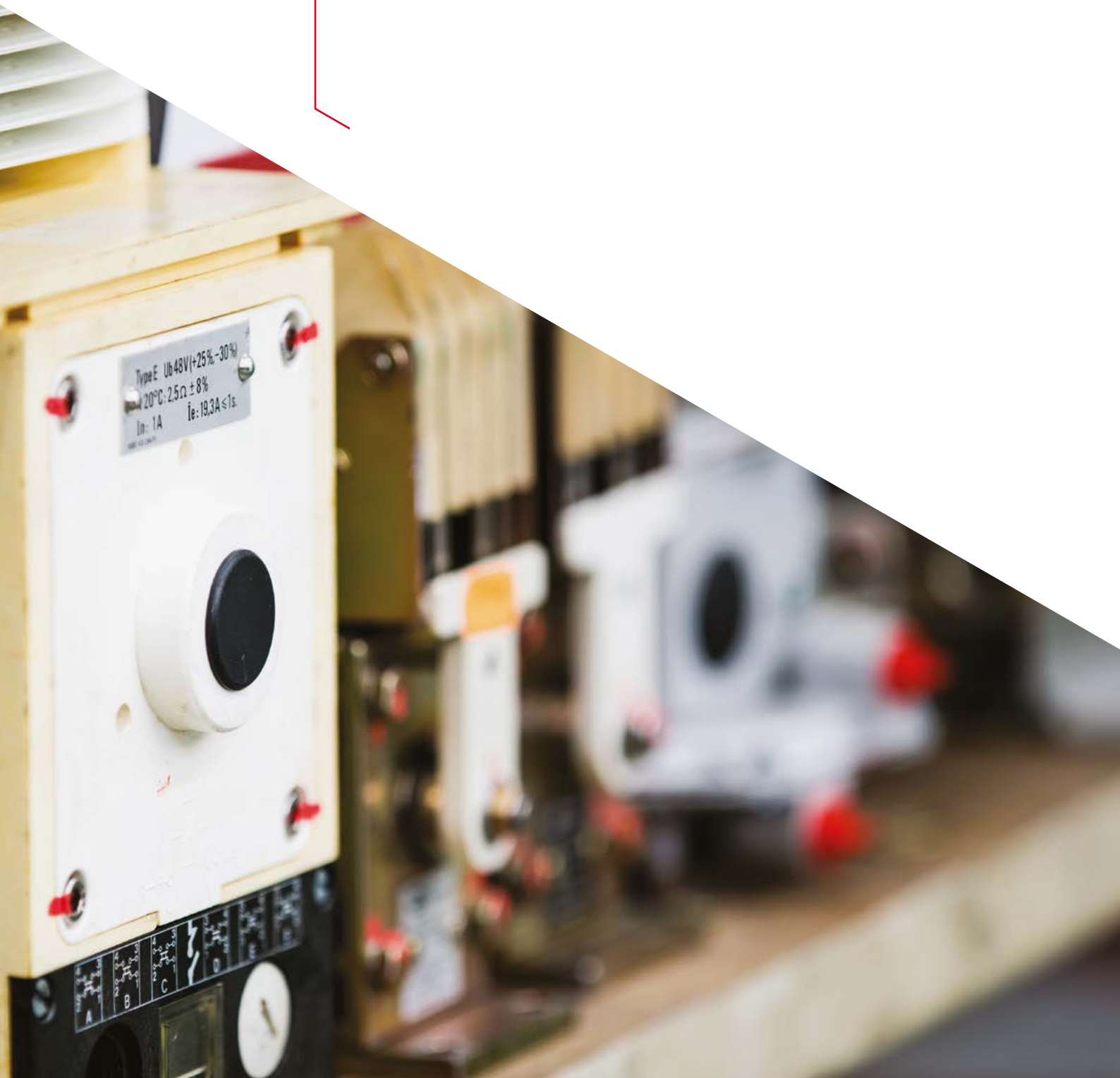




Rowe Hankins Ltd.

Product Guide





Precision...
made here

Timeline:



- 1979** Company founded by Toni Hankins and Roger Rowe, both qualified engineers with experience in military and traction projects.
- 1986** Rowe Hankins Ltd. was established.
- 1987** RH range introduced Circuit Breakers with British Rail approval. First used on the last tranches of Mark3 coaches in the UK and the 10E2 SAT loco in South Africa. It went on to become the BR and BREL preferred Breaker.
- 1988** Awarded BS 5750 accreditation.
- 1990** Moved into the Power House site with 4,000sq ft. factory space.
- 1992** Purchased the mining division of SEI (a GEC company) and started manufacturing intrinsically safe power supplies and coal cutting machinery control.
- 1993** Introduced an AC residual current Circuit Breaker based on the RH Breaker and used on the Mark4 coach and the Networker Class 465 EMU.
- 1995** Awarded BSEN9002 1995.
- 1996** Designed and manufactured the first DC Earth Leakage Units for insulation protection. Used on London Underground Northern Line and 1996 Jubilee Line tube stock.
- 1998** Completed the first factory extension to meet the growing demands of the new build traction market.
- 1999** Opened the Research and Development department to cope with the ever present problem of electronic component obsolescence on 30-35-year life expectancy of rolling stock.
- 2001** Introduced Dual Channel RFI and EMC immune Speed Sensors range with an improved air gap. Now approved as far afield as China, Australia and Brazil, as well as numerous European countries.
- 2004** Awarded BS EN ISO 9001 2000.
- 2005** Invested heavily in a new Service Centre for On-Train Monitor and Recording (OTMR), DC high speed Contactors and Circuit Breakers, achieving a 48-hour turnaround.
- 2006** Awarded the LUL Central Line drive package refurbishment, which was completed on time and within budget.
- 2009** Invented the first Intelligent Wheel Flange Lubrication System and demonstrated on the Long Marsden site (due to be used on London's new Elizabeth Line).
- 2010** Awarded IRIS accreditation.
- 2011** Completed type testing of an innovative low current signal monitor know as a NIC.
- 2013** Awarded a major contract from Network Rail to supply NIC's improved asset monitoring, leading up to the London 2012 Olympics.
- 2014** Redesigned AC and DC Earth Leakage devices to reduce their size and weight.

Extended the Power House factory space to 25,000sq ft. to meet increasing production capacity.
- 2015** Rowe Hankins Ltd. receives industry recognition, awarded The Modern Railways Innovation Award 2015 and the Light Rail Best Supplier 2015.
- 2016** Introduction of the MRH miniature Breaker range and the Split-Core NIC as part of the ongoing innovation and life cost reduction policy. Rowe Hankins Ltd. celebrates 30 years in the industry.
- 2017** Developed the new dual trip level AC current Imbalance Detector for protection of underfloor heating systems.
- 2018** Awarded the "Best Practice Representative" from the Parliamentary Review.
- 2019** Changed to a customer first approach, initiated by new Managing Director Richard Sykes.
- 2020** Released the 4 Channel Speed Sensor to the market which was Highly Commended at the Global Light Rail Awards 2020.

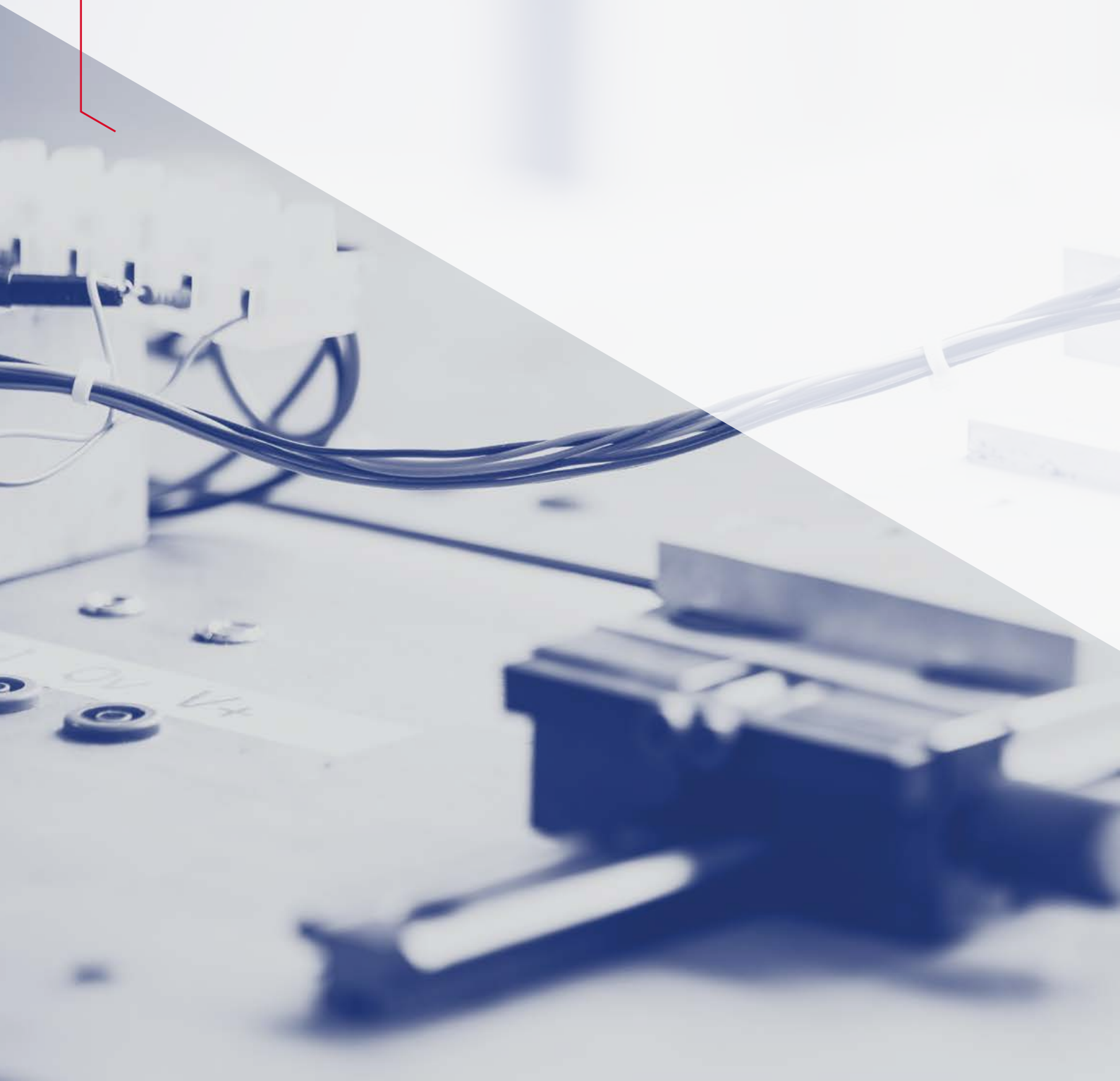
Introduction:

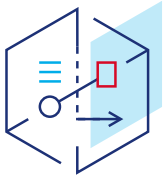
Rowe Hankins Ltd. specialises in innovative trainborne and wayside products for the world's railways; working closely with rolling stock manufacturers, fleet operators, track owners and infrastructure contractors, for Light and Heavy Rail Projects.

