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Vehicle Electronics Catalog

Special OEM Solutions for Automotive, Industry and Marine

VDO



The Future of Mobility Starts with Today's Innovations

As a global supplier of mobile technologies, our passion for mobility strengthens everything we do. Mobility is about more than just effectiveness, it is the key driving force that allows us to reach new goals, make progress, and push beyond boundaries. The concept of mobility is at the core of our vision and reflected in everything we do.

Our employees around the globe are united by their common enthusiasm for modern vehicles and the opportunities that technology offers. The ability to embrace new ideas is just as important to us as experience and focused research and development. That's why experts from a wide range of fields work together within our company. Today, our innovative developments are proof of the success of this operational model.

Examples include our VDO products for a diverse range of special vehicles and machinery. These system solutions and individual components meet the most demanding requirements, yet at the same time offer maximum driving and working convenience.

Our catalog: always up-to-date

We want our Vehicle Electronics catalog to be a reliable companion that is always at your side to help you in your work. To ensure that, it is frequently updated. You will be kept informed of these updates by e-mail. This means you can always have the latest information available with just a few clicks – simply visit our extranet at <http://extranet.vdo.com>.

The process is simple.

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Visit www.vdo.com for all the latest news on our products and their innovative features, to find your nearest sales office, or for further information about the world of mobility.

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* Only available for series production applications on request
** Only for trained partners

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Update 05 | 2011

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* Only available for series production applications on request

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Update 05 | 2011

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Mass Airflow Sensor (MAF)	03 2011
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Camshaft Position Sensor	03 2011
High temperatur Sensor	New 05 2011
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Update 05 | 2011

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* Only for trained partners
** Only available for series
production applications
on request

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6.3 Sensors for Engine Management Systems**

6.3.1 Intake Air Pressure Sensors (MAP, T-MAP)	03 2011
6.3.2 Mass Airflow Sensor (MAF)	03 2011
6.3.3 Knock Sensor	03 2011
6.3.4 Crankshaft Position Sensor	03 2011
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6.3.6 High temperatur Sensor	New 05 2011
6.3.7 Differential pressure Sensor	New 05 2011

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Challenging Tasks Call for Commitment and Experience. We Measure Up.

As requirements become more complex and operating conditions harsher, it is increasingly important to have a strong partner who can support you all the way. This is true across a huge number of applications, ranging from stationary machines through sports cars and leisure boats to special-purpose vehicles for industrial, construction, forestry, and agricultural applications. In all these cases, regular components typically do not offer a satisfactory solution. At the same time, it is essential to use innovative technologies with proven reliability in order to develop specialist custom solutions that deliver the required performance.

VDO's portfolio of products is designed to meet exactly these requirements and caters for a wide spectrum of applications, drawing on our long experience as a supplier to the automotive industry and manufacturer of specialist solutions. With complete solutions and specially developed components, the VDO range of products offers a one-stop shop for optimized system integration. Comprehensive testing and quality assurance procedures allow our solutions to function reliably at all times, even under the harshest of conditions.

A major area of focus for VDO products is management and optimization of engine performance. We support this application area with products, such as sensors, actuators, and fuel systems. These products can help reduce fuel consumption and pollutant emissions, while simultaneously boosting the efficiency of vehicles, boats, and machinery. We also supply a wide selection of versatile solutions for the driver's cockpit, ranging from instrumentation to pedals. These are designed particularly with ergonomics and comfort in mind, helping drivers and skippers stay in full control, whatever the conditions. Our portfolio is rounded out by a broad range of specialist solutions for leisure boats.



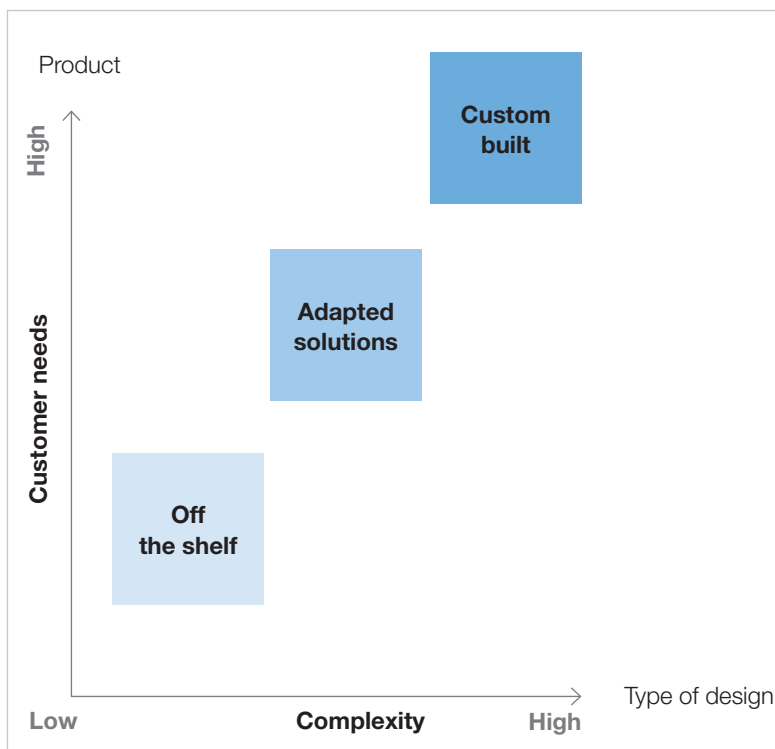


Our array of special products with their countless possibilities for system integration, together with our extensive depth of experience, is what makes us a reliable, trusted partner to manufacturers of special vehicles and machinery as well as the leisure boat industry.

We also develop sensor, control, and instrumentation technology for machines and other equipment, such as generators and compressors, that are powered by an engine but used solely in stationary applications. By utilizing systems that are already in large-scale production, we are able to offer highly cost-effective solutions.

Our solutions:

- Instrumentation
- Sensors
- Fuel system components
- Pedals
- Actuators
- RPM and speed control
- Control units and electronic network solutions
- Screen washer systems
- Equipment for leisure boats and sailing yachts



Complex product requirements make it particularly important to choose a partner who is experienced in series production and can offer specialist solutions that are perfectly adapted to your needs. Special vehicles and machinery in particular must function reliably at all times, no matter how harsh the conditions. The core focus of our work is custom solutions built on tried and tested concepts and adapted to special operating conditions as required. Because our innovative solutions and products are tailored precisely to your needs, they can be easily integrated into existing systems.

Flexible product solutions for diverse applications

We offer standard components, flexible systems, and customized solutions for on-highway and off-highway vehicles, stationary machinery, sports vehicles, and leisure boats.

On-highway

We develop comprehensive systems technology for commercial vehicles approved for highway use. Our portfolio focuses on products for heavy plant and special vehicles, including municipal vehicles, mobile cranes, buses, and other types of commercial vehicle. We offer tailored solutions to suit every type of vehicle, usage profile, and manufacturer requirement

Off-highway

Our systems for the various types of special off-highway vehicles are developed in close cooperation with engineering and production specialists. We offer proven systems, including audio equipment, for machinery, cranes, and special vehicles used in areas like forestry, agriculture, and aviation.

Leisure vehicles

Tuning companies and car manufacturers who primarily produce hand-finished vehicles in small production runs often have highly specialized requirements, especially when it comes to instrumentation. Many years of experience and a high degree of flexibility make us the ideal partner for anyone seeking custom solutions for these kinds of vehicles.

Leisure boats

We supply shipyards and boat manufacturers with reliable, accurate instruments for navigation, engine monitoring, and onboard electrical system monitoring. Our product range for motorboats and sailing yachts is based on our extensive expertise as a supplier to the boatbuilding industry.

Engines and stationary machinery

We also develop sensor, control, and instrumentation technology for machines and other equipment, such as generators and compressors, that are powered by an engine but used solely in stationary applications. By utilizing systems that are already in large-scale production, we are able to offer highly cost-effective solutions.



