

# OPTIDRIVE™ CP<sup>2</sup>

AC Variable Speed Drive

## Powerful Performance

Advanced motor control



0.75kW – 250kW / 1.0HP – 350HP  
**200–480V** Single & 3 Phase Input

# At a Glance...

High performance, excellent usability and flexible to meet the needs of your application

**Keyhole  
Mounts for fast  
installation**

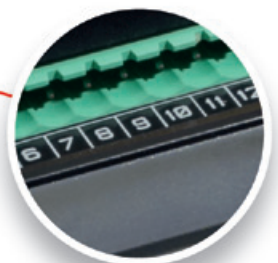


**Integrated  
Keypad & Display**  
(LED or Multi-language OLED  
Display)



**IP55 / NEMA 12**

**Integrated  
EMC Filter**



**Pluggable Control  
Terminals**



**High Quality  
Long-life Fans**

**Integral  
Brake  
Transistor**

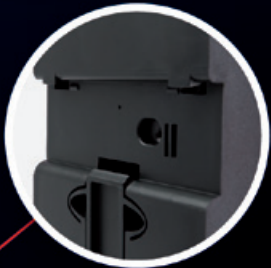


**Integrated Cable  
Management**

**Contactor-style Power Wiring Arrangement**



**Keyhole Mounts for fast installation**



**Convenient Reference Card**

**DIN Rail Mount**

**Modbus RTU and CANopen on board as standard**



**Modbus  
CANopen**



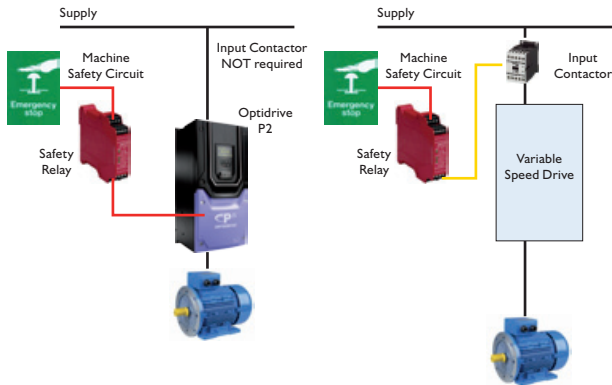
**Safe Torque Off** (provided as standard)

Optidrive P2 features a safe torque off function to allow simple integration into machine critical safety circuits.

- Simple machine design reduces component costs, saves panel space and minimises installation time
- Faster shut down and reset procedures reduce system maintenance time
- Better safety standard compared to mechanical solution
- Better motor connection. Single cable with no interruption.

**With**

**Without**



# Powerful Performance

World leading control for the latest generation of permanent magnet and standard induction motors

Manufacturing Pumping Conveyer Systems Machine Tools Processing Plants Chemical Rubber Elevators Cranes



## World Leading Motor Control

The all new Optidrive P2 offers the perfect combination of high performance together with ease of use to allow even the most demanding applications to be tackled easily.

Designed for fast installation and commissioning, Optidrive P2 provides the most cost effective solution for industry.

All Optidrive P2 units provide 150% overload for 60 seconds as standard, ensuring each drive is suitable for Heavy Duty applications, whilst the IP55 enclosed versions ensure the drive is tough enough to survive in industrial environments.

Extensive I/O and communications interface capabilities ensure the drive can be integrated quickly and efficiently into a wide variety of control systems with the minimum commissioning time, ensuring rapid start up. Inverter's simple parameter structure, and carefully selected factory parameter settings ensure that commissioning time is kept to a minimum.



Compliant with international standards.  
Manufactured in the UK.

150% overload for 60 seconds

## Advanced Motor Control

Invertek has developed advanced mathematical algorithms and uses the very latest hardware technology to ensure Optidrive P2 provides exceptional motor control with a simple interface to help users easily apply the benefits to their applications.



**IP20**

Panel mount units available up to 11kW



**IP55**

Wall mount units available up to 160kW



**IP66**

Wall mount units available up to 7.5kW

## Drive System Efficiency

With today's ever increasing energy costs, efficiency has long been a key factor in relation to drive system component selection. In many cases, an efficiency figure can be arrived at by simply multiplying the efficiencies of the various components together to find a combined efficiency figure, however this may not tell the whole story. The efficiency of components such as drives, motors and gearboxes can vary considerably with speed and load, hence simply combining the 'headline' efficiency figures can often be very misleading. In reality, the efficiency curves for the whole system should be overlaid, to provide a true efficiency figure for the system across the desired speed and load range.