For over 30 years, Rowe Hankins Ltd. has been designing and manufacturing Speed Sensors, Non-intrusive Current Monitoring devices, Intelligent Wheel Flange Lubrication Systems, Top of Rail Friction Modifier Systems, Circuit Breakers and AC and DC Earth Leakage Detection Units. With a global reputation for quality, reliability and innovation; our experienced engineers have a long and successful track record giving the highest possible level of service to rail projects worldwide.

In addition, electro-mechanical and electronic product service facilities are provided to maintain, overhaul and repair traction substation Circuit Breakers, Contactors and trainborne monitoring and recording (OTMR) systems.

Our Services





Engineering

Rowe Hankins Ltd. engineering and development department has a team of professional engineers with various specialities, including product engineering design and product development from conceptual design to final product build. In some cases, product concepts are determined from customer specification or a need to solve real-world engineering problems.

Industry standard project management is observed with key milestones and deliverables, allowing design progress to be easily reportable to customers as required.

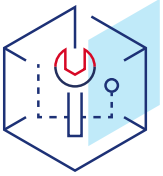


Electronic Servicing

Rowe Hankins Ltd. electronic service department specialises in service repair and maintenance of traction OTMR's (On Train Monitor Recorder). The diagnostic software/hardware is used to test a range of OTMR's, (e.g. 1500, 2200 series). Bespoke system test equipment to represent all OTMR interfaces can be designed, ensuring full functionality is tested before returning to the customer.

There is the capability to test/repair 'Optical Pulse Generators' used for train speed measurement. Engineering servicing can also be carried out by other manufacturers.





Mechanical Servicing

The mechanical service department carries out a variety of work, specifically overhaul, service and repair of:



DC Circuit Breakers



Contactors



Overcurrent Relays



Pressure Switches



Delta Switches

For high current DC Circuit Breakers, final testing and calibration are carried out by using dedicated high current injection test equipment (up to 5000 Amps). Instantaneous and continuous currents can be given as an output from the test equipment. For every unit that is repaired, serviced or overhauled at Rowe Hankins Ltd., a PDCA report is produced for traceability and for customer documentation if requested, along with the parts that have been used. All parts used are sourced from original suppliers to ensure full longevity of product life and compliance with the original product specification.

Overhaul contracts are regularly undertaken to customers deadlines, in high volumes and over agreed time periods.

For OEM products that have not been seen by the Rowe Hankins Ltd. service and overhaul department in the past, expertise reports and recommendations are produced for the customers' approval.



Beyond the solution

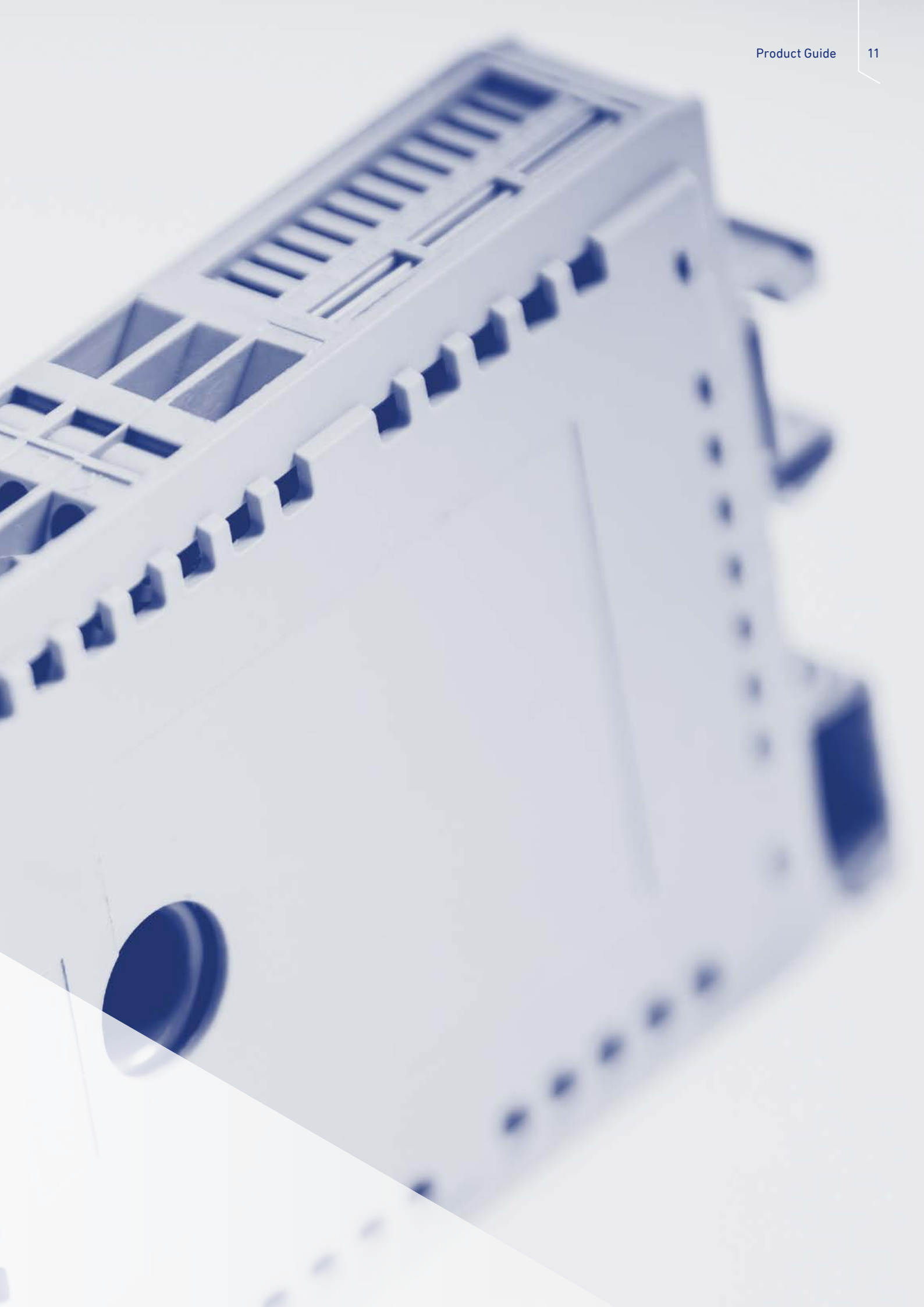
Working with rolling stock manufacturers, train operating companies, track owners and infrastructure contractors.

Rowe Hankins Ltd. provides innovative trainborne and wayside electro-mechanical equipment for safer and more efficient operations.

Our Products

Precision...
made here





iWFL: Intelligent Wheel Flange Lubrication System



Rowe Hankins Ltd. has supplied a UK Government-backed rail project with an award-winning intelligent modular system that enables asset managers to extend the lifecycle of wheel wear & rail infrastructure that makes passenger journeys greener and screech-free

Lubrication serves to reduce abrasion (wear) of wheel flanges and railheads, which occurs especially on track curves and at track switch points. Rowe Hankins Ltd. offers a reliable and effective solution for a smooth contact between the wheels and the rail. The Intelligent Wheel Flange Lubrication System (iWFL) is an innovative and effective trainborne solution. Lubrication consists of spraying the biodegradable lubricant from the nozzles onto the rotating wheels. The nozzles are located and are directed precisely to the zone of train wheel flanges or wheel treads.

The iWFL System is easy to integrate onto the bogie and the vehicle environment. The System incorporates a proven robust design, providing significant cost savings for the vehicle operators and the infrastructure owners. It uses compressed air available either from the vehicle or can be supplied from a dedicated compressor. We can supply bespoke user maintenance and configuration software, to allow the end user to perform maintenance activities and also set route spray parameters.

The iWFL system and biodegradable lubricant improves infrastructure and rolling stock service life, as well as overall safety by reducing both wheel and track wear. The reduced wear of the wheels, means wheels need to re-profiled less frequently in addition to reducing friction on the track. As a result, the green iWFL System uses less energy and fuel to run the rail vehicle compared to without.