Applications

Special OEM Solutions for

<p style="text-align: center;">On-highway</p> <p>Systems technology for commercial vehicles approved for road use</p> <ul style="list-style-type: none"> _ Trucks _ Mobile cranes _ Buses _ Specialist vehicles, e.g., fire trucks 	
<p style="text-align: center;">Off-highway</p> <p>Rugged solutions for tough conditions</p> <ul style="list-style-type: none"> _ Construction vehicles _ Agricultural and forestry vehicles _ Industrial trucks _ All types of special vehicles, e.g., for airports 	
<p style="text-align: center;">Engines/stationary machinery</p> <p>Sensor, control, and instrumentation technology for stationary machinery, e.g.:</p> <ul style="list-style-type: none"> _ Generators _ Compressors _ Engine-powered equipment _ Engines _ Transmissions 	
<p style="text-align: center;">Leisure vehicles</p> <p>Custom short-run solutions for the leisure and sports sectors, e.g.:</p> <ul style="list-style-type: none"> _ Sports vehicles (power quads, jet skis, snowmobiles, etc.) _ Motorcycles _ Tuned vehicles 	
<p style="text-align: center;">Leisure boats</p> <p>Ocean-going instrumentation, engine components for boatbuilders</p> <ul style="list-style-type: none"> _ Motor yachts _ Sailing boats _ Boat engines 	

1. Instrumentation

* Only available for series production applications on request
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1.1 Analog Instruments

- 1.1.1 Viewline instrument line
 - 1.1.1.a 52 mm OE-Version
 - 1.1.1.b 85 & 110 mm OE-Version
 - 1.1.1.c 110 mm X in 1 OE-Version
 - 1.1.1.d 52 mm Aftermarket-Version
 - 1.1.1.e 85 & 110 mm Aftermarket-Version
 - 1.1.1.f 110 mm X in 1 Aftermarket-Version
 - 1.1.1.g Accessories
 - 1.1.1.h Customer-Specific Solutions
 - 1.1.1.i Small Series Program
- 1.1.2 Modulcockpit II
 - 1.1.2.a Dual-Instrument Units – Vertical
 - 1.1.2.b Dual-Instrument Units – Horizontal
 - 1.1.2.c Quad-Instrument Units
 - 1.1.2.d Tachometer with Engine Hours Counter
 - 1.1.2.e Electronic Tachometer

1.2 Analog Clusters*

- 1.2.1 Centrobases 300
- 1.2.2 Centrobases 500

1.3 CAN Instruments

- 1.3.1 CANcockpit**
- 1.3.2 Ocean Link
- 1.3.3 Accessories

1.4 Display Solutions



Analog Instruments

1.1.1 Viewline instrument line

1.1.2 Modulcockpit II



Viewline instrument line

Viewline is our new standardized instrument platform for special vehicles and machinery from various sectors. With modular solutions in three housing variants, we offer more features, more flexible installation, and a wide variety of design options. Our space-saving multifunction and combi-instruments are unique in this sector. In addition, Viewline offers designers maximum freedom when laying out the cockpit and represents impressive value.

Built for the toughest jobs

As a technology leader, we are familiar with the complex product requirements of manufacturers of specialist vehicles for industry, construction, forestry, and agriculture. Our product range is tailored to meet these requirements, enabling us to offer fully customized, reliable solutions. Maximum precision and the integration of pioneering technologies are just as important to us as ease of use and stylish design. The latest outcome of our research and development program is Viewline –

an innovative and comprehensive standard instrumentation platform that will replace the existing product series. A whole host of instrumentation variants are possible thanks to the flexibility offered by a range of housing sizes.





Harmony in function and design

Our plug and play design concept for panel and flush mounting means that Viewline instruments offer maximum flexibility when it comes to installation. With or without bezel, the modular concept allows for a high degree of design variation. Uniquely for this sector, every solution features full backlight technology.

The Viewline platform now incorporates a generic display concept that allows a huge variety of sensor signals to be processed and displayed. Viewline is a forward-looking instrumentation concept that guarantees quality and flexibility and offers greater design freedom and diversity.

Long-term benefits with new technologies

During development of the Viewline instrumentation range, our focus lied firmly on the requirements of manufacturers. The result is a cross-platform standard that offers maximum freedom in cockpit design.

Simple to switch

The far-sighted flexibility of the Viewline design concept makes a high degree of installation freedom. This makes switching or upgrading to Viewline always a smooth and straightforward process. We offer a reliable, advanced solution for instruments in this range. As an experienced and trusted partner to leading manufacturers of special vehicles and machinery, we are on hand right from the planning stage to enable seamless integration and optimum utilization of all Viewline benefits.





Certified quality and innovative technology

Viewline is a comprehensive range of state-of-the-art modular instruments for engine monitoring. Featuring more functions and greater flexibility in terms of installation and design, Viewline increases the scope for creative cockpit design. High quality workmanship and engineering excellence allow for outstanding reliability and readability.

Flush or panel mounting

All Viewline instruments can be conveniently inserted in the instrument panel from behind. It is possible to install the instruments with modular bezels or to integrate them flush with the panel without a bezel. This allows high flexibility for cockpit customization and creates opportunities for numerous design variants.

Anti-fog, water resistant

Electrical devices designed for special vehicles and machinery used under extreme conditions need to be carefully protected. That is why every Viewline instrument casing is made from corrosion-proof materials and has a front face that is hermetically sealed in compliance with the IP 67 standard. Anti-fog double lenses in shock-resistant plastic are also available on request. Irritating reflections are practically eliminated and water resistance is increased. The domed construction also makes possible that rainwater flows off quickly even when instruments are mounted horizontally.

LED illumination and warning lights

Viewline instruments are fitted with highly visible, high intensity LED warning lights. These ensure that critical operating states can be quickly and safely move detected before quickly. In the case of multifunctional speedometers and rev counters, the Viewline platform allows instruments to be equipped with up to five warning lights. All Viewline instruments feature LED illumination for the LCD display, dial face, and needle.

Clip-on bezels

The modular bezel concept offers true design flexibility in the layout of instrument panels. The three attractive designs in black, white or chrome are suitable for every machinery instrument panel or special vehicle cockpit. The range also includes bezels with flat, round, and triangular profiles. Each of the bezel designs is compatible with every Viewline product.



Cutaway showing double lens



Highly visible LED warning lights



Bezels: choice of color and design

Liquid crystal display

In addition to an analog needle showing speed or engine revs, the new Viewline speedometer and rev counter instruments also feature an additional digital display.

- Display size 37 x 11 mm
- Quick, reliable access to additional data
- Optimized reading angle and display layout
- Displays for speed or engine revs
- Additional monitoring functions available on LCD
- Individual function selection via external control button

Full backlight technology

All Viewline instruments benefit from fully backlit dial faces and needles.

- Optimum contrast and superb readability of the display when lit
- Attractive display at night thanks to clear dial face design

Signal inputs

Viewline supports the following signal inputs:

- Standard speedometer and rev counter signals
- Second frequency input (optional)
- Standard signals for engine monitoring and onboard electrical system
- Signal inputs for special senders
- Up to five switching inputs for warning lights (optional)

Programmable displays

Viewline gives users a choice of different settings and programming options:

- Basic setup via dip switches, internal/external button or PC software
- Various configurable display functions



1.1.1 Viewline instrument line

1.1.1.a 52 mm OE-Version

1.1.1.b 85 & 110 mm OE-Version

1.1.1.c 110 mm X in 1 OE-Version

1.1.1.d 52 mm Aftermarket-Version

1.1.1.e 85 & 110 mm Aftermarket-Version

1.1.1.f 110 mm X in 1 Aftermarket-Version

1.1.1.g Accessories

1.1.1.h Customer-Specific Solutions

1.1.1.i Small Series Program

1.1.1.a Viewline instrument line | 52 mm OE-Version

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				

Ammeter

-30 – +30 A /
-



A2C59510000	Black	12/24 Volt	Single scale	-30 A	+30 A	None	None	60 mV	Single lens	No bezel	Bulk
A2C59510399	Black	12/24 Volt	Single scale	-30 A	+30 A	None	None	60 mV	Single lens	Triangular, black	Individual
A2C59510695	Black	12/24 Volt	Single scale	-30 A	+30 A	None	None	60 mV	Single lens	Triangular, black	Bulk
A2C59510004	White	12/24 Volt	Single scale	-30 A	+30 A	None	None	60 mV	Single lens	No bezel	Bulk
A2C59510403	White	12/24 Volt	Single scale	-30 A	+30 A	None	None	60 mV	Single lens	Triangular, chrome	Individual
A2C59510699	White	12/24 Volt	Single scale	-30 A	+30 A	None	None	60 mV	Single lens	Triangular, chrome	Bulk

