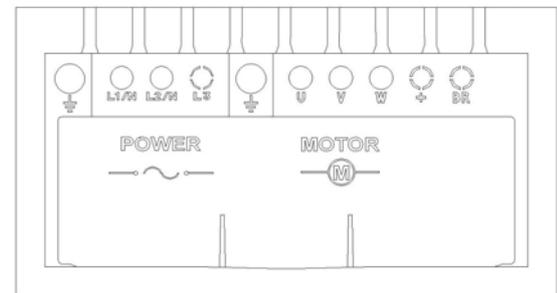


6.4.2. IP55 / NEMA 12 Drives

Size 1 Connections



Size 2 & 3 Connections



6.5. DC supply Input

Operation on DC Voltage supply is possible by connecting to L1 and L2 on the drive input. Suitable fusing should be used. Any regenerative energy will not pass back onto the supply.

Further information can be found in the Advanced User Guide

6.6. Parallel DC BUS Operation

On drive sizes 2 & 3 provision has been made for ±DC connections. This provides the ability to operate on parallel DC Bus systems where typically the motor/regenerative energy is transferred between the drives.

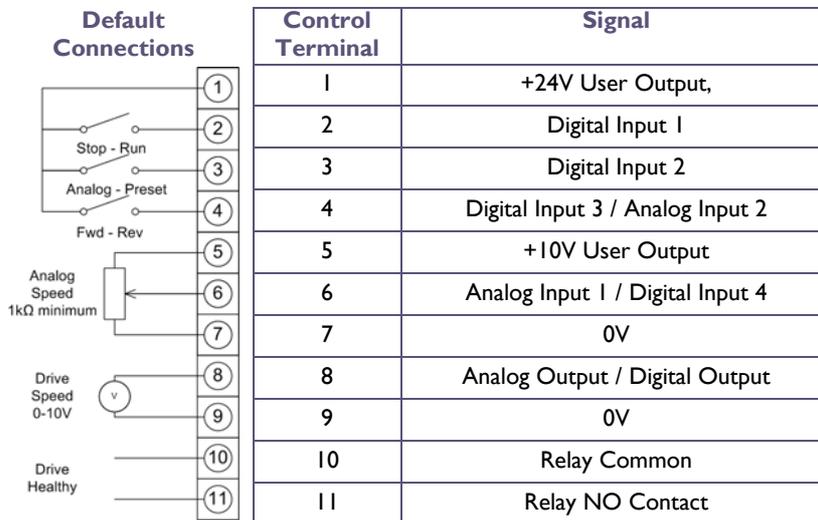
Further information can be found in the Advanced User Guide

7. Control Wiring



7. Control Wiring

7.1. Control terminal connections



| | |
|---------------------------|-------------------------|
| Control Terminal 1 | +24V User Output |
| Current Limit | 100mA |

| | |
|-----------------------------------|-----------|
| Control Terminal 7 & 9 | 0V |
|-----------------------------------|-----------|

| | |
|-----------------------------------|---------------------------------|
| Control Terminal 2 & 3 | Digital Inputs 1 & 2 |
| Positive Logic | |
| Digital Voltage Range | 8 to 30V |
| Sample Time | 8 ms |

| | |
|---------------------------|--|
| Control Terminal 8 | Analog Output or Digital Output |
| Analog Voltage Range | 0 to 10V |
| Digital Voltage Range | 0 to 24V |
| Max Output Current | 20mA |

| | |
|---------------------------|--|
| Control Terminal 4 | Digital Input 3 or Analog Input 2 |
| Positive Logic | |
| Digital Voltage Range | 8 to 30V |
| Sample Time | 8 ms |
| Analog Input formats | As per Parameter P-47 Voltage: 0-10V Current: 4-20mA, 0-20mA, 20-4mA |
| Resolution | 12-bit (0.025%) |

| | |
|-------------------------------------|--|
| Control Terminal 10 & 11 | User Relay Contacts |
| Voltage Rating | 250 Vac / 30Vdc |
| Current Rating | 6A / 5A |
| Contact Isolation | 2.5kV |
| Operation of Relay | OPEN: No AC Supply OR Function of P-18 disabled CLOSED: AC Supply present & Function of P-18 enabled. |

| | |
|---------------------------|--------------------|
| Control Terminal 5 | +10V Output |
| Current Limit | 10mA |
| Minimum Resistance | 1kΩ |

| | |
|---------------------------|--|
| Control Terminal 6 | Analog Input 1 or Digital Input 4 |
| Analog Input formats | As per Parameter P-16 Voltage: 0-10V Current: 4-20mA, 0-20mA, 20-4mA |
| Resolution | 12-bit (0.025%) |
| Positive Logic | |
| Digital Voltage Range | 8 to 30V |
| Sample Time | 8 ms |

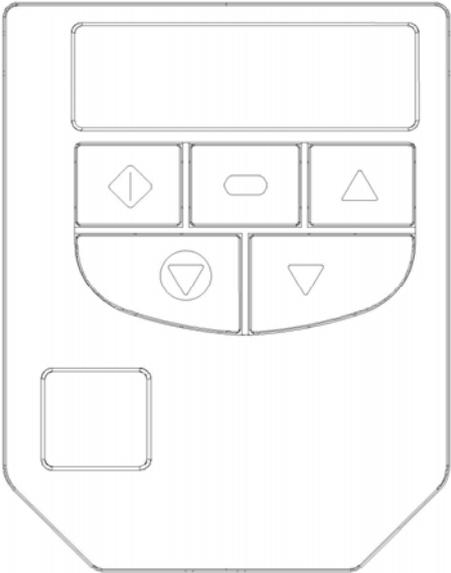
8. Operation



8. Operation

8.1. 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 | |

8.1.1. Changing Parameters

To change a parameter value press and hold the  key for >1s whilst the drive displays $StOP$. The display changes to $P-01$, indicating parameter 01.

Press and release the  key to display the value of this parameter.

Change to the required value using the  and  keys.

Press and release the  key once more to store the change.

Press and hold the  key for >1s to return to real-time mode.

The display shows $StOP$ if the drive is stopped or the real-time information (e.g. speed) if the drive is running.

8.1.2. Reset Factory Default Settings

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

9. Parameters



9. Parameters

9.1. Standard parameters

| Par. | Description | Range | Default | Explanation |
|------|--|--|-----------------------------|---|
| P-01 | Maximum speed | P-02 to 5*P-09 (max 500Hz) | 50Hz (60Hz) | Maximum speed limit – Hz or rpm. See P-10 |
| P-02 | Minimum speed | 0 to P-01 (max 500Hz) | 0Hz | Minimum speed limit – Hz or rpm. See P-10 |
| P-03 | Acceleration ramp time | 0 to 600s | 5s | Acceleration ramp time from 0 to base speed (P-09) in seconds |
| P-04 | Deceleration ramp time | 0 to 600s | 5s | Deceleration ramp time from base speed (P-09) to standstill in seconds. When P-04=0, the deceleration ramp is set by P-24. Setting P-04=0 also activates dynamic ramp control, where the ramp may be extended automatically to prevent an O-Volt trip. |
| P-05 | Stop mode select | 0 : Ramp stop (brown-out ride-through) 1 : Coast to stop 2 : Ramp to stop (fast stop) | 0 | If the supply is lost and P-05=0 then the drive will try to continue running by reducing the speed of the load using the load as a generator. If P-05 = 2, the drive will ramp to stop using the P-24 decel ramp with dynamic brake control when mains supply lost. |
| P-06 | Energy Optimiser | 0: Disabled 1: Enabled | 0 | When enabled, automatically reduces applied motor voltage on light load. Minimum value is 50% of nominal. |
| P-07 | Motor rated voltage | 0, 20V to 250V 0, 20V to 500V | 230V 400V (460V) | Rated (nameplate) voltage of the motor (Volts). Value limited to 250V for low voltage drives. Setting to zero disables voltage compensation |
| P-08 | Motor rated current | 25% -100% of drive rated current | Drive rating | Rated (nameplate) current of the motor (Amps). |
| P-09 | Motor rated frequency | 25Hz to 500Hz | 50Hz (60Hz) | Rated (nameplate) frequency of the motor. |
| P-10 | Motor rated speed | 0 to 30 000 rpm | 0 | When non-zero, all speed related parameters are displayed in rpm |
| P-11 | Voltage boost | Size 1: 0.0 to 20.0% Size 2: 0.0 to 15.0% Size 3: 0.0 to 10.0% of max output voltage. | Motor power dependent | Applies an adjustable boost to the Optidrive voltage output at low speed to assist with starting 'sticky' loads. For continuous applications at low speed use a forced ventilated motor. |
| P-12 | Terminal / Keypad / MODBUS / PI Drive Control Mode Selection | 0.Terminal control 1. Keypad control – fwd only 2. Keypad control – fwd and rev 3. MODBUS network control with internal accel / decel ramps 4. MODBUS network control with accel / decel ramp adjustment 5. User PI control 6. User PI control with analog input I summation | 0 | Primary Control Mode of the drive. 0. Terminal control 1. Uni-directional keypad control. Keypad START button does not reverse direction. 2. Bi-directional keypad control. Keypad START button toggles between forward and reverse. 3. Control via Modbus RTU (RS485) comms interface using the internal accel / decel ramps 4. Control via Modbus RTU (RS485) comms interface with accel / decel ramps updated via Modbus 5. User PI control with external feedback signal 6. User PI control with external feedback signal and summation with analog input I |
| P-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. Further fault event logging functions are available through parameter group zero. |
| P-14 | Extended menu access | Code 0 to 9 999 | 0 | Set to "101" (default) for extended menu access. Change code in P-39 to prevent unauthorised access to the Extended Parameter Set |