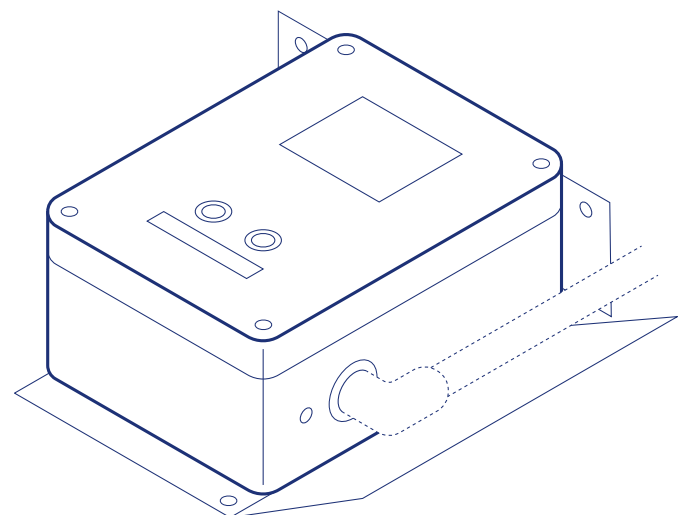
System design:

The iWFL System consists of line replacement units:

- ◊ A Fluid tank (typically 5L, 10L, up to 20L)
- ◊ A Pneumatic Unit (two outputs or four outputs to the nozzles)
- ◊ A Controller (Falcon Unit)
- ◊ Nozzles

With options such as:

- ◊ Air compressor if train air is not available
- ◊ GPS antenna



System operation:

The lubricant which is in the non-pressurised tank is transferred to the Pneumatic Unit by the pneumatically actuated pump located in the tank. From the Pneumatic Unit, a predetermined amount of lubricant is released by means of compressed air to a predefined nozzle, depending on the track curve (left/right discrimination).



Each nozzle can be individually switched or activated and provides a targeted application of lubrication only to a wheel flange. This prevents wastage of the lubricant.

Whole spray operation is controlled and triggered by the programmable electronic controller (Falcon Unit).

The spray activation is possible in three ways:

- At intervals of Time or Distance. The spraying pulses are triggered after the programmable pause time or the travelled distance.
- A Sensor that detects when the vehicle is on a curved track. The spraying pulses are triggered by the especially designed Sensor which detects when the vehicle is on the curved track.
- By GPS/Track Balise/TCMS signals allowing lubrication at specific predefined positions on the railway.

Cost benefits of iWFL

Description	Stick Lubrication	Rowe Hankins Ltd. iWFL
Distance until wheels have to be re-profiled	57,000 km	85,625 km
Frequency of refilling per year	25 to 30	6 to 9
Track Benefits	Life x 2	Life x 2 plus
Lubricant	Continuous Usage	Intelligent conditional dispensing

RHC-FG15 is the biodegradable lubricant produced by Rowe Hankins Ltd. for the iWFL system.



ToRFM: Top of Rail Friction Modifier System



Top of Rail Friction Modifier is engineered to reduce curve squeal noise and short pitch corrugation by the application of a Friction Modification grease to the top of the rail track. This reduction in friction reduces wheel and the track wear and noise.

The application of Friction Modifier (RHC-TG15) is achieved by a bespoke compressed air system which transfers the Friction Modifier to the top of rail. The Friction Modifier is also subsequently picked up by other passing wheels.

The friction modifier reduces rail contact fatigue, making both the rail and wheel more durable and long-lasting. This reduction in contact fatigue improves the environmental impact due to the frequency of replacement materials required, which in turn decreases downtime and costs.

The Wheel-Rail interface is a critical, targetable cost driver for performance, cost of inspection, maintenance, deterioration and renewal, all highly dependent upon the frictional interfaces.

Cost effective management of this interface to extend rail and wheel life by intelligent dispensing of customised Friction Modifiers from trainborne systems gives assurance and improved financial performance to operators and asset owners.

System operation:

The Friction Modifier, which is in the non-pressurised tank is transferred to the Pneumatic Unit by the pneumatically actuated tank pump. From the Pneumatic Unit, a predetermined amount of Friction Modifier is released by means of compressed air to a predefined nozzle, depending on the track bend.

Reduced Noise in Vehicle and Operating Environment.

- Active noise reduction for train / platform operatives, pedestrians and businesses located adjacent to the railway.
- Increased driver awareness of in-cab audible signals.
- Control of station approach curve noise exposure levels for platform staff and passengers.
- Improved intelligibility of public address systems at stations.

Reduced Vehicle and Track Maintenance Costs.

- Accurate spray profiles, GPS activation on curves.
- Low consumption 0.03g to 0.05g per operation.
- Selective wheel spraying - Flange / Back of Flange or ToRFM.
- Highly durable Friction Modifier: RHC-TG15, developed for ToRFM.
- Quarterly refill period.
- Extension of wheel inspection periodicity.
- Extension of wheel life to reduce heavy lift numbers.
- Reduced wear and vibration in drive systems.

Speed Sensors



A wide range of non-contact, multi-channel Speed and direction Sensors, designed for safety critical systems to operate in harsh environments.

All of the Speed Sensor ranges use Hall Effect technology to achieve accurate speed and direction sensing. The Speed Sensor operational air gap can be up to an absolute maximum of 4mm, this maximum air gap is determined by the type of Sensor and the Target/Gear Wheel tooth profile. Speed Sensors are manufactured with up to 4 galvanically isolated outputs, allowing for customer flexibility in the number of channels required.

The 4 Channel Speed Sensor can be used to replace existing single and dual channel Speed Sensors as the physical footprint is of the same form of sensors used in typical applications. Pushing the rail industry forward with the use of fewer Speed Sensors per train, having a novel design that improves the EMC immunity, therefore improving product life expectancy and reliability.

Output channel drive circuits are available as: open collector, supply tracking, push-pull and current output. The Speed Sensors are suitable for generating phase-shifted square wave signals proportional to the rotary speed. They have a static behaviour, so that pulse generation is guaranteed down to zero speed corresponding to a frequency of 0Hz.

Features & Benefits:



Designed to be installed in the harsh rail environment.



Various signal output types are available.



Single, Dual or multi-channel outputs up to four channels.



Capable of measuring from 0Hz to 20kHz* (type dependant).



Reverse supply voltage is protected.



Stainless steel housing in various styles protects against corrosion.



Various terminal connections or connectors.



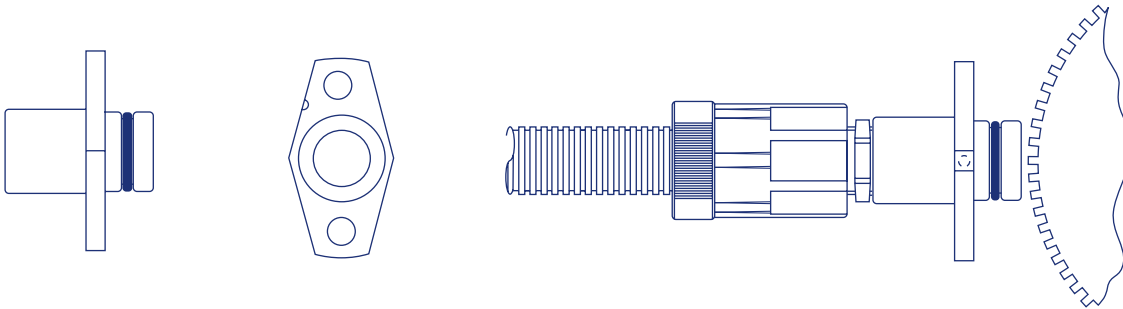
High reliability.

All of the Speed Sensors are designed and manufactured as bespoke products to meet customer requirements.

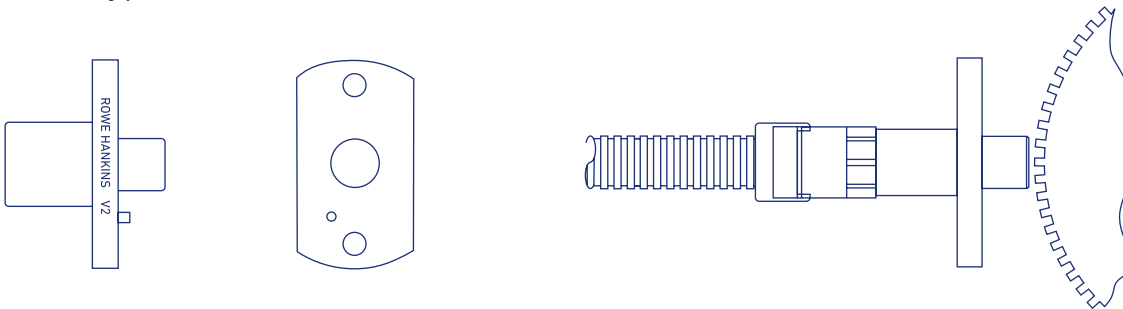
Rowe Hankins Ltd. selection of standard Sensor shell housing styles can be manufactured as shown below. Bespoke Sensor shells can be designed also.

◊ Standard shell types: HW, AN and ST.

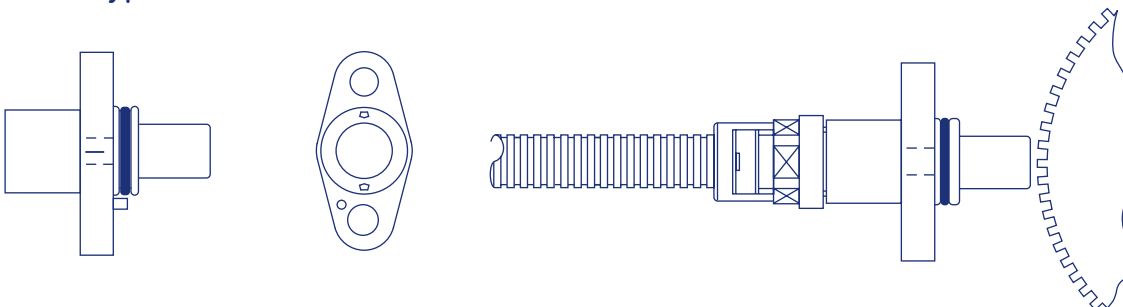
Shell Type HW



Shell Type AN



Shell Type ST

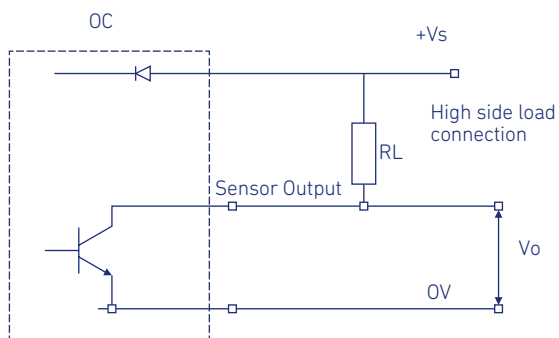


Variations of Speed Sensors.