-60 – +60 A /
-


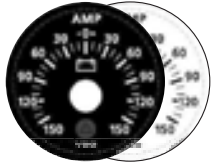


A2C59510001	Black	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Single lens	No bezel	Bulk
A2C59510022	Black	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Double lens	No bezel	Bulk
A2C59510400	Black	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Single lens	Triangular, black	Individual
A2C59510696	Black	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Single lens	Triangular, black	Bulk
A2C59510421	Black	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Double lens	Round, black	Individual
A2C59510717	Black	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Double lens	Round, black	Bulk
A2C59510005	White	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Single lens	No bezel	Bulk
A2C59510024	White	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Double lens	No bezel	Bulk
A2C59510404	White	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Single lens	Triangular, chrome	Individual
A2C59510700	White	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Single lens	Triangular, chrome	Bulk
A2C59510423	White	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Double lens	Round, white	Individual
A2C59510719	White	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Double lens	Round, white	Bulk

-100 – +100 A /
-



A2C59510002	Black	12/24 Volt	Single scale	-100 A	+100 A	None	None	60 mV	Single lens	No bezel	Bulk
A2C59510401	Black	12/24 Volt	Single scale	-100 A	+100 A	None	None	60 mV	Single lens	Triangular, black	Individual
A2C59510697	Black	12/24 Volt	Single scale	-100 A	+100 A	None	None	60 mV	Single lens	Triangular, black	Bulk
A2C59510006	White	12/24 Volt	Single scale	-100 A	+100 A	None	None	60 mV	Single lens	No bezel	Bulk
A2C59510701	White	12/24 Volt	Single scale	-100 A	+100 A	None	None	60 mV	Single lens	Triangular, chrome	Bulk
A2C59510405	White	12/24 Volt	Single scale	-100 A	+100 A	None	None	60 mV	Single lens	Triangular, chrome	Individual

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>-150 – +150 A /</p>  </div>  </div>											
A2C59510003	Black	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Single lens	No bezel	Bulk
A2C59510023	Black	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Double lens	No bezel	Bulk
A2C59510402	Black	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Single lens	Triangular, black	Individual
A2C59510698	Black	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Single lens	Triangular, black	Bulk
A2C59510422	Black	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Double lens	Round, black	Individual
A2C59510718	Black	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Double lens	Round, black	Bulk
A2C59510007	White	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Single lens	No bezel	Bulk
A2C59510025	White	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Double lens	No bezel	Bulk
A2C59510406	White	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Single lens	Triangular, chrome	Individual
A2C59510702	White	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Single lens	Triangular, chrome	Bulk
A2C59510424	White	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Double lens	Round, white	Individual
A2C59510720	White	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Double lens	Round, white	Bulk


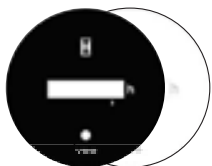
Part Number	Ampere	Volt	Packaging
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Ammeter Shunts

A2C59514041	30 A	60 mV	Individual
A2C59514042	30 A	60 mV	Bulk
A2C59514043	60 A	60 mV	Individual
A2C59514044	60 A	60 mV	Bulk
A2C59514045	100 A	60 mV	Individual
A2C59514046	100 A	60 mV	Bulk
A2C59514047	150 A	60 mV	Individual
A2C59514048	150 A	60 mV	Bulk

Engine Hours Counter (EHC)

Illuminated

<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">  </div>  </div>											
A2C59510874	Black	12/24 Volt	None	None	None	None	None	None	Single lens	No bezel	Bulk
A2C59510876	Black	12/24 Volt	None	None	None	None	None	None	Double lens	No bezel	Bulk
A2C59510881	Black	12/24 Volt	None	None	None	None	None	None	Single lens	Triangular, chrome	Individual
A2C59510879	Black	12/24 Volt	None	None	None	None	None	None	Double lens	Triangular, chrome	Individual
A2C59510880	Black	12/24 Volt	None	None	None	None	None	None	Double lens	Round, black	Individual
A2C59510875	White	12/24 Volt	None	None	None	None	None	None	Single lens	No bezel	Bulk
A2C59510877	White	12/24 Volt	None	None	None	None	None	None	Double lens	No bezel	Bulk
A2C59510883	White	12/24 Volt	None	None	None	None	None	None	Double lens	Round, white	Individual
A2C59510884	White	12/24 Volt	None	None	None	None	None	None	Single lens	Triangular, chrome	Individual

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				


Non-illuminated


A2C59510872	Black	12/24 Volt	None	None	None	None	None	None	Single lens	No bezel	Bulk
A2C59510882	Black	12/24 Volt	None	None	None	None	None	None	Single lens	Triangular, chrome	Individual
A2C59510888	Black	12/24 Volt	None	None	None	None	None	None	Single lens	Triangular, black	Individual
A2C59510871*	Black	12/24 Volt	None	None	None	None	None	None	Single lens	Triangular, black	Bulk
A2C59510873	White	12/24 Volt	None	None	None	None	None	None	Single lens	No bezel	Bulk
A2C59510885	White	12/24 Volt	None	None	None	None	None	None	Single lens	Triangular, chrome	Individual

*Supplied on request – limited availability

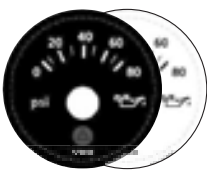

Pressure


Pressure


0 – 100 psi / 											
	A2C60000975	Black	12/24 Volt	Single scale	0 psi	100 psi	None	None	10–184 Ω	Double lens	No bezel







0 – 150 psi / 											
	A2C60000992	White	12/24 Volt	Single scale	0 psi	150 psi	None	None	10–184 Ω	Double lens	No bezel





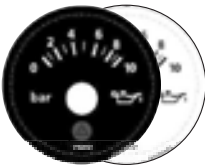



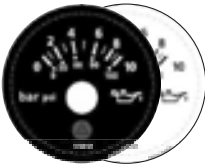



Engine oil pressure












0 – 80 psi / 											
	A2C60000972	Black	12/24 Volt	Single scale	0 psi	80 psi	None	None	10–184 Ω	Double lens	No bezel
											
	A2C60000973	Black	12/24 Volt	Single scale	0 psi	80 psi	None	None	240–33.5 Ω	Double lens	No bezel
A2C60000990	White	12/24 Volt	Single scale	0 psi	80 psi	None	None	10–184 Ω	Double lens	No bezel	Bulk

0 – 100 psi / 											
	A2C60000974	Black	12/24 Volt	Single scale	0 psi	100 psi	None	None	240–33.5 Ω	Double lens	No bezel

0 – 150 psi / 											
	A2C60000976	Black	12/24 Volt	Single scale	0 psi	150 psi	None	None	240–33.5 Ω	Double lens	No bezel
A2C60000977	Black	12/24 Volt	Single scale	0 psi	150 psi	None	None	10–184 Ω	Double lens	No bezel	Bulk



Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 80 psi / 0 – 5 bar 											
A2C60000983	Black	12/24 Volt	Double scale	0 psi	80 psi	0 bar	5 bar	240–33.5 Ω	Double lens	No bezel	Bulk
A2C60001028	Black	12/24 Volt	Double scale	0 psi	80 psi	0 bar	5 bar	10–184 Ω	Double lens	No bezel	Bulk
A2C60001039	White	12/24 Volt	Double scale	0 psi	80 psi	0 bar	5 bar	240–33.5 Ω	Double lens	No bezel	Bulk
A2C60001044	White	12/24 Volt	Double scale	0 psi	80 psi	0 bar	5 bar	10–184 Ω	Double lens	No bezel	Bulk
0 – 100 psi / 0 – 7 bar 											
A2C60001029	Black	12/24 Volt	Double scale	0 psi	100 psi	0 bar	7 bar	240–33.5 Ω	Double lens	No bezel	Bulk
A2C60001045	White	12/24 Volt	Double scale	0 psi	100 psi	0 bar	7 bar	240–33.5 Ω	Double lens	No bezel	Bulk
0 – 150 psi / 0 – 10 bar 											
A2C600001030	Black	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	240–33.5 Ω	Double lens	No bezel	Bulk
A2C600001031	Black	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	10–184 Ω	Double lens	No bezel	Bulk
A2C600001046	White	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	240–33.5 Ω	Double lens	No bezel	Bulk
A2C600001047	White	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	10–184 Ω	Double lens	No bezel	Bulk
0 – 30 psi / - OIL 											
A2C60000988	White	12/24 Volt	Single scale	0 psi	30 psi	None	None	10–184 Ω	Double lens	No bezel	Bulk
0 – 100 psi / - OIL 											
A2C60000991	White	12/24 Volt	Single scale	0 psi	100 psi	None	None	10–184 Ω	Double lens	No bezel	Bulk
0 – 80 psi / 0 – 5 kpa ENGINE OIL 											
A2C60000995	Black	12/24 Volt	Double scale	0 psi	80 psi	0 kpa	5 kpa	10–184 Ω	Double lens	No bezel	Bulk
A2C60000996	Black	12/24 Volt	Double scale	0 psi	80 psi	0 kpa	5 kpa	240–33.5 Ω	Double lens	No bezel	Bulk