| | |
|------|--|
| NOTE | Default parameter values for Horse Power rated drives are shown in brackets |
| NOTE | Standby mode is enabled automatically when the drive is at zero speed for > 20 seconds |

9. Parameters



9.2. Extended parameters

| Par. | Description | Range | Default | Explanation |
|------|---|---|-----------|---|
| P-15 | Digital input function select | 0 to 12 | 0 | Defines the function of the digital inputs depending on the control mode setting in P-12. See section 10 Analog and Digital Input Configurations for more information. |
| P-16 | Analog input format | 0..10V, b 0..10V, 0..20mA, t 4..20mA, r 4..20mA, t 20..4mA r 20..4mA | 0..10V | Configures the voltage or current format of the analog input signal. b 0..10V can be used for bipolar input signals. A 50% offset can be applied to P-39 and 200% scaling in P-35 gives \pm P-01 "t" indicates the drive will trip if signal removed when drive is enabled. "r" indicates the drive will ramp to Preset Speed 1 if signal is removed when drive is enabled |
| P-17 | Effective switching frequency | 4 .. 32kHz | 8 / 16kHz | Sets maximum effective switching frequency of the drive. If "rEd" is displayed, the switching frequency has been reduced to the level in P00-14 due to excessive drive heatsink temperature. |
| P-18 | User relay output select | 0 : Drive enabled 1 : Drive healthy 2 : Motor at target speed 3 : Drive tripped 4 : Motor speed \geq limit 5 : Motor current \geq limit 6 : Motor speed < limit 7 : Motor current < limit | 1 | Defines the function of the user relay, when the operating conditions are met. Disabled : Contacts open Enabled : Contacts closed Options 4 to 7: the Relay output is enabled using the level set in P-19 |
| P-19 | User relay output limit | 0.0 to 100% | 100% | Sets the limit for P-18 |
| P-20 | Preset speed 1 | -P-01 to P-01 | 0 Hz | Sets jog / preset speed 1 |
| P-21 | Preset speed 2 | -P-01 to P-01 | 0 Hz | Sets jog / preset speed 2 |
| P-22 | Preset speed 3 | -P-01 to P-01 | 0 Hz | Sets jog / preset speed 3 |
| P-23 | Preset speed 4 | -P-01 to P-01 | 0 Hz | Sets jog / preset speed 4 |
| P-24 | 2nd decel ramp time (Fast Stop) | 0...25.0s | 0 | 2nd Deceleration ramp time from base speed (P-09) to standstill in seconds. Selected using fast stop function via digital input setting or on mains loss as set by P-05 If set to zero drive will coast to STOP. |
| P-25 | Analog output function select | Digital output mode 0 : Drive enabled 1 : Drive healthy 2 : Motor at target speed 3 : Drive tripped 4 : Motor speed \geq limit 5 : Motor current \geq limit 6 : Motor speed < limit 7 : Motor current < limit Analog output mode 8 : Motor speed 9 : Motor current | 8 | Digital Output Mode Options 0 to 7 select a digital voltage output signal Disabled : 0V Enabled : +24V, (25mA limit) Options 4 to 7 : the Digital output is enabled using the level set in P-19 Analog Output Mode Option 8 : Motor Speed signal range 0..10V = 0..100% of P-01 Option 9 : Motor Current signal range 0..10V = 0..200% of P-08 |
| P-26 | Skip frequency hysteresis band | 0 to P-01 | 0 Hz | Set P-09 before adjusting. Speed reference held at upper or lower skip frequency limit until input signal reaches the opposite skip frequency limit. Speed ramps through the skip frequency band at a rate set by P-03 and P-04. |
| P-27 | Skip frequency | 0 to P-01 | 0 Hz | Set P-09 before adjusting. Skip frequency centre point |
| P-28 | V/F characteristic adjustment voltage | 0 ... P-07 | 0 | Adjusts the applied motor voltage to this value at the frequency set in P-29 |
| P-29 | V/F characteristic adjustment frequency | 0 ... P-09 | 0.0Hz | Sets the frequency at which the adjustment voltage set in P-28 is applied |

9. Parameters



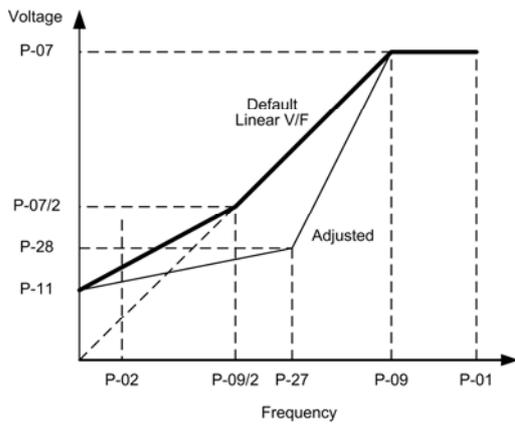
| | | | | |
|-------------|---|--|---------------------------|---|
| P-30 | Terminal mode restart function | Edge-r, Auto-0 .. Auto-5 | Auto-0 | Edge-r : if drive is powered up with Digital Input I closed (enabled), drive will not run. The switch must be opened & closed after power up or after clearing a trip for the drive to run. Auto-0 : drive will run whenever digital input I is closed (if not tripped). Auto-1..5 : drive will make 1..5 attempts to automatically restart after a trip (25s between attempts). If fault has cleared drive will restart. To reset the counter the Drive must be powered down, reset on the keypad or by re-enabling the drive. |
| P-31 | Keypad mode restart function | 0 : Minimum speed 1 : Previous speed 2 : Minimum speed (Auto-run) 3 : Previous speed (Auto-run) | 1 | If set to 0 or 2, drive will always start from minimum speed. If set to 1 or 3, drive ramps up to the operating speed prior to the last STOP command. If set to 2 or 3, the status of digital input I controls drive to start or stop. The start and stop button on the drive will not function in this case. |
| P-32 | DC injection on stop | 0 to 25.0s | 0 (disabled) | When > 0, DC injection braking activated when speed reaches zero with stop signal applied. Only applied on disable (Stop), not on enable. Uses the level set in P-11. |
| P-33 | Spin Start (S2 & S3 only) DC injection on start (S1) | 0 : Disabled 1 : Enabled | 0 | When enabled, drive starts from detected motor rotor speed. Short start delay possible if rotor stationary. Recommended for high inertia load applications. For Size 1 drives, P-33 = 1 enables DC injection braking on enable. The duration and levels are set by P-32 and P-11 respectively. |
| P-34 | Brake chopper enable (not S1) | 0 : Disabled 1 : Enabled with s/w protection 2 : Enabled without s/w protection | 0 | Software protection for Invertek standard brake resistors (200W). For Non-Invertek approved resistors and higher braking applications set to 2. |
| P-35 | Analog input scaling | 0 ... 500.0% | 100% | Analog input scaling, resolution 0.1%. |
| P-36 | Serial Communications address | Adr : 0 disable, 1..63 | 1 | Adr : Unique drive address for communication network When set to OP-buS, MODBUS disabled. Communication with PDA, Optistick and Optiport E2 possible Setting a baudrate enables MODBUS at that baudrate and disables OP-buS. The time before a trip in the event of a communication loss can be set in milliseconds. Setting "0" disables the communications trip. "t" indicates the drive will trip if time exceeded. "r" indicates the drive will ramp to stop if time exceeded. |
| | MODBUS enable / baudrate select | OP-buS (fixed at 115.2 kbps) 9.6k to 115.2kbps (Modbus) | OP-buS | |
| | Trip enable / delay | 0 (no trip), t 30, 100, 1000, 3000 (ms) r 30, 100, 1000, 3000 (ms)) | t 3000 (3 second trip) | |
| P-37 | Access code definition | 0 to 9 999 | 101 | Defines Extended Parameter Set access code, P-14 |
| P-38 | Parameter access lock | 0: Parameters can be changed & automatically saved on power down 1: Read-only. No changes allowed. | 0 | Controls user access to parameters. When P-38 = 0, all parameters can be changed and these changes will be stored automatically. When P-38 = 1, parameters are locked and cannot be changed. |
| P-39 | Analog input offset | -500.0 ... 500.0% | 0% | Introduces an offset to the analog input level with a resolution 0.1%. e.g. 10% = 1V = 0Hz |
| P-40 | Display speed scaling factor | 0.000 to 6.000 | | Custom scaling factor applied to drive speed. If P-10 = 0, speed in Hz scaled by this factor. If P-10 > 0, speed in RPM scaled. Displayed as real-time variable on the drive display, indicated by a "c". |