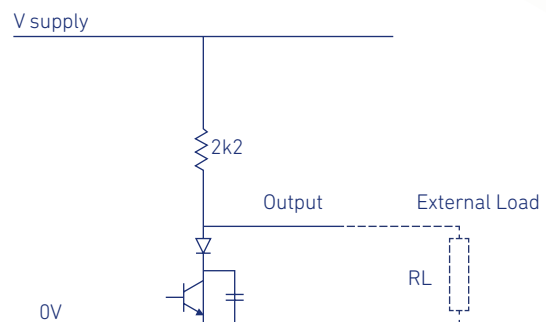
Industry standard / recognised Sensor electrical configurations are available in four different types; open collector, supply tracking, push pull and current output.

- Industry leading cable manufacturers are all used, with bespoke customer requests also available.
- Connector types are typically MIL-C 5015 bayonet or thread locking. AB, Amphenol, Souriau, or other on request are available).
- Cable protection, if required - using PMA conduit as a standard or other type to customers specification.

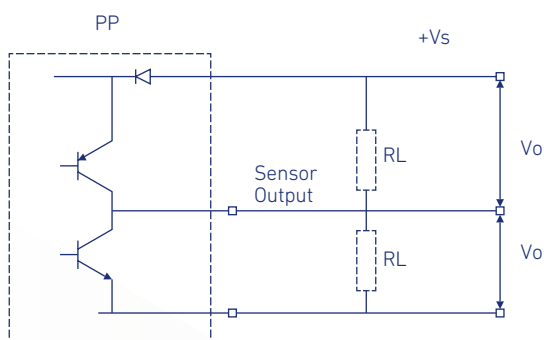
Open Collector



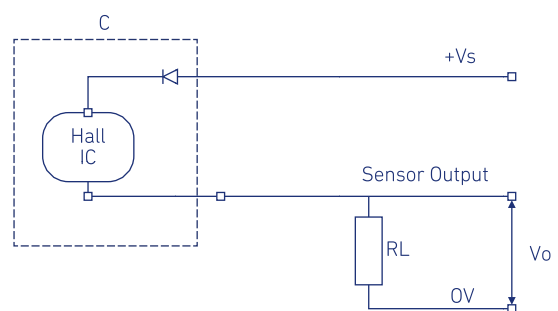
Supply Tracking



Push-Pull



Current Output



Mechanical

Air gap:	Typically $1.0 \pm 0.5\text{m}$ (target dependent)
Ambient temperature range:	-40°C to 120°C ,
Thermal shock:	$\pm 35^{\circ}\text{C}$ over 30 seconds
Relative humidity:	0-98% condensing
Protection class (IEC60529):	IP67
Impervious to:	Oil mist, salt spray, conductive dust
Shock and vibration:	EN 61373 category 3
Sensor housing material:	Stainless steel, grade SAE 30303



Electrical

Sensor Output Type:	Open Collector	Supply Tracking	Push-Pull	2-wire
Power Supply (Vs):	10V-24V DC	10V-24V DC	10V-30V DC	10V-24V DC
Current consumption:	< 12mA for single channel, < 36mA for 2, < 65mA for 4 channels (without load)			
Insulation resistance and test:	Insulation resistance > 100MΩ Flash test @ 600Vrms, 50Hz			
Maximum output source current:	n/a	14mA @Vs=30V	20mA	16mA per channel
Maximum output sink current:	20mA	20mA	20mA	n/a
Number of signal outputs:	1 to 4			
Output waveform:	Square wave			
Signal output low voltage:	Vs <1.0V@ 20mA	Vs <1.0V@ 20mA	Vs <1.8V@ 20mA	n/a
Signal output high voltage:	Supply and load dependent	$(V_s/2k_2+R_L) * R_L$	>Vs -2V @20mA	n/a
Signal output low current:	n/a	n/a	n/a	4-8.4mA
Signal output high current:	n/a	n/a	n/a	12-16mA
Signal output frequency:	0 to 20kHz	0-8kHz		
Phase displacement (2 signal pairs):	90° +/- 45° (target & alignment dependent)			
Duty Cycle:	30%-70% (target & alignment dependent)			
Electromagnetic compatibility (EMC):	EN 50121-3-2			
Cable screen termination at sensor end:	According to customer requirements			
Cable (screened):	2 to 8 core, Low smoke, Zero Halogen			
Conduit for cable protection (if required):	Low smoke, Zero Halogen			
Connector (if required):	Typically, MIL-C5015 Bayonet			

TACHO Units (axle end mounting)

The end installation for Speed Sensors is normally onto train/tram axle box housing and so Rowe Hankins Ltd. also manufacture a complete Tacho Unit which comprises of: Hall Effect Speed Sensor/Axle end housing and a Modular Gear or Target Wheel.

The Speed Sensor is derived from the standard range of Sensors, typically a dual channel Sensor, that allows for detection of vehicle direction and operates down to zero speed. A steel toothed Target Wheel will typically have 60 to 100 teeth, which is bolted onto the axle end or maybe magnetically attached.

An axle end housing, made from stainless steel, supports the mounting of the Speed Sensor, together with cable/conduit strain relief if required. The housing with the Sensor is securely bolted onto the axle end.

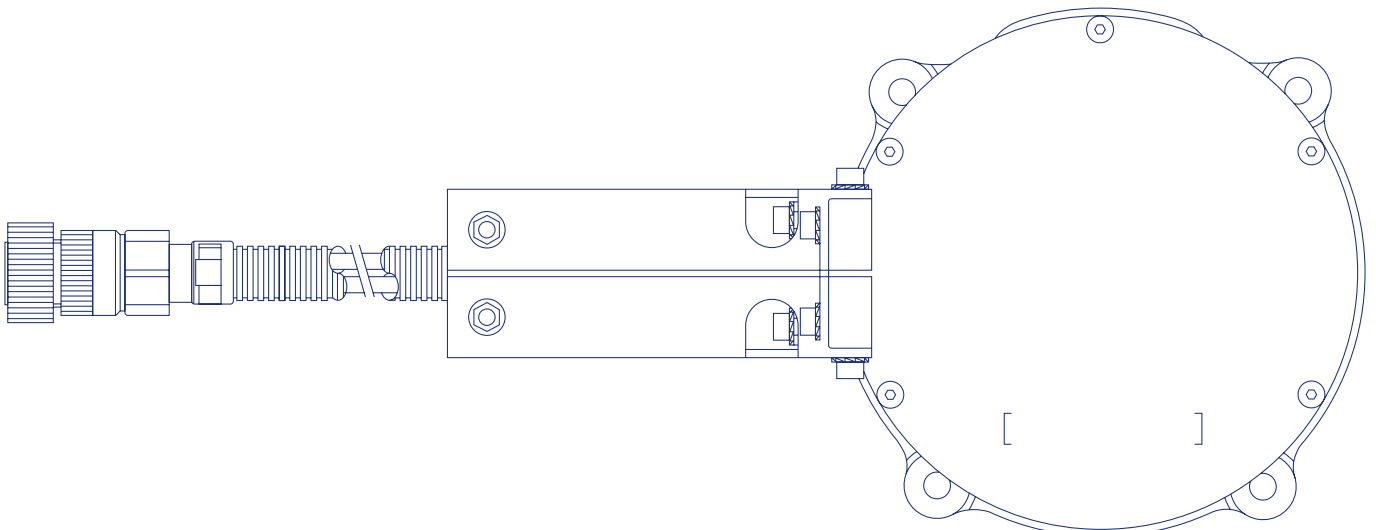
A complete Tacho Unit design meets mandatory and customer specific verification requirements which are governed by the following BS EN standards.

The benefit of the Rowe Hankins Ltd. supplying a Tacho Unit is that it is designed and tested as a subsystem ready to install onto the vehicle.

BS EN 50155 - Railway Applications.
Electronic equipment used on rolling stock.

BS EN 50121-3-2 - Railway Applications.
Electromagnetic compatibility (pt3-2 Rolling stock - apparatus).

BS EN 61373 Category 3 - Axle mounted equipment.
Shock and Vibration.