Modern AC inverters will typically have an electrical efficiency of around 98%, which represents the difference between the electrical output power compared to electrical input power only. A further factor that is often overlooked is the efficiency of the motor control strategy employed by the drive. This can have a significant effect on the overall system efficiency, and is often not considered when energy saving calculations are made.

Optidrive P2 has been designed to work with both standard induction motors, which typically meet the IE2 efficiency standards currently in place in Europe, and the latest generation of high efficiency PM motors designed to meet the future IE4 requirements. This means that an efficient drive can be purchased now, allowing for a future update of the motor without requiring a change to the installed drive.

Furthermore, Optidrive P2 has been designed and developed to work with all PM motors, and control them with Optimum efficiency, providing the most efficient PM motor control available.

The graphs below clearly demonstrate these two factors:

- The overall efficiency of the system varies with speed and load and is not a constant
- Motor control efficiency significantly affects overall system efficiency

The graphs are generated by measuring the electrical power drawn from the mains supply compared to the torque generated at the output shaft. These are based on a system requirement of 2.2kW motor power.

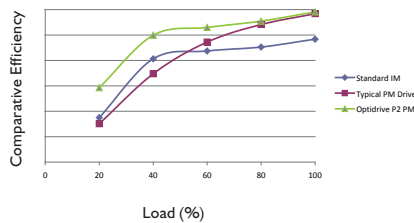
The **blue line** represents what will be considered a "high efficiency" solution using an efficient IM motor, a modern AC drive and efficient gearbox.

The **red line** represents efficiency of a typical PM motor and drive solution. Efficiency is improved at high speeds and loads, however it is actually reduced at very low loads, and output torque cannot be maintained at low speeds.

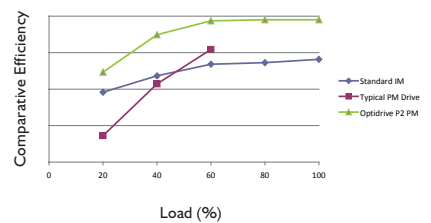
The **green line** represents the Optidrive P2 controlling the same PM motor. Efficiency is improved at all speeds and loads.

In simple terms, Optidrive P2 PM motor control produces the maximum amount of output shaft torque per electrical kW consumed across all speed and torque ranges.

Improvement in Efficiency at 100% Rated Speed Output



Improvement in Efficiency at 10% Rated Speed Output



# Applications

High performance, accurate motor control for even the most demanding of applications



## Mining & Quarrying

- Feed conveyers
- Crushers
- Cranes

## Metals & Processing

- Grinding
- Cutting
- Polishing
- Drilling
- Rolling

## Rubber & Plastics

- Extruders
- Moulding
- Mixers
- Winding

## Food & Beverage

- Conveyers
- Pumps
- Mixers
- Palletisers

Powerful, versatile and easy to use

## Cranes



### Requirements:

- High starting torque
- Smooth motor operation throughout starting and stopping phases
- Motor holding brake control
- Avoidance of load droop and sag
- Regeneration and braking capability during load lowering

### Optidrive P2 provides:

- Dedicated Hoist Mode Operation with motor holding brake control algorithm
- Up to 200% torque from zero speed in vector operation without encoder feedback
- Multiple Preset Speed or variable speed operation
- Built in dynamic braking transistor, requires only an external resistor

## Compressors



### Requirements:

- Precise regulation of speed to ensure a consistent end product
- High starting torque demand in many applications
- Maximum efficiency under all conditions
- Safe operation to prevent accidents and injuries

### Optidrive P2 Provides:

- PM Motor control mode to allow open loop operation with Permanent Magnet motors for maximum efficiency
- Maximum starting torque with standard AC motors
- Better than 0.5% speed holding accuracy in Open Loop Vector Operation
- Dedicated Safe Torque Off input complies with EN62061 SIL Level 2 for safe operation

## Winding



### Requirements:

- Precise control of motor torque over a broad speed range
- Accurate control of material tension under all conditions
- Open or closed loop control capability, based on tension feedback or winding diameter
- Web break protection in case of material breakage

### Optidrive P2 Provides:

- PID Closed Loop Tension Control with feedback from a load cell or dancer arm
- Open Loop Vector control provides optimum control of the output torque level
- Encoder feedback option allows for a very wide speed range, even down to zero speed
- Safe Torque Off input immediately disables the drive in Emergency conditions

# Options & Accessories

Installation options, plug-in modules and commissioning tools



## Plug-in Option Modules



### Fieldbus Interfaces Communication Options

#### Profibus DP



Product Code: OPT-2-PROFB-IN

Modbus RTU and CANopen  
on board as standard

#### DeviceNet



Product Code: OPT-2-DEVNT-IN

#### Ethernet IP



Product Code: OPT-2-ETHNT-IN

#### Modbus TCP



Product Code: OPT-2-MODIP-IN

#### Profinet



Product Code: OPT-2-PFNET-IN

#### EtherCat



Product Code: OPT-2-ETCAT-IN

### Expansion Modules

Extended Functionality

#### Encoder Feedback

Closed loop encoder feedback, compatible with a wide range of incremental encoders.