9. Parameters



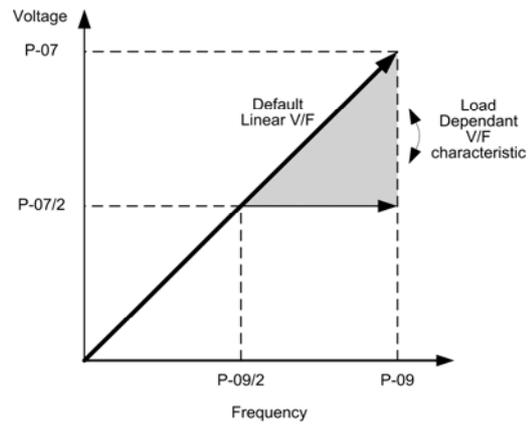
| | | | | |
|-------------|--------------------------------|--|---------|---|
| P-41 | User PI Proportional Gain | 0.0 ... 30.0 | 1.0 | Higher value used for high inertia. Too high a value gives instability. |
| P-42 | User PI Integral time constant | 0.0s ... 30.0s | 1.0s | Higher value gives slower, more damped response. |
| P-43 | User PI operating mode | 0: Direct 1: Inverse | 0 | If an increasing feedback signal should increase the speed of the motor, set to 'Inverse' mode. |
| P-44 | User PI reference select | 0: Digital 1: Analog | 0 | Sets the source for the PI control reference signal. When set to 1, analog input 1 is used. |
| P-45 | User PI digital reference | 0 ... 100% | 0.0 % | Sets the preset reference used when P-44 = 0. |
| P-46 | User PI feedback select | 0 : 2nd analog input (T4) 1 : 1st analog input (T6) 2 : motor load current | 0 | This parameter selects the feedback signal source. |
| P-47 | 2nd analog input format | 0..10V, 0..20mA, t 4..20mA, r 4..20mA, t 20..4mA r 20..4mA | 0 ..10V | Selects the format of the 2nd analog input. "t" indicates the drive will trip if signal removed when drive is enabled. "r" indicates the drive will ramp to Preset Speed 1 if signal is removed when the drive is enabled |

Adjusting the Voltage / Frequency (V/f) characteristics



The V/f characteristic is defined by several parameters as shown. Reducing the voltage at a particular frequency reduces the current in the motor and hence the torque and power. The V/f curve can be further modified by using P-28 and P-29, where P-28 determines the percentage increase or decrease of the voltage applied to the motor at the frequency specified in P-29. This can be useful if motor instability is experienced at certain frequencies, if this is the case increase or decrease the voltage (P-28) at the speed of instability (P-29).

Energy Saving with Energy Optimisation in P-06



For applications requiring energy saving, typically HVAC and pumping, the energy optimiser (P-06) parameter can be enabled. The drive automatically reduces the applied motor voltage (hence torque) depending on the load conditions.

The advantage of this control over a variable torque characteristic traditionally used, is that a higher starting torque can be achieved.

9. Parameters



9.3. P-00 Read Only Drive Status Parameters

| | Description | Display range | Explanation |
|--------|--|--|--|
| P00-01 | 1st Analog input value | 0 ... 100% | 100% = max input voltage |
| P00-02 | 2nd Analog input value | 0 ... 100% | 100% = max input voltage |
| P00-03 | Speed reference input | -PI-01 ... PI-01 | Displayed in Hz if P-10 = 0, otherwise displayed in RPM |
| P00-04 | Digital input status | Binary value | Drive digital input status |
| P00-05 | Reserved | 0 | Reserved |
| P00-06 | Reserved | 0 | Reserved |
| P00-07 | Applied motor voltage | 0 ... 600V AC | Value of RMS voltage applied to motor |
| P00-08 | DC bus voltage | 0 ... 1000V dc | Internal DC bus voltage |
| P00-09 | Internal Heatsink temperature | -20 ... 100 °C | Temperature of heatsink in °C |
| P00-10 | Hours run meter | 0 to 99 999 hours | Not affected by resetting factory default parameters |
| P00-11 | Run time since last trip (1) | 0 to 99 999 hours | Run-time clock stopped by drive disable (or trip), reset on next enable only if a trip occurred. Reset also on next enable after a drive power down. |
| P00-12 | Run time since last trip (2) | 0 to 99 999 hours | Run-time clock stopped by drive disable (or trip), reset on next enable only if a trip occurred (under-volts not considered a trip) – not reset by power down / power up cycling unless a trip occurred prior to power down |
| P00-13 | Run time since last disable | 0 to 99 999 hours | Run-time clock stopped on drive disable, value reset on next enable |
| P00-14 | Drive Effective Switching Frequency | 4 to 32 kHz | Actual drive effective output switching frequency. This value maybe lower than the selected frequency in P-17 if the drive is too hot. The drive will automatically reduce the switching frequency to prevent an over temperature trip and maintain operation. |
| P00-15 | DC bus voltage log | 0 ... 1000V | 8 most recent values prior to trip, updated every 250ms |
| P00-16 | Thermistor temperature log | -20 ... 120 °C | 8 most recent values prior to trip, updated every 500ms |
| P00-17 | Motor current | 0 to 2x rated current | 8 most recent values prior to trip, updated every 250ms |
| P00-18 | Software ID, I/O processor & motor control | e.g. "1.00", "47AE" | Version number and checksum. "1" on LH side indicates I/O processor, "2" indicates motor control |
| P00-19 | Drive serial number | 000000 ... 999999 00-000 ... 99-999 | Unique drive serial number e.g. 540102 / 32 / 005 |
| P00-20 | Drive identifier | Drive rating | Drive rating, drive type e.g. 0.37, I 230,3P-out |

9.3.1. Parameter group zero access and navigation

When P-14 = P-37, all P-00 parameters are visible. Default value is 101.

When the user scrolls to P-00, pressing  will display "P-00 A", where A represents the secondary number within P-00. (i.e. 1 to 20). The User can then scroll to the required P-00 parameter.

Pressing  once more will then display the value of that particular group zero parameter.