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
<p>0 – 100 psi / 0 – 7 kpa</p>  <p>ENGINE OIL</p>											
A2C60000997	Black	12/24 Volt	Double scale	0 psi	100 psi	0 kpa	7 kpa	10–184 Ω	Double lens	No bezel	Bulk
<p>0 – 150 psi / 0 – 10 bar</p>  <p>ENGINE OIL</p>											
A2C60000994	Black	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	10–184 Ω	Double lens	No bezel	Bulk
<p>0 – 5 bar / –</p>  											
A2C60000967	Black	12/24 Volt	Single scale	0 bar	5 bar	None	None	10–184 Ω	Double lens	No bezel	Bulk
A2C60000984	White	12/24 Volt	Single scale	0 bar	5 bar	None	None	10–184 Ω	Double lens	No bezel	Bulk
<p>0 – 10 bar / –</p>  											
A2C60000968	Black	12/24 Volt	Single scale	0 bar	10 bar	None	None	10–184 Ω	Double lens	No bezel	Bulk
A2C60000985	White	12/24 Volt	Single scale	0 bar	10 bar	None	None	10–184 Ω	Double lens	No bezel	Bulk
<p>0 – 5 bar / 0 – 80 psi</p>  											
A2C60001024	Black	12/24 Volt	Double scale	0 bar	5 bar	0 psi	80 psi	10–184 Ω	Double lens	No bezel	Bulk
A2C60001035	White	12/24 Volt	Double scale	0 bar	5 bar	0 psi	80 psi	10–184 Ω	Double lens	No bezel	Bulk
<p>0 – 10 bar / 0 – 150 psi</p>  											
A2C60001025	Black	12/24 Volt	Double scale	0 bar	10 bar	0 psi	150 psi	10–184 Ω	Double lens	No bezel	Bulk
A2C60001036	White	12/24 Volt	Double scale	0 bar	10 bar	0 psi	150 psi	10–184 Ω	Double lens	No bezel	Bulk
<p>0 – 25 bar / 0 – 350 psi</p>  											
A2C60001037	White	12/24 Volt	Double scale	0 bar	25 bar	0 psi	350 psi	10–184 Ω	Double lens	No bezel	Bulk

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 30 bar / 0 – 435 psi</p>  </div> <div style="width: 15%; text-align: center;">  </div> </div>											
A2C60001038	White	12/24 Volt	Double scale	0 bar	30 bar	0 psi	435 psi	10–184 Ω	Double lens	No bezel	Bulk
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 5 kPa / –</p>  </div> <div style="width: 15%; text-align: center;">  </div> </div>											
A2C60000980	Black	12/24 Volt	Single scale	0 kPa	5 kPa	None	None	10–184 Ω	Double lens	No bezel	Bulk
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 10 kPa / –</p>  </div> <div style="width: 15%; text-align: center;">  </div> </div>											
A2C60000981	Black	12/24 Volt	Single scale	0 kPa	10 kPa	None	None	10–184 Ω	Double lens	No bezel	Bulk
Brake pressure											
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 10 bar / –</p>  </div> <div style="width: 15%; text-align: center;">  </div> </div>											
A2C60000969	Black	12/24 Volt	Single scale	0 bar	10 bar	None	None	10–184 Ω	Double lens	No bezel	Bulk
A2C60000986	White	12/24 Volt	Single scale	0 bar	10 bar	None	None	10–184 Ω	Double lens	No bezel	Bulk
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 150 psi / 0 – 10 kPa</p>  </div> <div style="width: 15%; text-align: center;">  </div> </div>											
A2C60000999	Black	12/24 Volt	Double scale	0 psi	150 psi	0 kPa	10 kPa	10–184 Ω	Double lens	No bezel	Bulk
Air pressure											
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 150 psi / 0 – 10 kPa</p> <p>AIR</p> </div> <div style="width: 15%; text-align: center;">  </div> </div>											
A2C60000998	Black	12/24 Volt	Double scale	0 psi	150 psi	0 kPa	10 kPa	10–184 Ω	Double lens	No bezel	Bulk



Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				



Transmission pressure


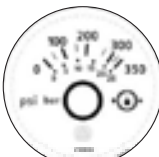
0 – 25 bar / 0 – 350 psi 											
	A2C60001026	Black	12/24 Volt	Double scale	0 bar	25 bar	0 psi	350 psi	10–184 Ω	Double lens	No bezel


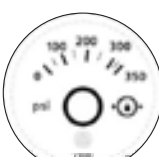
0 – 25 bar / – 											
	A2C60000970	Black	12/24 Volt	Single scale	0 bar	25 bar	None	None	10–184 Ω	Double lens	No bezel
A2C60000987	White	12/24 Volt	Single scale	0 bar	25 bar	None	None	10–184 Ω	Double lens	No bezel	Bulk


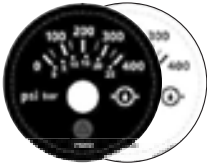
0 – 25 kpa / – 											
	A2C60000982	Black	12/24 Volt	Single scale	0 kpa	25 kpa	None	None	10–184 Ω	Double lens	No bezel



0 – 30 bar / 0 – 435 psi 											
	A2C60001027	Black	12/24 Volt	Double scale	0 bar	30 bar	0 psi	435 psi	10–184 Ω	Double lens	No bezel


0 – 350 psi / 0 – 25 kpa 											
	A2C60001000	Black	12/24 Volt	Double scale	0 psi	350 psi	0 kpa	25 kpa	10–184 Ω	Double lens	No bezel

0 – 350 psi / 0 – 25 bar 											
	A2C60001048	White	12/24 Volt	Double scale	0 psi	350 psi	0 bar	25 bar	10–184 Ω	Double lens	No bezel



0 – 350 psi / – 											
	A2C60000993	White	12/24 Volt	Single scale	0 psi	350 psi	None	None	10–184 Ω	Double lens	No bezel


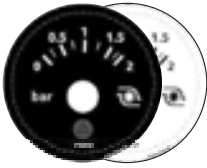
Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
<p>0 – 400 psi / 0 – 25 bar</p>  											
A2C60001032	Black	12/24 Volt	Double scale	0 psi	400 psi	0 bar	25 bar	10–184 Ω	Double lens	No bezel	Bulk
A2C60001049	White	12/24 Volt	Double scale	0 psi	400 psi	0 bar	25 bar	10–184 Ω	Double lens	No bezel	Bulk



<p>0 – 400 psi / –</p>  											
A2C60000979	Black	12/24 Volt	Single scale	0 psi	400 psi	None	None	10–184 Ω	Double lens	No bezel	Bulk



<p>0 – 400 psi / – TRANS</p> 											
A2C60000978	Black	12/24 Volt	Single scale	0 psi	400 psi	None	None	10–184 Ω	Double lens	No bezel	Bulk

Turbopressure

<p>0 – 2 bar / 0 – 30 psi</p>  											
A2C60001023	Black	12/24 Volt	Double scale	0 bar	2 bar	0 psi	30 psi	10–184 Ω	Double lens	No bezel	Bulk
A2C60001034	White	12/24 Volt	Double scale	0 bar	2 bar	0 psi	30 psi	10–184 Ω	Double lens	No bezel	Bulk

<p>0 – 2 bar / –</p>  											
A2C60000966	Black	12/24 Volt	Single scale	0 bar	2 bar	None	None	10–184 Ω	Double lens	No bezel	Bulk
A2C60001033	White	12/24 Volt	Single scale	0 bar	2 bar	None	None	10–184 Ω	Double lens	No bezel	Bulk

<p>0 – 30 psi / –</p>  											
A2C60000971	Black	12/24 Volt	Single scale	0 psi	30 psi	None	None	10–184 Ω	Double lens	No bezel	Bulk

<p>0 – 80 psi / –</p>  											
A2C60000989	White	12/24 Volt	Single scale	0 psi	80 psi	None	None	10–184 Ω	Double lens	No bezel	Bulk