Product Code: OPT-2-ENCOD-IN

#### Extended I/O

- Additional 3 Digital Inputs
- Additional Relay Output

Product Code: OPT-2-EXTIO-IN

#### Extended Relay

Additional 3 Relay Outputs:

- Relay 3** – Drive Healthy Indication
- Relay 4** – Drive Fault Indication
- Relay 5** – Drive Running Indication

Functions are programmable / adjustable

Product Code: OPT-2-CASCD-IN



## Installation & Peripheral Options

A range of external EMC Filters, Brake Resistors, Input Chokes and Output Filters are available, to suit all installation requirements

### Optistick

 Bluetooth®

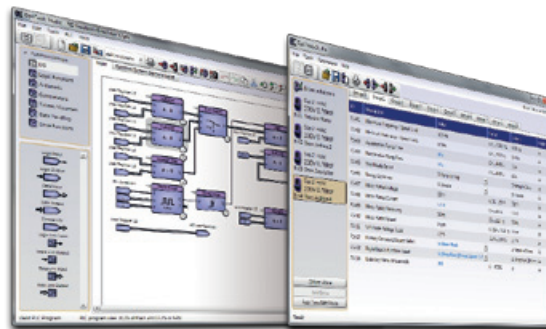


#### Rapid Commissioning

- Allows rapid copying of parameters between multiple drives
- Provides Bluetooth wireless interface to a PC running OptiTools Studio
- Backup and restore of drive parameters

**Product Code: OPT-2-STICK-IN**

## OptiTools Studio



## Powerful PC Software

Drive commissioning and parameter backup

- Real-time parameter editing
- Drive network communication
- Parameter upload, download and storage
- Simple PLC function programming