Pressing  returns to the next level up. If  is then pressed again (without pressing  or ) the display changes to the next level up (main parameter level, i.e. P-00).

If  or  is pressed whilst on the lower level (e.g. P00-05) to change the P-00 index, pressing <NAVIGATE> quickly displays that parameter value.

9.3.2. Event log analysis with Time stamps

The Optidrive E2 have built in timestamp information for event log analysis. This enables the user to determine the condition of the drive prior to a trip.

For those parameters which have multiple values, pressing the  and  keys will scroll the different values within that parameter.

Event logging parameters are:

P00-11, P00-12, P00-13, P00-14, P00-15, P00-16, P00-17, P-13

10. Analog and Digital Input Configurations



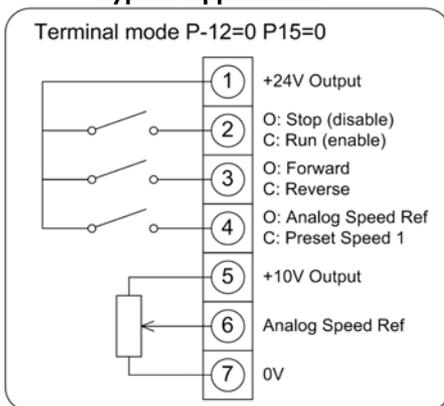
10. Analog and Digital Input Configurations

10.1. Terminal mode (P-12 = 0)

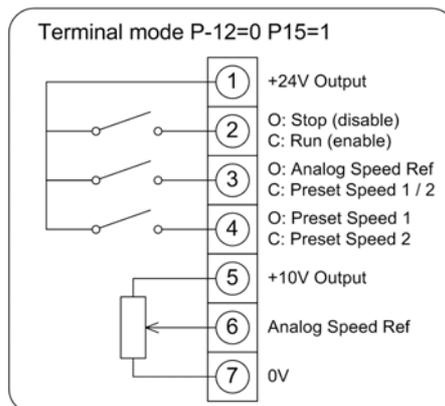
| P-15 | Digital input 1 (T2) | Digital input 2 (T3) | Digital input 3 (T4) | Analog input (T6) | Comments |
|-----------------|--|--|--|--------------------------|--|
| 0 | Open: Stop (disable) Closed: Run (enable) | Open : Forward run Closed : Reverse run | Open : Analog speed ref Closed : Preset speed 1 | Analog input 1 reference | |
| 1 | Open: Stop (disable) Closed: Run (enable) | Open: Analog speed ref Closed: Preset speed 1/2 | Open: Preset speed 1 Closed: Preset speed 2 | Analog input 1 reference | |
| 2 | Open: Stop (disable) Closed: Run (enable) | Digital Input 2 | Digital Input 3 | Preset Speed | Open: Preset speeds 1-4 Closed: Max Speed (P-01) |
| | | Open | Open | Preset Speed 1 | |
| | | Closed | Open | Preset Speed 2 | |
| | | Open | Closed | Preset Speed 3 | |
| | | Closed | Closed | Preset Speed 4 | |
| 3 ¹⁾ | Open: Stop (disable) Closed: Run (enable) | Open : Analog speed ref Closed : Preset speed 1 | External trip input : Open: Trip, Closed: Run | Analog input 1 reference | Connect external thermistor type PT100 or similar to digital input 3 |
| 4 | Open: Stop (disable) Closed: Run (enable) | Open : Analog input 1 Closed : Analog input 2 | Analog input 2 reference | Analog input 1 reference | Switches between analog inputs 1 and 2 |
| 5 | Open: Fwd Stop Closed: Fwd Run | Open: Reverse Stop Closed: Reverse Run | Open : Analog speed ref Closed : Preset speed 1 | Analog input 1 reference | Closing digital inputs 1 and 2 together carries out a fast stop (P-24) |
| 6 ¹⁾ | Open: Stop (disable) Closed: Run (enable) | Open : Forward Closed : Reverse | External trip input : Open: Trip, Closed: Run | Analog input 1 reference | Connect external thermistor type PT100 or similar to digital input 3 |
| 7 | Open: Stop (disable) Closed: Fwd Run (enable) | Open: Stop (disable) Closed: Rev Run (enable) | External trip input : Open: Trip, Closed: Run | Analog input 1 reference | Closing digital inputs 1 and 2 together carries out a fast stop (P-24) |
| 8 | Open: Stop (disable) Closed: Run (enable) | Open : Forward Closed : Reverse | Digital Input 2 | Analog Input 1 | Preset Speed |
| | | | Open | Open | Preset Speed 1 |
| | | | Closed | Open | Preset Speed 2 |
| | | | Open | Closed | Preset Speed 3 |
| | | | Closed | Closed | Preset Speed 4 |
| 9 | Open: Stop (disable) Closed: Forward Run (enable) | Open: Stop (disable) Closed: Reverse Run (enable) | Digital Input 2 | Analog Input 1 | Preset Speed |
| | | | Open | Open | Preset Speed 1 |
| | | | Closed | Open | Preset Speed 2 |
| | | | Open | Closed | Preset Speed 3 |
| | | | Closed | Closed | Preset Speed 4 |
| 10 | Normally Open (NO) Momentary close to run | Normally Closed (NC) Momentary open to stop | Open : Analog speed ref Closed: Preset speed 1 | Analog input 1 reference | |
| 11 | Normally Open (NO) Momentary close to run | Normally Closed (NC) Momentary open to stop | Normally Open (NO) Momentary close to rev | Analog input 1 reference | Closing digital inputs 1 and 3 together carries out a fast stop (P-24) |
| 12 | Open: Stop (disable) Closed: Run (enable) | Open: Fast Stop (disable) Closed: Run (enable) | Open : Analog speed ref Closed : Preset speed 1 | Analog input 1 reference | |

NOTE Negative Preset Speeds will be inverted if Run Reverse selected.

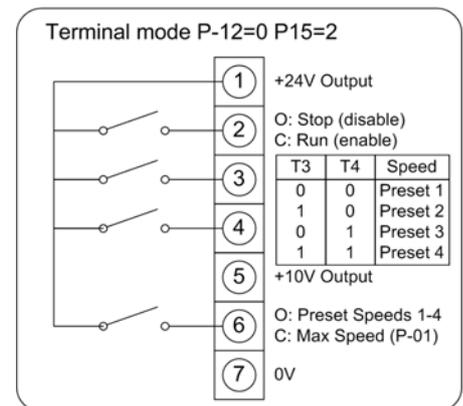
Typical Applications



Analog speed input with 1 preset speed and fwd/rev switch

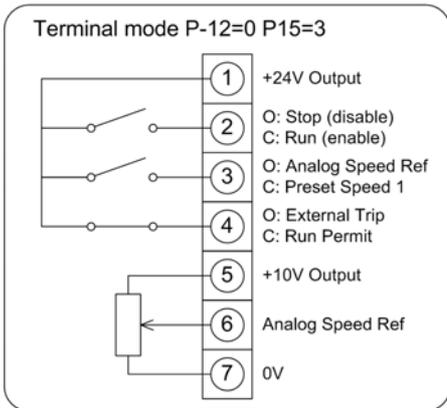


Analog speed input with 2 preset speeds

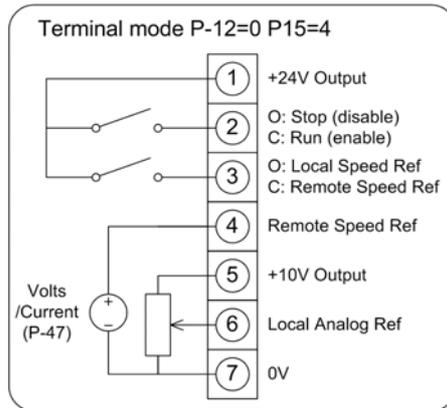


4 preset speeds and max speed select switch. Effectively giving 5 preset speeds

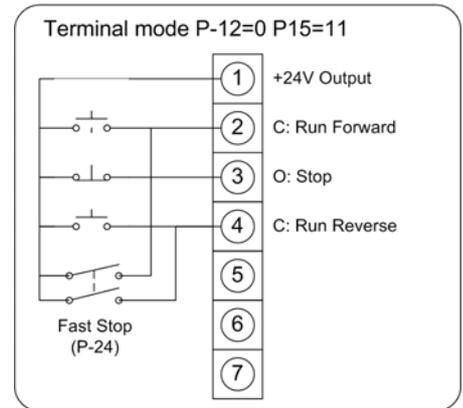
10. Analog and Digital Input Configurations