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				

Tachometer

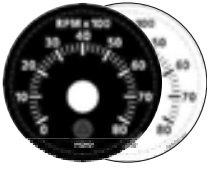
Engine speed

0 – 4000 / —											
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A2C59510016	Black	12/24 Volt	Single scale	0	4000	None	None	None	Single lens	No bezel	Bulk
A2C59510038	Black	12/24 Volt	Single scale	0	4000	None	None	None	Double lens	No bezel	Bulk
A2C59510415	Black	12/24 Volt	Single scale	0	4000	None	None	None	Single lens	Triangular, black	Individual
A2C59510711	Black	12/24 Volt	Single scale	0	4000	None	None	None	Single lens	Triangular, black	Bulk
A2C59510437	Black	12/24 Volt	Single scale	0	4000	None	None	None	Double lens	Round, black	Individual
A2C59510733	Black	12/24 Volt	Single scale	0	4000	None	None	None	Double lens	Round, black	Bulk
A2C59510019	White	12/24 Volt	Single scale	0	4000	None	None	None	Single lens	No bezel	Bulk
A2C59510041	White	12/24 Volt	Single scale	0	4000	None	None	None	Double lens	No bezel	Bulk
A2C59510418	White	12/24 Volt	Single scale	0	4000	None	None	None	Single lens	Triangular, chrome	Individual
A2C59510714	White	12/24 Volt	Single scale	0	4000	None	None	None	Single lens	Triangular, chrome	Bulk
A2C59510440	White	12/24 Volt	Single scale	0	4000	None	None	None	Double lens	Round, white	Individual
A2C59510736	White	12/24 Volt	Single scale	0	4000	None	None	None	Double lens	Round, white	Bulk

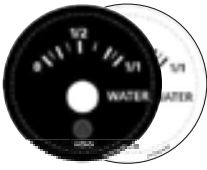
0 – 6000 / —											
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A2C59510017	Black	12/24 Volt	Single scale	0	6000	None	None	None	Single lens	No bezel	Bulk
A2C59510039	Black	12/24 Volt	Single scale	0	6000	None	None	None	Double lens	No bezel	Bulk
A2C59510416	Black	12/24 Volt	Single scale	0	6000	None	None	None	Single lens	Triangular, black	Individual
A2C59510712	Black	12/24 Volt	Single scale	0	6000	None	None	None	Single lens	Triangular, black	Bulk
A2C59510734	Black	12/24 Volt	Single scale	0	6000	None	None	None	Double lens	Round, black	Bulk
A2C59510438	Black	12/24 Volt	Single scale	0	6000	None	None	None	Double lens	Round, black	Individual
A2C59510020	White	12/24 Volt	Single scale	0	6000	None	None	None	Single lens	No bezel	Bulk
A2C59510042	White	12/24 Volt	Single scale	0	6000	None	None	None	Double lens	No bezel	Bulk
A2C59510419	White	12/24 Volt	Single scale	0	6000	None	None	None	Single lens	Triangular, chrome	Individual
A2C59510715	White	12/24 Volt	Single scale	0	6000	None	None	None	Single lens	Triangular, chrome	Bulk
A2C59510441	White	12/24 Volt	Single scale	0	6000	None	None	None	Double lens	Round, white	Individual
A2C59510737	White	12/24 Volt	Single scale	0	6000	None	None	None	Double lens	Round, white	Bulk

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
<div style="display: flex; align-items: center;"> <div style="width: 15%; text-align: center;"> <p>0 – 8000 /</p> <p>–</p> </div>  </div>											
A2C59510018	Black	12/24 Volt	Single scale	0	8000	None	None	None	Single lens	No bezel	Bulk
A2C59510040	Black	12/24 Volt	Single scale	0	8000	None	None	None	Double lens	No bezel	Bulk
A2C59510417	Black	12/24 Volt	Single scale	0	8000	None	None	None	Single lens	Triangular, black	Individual
A2C59510713	Black	12/24 Volt	Single scale	0	8000	None	None	None	Single lens	Triangular, black	Bulk
A2C59510439	Black	12/24 Volt	Single scale	0	8000	None	None	None	Double lens	Round, black	Individual
A2C59510735	Black	12/24 Volt	Single scale	0	8000	None	None	None	Double lens	Round, black	Bulk
A2C59510021	White	12/24 Volt	Single scale	0	8000	None	None	None	Single lens	No bezel	Bulk
A2C59510043	White	12/24 Volt	Single scale	0	8000	None	None	None	Double lens	No bezel	Bulk
A2C59510420	White	12/24 Volt	Single scale	0	8000	None	None	None	Single lens	Triangular, chrome	Individual
A2C59510716	White	12/24 Volt	Single scale	0	8000	None	None	None	Single lens	Triangular, chrome	Bulk
A2C59510442	White	12/24 Volt	Single scale	0	8000	None	None	None	Double lens	Round, white	Individual
A2C59510738	White	12/24 Volt	Single scale	0	8000	None	None	None	Double lens	Round, white	Bulk


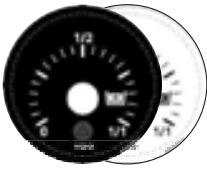
Freshwater/blackwater

Freshwater

<div style="display: flex; align-items: center;"> <div style="width: 15%; text-align: center;"> <p>0 – 1/1 /</p> <p>–</p> <p>WATER</p> </div>  </div>											
A2C60001061	Black	12/24 Volt	Single scale	0	1/1	None	None	3 – 180 Ω	Double lens	No bezel	Bulk
A2C60520086	Black	12/24 Volt	Single scale	0	1/1	None	None	4 – 20 mA	Double lens	No bezel	Bulk
A2C60001063	White	12/24 Volt	Single scale	0	1/1	None	None	3 – 180 Ω	Double lens	No bezel	Bulk
A2C60520087	White	12/24 Volt	Single scale	0	1/1	None	None	4 – 20 mA	Double lens	No bezel	Bulk


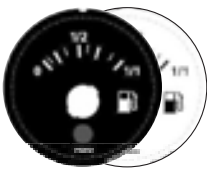
<div style="display: flex; align-items: center;"> <div style="width: 15%; text-align: center;"> <p>E – F /</p> <p>–</p> <p>WATER</p> </div>  </div>											
A2C60001062	Black	12/24 Volt	Single scale	E	F	None	None	3 – 180 Ω	Double lens	No bezel	Bulk
A2C60001064	White	12/24 Volt	Single scale	E	F	None	None	3 – 180 Ω	Double lens	No bezel	Bulk


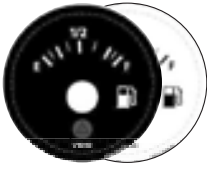
Blackwater

<div style="display: flex; align-items: center;"> <div style="width: 15%; text-align: center;"> <p>0 – 1/1 /</p> <p>–</p>  </div>  </div>											
A2C59510036	Black	12/24 Volt	Single scale	0	1/1	None	None	4 – 20 mA	Double lens	No bezel	Bulk
A2C59510435	Black	12/24 Volt	Single scale	0	1/1	None	None	4 – 20 mA	Double lens	Round, black	Individual
A2C59510731	Black	12/24 Volt	Single scale	0	1/1	None	None	4 – 20 mA	Double lens	Round, black	Bulk
A2C59510037	White	12/24 Volt	Single scale	0	1/1	None	None	4 – 20 mA	Double lens	No bezel	Bulk
A2C59510436	White	12/24 Volt	Single scale	0	1/1	None	None	4 – 20 mA	Double lens	Round, white	Individual
A2C59510732	White	12/24 Volt	Single scale	0	1/1	None	None	4 – 20 mA	Double lens	Round, white	Bulk

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				

Fuel

<div style="display: flex; align-items: center;"> <div style="text-align: center; margin-right: 10px;"> <p>0 - 1/1 /</p>  </div>  </div>											
A2C60001050	Black	12/24 Volt	Single scale	0	1/1	None	None	3-180 Ω	Double lens	No bezel	Bulk
A2C60001051	Black	12/24 Volt	Single scale	0	1/1	None	None	90*-0.5 Ω	Double lens	No bezel	Bulk
A2C60001056	White	12/24 Volt	Single scale	0	1/1	None	None	3-180 Ω	Double lens	No bezel	Bulk
A2C60001057	White	12/24 Volt	Single scale	0	1/1	None	None	90*-0.5 Ω	Double lens	No bezel	Bulk

<div style="display: flex; align-items: center;"> <div style="text-align: center; margin-right: 10px;"> <p>E - F /</p>  </div>  </div>											
A2C60001052	Black	12/24 Volt	Single scale	E	F	None	None	3-180 Ω	Double lens	No bezel	Bulk
A2C60001053	Black	12/24 Volt	Single scale	E	F	None	None	240-33.5 Ω	Double lens	No bezel	Bulk
A2C60001054	Black	12/24 Volt	Single scale	E	F	None	None	0-90 Ω	Double lens	No bezel	Bulk
A2C60001055	Black	12/24 Volt	Single scale	E	F	None	None	90*-0.5 Ω	Double lens	No bezel	Bulk
A2C60001058	White	12/24 Volt	Single scale	E	F	None	None	240-33.5 Ω	Double lens	No bezel	Bulk
A2C60001059	White	12/24 Volt	Single scale	E	F	None	None	0-90 Ω	Double lens	No bezel	Bulk
A2C60001060	White	12/24 Volt	Single scale	E	F	None	None	90*-0.5 Ω	Double lens	No bezel	Bulk