Typical technical properties are listed below:

General:

Number of pulses per revolution:	110
Number of output channels	2
Air gap (between sensor and target):	1.0mm \pm 0.5
Ambient temperature range:	-25°C to 80°C
Thermal shock:	+/- 35°C (95°F) over 30 seconds
Relative humidity:	0-98% condensing
Protection class (BS EN 60529):	IP67
Shock and Vibration:	IEC 61373 category 3 - Axle mounted equipment
Cable & Conduit Type:	2 X 4 core screened cable, low smoke, zero halogen
Cable length:	~2m
Connector type:	10-way plug (MIL-C-5015)
Estimated mass:	Tacho housing & Sensor ~6kg. Target ~2.8kg

Electrical Properties:

Power supply Vs:	Nominal in the range 15-24VDC
Current consumption:	Less than 60mA @ 24V
Number of Signal outputs:	Two
Output waveform:	Square wave
Signal output low voltage:	£0.03V at 6mA (sink current)
Signal output high voltage:	< Vs * 0.7 at 6mA (source current)
Signal output frequency:	0 to 3 kHz
Duty cycle	50% \pm 15
Phasing between channel 1 & 2	90° \pm 36°

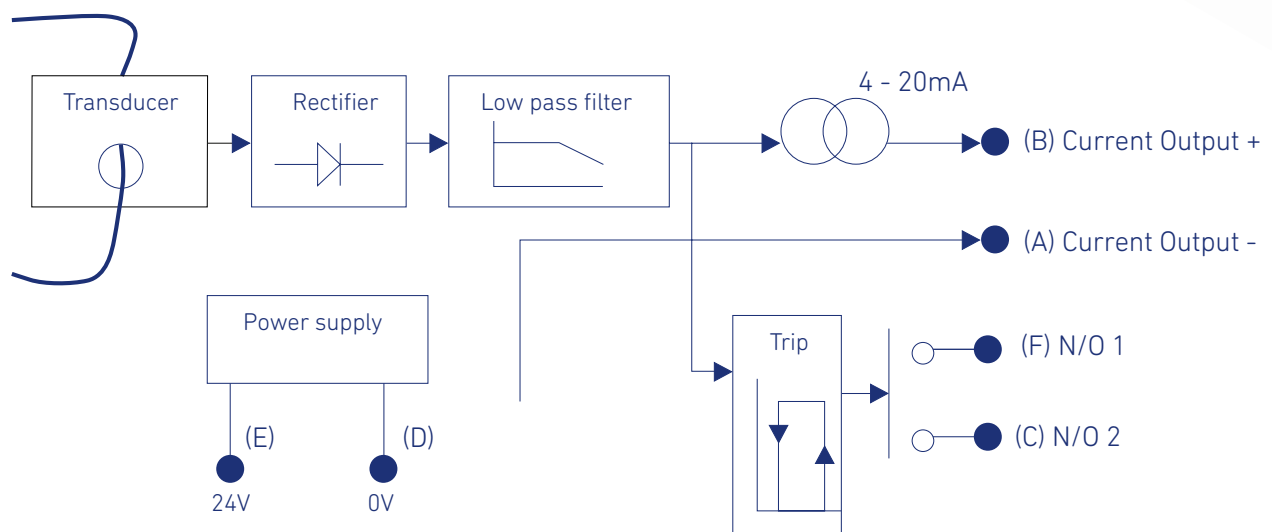


NIC: Non-Intrusive Current Monitoring Unit

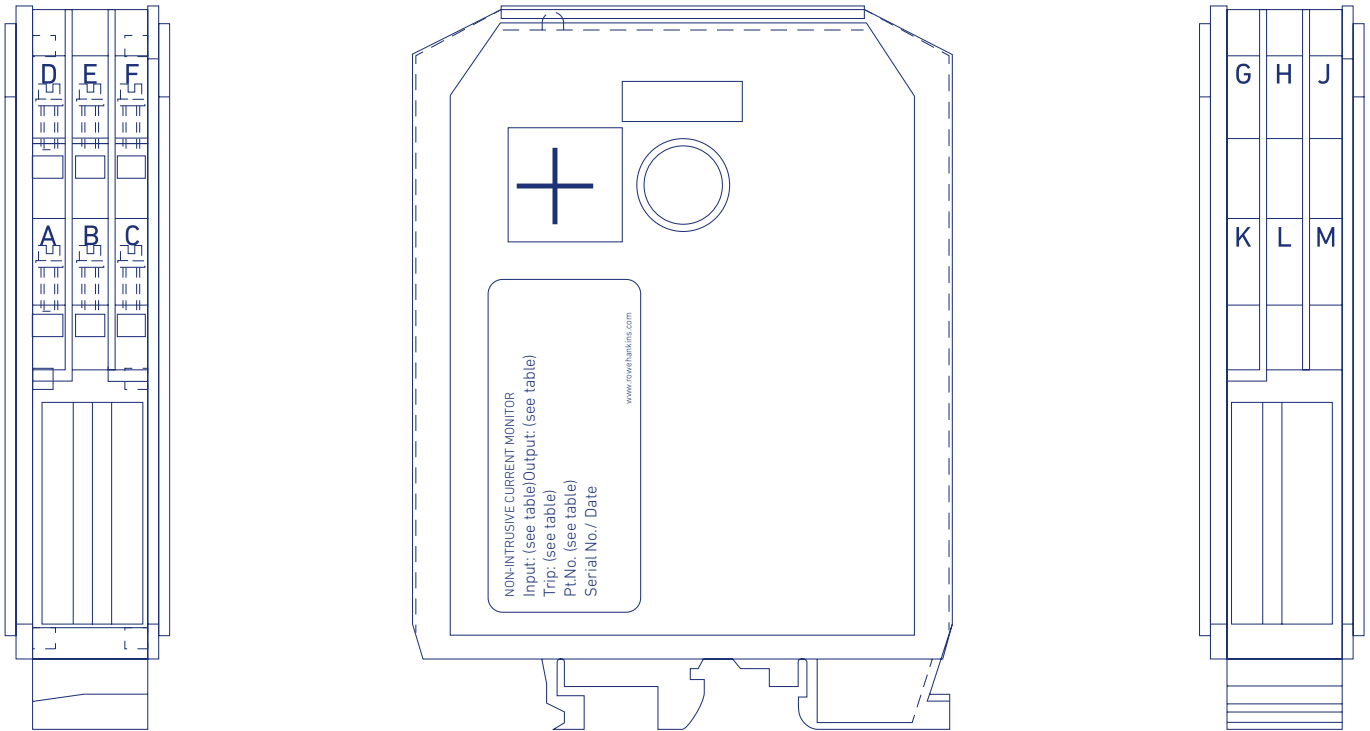


Non-intrusive Current Monitors (NIC) are used for wayside applications to assist in preventative maintenance in signalling AC and DC currents. Indicating the equipment requires repair or replacement before failure. The NIC Unit has a 4-20mA current loop output and volt free contacts which activate when the threshold of the device is reached.

Functional block diagram



The current carrying conductor of the circuit that requires to be monitoring is passed through the aperture of the NIC Unit, internally the conductor passes through a current transducer which provides a voltage proportional to the current being measured. The signal output is then passed through signal processing circuitry (amplification, full wave rectification and filtration) to then provide a 4-20mA current output proportional to the current range being measured.



Features & Benefits:



Intelligent infrastructure initiative for remote condition monitoring and proactive maintenance.



Ability for equipment to be 'fixed before failure'.



Enables significant reduction in a manual routine inspection.



Non-contact measurement of DC currents up to $\pm 600\text{mA}$.



4 to 20mA current output.



Current trip with relay output.



LED trip level indicator.



24V DC power supply.



Supply Reverse Polarity protection.



DIN rail mounting.



Unipolar versions are also available.



Network Rail approved.



The product is RoHS and WEEE Compliant.

	Value	Units	Notes
Primary Current I_{pmax}	± 100	mA	Type 1
	± 200	mA	Type 2
	± 400	mA	Type 4
	± 600	mA	Type 6
	+ 600	mA	Type 6a. This is unipolar monitor.
Output Current			
at $I_p=0$	4	mA	
at $I_p=I_{pmax}$	20	mA	
Load resistance max	500	ohms	
Trip Level (Optional)	5 to 90% of I_{pmax}	%	Factory set
Hysteresis	30	%	
Trip LED	Red		
Relay Output (Optional)			
			Only available if trip level set
Voltage	110V dc max	V	
Current	500 mA max	mA	Resistive load
Power Supply			
Volts	24V dc $\pm 10\%$	V	
Current	< 100mA	mA	@20mA load
Power on LED	Green		
Frequency Response	DC to 40Hz DC to 5Hz (Type 6a)	Hz	3dB
Step response	50ms typical	ms	To 90%
Accuracy	± 2	%	
Operating temperature	-20 to +85	$^{\circ}\text{C}$	