Analog speed input with 1 preset speed and motor thermistor trip



Local or remote analog speeds (2 analog inputs)

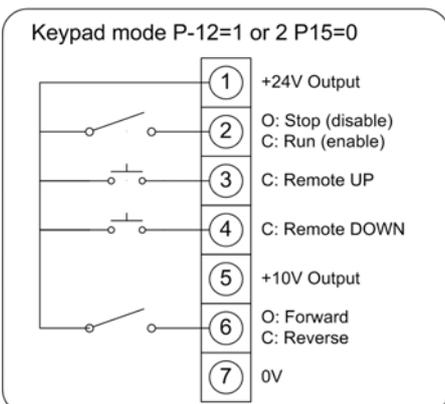


Push button fwd/rev/stop with fast stop using 2nd deceleration ramp

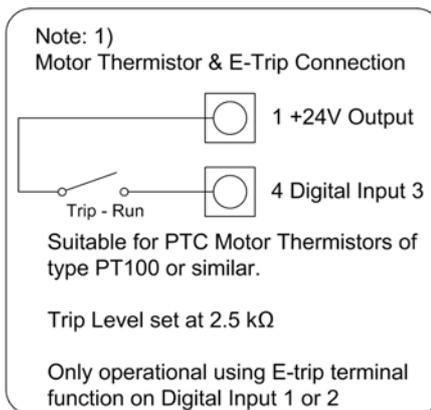
10.2. Keypad mode (P-12 = 1 or 2)

| P-15 | Digital input 1 (T2) | Digital input 2 (T3) | Digital input 3 (T4) | Analog input (T6) | Comments |
|----------------|--|--|---|--|--|
| 0, 1, 5, 8..12 | Open: Stop (disable) Closed: Run (enable) | Closed : remote UP push-button | Closed : remote DOWN push-button | Open : Forward +24V : Reverse | |
| 2 | Open: Stop (disable) Closed: Run (enable) | Closed : remote UP push-button | Closed : remote DOWN push-button | Open : Keypad speed ref +24V : Preset speed 1 | |
| 3 1) | Open: Stop (disable) Closed: Run (enable) | Closed : remote UP push-button | External trip input : Open: Trip, Closed: Run | Closed : remote DOWN push-button | Connect external thermistor type PT100 or similar to digital input 3 |
| 4 | Open: Stop (disable) Closed: Run (enable) | Closed : remote UP push-button | Open : Keypad speed ref Closed : Analog input 1 | Analog input 1 | |
| 6 1) | Open: Stop (disable) Closed: Run (enable) | Open : Forward run Closed : Reverse run | External trip input : Open: Trip, Closed: Run | Open : Keypad speed ref +24V : Preset speed 1 | Connect external thermistor type PT100 or similar to digital input 3 |
| 7 | Open: Forward Stop Closed: Forward Run | Open: Reverse Stop Closed: Reverse Run | External trip input : Open: Trip, Closed: Run | Open : Keypad speed ref +24V : Preset speed 1 | Closing digital inputs 1 and 2 together carries out a fast stop (P-24) |

Example Wiring



Remote push button speed control with fwd/rev



NOTE By default if the enable signal is present the drive will not Enable until the START button is pressed. To automatically enable the drive when the enable signal is present set P-31 = 2 or 3. This then disables the use of the START & STOP buttons

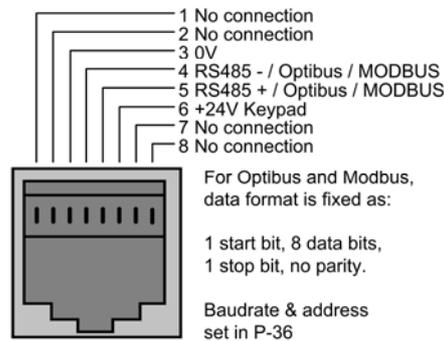
10. Analog and Digital Input Configurations



10.3. MODBUS control mode (P12 = 3 or 4)

| P-15 | Digital input 1 (T1) | Digital input 2 (T2) | Digital input 3 (T4) | Analog input (T6) | Comments |
|-------------------|--|--|---|------------------------|--|
| 0..2, 4..5, 8..12 | Open: Stop (disable) Closed: Run (enable) | No effect | No effect | No effect | Run and stop commands given via the RS485 link and Digital input 1 must be closed for the drive to run. |
| 3 ¹⁾ | Open: Stop (disable) Closed: Run (enable) | Open : Master speed ref Closed : Preset speed 1 | External trip input : Open: Trip, Closed: Run | No effect | Connect external thermistor type PT100 or similar to digital input 3 |
| 6 ¹⁾ | Open: Stop (disable) Closed: Run (enable) | Open : Master speed ref Closed : Analog input | External trip input : Open: Trip, Closed: Run | Analog input reference | Master Speed Ref - start and stop controlled via RS485. Keypad Speed Ref - drive auto runs if digital input 1 closed, depending on P-31 setting |
| 7 ¹⁾ | Open: Stop (disable) Closed: Run (enable) | Open : Master speed ref Closed : keypad speed ref | External trip input : Open: Trip, Closed: Run | No effect | |

10.3.1. RJ45 Data Connection pin configuration



10.3.2. Typical MODBUS configuration



Further information the MODBUS RTU Register Map and communication setup; please refer to the Advanced User Guide.

Master/Slave operation via the serial communications is only possible with Optidrive Plus 3GV or Optidrive VTC. Please visit www.invertek.co.uk for further information on these products.

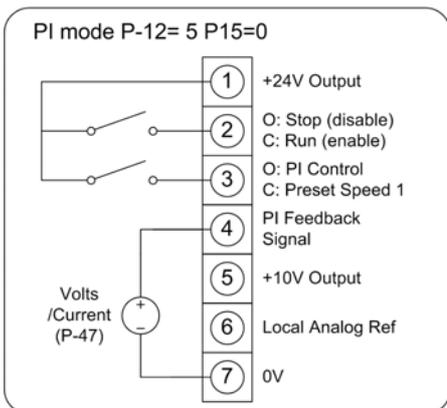
10. Analog and Digital Input Configurations



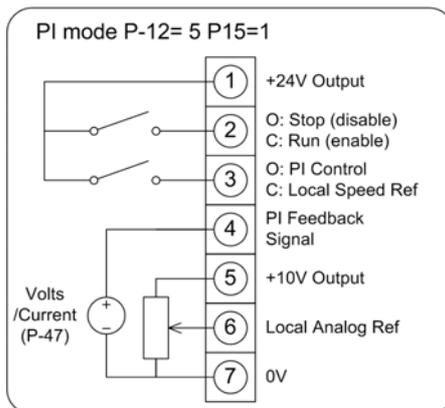
10.4. User PI control mode (P-12 = 5)

| P-15 | Digital input 1 (T2) | Digital input 2 (T3) | Digital input 3 (T4) | Analog input (T6) | Comments |
|-----------------------|--|--|--|--------------------------|--|
| 0, 2, 4..5, 8..12 | Open: Stop (disable) Closed: Run (enable) | Open : PI control Closed : Preset speed 1 | PI feedback analog input | No effect | |
| 1 | Open: Stop (disable) Closed: Run (enable) | Open : PI control Closed : Analog input 1 | PI feedback analog input | Analog input 1 | |
| 3, 6, 7 ¹⁾ | Open: Stop (disable) Closed: Run (enable) | Open : PI control Closed : Preset speed 1 | External trip input : Open: Trip, Closed: Run | PI feedback analog input | Connect external thermistor type PT100 or similar to digital input 3 |