Compatible with Windows XP, Windows Vista & Windows 7

kW Model Code	Product Range	Generation	Frame Size	Supply Voltage	Power Rating	Input Phases	Power Type	Factory Build Options	HP Model Code	Product Range	Generation	Frame Size	Supply Voltage	Power Rating	Input Phases	Power Type	Factory Build Options	Factory Build Options							
																		EMC Filter	Brake Transistor	Enclosure	IP20	IP35	IP66 Non-switched	IP66 Switched	Display
200-240V ± 10% 1 Phase Input	0.75	1	4.3	2	ODP-2-2-2 075-1 K	F 4 #	# #		ODP-2-2-2 010-1 H	F 4 #	# #							F	4	2	X Y	S T	N C		
	1.5	2	7	2	ODP-2-2-2 150-1 K	F 4 #	# #		ODP-2-2-2 020-1 H	F 4 #	# #							F	4	2	X Y	S T	N C		
	2.2	3	10.5	2	ODP-2-2-2 220-1 K	F 4 #	# #		ODP-2-2-2 030-1 H	F 4 #	# #							F	4	2	X Y	S T	N C		
200-240V ± 10% 3 Phase Input	0.75	1	4.3	2	ODP-2-2-2 075-3 K	F 4 #	# #		ODP-2-2-2 010-3 H	F 4 #	# #							F	4	2	X Y	S T	N C		
	1.5	2	7	2	ODP-2-2-2 150-3 K	F 4 #	# #		ODP-2-2-2 020-3 H	F 4 #	# #							F	4	2	X Y	S T	N C		
	2.2	3	10.5	2	ODP-2-2-2 220-3 K	F 4 #	# #		ODP-2-2-2 030-3 H	F 4 #	# #							F	4	2	X Y	S T	N C		
	4	5	18	3	ODP-2-3-2 040-3 K	F 4 #	# #		ODP-2-3-2 050-3 H	F 4 #	# #							F	4	2	X Y	S T	N C		
	5.5	7.5	24	3	ODP-2-3-2 055-3 K	F 4 2	# #		ODP-2-3-2 075-3 H	F 4 2	# #							F	4	2	X Y	S T	N C		
	5.5	7.5	24	4	ODP-2-4-2 055-3 K	F 4 N	# #		ODP-2-4-2 075-3 H	F 4 N	# #							F	4		N	S T	N C		
	7.5	10	30	4	ODP-2-4-2 075-3 K	F 4 N	# #		ODP-2-4-2 100-3 H	F 4 N	# #							F	4		N	S T	N C		
	11	15	46	4	ODP-2-4-2 110-3 K	F 4 N	# #		ODP-2-4-2 150-3 H	F 4 N	# #							F	4		N	S T	N C		
	15	20	61	5	ODP-2-5-2 150-3 K	F 4 N	# #		ODP-2-5-2 020-3 H	F 4 N	# #							F	4		N	S T	N C		
	18.5	25	72	5	ODP-2-5-2 185-3 K	F 4 N	# #		ODP-2-5-2 025-3 H	F 4 N	# #							F	4		N	S T	N C		
	22	30	90	6	ODP-2-6-2 022-3 K	F # N	# #		ODP-2-6-2 030-3 H	F # N	# #							F	1 4		N	S T	N C		
	30	40	110	6	ODP-2-6-2 030-3 K	F # N	# #		ODP-2-6-2 040-3 H	F # N	# #							F	1 4		N	S T	N C		
	37	50	150	6	ODP-2-6-2 037-3 K	F # N	# #		ODP-2-6-2 050-3 H	F # N	# #							F	1 4		N	S T	N C		
	45	60	180	6	ODP-2-6-2 045-3 K	F # N	# #		ODP-2-6-2 060-3 H	F # N	# #							F	1 4		N	S T	N C		
	55	75	202	7	ODP-2-7-2 055-3 K	F # N	# #		ODP-2-7-2 075-3 H	F # N	# #							F	1 4		N	S T	N C		
75	100	248	7	ODP-2-7-2 075-3 K	F # N	# #		ODP-2-7-2 100-3 H	F # N	# #							F	1 4		N	S T	N C			
380-480V ± 10% 3 Phase Input	0.75	1	2.2	2	ODP-2-2-4 075-3 K	F 4 #	# #		ODP-2-2-4 010-3 H	F 4 #	# #							F	4	2	X Y	S T	N C		
	1.5	2	4.1	2	ODP-2-2-4 150-3 K	F 4 #	# #		ODP-2-2-4 020-3 H	F 4 #	# #							F	4	2	X Y	S T	N C		
	2.2	3	5.8	2	ODP-2-2-4 220-3 K	F 4 #	# #		ODP-2-2-4 030-3 H	F 4 #	# #							F	4	2	X Y	S T	N C		
	4	5	9.5	2	ODP-2-2-4 400-3 K	F 4 #	# #		ODP-2-2-4 050-3 H	F 4 #	# #							F	4	2	X Y	S T	N C		
	5.5	7.5	14	3	ODP-2-3-4 055-3 K	F 4 #	# #		ODP-2-3-4 075-3 H	F 4 #	# #							F	4	2	X Y	S T	N C		
	7.5	10	18	3	ODP-2-3-4 075-3 K	F 4 #	# #		ODP-2-3-4 100-3 H	F 4 #	# #							F	4	2	X Y	S T	N C		
	11	15	24	3	ODP-2-3-4 110-3 K	F 4 2	# #		ODP-2-3-4 150-3 H	F 4 2	# #							F	4	2	X Y	S T	N C		
	11	15	24	4	ODP-2-4-4 110-3 K	F 4 N	# #		ODP-2-4-4 150-3 H	F 4 N	# #							F	4		N	S T	N C		
	15	20	30	4	ODP-2-4-4 150-3 K	F 4 N	# #		ODP-2-4-4 200-3 H	F 4 N	# #							F	4		N	S T	N C		
	18.5	25	39	4	ODP-2-4-4 185-3 K	F 4 N	# #		ODP-2-4-4 250-3 H	F 4 N	# #							F	4		N	S T	N C		
	22	30	46	4	ODP-2-4-4 220-3 K	F 4 N	# #		ODP-2-4-4 300-3 H	F 4 N	# #							F	4		N	S T	N C		
	30	40	61	5	ODP-2-5-4 300-3 K	F 4 N	# #		ODP-2-5-4 040-3 H	F 4 N	# #							F	4		N	S T	N C		
	37	50	72	5	ODP-2-5-4 370-3 K	F 4 N	# #		ODP-2-5-4 050-3 H	F 4 N	# #							F	4		N	S T	N C		
	45	60	90	6	ODP-2-6-4 045-3 K	F # N	# #		ODP-2-6-4 060-3 H	F # N	# #							F	1 4		N	S T	N C		
	55	75	110	6	ODP-2-6-4 055-3 K	F # N	# #		ODP-2-6-4 075-3 H	F # N	# #							F	1 4		N	S T	N C		
	75	120	150	6	ODP-2-6-4 075-3 K	F # N	# #		ODP-2-6-4 120-3 H	F # N	# #							F	1 4		N	S T	N C		
	90	150	180	6	ODP-2-6-4 090-3 K	F # N	# #		ODP-2-6-4 150-3 H	F # N	# #							F	1 4		N	S T	N C		
	110	175	202	7	ODP-2-7-4 110-3 K	F # N	# #		ODP-2-7-4 175-3 H	F # N	# #							F	1 4		N	S T	N C		
	132	200	240	7	ODP-2-7-4 132-3 K	F # N	# #		ODP-2-7-4 200-3 H	F # N	# #							F	1 4		N	S T	N C		
	160	250	302	7	ODP-2-7-4 160-3 K	F # N	# #		ODP-2-7-4 250-3 H	F # N	# #							F	1 4		N	S T	N C		
200	300	370	8	ODP-2-8-4 200-3 K	F # 4	# #		ODP-2-8-4 300-3 H	F # 4	# #							F	1 4	4		S T	N C			
250	350	450	8	ODP-2-8-4 250-3 K	F # 4	# #		ODP-2-8-4 350-3 H	F # 4	# #							F	1 4	4		S T	N C			