Part Number	Qty.	Description
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Fuel set devices including sensor, black

A2C59513200		
A2C59510165	1	ALAS I Fuel Level Senders, Lever-Arm Type
A2C60001052	1	Tank
N05-801-432	1	Spacer
A2C59512947	1	Adapter cable

Fuel set devices including sensor, white


A2C59513459		
A2C59510165	1	ALAS I Fuel Level Senders, Lever-Arm Type
A2C60001056	1	Tank
N05-801-432	1	Spacer
A2C59512947	1	Adapter cable

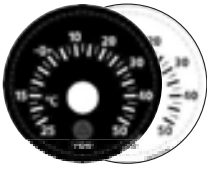
*adjustable

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				


Temperature



Outside temperature

-10 – +120 °F / 											
A2C59510013	Black	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Single lens	No bezel	Bulk
A2C59510031	Black	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Double lens	No bezel	Bulk
A2C59510412	Black	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Single lens	Triangular, black	Individual
A2C59510708	Black	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Single lens	Triangular, black	Bulk
A2C59510430	Black	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Double lens	Round, black	Individual
A2C59510726	Black	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Double lens	Round, black	Bulk
A2C59510015	White	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Single lens	No bezel	Bulk
A2C59510033	White	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Double lens	No bezel	Bulk
A2C59510414	White	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Single lens	Triangular, chrome	Individual
A2C59510710	White	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Single lens	Triangular, chrome	Bulk
A2C59510432	White	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Double lens	Round, white	Individual
A2C59510728	White	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Double lens	Round, white	Bulk

-25 – +50 °C / 											
A2C59510012	Black	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Single lens	No bezel	Bulk
A2C59510030	Black	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Double lens	No bezel	Bulk
A2C59510411	Black	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Single lens	Triangular, black	Individual
A2C59510707	Black	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Single lens	Triangular, black	Bulk
A2C59510429	Black	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Double lens	Round, black	Individual
A2C59510725	Black	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Double lens	Round, black	Bulk
A2C59510014	White	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Single lens	No bezel	Bulk
A2C59510032	White	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Double lens	No bezel	Bulk
A2C59510413	White	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Single lens	Triangular, chrome	Individual
A2C59510709	White	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Single lens	Triangular, chrome	Bulk
A2C59510431	White	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Double lens	Round, white	Individual
A2C59510727	White	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Double lens	Round, white	Bulk




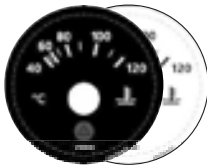








Hydraulic temperature



20 – 100 °C /  											
A2C60000949	Black	12/24 Volt	Single scale	20 °C	100 °C	None	None	287.4–22.7 Ω	Double lens	No bezel	Bulk

40 – 120 °C /  											
A2C60000951	Black	12/24 Volt	Single scale	40 °C	120 °C	None	None	287.4–22.7 Ω	Double lens	No bezel	Bulk


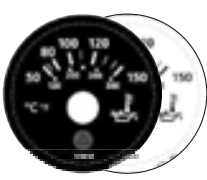
Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				



Coolant temperature


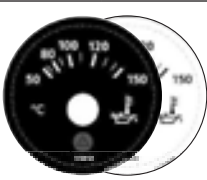
<p>40 – 120 °C / 105 – 250 °F</p>  											
A2C60001076	Black	12/24 Volt	Double scale	40 °C	120 °C	105 °F	250 °F	287.4–22.7 Ω	Double lens	No bezel	Bulk
A2C60001080	White	12/24 Volt	Double scale	40 °C	120 °C	105 °F	250 °F	287.4–22.7 Ω	Double lens	No bezel	Bulk
<p>40 – 120 °C / -</p>  											
A2C60000950	Black	12/24 Volt	Single scale	40 °C	120 °C	None	None	287.4–22.7 Ω	Double lens	No bezel	Bulk
A2C60000961	White	12/24 Volt	Single scale	40 °C	120 °C	None	None	287.4–22.7 Ω	Double lens	No bezel	Bulk
<p>40 – 120 °C / -</p>  											
A2C60000952	Black	12/24 Volt	Single scale	40 °C	120 °C	None	None	287.4–22.7 Ω	Double lens	No bezel	Bulk
<p>100 – 240 °F / -</p>  											
A2C60000957	Black	12/24 Volt	Single scale	100 °F	240 °F	None	None	384–29 Ω	Double lens	No bezel	Bulk
<p>100 – 240 °F / -</p> <p>WATER</p>  											
A2C60000963	White	12/24 Volt	Single scale	100 °F	240 °F	None	None	384–29 Ω	Double lens	No bezel	Bulk
<p>105 – 250 °F / 40 – 120 °C</p>  											
A2C60001078	Black	12/24 Volt	Double scale	105 °F	250 °F	40 °C	120 °C	287.4–22.7 Ω	Double lens	No bezel	Bulk
A2C60001021	White	12/24 Volt	Double scale	105 °F	250 °F	40 °C	120 °C	287.4–22.7 Ω	Double lens	No bezel	Bulk


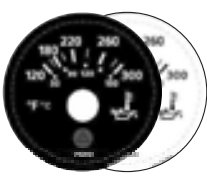
Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
105 – 250 °F /  											
A2C60000958	Black	12/24 Volt	Single scale	105 °F	250 °F	None	None	287.4–22.7 Ω	Double lens	No bezel	Bulk
A2C60000964	White	12/24 Volt	Single scale	105 °F	250 °F	None	None	287.4–22.7 Ω	Double lens	No bezel	Bulk



Engine oil temperature



50 – 150 °C / 120 – 300 °F  											
A2C60001077	Black	12/24 Volt	Double scale	50 °C	150 °C	120 °F	300 °F	322.8–18.6 Ω	Double lens	No bezel	Bulk
A2C60001020	White	12/24 Volt	Double scale	50 °C	150 °C	120 °F	300 °F	322.8–18.6 Ω	Double lens	No bezel	Bulk

50 – 150 °C /  											
A2C60000954	Black	12/24 Volt	Single scale	50 °C	150 °C	None	None	322.8–18.6 Ω	Double lens	No bezel	Bulk



50 – 150 °C /  											
A2C60000953	Black	12/24 Volt	Single scale	50 °C	150 °C	None	None	322.8–18.6 Ω	Double lens	No bezel	Bulk
A2C60000962	White	12/24 Volt	Single scale	50 °C	150 °C	None	None	322.8–18.6 Ω	Double lens	No bezel	Bulk

120 – 300 °F / 50 – 150 °C  											
A2C60001079	Black	12/24 Volt	Double scale	120 °F	300 °F	50 °C	150 °C	322.8–18.6 Ω	Double lens	No bezel	Bulk
A2C60001022	White	12/24 Volt	Double scale	120 °F	300 °F	50 °C	150 °C	322.8–18.6 Ω	Double lens	No bezel	Bulk



120 – 300 °F /  											
A2C60000959	Black	12/24 Volt	Single scale	120 °F	300 °F	None	None	322.8–18.6 Ω	Double lens	No bezel	Bulk



Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>120 – 300 °F / —</p>  </div>  </div>											
A2C60000965	White	12/24 Volt	Single scale	120 °F	300 °F	None	None	322.8–18.6 Ω	Double lens	No bezel	Bulk

Transmission temperature



<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>50 – 150 °F / —</p>  </div>  </div>											
A2C60000955	Black	12/24 Volt	Single scale	50 °C	150 °C	None	None	322.8–18.6 Ω	Double lens	No bezel	Bulk


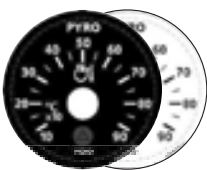
Cylinder temperature

<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>60 – 200 °C / —</p>  </div>  </div>											
A2C60000956	Black	12/24 Volt	Single scale	60 °C	200 °C	None	None	482.5–14.3 Ω	Double lens	No bezel	Bulk