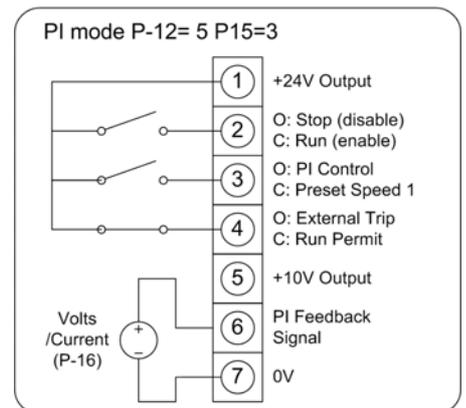
Example Wiring



Remote closed loop PI feedback control with Local Preset speed 1



Remote closed loop PI feedback control with Local Analog speed input

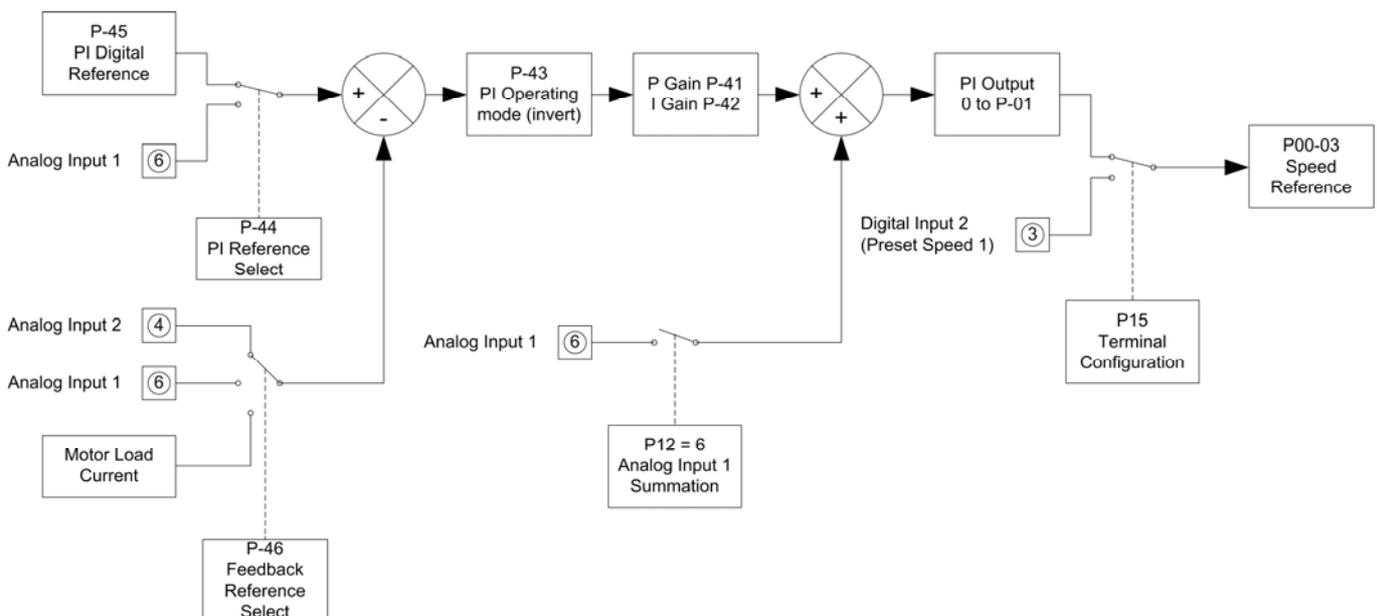


Remote closed loop PI feedback control with Local Preset speed 1 and motor thermistor trip

NOTE By default the PI reference is set for a digital reference level set in P-45. When using an Analog reference set P-44 = 1 (analog) and connect reference signal to analog input 1 (T6). The default settings for proportional gain (P-41), integral gain (P-42) and feedback mode (P-43) are suitable for most HVAC and pumping applications.

The analog reference used for PI controller can also be used as the local speed reference when P15=1.

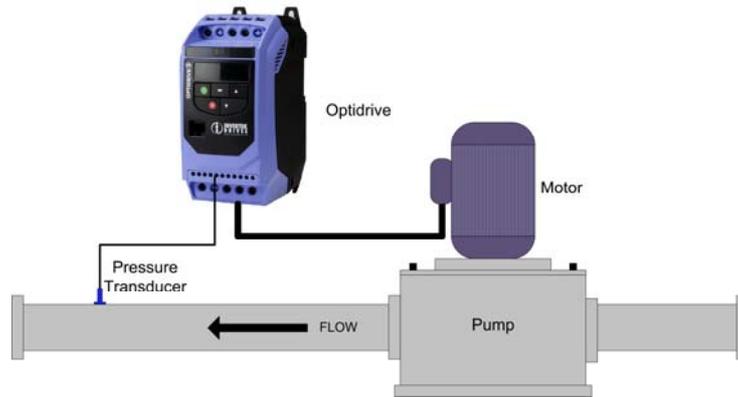
10.4.1. PI Logic Diagram



10. Analog and Digital Input Configurations



10.4.2. Typical PI Pressure control configuration.



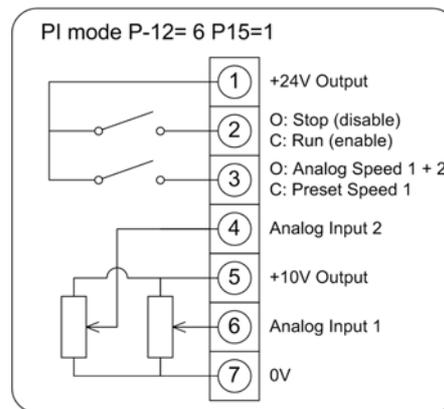
Further information on configuring the PI controller for typical feedback applications; please refer to the Advanced User Guide.

10.5. User PI with Analog Input Summation (P-12 = 5)

This setting utilises the PI controller to provide the drive with the ability to sum 2 analog signals together. Particularly useful for applications such as:

- Fume extraction cupboards
- Master / Slave applications requiring slave speed scaling
- Fine and course speed adjustment.

The signal from analog input 2 (PI feedback) uses the PI controller and provides a speed output which is summed with analog input 1 to provide the final drive speed output. Offsets and scaling factors can be introduced using the settings below.



Analog input 1 FINE speed adjustment
 Analog input 2 COURSE speed adjustment
 with control override using one Preset speed.

Analog Signal Offset & scaling

| Analog Input | Scaling | Offset |
|--------------|--------------------------|--------|
| 1 | P-35 | P-39 |
| 2 | P-41 (Proportional Gain) | N/A |

Further information on configuring the drive for such applications; please refer to the Advanced User Guide.

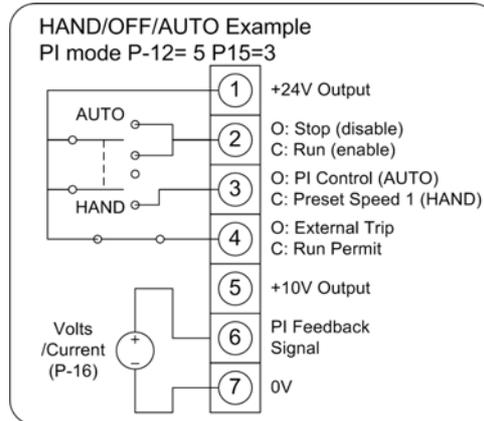
10. Analog and Digital Input Configurations



10.6. HAND/OFF/AUTO (Local/Remote) Applications

The Optidrive E2 supports Hand/Off/Auto control applications (also known as Local/Remote) for the HVAC and pumping industries.

Changeover from AUTO to HAND in most settings is done by toggling Digital Input 2 (T3). The drive always requires a hardware enable signal on Digital Input 1 (T2) in any mode of operation.