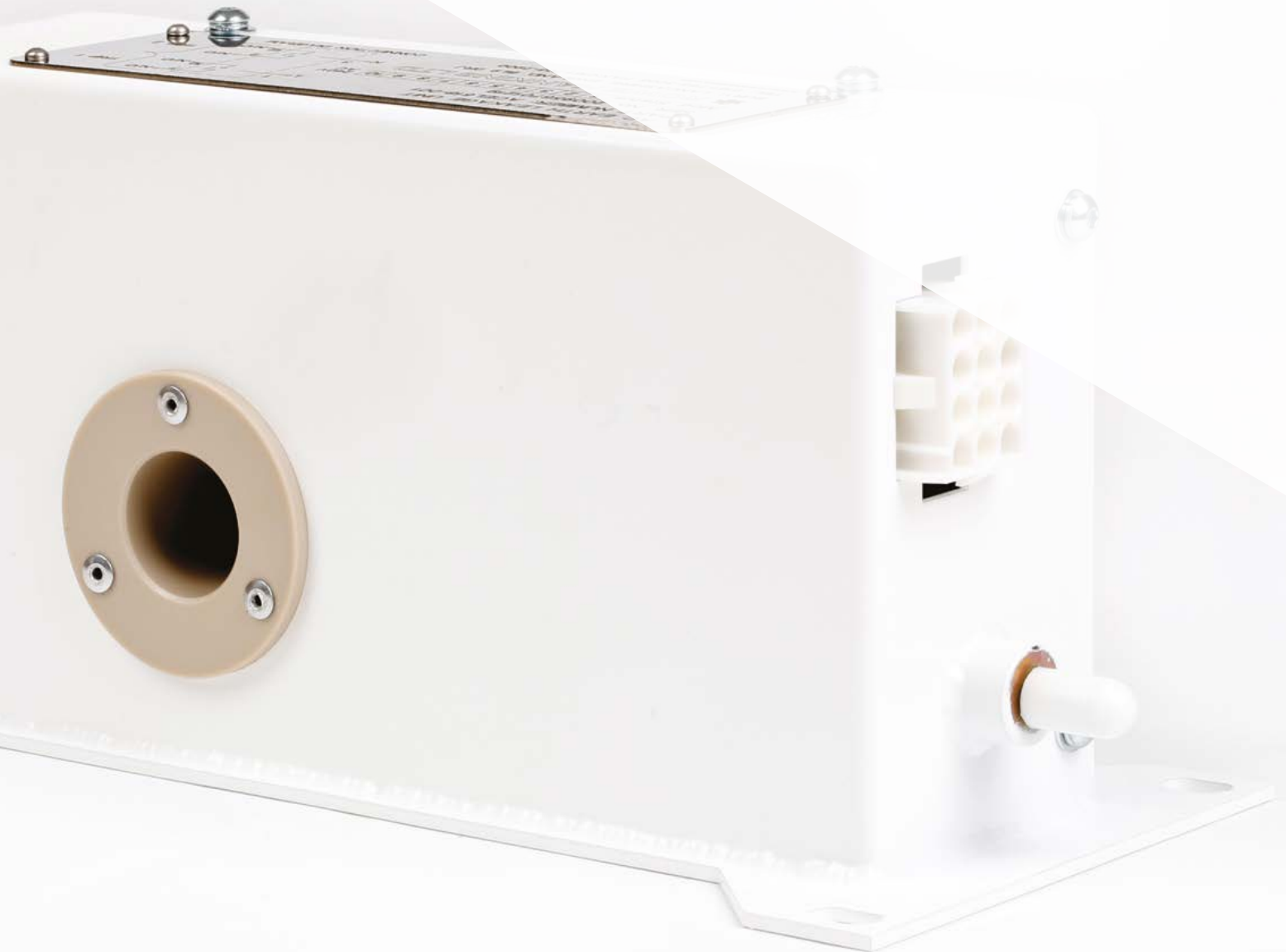
Electrical Connections

Signal	Terminal	Notes
+24V	E	
0V	D	
Output O/P+	B	
Output O/P-	A	
Relay Output N/O1	F	Connections only available if unit has trip setting
Relay Output N/O2	C	
Primary Current	N/A	Cable passed through side hole

Mechanical Data

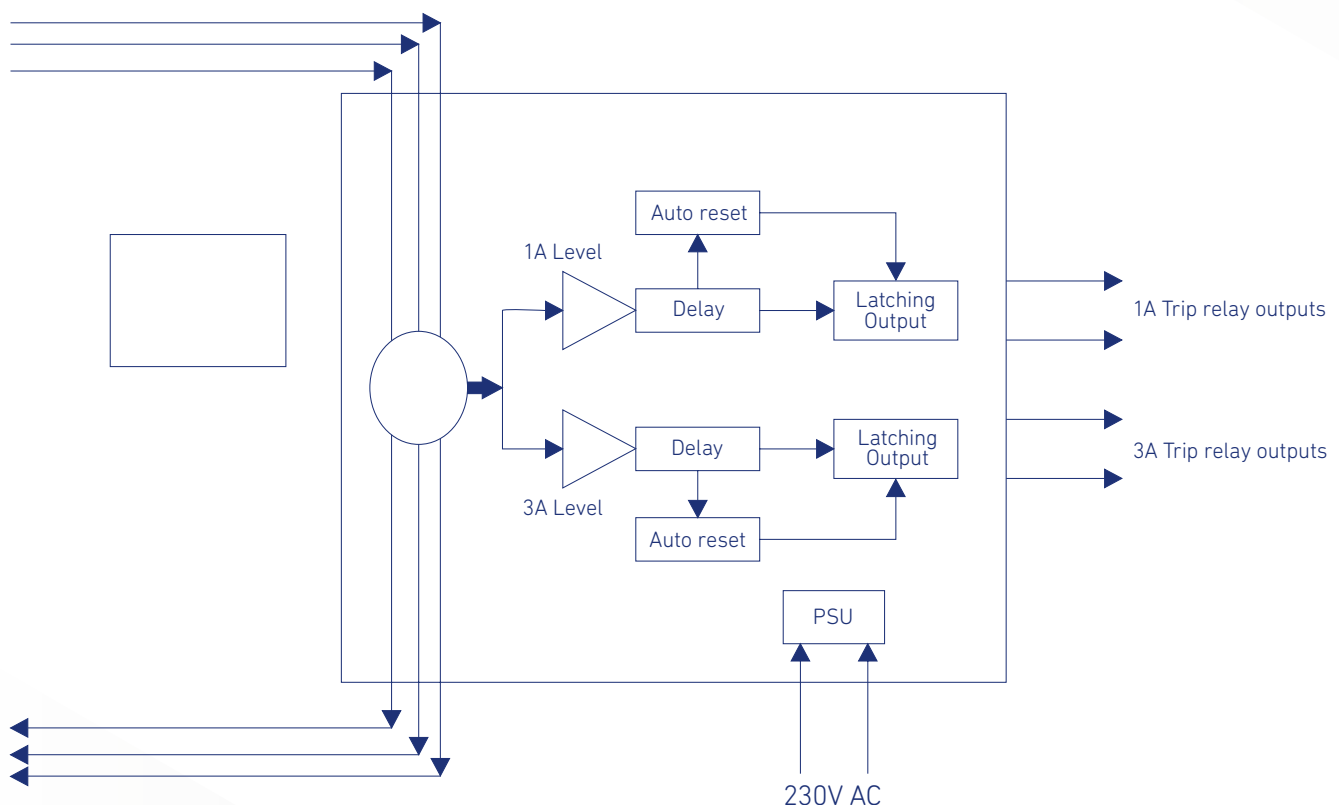
Case - DIN Rail	Value	Units	Notes
Width	22.5	mm	
Depth	60.5	mm	
Height	98	mm	
Primary cable hole diameter	11	mm	
Material	Polyamide		
Mass	110	g	Maximum

AC/DC Earth Leakage Units



An Earth Leakage Unit detects current imbalance or earth leakage in AC/DC power supply circuits. This allows disconnection of supply in a specified time period at a specified leakage current.

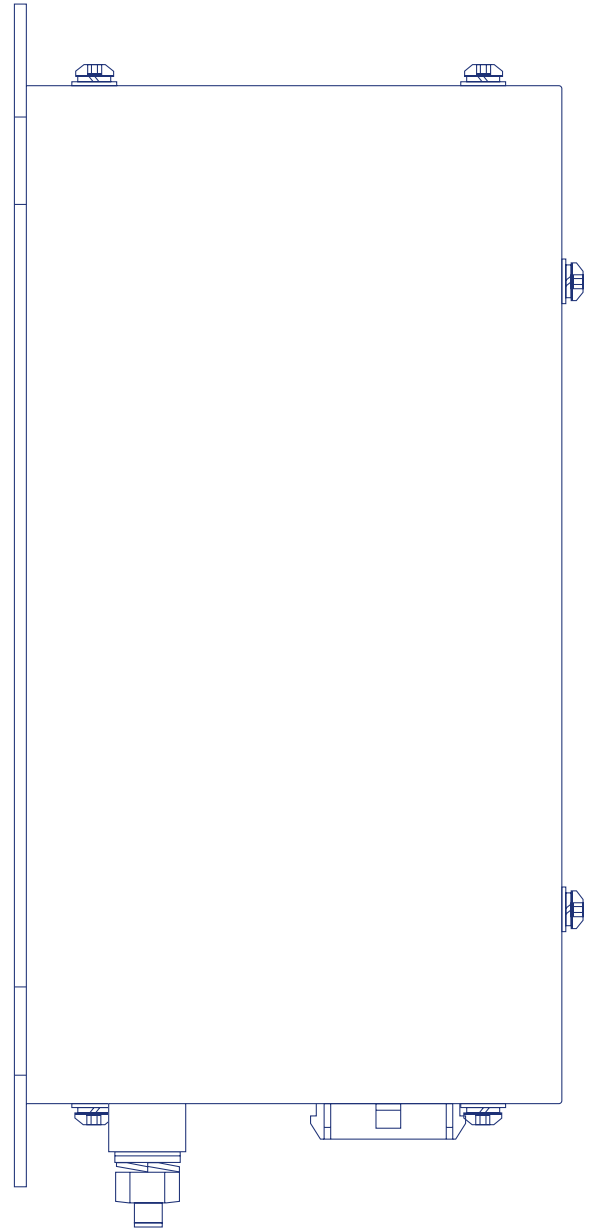
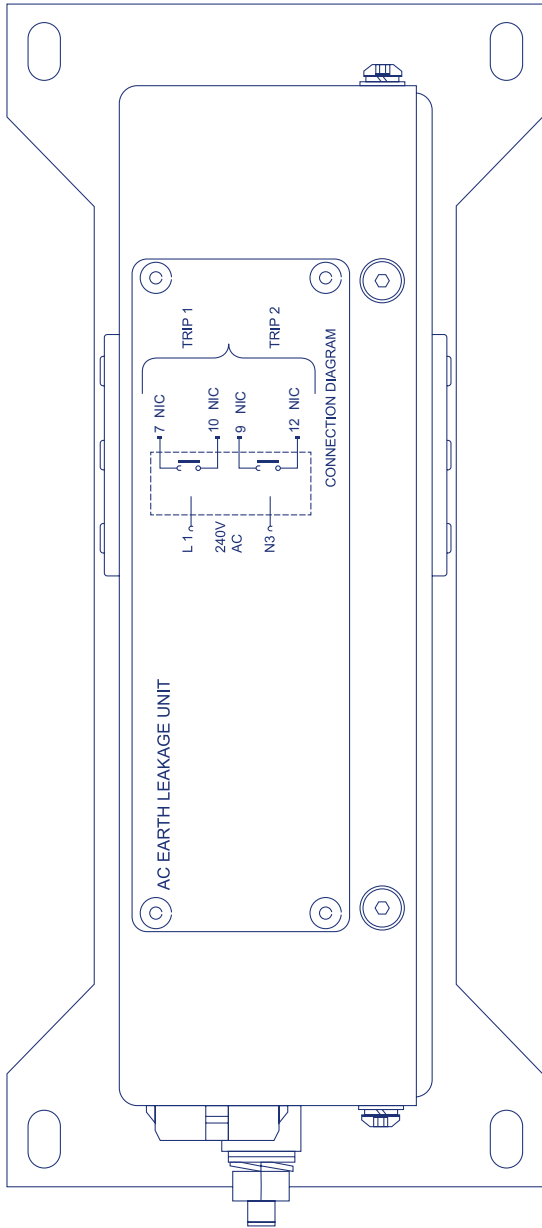
3 Phase Cables



The primary conductors of the system are passed through a current transformer or transducer. Allowing any imbalance or leakage to be detected. Any detected current imbalance signal is filtered and processed, and if it exceeds a set limit for a set time, a fault signal is generated. Output fault signals can take the form of voltage free relay contacts.