**kW Models: Factory Settings**  
 Motor Rated Frequency: 50Hz  
 Motor Rated Voltage: 400V

**HP Models: Factory Settings**  
 Motor Rated Frequency: 60Hz  
 Motor Rated Voltage: 460V

Replace # in model code with colour-coded option  
 IP20 units are available with 7 Segment LED Display only

NOT TO SCALE

Size	2	2	3	3	4	5	6	7	8
Enclosure	IP20	IP66	IP20	IP66	IP55	IP55	IP55	IP55	IP40
Height (mm)	221	257	261	310	440	540	865	1280	2000
Width (mm)	112	188	131	211	171	235	330	330	500
Depth (mm)	185	239	205	251	240	270	330	360	516
Weight (kg)	1.8	4.8	3.5	7.3	11.5	22.5	50	80	270

W      H      D

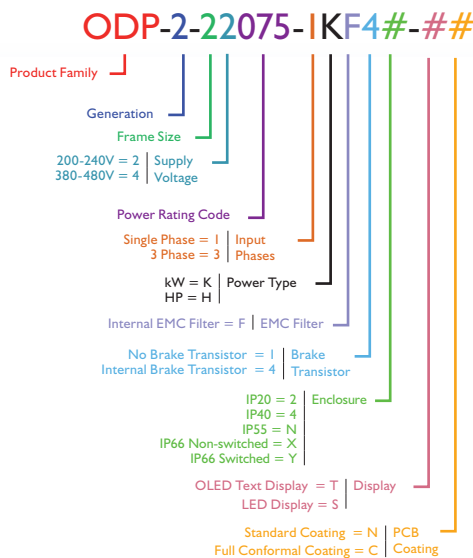
## Drive Specification

Input Ratings	Supply Voltage	200 – 240V ± 10% 380 – 480V ± 10%
	Supply Frequency	48 – 62Hz
	Displacement Power Factor	> 0.98
	Phase Imbalance	3% Maximum allowed
	Inrush Current	< rated current
	Power Cycles	120 per hour maximum, evenly spaced
Output Ratings	Output Power	230V 1 Phase Input: 0.75–2.2kW (1–3HP) 230V 3 Phase Input: 0.75–75kW (1–100HP) 400V 3 Phase Input: 0.75–250kW 460V 3 Phase Input: 1–350HP
	Overload Capacity	150% for 60 seconds
	Output Frequency	0 – 500Hz, 0.1Hz resolution
	Typical Efficiency	98%
	Ambient Conditions	Temperature: Storage : –40 to 60°C Operating : –10 to 50°C Altitude: Up to 1000m ASL without derating Up to 2000m maximum UL Approved Up to 4000m maximum (non UL) Above 1000m : Derate by 1% per 100m Humidity: 95% Max, non-condensing
Enclosure	Ingress Protection	IP20 (Size 2, 3) IP40 (Size 8) IP55 (Size 4, 5, 6, 7) IP66 (Size 2, 3)
	Programming	Keypad: Built-in Keypad as standard Optional remote mountable keypad Display: Optional OLED or LED display (OLED Display Multi Language) PC: OptiTools Studio