Some example modes of operation available for Hand/Off/Auto control have been defined below.

| HAND reference | AUTO reference | Parameter Settings |
|-------------------|------------------|---------------------|
| Preset Speed 1 | Master Speed Ref | P12= 3 or 4, P-15=3 |
| Analog input 1 | Master Speed Ref | P12= 3 or 4, P-15=6 |
| Digital Speed ref | Master Speed Ref | P12= 3 or 4, P-15=7 |
| Digital Speed ref | Analog input 1 | P12= 1 or 2, P-15=4 |
| Preset Speed 1 | Analog input 1 | P12= 0, P-15=0 |
| Analog input 2 | Analog input 1 | P12= 0, P-15=0 |
| Analog input 1 | PID Control | P12= 5, P-15=1 |
| Preset Speed 1 | PID Control | P12= 5, P-15=3 |

| | |
|--------------------------|---|
| Digital Speed ref | Speed set using keypad up & down keys |
| Analog input 1 | Speed set from analog input 1 |
| Analog input 2 | Speed set from analog input 2 |
| PID Control | Speed set by PID controller using external feedback reference |
| Master Speed Ref | MODBUS control speed reference |
| Preset Speed 1 | Fixed preset speed set in parameter P-20 |

Other configurations are also available; please refer to Optidrive E2 User Guide for configuring the Analog and Digital input terminals using parameter P-15.

For applications where a motor thermal protection is required, the PTC motor thermistor can be connected to the drive terminals with P-15 set provide a drive E-trip.

IP55 / NEMA 12 HVAC operation

The IP55 / NEMA 12 switched drive is pre-configured ready for use in HAND/OFF/AUTO applications. By settings the parameters above the drive with change from HAND to AUTO when the FWD/REV switch is changed.

11. Drive Protection



11. Drive Protection

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 |
| O-I | Over current on drive output. Excess load on the motor. Over temperature on the drive heatsink | Motor at constant speed: investigate overload or malfunction. Motor starting: load stalled or jammed. Check for star-delta motor wiring error. Motor accelerating/decelerating: The accel/decel time too short requiring too much power. If P-03 or P-04 cannot be increased, a bigger drive is required. Cable fault between drive and motor. |
| I.t-brP | Drive has tripped on overload after delivering >100% of value in P-08 for a period of time. | Check to see when the decimal points are flashing (drive in overload) and either increase acceleration ramp (P-03) or decrease motor load. Check cable length is within drive specification. Check the load mechanically to ensure it is free, and no jams, blockages or other mechanical faults exist |
| OI-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 from the rating tables are observed. |
| OL-br | Brake resistor overload | Brake resistor overload. Increase deceleration time, reduce load inertia or add further brake resistors in parallel. Ensure minimum resistance values from the rating tables are observed. |
| PS-brP | Internal power stage fault | 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. |
| O-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. |
| O-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. |
| th-FLt | Faulty thermistor on heatsink. | Refer to your IDL Authorised Distributor. |
| E-tr iP | External trip (on digital Input 2 or 3) | E-trip requested on digital input 2 or 3. Normally closed contact has opened for some reason. If motor thermistor is connected check if the motor is too hot. |
| SC-brP | Comms loss trip | Check communication link between drive and external devices. Make sure each drive in the network has its unique address. |
| P-LOSS | Input phase loss trip | Drive intended for use with a 3 phase supply has lost one input phase. |
| SPI n-F | Spin start failed | Spin start function failed to detect the motor speed. |
| dAtA-F | Internal memory fault. | Parameters not saved, defaults reloaded. Try again. If problem recurs, refer to your IDL Authorised Distributor. |
| 4-20 F | Analog input current out of range | Check input current in range defined by P-16. Check for loss of current input signal. |

12. Options



12. Options

12.1. Output Filters

Optidrive E2, like the majority of other inverter drives has unfiltered outputs. In the majority of applications this will give satisfactory performance, however, in a small number of applications output filtering is strongly recommended to improve system functionality, reliability and longevity. These applications include:

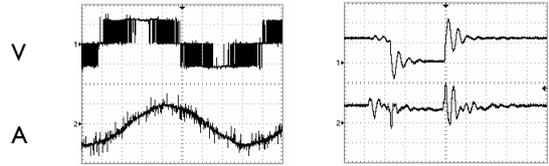
- Long motor cables, up to 200m
- High capacitance motor cables (ie typical "pyro" wire, used for fire protection)
- Multiple motors connected in parallel
- Motors without inverter grade insulation (typically older motors)

A range of high quality output filters are available for Optidrive with the following key features:

- Limits output voltage gradient, typically < 200V/μs
- Limits transient over voltages at the motor terminals, typically < 1000V
- Suppression of mains conducted interference in lower frequency ranges
- Compensation of capacitive load currents
- Reduction of rfi emissions from the motor cable
- Reduction of motor losses and audible noise caused by ripple

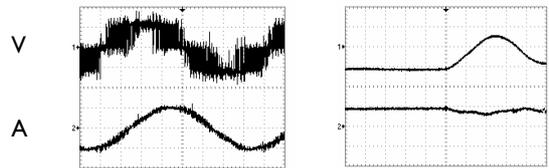
Comparison of characteristics:

Without filter



Switching pulse

With filter



Switching pulse

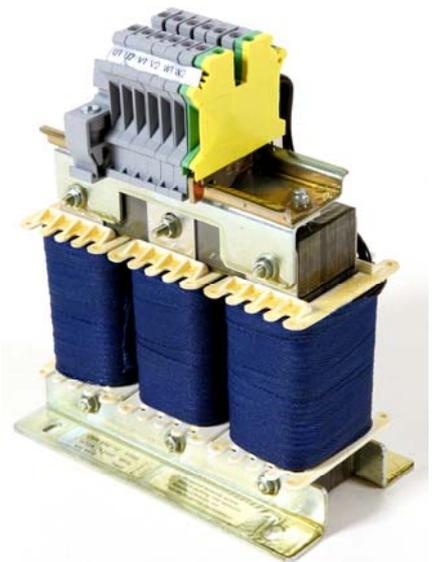
Note with filter that switching pulse rises slower and to a lower amplitude.

IP20 Output Filters

| Product Code | Optidrive Size | Rated Voltage | Phase | Rated Current (A) | Inductance / limb (mH) |
|--------------|----------------|---------------|-------|-------------------|------------------------|
| OD-OUTF1-xx | Size 1 | < 500V | 3 | 8 | 2 |
| OD-OUTF2-xx | Size 2 | | | 12 | 1.3 |
| OD-OUTF3-xx | Size 3 | | | 30 | 0.5 |

IP55 Output Filters

| Product Code | Optidrive Size | Rated Voltage | Phase | Rated Current (A) | Inductance / limb (mH) |
|-------------------|----------------|---------------|-------|-------------------|------------------------|
| OD-OUTF1-IN-I55 | Size 1 | < 400V | 3 | 8 | 2 |
| OD-OUTF2- IN-I55 | Size 2 | < 600V | | 12 | 1.3 |
| OD-OUTF3- IN-I55* | Size 3 | | | 30 | 0.5 |



12. Options



12.2. Optibrake – Dynamic Braking Resistors

Optibrake dynamic braking resistors are designed specifically for the Optidrive range. For use with high inertia loads which need to be stopped rapidly,

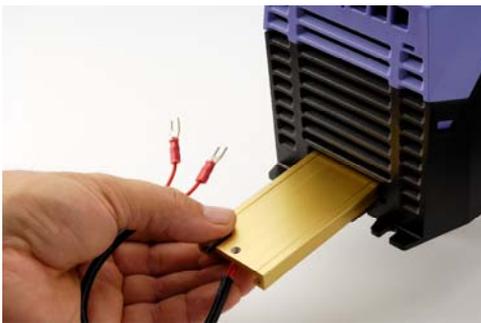
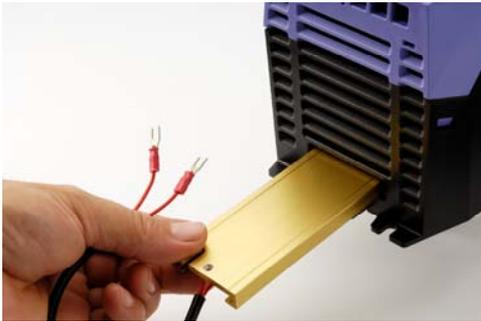
Optibrake dynamic braking resistors assist the Optidrive manage the electrical energy returned from the motor during braking, by converting it to heat energy.