Fault state may be latched, requiring unit power-up reset or fault is reset automatically after a specified time if no current imbalance is detected.

Rowe Hankins Ltd. new dual trip AC Earth Leakage Unit is digitally programmed and is the next evolution of current imbalance detection.



Features & Benefits:



For protection of AC/DC power supply circuits.



Locked fault output.



Compact IP20 rated steel enclosure
~(Length:252mm, Height: 117mm, Width: 100mm).



Cable aperture is ~ 14mm in diameter.



Bespoke settings for customer requirements.



Compact steel IP20 rated enclosure.

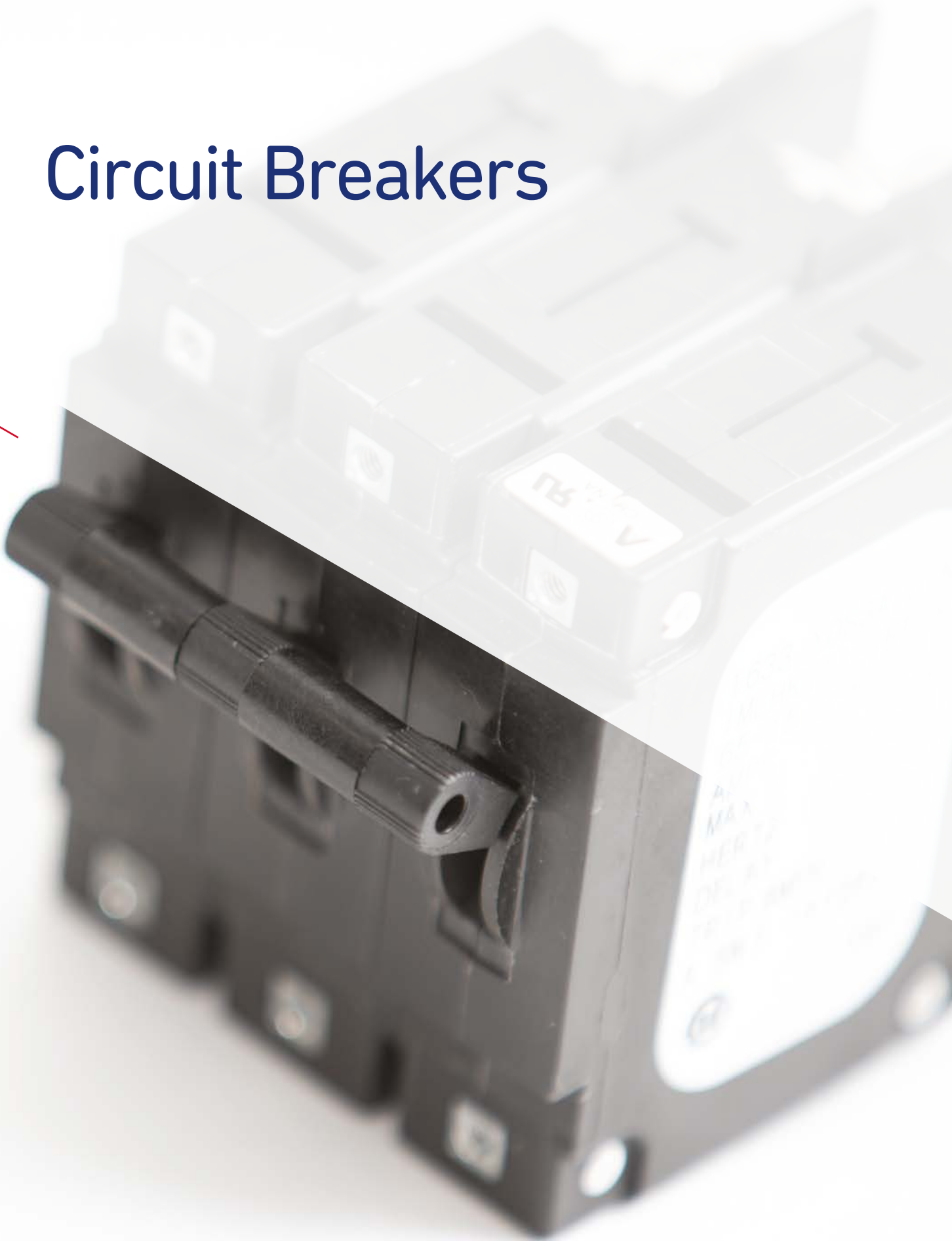


Compliant to Standards:
BSEN 50155:2007, BSEN 60529:1992,
BSEN 50121-3-2:2006, BSEN 61373:2010.

Precise, nuisance-free circuit protection

Hydraulic magnetic circuit breakers offer high performance with high current applications. They provide precision protection and offer great advantages, such as elimination of nuisance tripping and continuous operation at 100% of current. The circuit breakers are immediately resettable and are temperature independent. They are available with a choice of non-delayed or time-delayed trip characteristics.

Circuit Breakers



Rowe Hankins Ltd. supply two main ranges of Circuit Breakers, the RH and the MRH range to suit a wide application range. With current ratings up to 100A (for specific applications) employing the use of hydraulic magnetic technology.

Features & Benefits:



Continuous operation at 100% rated current at temperatures between -40°C and +85°C.



Low smoke and zero halogen.



Resistant to corrosion.



1-6 poles are available with multiple poles internally coupled; with series or relay configuration with auxiliary contacts.



The range has a minimum of 10,000 switching operations.



DC, 50/60Hz, AC/DC and 400Hz options.



A simple On/Off toggle switch, this signage enables the Circuit Breaker to be fitted in either standard or reverse orientation.



Increased shock and vibration parameters.



Available with M5 or M6 stud terminals.



There is a choice of various trip curves available, instant, motor start and high inrush.

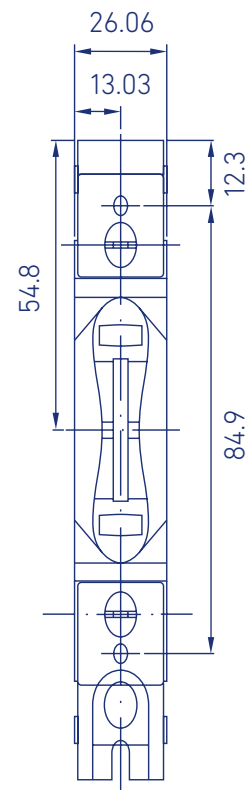
The RH Range

The RH Circuit Breaker family is available from single pole units up to 6 poles. Each pole can be independently configured in terms of terminal type and trip configuration to suit any application requirement.

The RH Circuit Breaker is designed to protect systems that in particular may have high inrush current present upon start up without the sacrifice of functionality or longevity of the products lifespan. Also, for systems that may be susceptible to high interrupt capacity.

Terminal configuration:

The RH range of Circuit Breakers can be supplied with a variety of different terminal configurations; screw terminals, stud terminals or solderless connections. The choice of stud terminals is available with rear connections. Alternatively, screw terminals or solderless connections are available with front connections.



All dimensions are in millimeters

Mounting

The RH Circuit Breaker mounting is achieved with the use of M4 mounting inserts.

Description	<p>Single or Multi-pole general purpose medium current Circuit Breaker.</p> <p>Compact E-Frame configuration.</p> <p>Wide choice of trip delays; remote off, shunt trip, auxiliary switch, relay trip & high inrush.</p>
Handle colour and marking	White toggle as standard with Black I/O identification.
Current & Voltage Rating	<p>100A at 600V, 20 to 60Hz from a sinusoidal supply, or 125VDC.</p> <p>The contact is capable of rupturing short-circuit currents of up to 7,500A under certain conditions.</p>
Operating Temperature and Environmental conditions	-40°C to +85°C. Relative Humidity: 0-100%. Atmosphere: Saline.
Auxiliary Contacts	NO / NC contacts activated by the function of the Circuit Breaker. The maximum rating of the auxiliary contacts is 10A, 250Vac, 50/60Hz.
Insulation	<p>Circuit Breaker withstands voltage ratings. Test conditions; (AC, RMS, 50Hz for 1 minute).</p> <p>Main Contacts - mounting points 3,100V</p> <p>Main Contacts - auxiliary contacts 3,100V</p> <p>Auxiliary Contacts - mounting point 2,500V</p>
Terminal configuration and Torque settings	<p>M6 45mm terminals are standard.</p> <p>Maximum torque on main terminals studs are 34-40Nm.</p>
Terminal configuration and Torque settings	M6 45mm terminals are standard.
Approvals	<p>EN 45545-2</p> <p>EN 60934</p> <p>EN 60947-2</p> <p>EN 60529</p> <p>EN 50125-1</p> <p>EN 61373</p> <p>EN 600628-2-38</p> <p>EN 60068-2-11</p> <p>UL recognised</p> <p>CSA certified</p> <p>VDE approved</p> <p>CE compliant</p> <p>CC approved</p> <p>NF F62-001</p> <p>NF F16-101</p> <p>REACH</p> <p>ROHS</p>

Trip curve data sheet, available on request.