Control Specification	Control Method	V/F Voltage Vector Energy Optimised V/F Sensorless Vector Speed Control Sensorless Vector Torque Control Closed Loop (Encoder) Speed Control  Closed Loop (Encoder) Torque Control  Open Loop PM Vector Control
	PWM Frequency	4 – 32kHz Effective
	Stopping Mode	Ramp to Stop : User Adjustable 0.1 – 600 seconds Coast to Stop
	Braking	Motor Flux Braking Built-in Braking Transistor (Optional for frame sizes 6 & 7)
Setpoint Control	Skip Frequency	Single point, user adjustable
	Analog Signal	0 to 10 Volts 10 to 0 Volts –10 to 10 Volts 0 to 20mA 20 to 0mA 4 to 20mA 20 to 4 mA
	Digital	Motorised Potentiometer (Keypad) Modbus RTU CANopen
Optional	Profibus DP, DeviceNet, EthernetIP, Modbus TCP, EtherCat, Profinet	

I/O Specification	Power Supply	24 Volt DC, 100mA, Short Circuit Protected 10 Volt DC, 5mA for Potentiometer
	Programmable Inputs	5 Total as standard (Optional additional 3)  3 Digital (Optional additional 3) 2 Analog / Digital Selectable
	Digital Inputs	10 – 30 Volt DC, internal or external supply, PNP Response time : < 4ms
	Analog Inputs	Resolution : 12 bits Response time : < 4ms Accuracy : < +/-2% of Full Scale Parameter adjustable scaling and offset
	Programmable Outputs	4 Total (Optional additional 3) 2 Analog / Digital 2 Relays (Optional additional 3)
	Relay Outputs	Maximum Voltage : 250 VAC, 30 VDC Switching Current Capacity : 6A AC,  0 to 10 Volt 0 to 20mA 4 to 20mA
Control Features	Hoist Operation	Dedicated Hoist Operation Mode
	PID Control	Internal PID control with feedback display
Maintenance & Diagnostics	Fault Memory	Last 4 Trips stored with time stamp
	Data Logging	Logging of data prior to trip for diagnostic purposes : Output Current, Drive Temperature, DC Bus Voltage
	Maintenance Indicator	Maintenance Indicator with user adjustable maintenance interval Onboard service life monitoring
	Monitoring	Hours Run Meter Resettable & Non Resettable kWh meters
Standards Compliance	EN 61800-3:2004	Adjustable speed electrical power drive systems. EMC requirements.
		2004/108/EC
	Low Voltage Directive	230 Volt 1 Phase Models Category C1 according to EN61800-3:2004  400 Volt 3 Phase Models Category C2 according to EN61800-3:2004
	Machinery Directive	98/37/EC
	Conformance	UL, cUL, C-Tick, ROHS, Gost R

## Model Code Guide



## Connection Diagram



Function	Default Setting
12 Volt DC Output, 100mA max / 24 Volt DC Input	
Digital Input 1	Drive Enable
Digital Input 2	Forward / Reverse Select
Digital Input 3	Preset Speed 1 Select
+ 10 Volt Power Supply	5mA
Analog Input 1	Speed Reference 0–10 Volt
0 Volt	
Analog Output 1	Motor Speed
0 Volt	
Analog Input 2	
Analog Output 2	Motor Current
Safe Torque Off Input	
Safe Torque Off Input	
Output Relay 1	Drive Healthy / Fault
Output Relay 2	Drive Running



UK Head Office, Welshpool

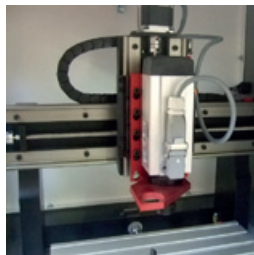
## Global Drive Solutions

Invertek Drives operate at the heart of automated systems around the world



### Crane Control

Demanding application at South African mine



### Machine Tool OEM

UK machine tool supplier specifies Optidrive



### Film Manufacturing

Optimum tension control in Australia



### Food Processing

Precision conveyor control in Spain



### Amusement Parks

Reliable control of difficult loads in Spain



### Optidrive P2 User Guide



Scan to download or visit the Invertek Drives website

[www.invertekdrives.com/optidrive-p2](http://www.invertekdrives.com/optidrive-p2)

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