Key Benefits

- Optidrive software protects the Optibrake from overload, hence no need for expensive overload relays are required (P-34=1)
- Internal fusible element ensures fail safe operation
- IP20 resistor fits inside of the drive, using heatsinking properties of heatsink to prevent overheating. No space envelope penalty, fits inside of drive
- Series & parallel arrangements for more demanding applications



| Product Code | OD-BR100-IN | OD-BR050-IN-I55 |
|------------------------|-------------|-----------------|
| Ingress Protection | IP20 | IP55 |
| Resistance | 100 Ω | 50 Ω |
| Continuous Power | 200 W | 200 W |
| Peak Power (0.125secs) | 12 kW | 12 kW |



The brake resistor fits into the drive as shown and is secured in place using 2 * M4 screws into the rear of the drive.

Minimum Brake resistor values to be fitted to the Optidrive E2.

| Drive Voltage Rating | Drive kW Rating | Drive HP Rating | Minimum Resistor Value |
|----------------------|-----------------|-----------------|------------------------|
| 110-115V | - | 2 | 47 Ω |
| 200-240V | 1.5 to 4 | 2 to 5 | 47 Ω |
| 380-480V | 1.5 to 5 | 2 & 5 | 47 Ω |
| | 5.5 & 7.5 | 7.5 & 10 | 22 Ω |

Brake Voltage Levels (based on the internal DC bus voltage – P00-I5)

| Drive Voltage Rating | Brake Turn Off Level | Brake Turn On Level |
|----------------------|----------------------|---------------------|
| 200-240V | 378 Vdc | 390 Vdc |
| 380-480V | 756 Vdc | 780 Vdc |



For non-Invertek approved resistors or application requiring higher braking powers external thermal/overload protection for the resistor is required

12. Options



12.3. Optiport E2 – Remote Keypad and Display

Optiport E2 is an intelligent device with a built in microcontroller.

Optidrive E2 connects to Optidrive E2 units, either singularly or in a network.

Optiport units act as the remote keypad and display for the Optidrive on the network which has the same serial address. The physical layout and the operation of the Optiport keypad and display mimic the Optidrive exactly.



Key Benefits

- Real time keypad and display operation mimics Optidrive
- Single electrical interface for power and data
- Communicates with any compatible drive across a network
- Automatic connection to compatible drives
- IP54 rated when through panel mounted
- Bright LED Display
- Membrane keypad
- Parameter lock function available

General Specification

- Signal Interface: Standard 8 way RJ45 connector.
- Supply Input: 10 – 36VDC, 30mA
- RS485 signal : industry standard 2 wire + 5V differential
- Operating Temperature : 0 – 50°C
- Storage Temperature : -40 – 60°C
- Relative Humidity : <95% (non condensing)
- Protection Rating : IP54 when installed

Product Code: OPT-OPOINT-IN -

The Optiport E2 is supplied with an RJ45 to RJ45 3m data cable (OPT-J4530).

One Optiport with a single drive



One Optiport with a multiple drives



12. Options

12.4. Optistick

For fast and accurate repeat drive programming

Simply insert Optistick into the RJ45 slot on the face of the Optidrive E2:

- Upload/download buttons allow for fast copying of parameters between drives
- Infra red communications capability provides remote control convenience
- Can be programmed with PDA or Smart phone

Product Code: OPT-STICK



12.5. Optiwand PDA / Optiwand SP

Unique Wireless Programming Tool

Optiwand software is a Windows Mobile 5 application software, available as Optiwand PDA for Pocket PC's (PDAs) and Optiwand SP for Smartphones. This unique concept allows users to commission drives and retain parameter records without the requirement for an expensive lap top PC or complex connection cables, saving both time and costs. Parameter sets are stored as files for simple editing and later transfer to a PC. Communication can take place through transparent materials, such as glass and perspex.

Key Features

- Real Time Parameter Access and Monitoring
- Infra Red based communications, no cable required
- Multi Language Support
- Online Parameter Help and Descriptions
- Fast Copy Facility
- Remote Control and Monitoring

Optiwand SP and Optiwand PDA are compatible with most Pocket PCs and Smartphones running the Windows Mobile 5.0 operating system.

Optiwand software is available as a free download from our website: www.invertek.co.uk



12. Options



12.6. RJ45 Data Cable Splitter

The data cable splitter is an RJ45 1 to 2 way connection block. Suitable for connecting multiple drives to a communications network.

Product Code: OPT -J45SP



12.7. RJ45 Data Cables

All RJ45 data cables for connecting to Optidrive E2 are available in blue and come in blue.



Product code: OPT-J4505
RJ45 to RJ45 RS485 Data Cable, 0.5m length, Blue
Product code: OPT-J4510
RJ45 to RJ45 RS485 Data Cable, 1.0m length, Blue
Product code: OPT-J4530
RJ45 to RJ45 RS485 Data Cable, 3.0m length, Blue

12.8. Relay Option Cards

2ROUT

2ROUT provides a programmable second relay output to the drive.

Using the control parameter settings of the User Relay (Relay 1) and the digital output (Relay 2).



Product Code: ODP -2ROUT

SPECIFICATION

| | |
|-------------------------------------|---------------------------------------|
| Size: | 56 x 33 (not pins) x 14mm (L x W x H) |
| Max relay switching voltage: | 250V AC/ 220V DC |
| Max relay switching current: | 1 A |
| Operating Temperature: | -10°C to + 50°C |
| Protection Class: | IP20 |
| Conformity: | UL94V-0 |

HVACO

HVACO provides 2 relays for typical "drive running" & "drive tripped" indicators



Product Code: OPT -HVACO

SPECIFICATION

| | |
|-------------------------------------|---------------------------------------|
| Size: | 56 x 33 (not pins) x 14mm (L x W x H) |
| Max relay switching voltage: | 250V AC/ 220V DC |
| Max relay switching current: | 1 A |
| Operating Temperature: | -10°C to + 50°C |
| Protection Class: | IP20 |
| Conformity: | UL94V-0 |

12. Options



12.9. Fieldbus Gateways

Optidrive to Fieldbus & Industrial Ethernet Gateway family incorporating the Anybus Communicator. Ideal for factory, building and process automation industries.

Anybus Communicator can connect an Optidrive with a MODBUS RTU RS485 communication interface to Fieldbus and Industrial Ethernet networks. The Communicator performs an intelligent conversion between the serial protocol and the chosen industrial network. The translation between the serial protocol and the network is configured by Invertertek.

TECHNICAL SPECIFICATIONS

| | |
|---------------------------|--|
| Size: | 120 x 75 x 27mm (L x W x H) 4.72 x 2.95 x 1.06" (L x W x H) |
| Power Supply: | 24V ± 10% Consumption: Max 280mA on 24V Typically 100mA |
| Temperature: | Operating +0°C to + 55°C : Non-Operating -5°C to + 85°C |
| Mounting: | DIN-rail, PE via DIN-rail |
| Protection Class: | IP20 |
| EMC Certification: | CE marked, UL & cUL conformance |
| Conformance: | Tested and verified for fieldbus conformance |



| Product Code | Network Type | Comprises | Default No. of Drives | Max No. of Drives |
|---------------------|--------------|--|-----------------------|-------------------|
| OD-PROFB-IN | Profibus DP | Profibus gateway with RJ11 - 9 way D type & RJ45 - 9 way D type data cables | 4 | 8 |
| OD-DEVNET-IN | DeviceNet | DeviceNet gateway with RJ11 - 9 way D type & RJ45 - 9 way D type data cables | 4 | 4 |
| OD-ETHNET-IN | Ethernet | Ethernet gateway with RJ11 - 9 way D type & RJ45 - 9 way D type data cables | 4 | 4 |

Each gateway module is pre-programmed by Invertertek for the default number of drives. The gateway can be configured to match the number of drives connected (up to the max). The configuration files are available upon request from Invertertek.

There are 2 cables supplied with the Gateway, one is for connecting to an Optidrive Plus & VTC drive network (RJ11), the second is for connecting to an Optidrive E2 network (RJ45).

It is not possible to mix Optidrive Plus and Optidrive VTC drives with an Optidrive E2 drives from a single gateway module.

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