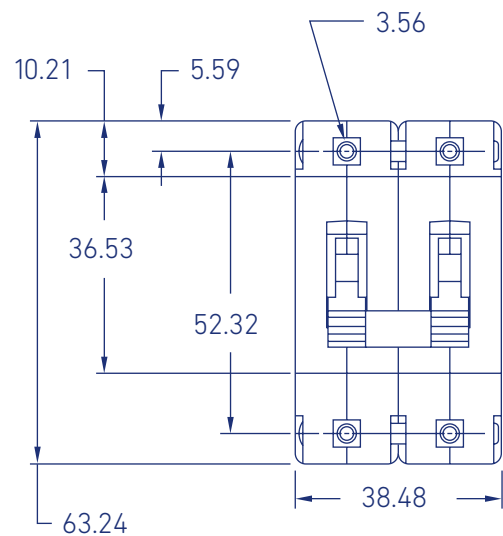
The MRH Range

The MRH Circuit Breaker family is available from single pole up to 4 poles as standard, for 5 and 6 poles units are subject to availability. Each pole can be independently configured in terms of terminal type and trip configuration.

The MRH Circuit Breaker is designed to protect systems that in particular may have a linear inrush current present upon start. Also, for systems that may be susceptible to high interrupt capacity, typically up to and including 5KA.

Terminal configuration:

The MRH range of Circuit Breakers can be supplied with a variety of different terminal configuration; stud terminals, (M6, 1/4-20, M5, 10-32) screw terminals, clip terminals and bullet terminals. All terminal variants are available with the rear connection.



All dimensions are in millimeters

Mounting

Circuit Breaker mounting is achieved by M3 mounting inserts.

Description	Single or Multi-pole general, with current monitoring capabilities of up to 100A for 24Vac systems and 50A for 425Vac systems. A Wide choice of trip delays; remote off, shunt trip, auxiliary switch, relay trip & high inrush.
Handle colour and marking	Black toggle as standard with black I/O marking.
Current & Voltage Rating	5-100A, 110VDC to 240Vac 5-100A 240Vac 50/60Hz 5-50A 415Vac 50/60Hz Units rated for 240/415Vac and above 50A. Not suitable for across the line motor starting.
Operating Temperature and Environmental conditions	-40°C to +85°C. Relative Humidity: 0-100%. Atmosphere: Saline.
Auxiliary Contacts	Non VDE approved switches have a maximum UL rating of 10A, 250 Vac, 50/60Hz: 3A, 50Volts DC. The maximum VDE ratings are 1A, 125 Volts, 60Hz and 0.1A, 125 Volts, 60Hz. Connection achieved via 2.8mm quick connect terminals.
Insulation Dielectric strength	The MRH Range protectors withstand 3750Vac, 60Hz for 60 seconds between all electrically isolated terminals. The auxiliary switch terminals shall withstand 600Vac, 60Hz. Four terminal dual coil and relay construction will withstand 1500Vac.
Terminals	M5 terminals are standard unless the current rating is 80A or over in which case M6 terminals are used. Maximum torque settings are 2mm, 3mm and 4mm respectively.
Approvals	EN 45545-2 EN 60934 EN 60947-2 EN 60529 EN 50125-1 EN 61373 EN 600628-2-38 EN 60068-2-11 UL recognised CSA certified VDE approved CE compliant CC approved NF F62-001 NF F16-101 REACH ROHS

Trip curve data sheet, available on request.

RCBO: Residual Current Breaker Overload

The RCBO is a hydraulic magnetic Circuit Breaker with the added benefit of residual current protection, the RCBO family is available in both 2 pole and 4 pole configurations.

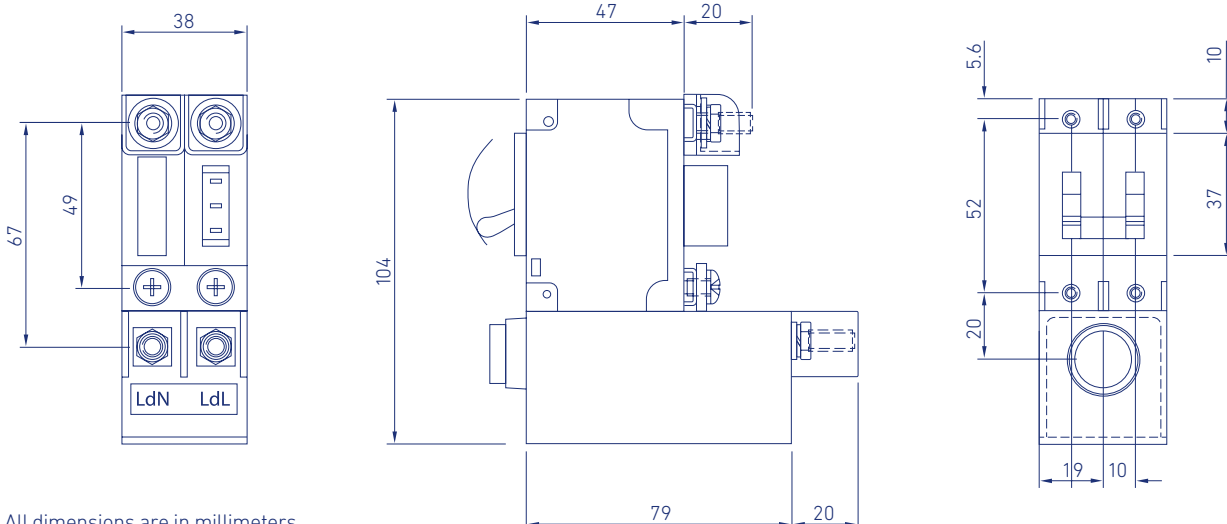
The time delay of the RCBO can be chosen for either fixed or inverse time delay according to customer specifications, typically 80ms or 100ms fixed time delay. Current imbalance trip levels range from 5mA up to 300mA depending again on the customer requirements, typical trip levels are 30mA, 100mA and 300mA.

The functionality and the operation of the RCBO can be verified in situ with the use of a test button. A test signal is injected into the internal circuitry, thus verifying the mechanical and electrical functionality of the RCBO.

Terminal configuration:

Electrical connections to the units are achieved via M6 stud terminals as standard. M5 terminals are also available upon request.

N/O and N/C auxiliary contact are supplied with the RCBO as standard, allowing the state of the Circuit Breaker to be continuously monitored.



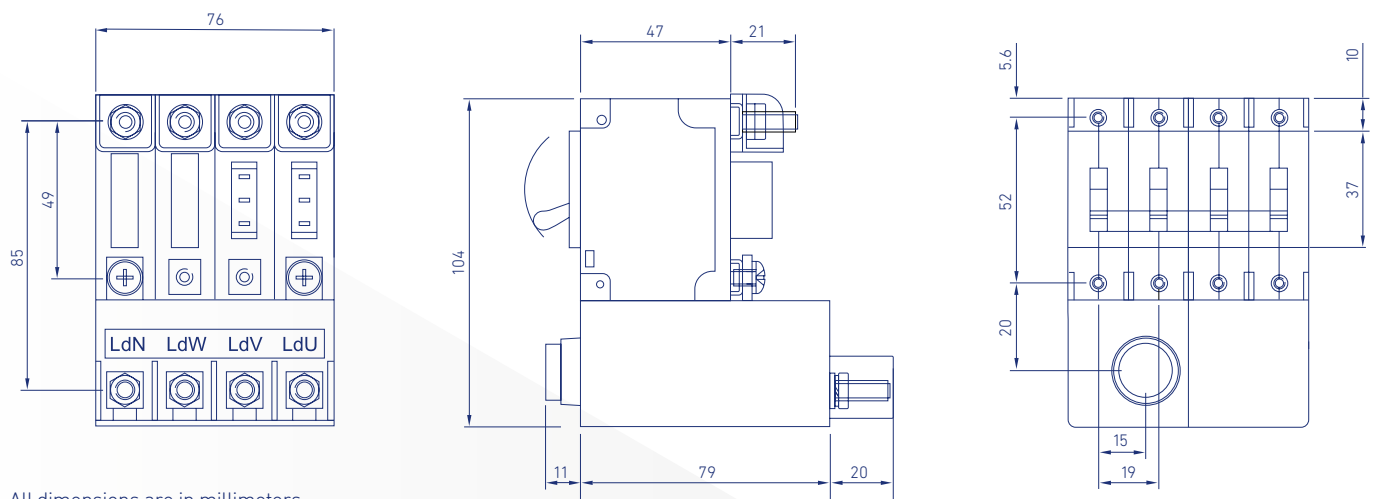
All dimensions are in millimeters

Mounting

The Circuit Breaker mounting is achieved by M3 mounting inserts.

Description	2 and 4 pole configurations are available to protect 24Vac systems and 415Vac systems with current ratings up to 50A.	
Handle colour and marking	Black toggle as standard with black I/O marking.	
Current & Voltage Rating	5-50A 240Vac 50/60Hz 5-50A 415Vac 50/60Hz Units rated for 240/415Vac up to and including 50A.	
Operating Temperature and Environmental conditions	-40°C to +85°C. Relative Humidity: 0-100%. Atmosphere: Saline.	
Auxiliary Contacts	Non VDE approved switches have a maximum UL rating of 10A, 250 Vac, 50/60Hz: 3A. 50Volts DC. The maximum VDE ratings are 1A, 125 Volts, 60Hz and 0.1A, 125 Volts, 60Hz. Connection achieved via 2.8mm quick connect terminals.	
Terminals	M6 stud terminals as standard, M5 stud terminals available upon request.	
Approvals	EN 45545-2 EN 60947-2 EN 50125-1 EN 600628-2-38 UL recognised VDE approved CC approved NF F16-101 ROHS	EN 60934 EN 60529 EN 61373 EN 60068-2-11 CSA certified CE compliant NF F62-001 REACH

Trip curve data sheet, available on request.



All dimensions are in millimeters



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