<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>140 – 400 °F / —</p>  </div>  </div>											
A2C60000960	Black	12/24 Volt	Single scale	140 °F	400 °F	None	None	482.5–14.3 Ω	Double lens	No bezel	Bulk


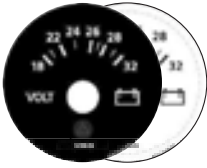
Pyrometer

<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>250 – 1650 °F / —</p>  </div>  </div>											
A2C59510010	Black	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Single lens	No bezel	Bulk
A2C59510028	Black	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Double lens	No bezel	Bulk
A2C59510409	Black	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Single lens	Triangular, black	Individual
A2C59510705	Black	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Single lens	Triangular, black	Bulk
A2C59510427	Black	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Double lens	Round, black	Individual
A2C59510723	Black	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Double lens	Round, black	Bulk
A2C59510011	White	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Single lens	No bezel	Bulk
A2C59510029	White	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Double lens	No bezel	Bulk
A2C59510410	White	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Single lens	Triangular, chrome	Individual
A2C59510706	White	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Single lens	Triangular, chrome	Bulk
A2C59510428	White	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Double lens	Round, white	Individual
A2C59510724	White	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Double lens	Round, white	Bulk


Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>100 – 900 °C /</p>  </div>  </div>											
A2C59510008	Black	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Single lens	No bezel	Bulk
A2C59510026	Black	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Double lens	No bezel	Bulk
A2C59510407	Black	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Single lens	Triangular, black	Individual
A2C59510703	Black	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Single lens	Triangular, black	Bulk
A2C59510425	Black	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Double lens	Round, black	Individual
A2C59510721	Black	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Double lens	Round, black	Bulk
A2C59510009	White	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Single lens	No bezel	Bulk
A2C59510027	White	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Double lens	No bezel	Bulk
A2C59510408	White	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Single lens	Triangular, chrome	Individual
A2C59510704	White	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Single lens	Triangular, chrome	Bulk
A2C59510426	White	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Double lens	Round, white	Individual
A2C59510722	White	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Double lens	Round, white	Bulk

Voltmeter


<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>8 – 16 V /</p>  </div>  </div>											
A2C60100176	Black	12 Volt	Single scale	8 V	16 V	None	None	None	Single lens	No bezel	Bulk
A2C60100178	Black	12 Volt	Single scale	8 V	16 V	None	None	None	Double lens	No bezel	Bulk
A2C59510316	Black	12 Volt	Single scale	8 V	16 V	None	None	None	Single lens	Triangular, black	Individual
A2C59510638	Black	12 Volt	Single scale	8 V	16 V	None	None	None	Single lens	Triangular, black	Bulk
A2C59510393	Black	12 Volt	Single scale	8 V	16 V	None	None	None	Double lens	Triangular, chrome	Individual
A2C59510362	Black	12 Volt	Single scale	8 V	16 V	None	None	None	Double lens	Round, black	Individual
A2C59510684	Black	12 Volt	Single scale	8 V	16 V	None	None	None	Double lens	Round, black	Bulk
A2C60100177	White	12 Volt	Single scale	8 V	16 V	None	None	None	Single lens	No bezel	Bulk
A2C60100179	White	12 Volt	Single scale	8 V	16 V	None	None	None	Double lens	No bezel	Bulk
A2C59510640	White	12 Volt	Single scale	8 V	16 V	None	None	None	Single lens	Triangular, chrome	Bulk
A2C59510318	White	12 Volt	Single scale	8 V	16 V	None	None	None	Single lens	Triangular, chrome	Individual
A2C59510364	White	12 Volt	Single scale	8 V	16 V	None	None	None	Double lens	Round, white	Individual
A2C59510686	White	12 Volt	Single scale	8 V	16 V	None	None	None	Double lens	Round, white	Bulk

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>18 – 32 V /</p>  </div>  </div>											
A2C60100076	Black	24 Volt	Single scale	18 V	32 V	None	None	None	Single lens	No bezel	Bulk
A2C60100078	Black	24 Volt	Single scale	18 V	32 V	None	None	None	Double lens	No bezel	Bulk
A2C59510317	Black	24 Volt	Single scale	18 V	32 V	None	None	None	Single lens	Triangular, black	Individual
A2C59510639	Black	24 Volt	Single scale	18 V	32 V	None	None	None	Single lens	Triangular, black	Bulk
A2C59510394	Black	24 Volt	Single scale	18 V	32 V	None	None	None	Double lens	Triangular, chrome	Individual
A2C59510363	Black	24 Volt	Single scale	18 V	32 V	None	None	None	Double lens	Round, black	Individual
A2C59510685	Black	24 Volt	Single scale	18 V	32 V	None	None	None	Double lens	Round, black	Bulk
A2C60100077	White	24 Volt	Single scale	18 V	32 V	None	None	None	Single lens	No bezel	Bulk
A2C60100079	White	24 Volt	Single scale	18 V	32 V	None	None	None	Double lens	No bezel	Bulk
A2C59510319	White	24 Volt	Single scale	18 V	32 V	None	None	None	Single lens	Triangular, chrome	Individual
A2C59510641	White	24 Volt	Single scale	18 V	32 V	None	None	None	Single lens	Triangular, chrome	Bulk
A2C59510365	White	24 Volt	Single scale	18 V	32 V	None	None	None	Double lens	Round, white	Individual
A2C59510687	White	24 Volt	Single scale	18 V	32 V	None	None	None	Double lens	Round, white	Bulk

Rudder angle

<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>40° Port – 40° Stb</p> <p>/</p> <p>–</p> </div>  </div>											
A2C60001065	Black	12/24 Volt	Single scale	40° Port	40° Stb	None	None	3 – 180 Ω	Double lens	No bezel	Bulk
A2C60001066	White	12/24 Volt	Single scale	40° Port	40° Stb	None	None	3 – 180 Ω	Double lens	No bezel	Bulk

Trim

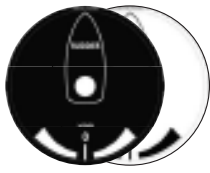
<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>TRIM</p> </div>  </div>											
A2C60001067	Black	12/24 Volt	Single scale	Up	Down	None	None	167 – 10 Ω	Double lens	No bezel	Bulk
A2C60001068	White	12/24 Volt	Single scale	Up	Down	None	None	167 – 10 Ω	Double lens	No bezel	Bulk

1.1.1.b Viewline instrument line | 85 & 110 mm OE-Version

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				


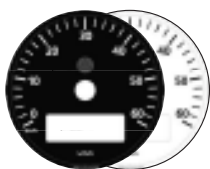
Rudder angle

85 mm

-45 – +45° /											
											
A2C59510106	Black	12/24 Volt	Single scale	-45°	+45°	None	None	0–180 Ohm	Double lens	No bezel	Bulk
A2C59510505	Black	12/24 Volt	Single scale	-45°	+45°	None	None	0–180 Ohm	Double lens	Round, black	Individual
A2C59510801	Black	12/24 Volt	Single scale	-45°	+45°	None	None	0–180 Ohm	Double lens	Round, black	Bulk
A2C59510107	White	12/24 Volt	Single scale	-45°	+45°	None	None	0–180 Ohm	Double lens	No bezel	Bulk
A2C59510506	White	12/24 Volt	Single scale	-45°	+45°	None	None	0–180 Ohm	Double lens	Round, white	Individual
A2C59510802	White	12/24 Volt	Single scale	-45°	+45°	None	None	0–180 Ohm	Double lens	Round, white	Bulk


Speedometer

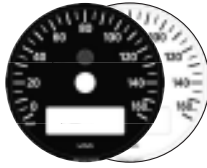
85 mm

0 – 25 kmh /											
											
A2C59510062	Black	12/24 Volt	Single scale	0 km/h	25 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510461	Black	12/24 Volt	Single scale	0 km/h	25 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510757	Black	12/24 Volt	Single scale	0 km/h	25 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
0 – 60 kmh /											
											
A2C59510063	Black	12/24 Volt	Single scale	0 km/h	60 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510462	Black	12/24 Volt	Single scale	0 km/h	60 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510758	Black	12/24 Volt	Single scale	0 km/h	60 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
A2C59510075	White	12/24 Volt	Single scale	0 km/h	60 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510474	White	12/24 Volt	Single scale	0 km/h	60 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Individual
A2C59510770	White	12/24 Volt	Single scale	0 km/h	60 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Bulk


Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 80 kmh / 											
A2C59510064	Black	12/24 Volt	Single scale	0 km/h	80 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510463	Black	12/24 Volt	Single scale	0 km/h	80 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510759	Black	12/24 Volt	Single scale	0 km/h	80 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
A2C59510076	White	12/24 Volt	Single scale	0 km/h	80 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510475	White	12/24 Volt	Single scale	0 km/h	80 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Individual
A2C59510771	White	12/24 Volt	Single scale	0 km/h	80 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Bulk
0 – 120 kmh / 											
A2C59510065	Black	12/24 Volt	Single scale	0 km/h	120 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510464	Black	12/24 Volt	Single scale	0 km/h	120 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510760	Black	12/24 Volt	Single scale	0 km/h	120 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
A2C59510077	White	12/24 Volt	Single scale	0 km/h	120 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510476	White	12/24 Volt	Single scale	0 km/h	120 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Individual
A2C59510772	White	12/24 Volt	Single scale	0 km/h	120 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Bulk
0 – 200 kmh / 											
A2C59510066	Black	12/24 Volt	Single scale	0 km/h	200 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510465	Black	12/24 Volt	Single scale	0 km/h	200 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510761	Black	12/24 Volt	Single scale	0 km/h	200 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
A2C59510078	White	12/24 Volt	Single scale	0 km/h	200 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510477	White	12/24 Volt	Single scale	0 km/h	200 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Individual
A2C59510773	White	12/24 Volt	Single scale	0 km/h	200 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Bulk
0 – 300 kmh / 											
A2C59510067	Black	12/24 Volt	Single scale	0 km/h	300 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510466	Black	12/24 Volt	Single scale	0 km/h	300 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510762	Black	12/24 Volt	Single scale	0 km/h	300 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk


Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 30 mph / 0 – 50 kmh 											
A2C59510068	Black	12/24 Volt	Double scale	0 mph	30 mph	0 km/h	50 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510467	Black	12/24 Volt	Double scale	0 mph	30 mph	0 km/h	50 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510763	Black	12/24 Volt	Double scale	0 mph	30 mph	0 km/h	50 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
A2C59510081	White	12/24 Volt	Double scale	0 mph	30 mph	0 km/h	50 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510480	White	12/24 Volt	Double scale	0 mph	30 mph	0 km/h	50 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Individual
A2C59510776	White	12/24 Volt	Double scale	0 mph	30 mph	0 km/h	50 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Bulk
0 – 60 mph / 0 – 95 kmh 											
A2C59510069	Black	12/24 Volt	Double scale	0 mph	60 mph	0 km/h	95 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510468	Black	12/24 Volt	Double scale	0 mph	60 mph	0 km/h	95 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510764	Black	12/24 Volt	Double scale	0 mph	60 mph	0 km/h	95 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
A2C59510082	White	12/24 Volt	Double scale	0 mph	60 mph	0 km/h	95 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510481	White	12/24 Volt	Double scale	0 mph	60 mph	0 km/h	95 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Individual
A2C59510777	White	12/24 Volt	Double scale	0 mph	60 mph	0 km/h	95 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Bulk
0 – 85 mph / 0 – 140 kmh 											
A2C59510070	Black	12/24 Volt	Double scale	0 mph	85 mph	0 km/h	140 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510469	Black	12/24 Volt	Double scale	0 mph	85 mph	0 km/h	140 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510765	Black	12/24 Volt	Double scale	0 mph	85 mph	0 km/h	140 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
A2C59510083	White	12/24 Volt	Double scale	0 mph	85 mph	0 km/h	140 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510482	White	12/24 Volt	Double scale	0 mph	85 mph	0 km/h	140 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Individual
A2C59510778	White	12/24 Volt	Double scale	0 mph	85 mph	0 km/h	140 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Bulk


Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 120 mph / 0 – 200 kmh 											
A2C59510071	Black	12/24 Volt	Double scale	0 mph	120 mph	0 km/h	200 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510470	Black	12/24 Volt	Double scale	0 mph	120 mph	0 km/h	200 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510766	Black	12/24 Volt	Double scale	0 mph	120 mph	0 km/h	200 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
A2C59510084	White	12/24 Volt	Double scale	0 mph	120 mph	0 km/h	200 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510483	White	12/24 Volt	Double scale	0 mph	120 mph	0 km/h	200 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Individual
A2C59510779	White	12/24 Volt	Double scale	0 mph	120 mph	0 km/h	200 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Bulk
0 – 120 mph / - 											
A2C59510073	Black	12/24 Volt	Single scale	0 mph	120 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510472	Black	12/24 Volt	Single scale	0 mph	120 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510768	Black	12/24 Volt	Single scale	0 mph	120 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
A2C59510079	White	12/24 Volt	Single scale	0 mph	120 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510478	White	12/24 Volt	Single scale	0 mph	120 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Individual
A2C59510774	White	12/24 Volt	Single scale	0 mph	120 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Bulk
0 – 140 mph / 0 – 220 kmh 											
A2C59510072	Black	12/24 Volt	Double scale	0 mph	140 mph	0 km/h	220 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510471	Black	12/24 Volt	Double scale	0 mph	140 mph	0 km/h	220 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510767	Black	12/24 Volt	Double scale	0 mph	140 mph	0 km/h	220 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
A2C59510085	White	12/24 Volt	Double scale	0 mph	140 mph	0 km/h	220 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510484	White	12/24 Volt	Double scale	0 mph	140 mph	0 km/h	220 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Individual
A2C59510780	White	12/24 Volt	Double scale	0 mph	140 mph	0 km/h	220 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Bulk






Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 160 mph / 											
A2C59510074	Black	12/24 Volt	Single scale	0 mph	160 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510473	Black	12/24 Volt	Single scale	0 mph	160 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510769	Black	12/24 Volt	Single scale	0 mph	160 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
A2C59510080	White	12/24 Volt	Single scale	0 mph	160 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510479	White	12/24 Volt	Single scale	0 mph	160 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Individual
A2C59510775	White	12/24 Volt	Single scale	0 mph	160 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome	Bulk


110 mm


0 – 25 kmh / 											
A2C59510115	Black	12/24 Volt	Single scale	0 km/h	25 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510514	Black	12/24 Volt	Single scale	0 km/h	25 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510810	Black	12/24 Volt	Single scale	0 km/h	25 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk


0 – 60 kmh / 											
A2C59510116	Black	12/24 Volt	Single scale	0 km/h	60 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510515	Black	12/24 Volt	Single scale	0 km/h	60 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510811	Black	12/24 Volt	Single scale	0 km/h	60 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk

0 – 80 kmh / 											
A2C59510117	Black	12/24 Volt	Single scale	0 km/h	80 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510516	Black	12/24 Volt	Single scale	0 km/h	80 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510812	Black	12/24 Volt	Single scale	0 km/h	80 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk

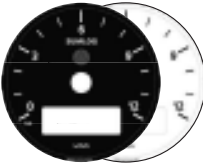
Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 120 kmh / 											
A2C59510118	Black	12/24 Volt	Single scale	0 km/h	120 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510517	Black	12/24 Volt	Single scale	0 km/h	120 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510813	Black	12/24 Volt	Single scale	0 km/h	120 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
0 – 200 kmh / 											
A2C59510119	Black	12/24 Volt	Single scale	0 km/h	200 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510518	Black	12/24 Volt	Single scale	0 km/h	200 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510814	Black	12/24 Volt	Single scale	0 km/h	200 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
0 – 300 kmh / 											
A2C59510120	Black	12/24 Volt	Single scale	0 km/h	300 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510519	Black	12/24 Volt	Single scale	0 km/h	300 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510815	Black	12/24 Volt	Single scale	0 km/h	300 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
0 – 60 mph / 0 – 95 kmh 											
A2C59510122	Black	12/24 Volt	Double scale	0 mph	60 mph	0 km/h	95 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510521	Black	12/24 Volt	Double scale	0 mph	60 mph	0 km/h	95 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510817	Black	12/24 Volt	Double scale	0 mph	60 mph	0 km/h	95 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk
0 – 85 mph / 0 – 140 kmh 											
A2C59510123	Black	12/24 Volt	Double scale	0 mph	85 mph	0 km/h	140 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510522	Black	12/24 Volt	Double scale	0 mph	85 mph	0 km/h	140 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510818	Black	12/24 Volt	Double scale	0 mph	85 mph	0 km/h	140 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk

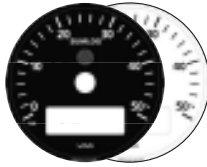
Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 120 mph / 											
A2C59510121	Black	12/24 Volt	Single scale	0 mph	120 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510520	Black	12/24 Volt	Single scale	0 mph	120 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510816	Black	12/24 Volt	Single scale	0 mph	120 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk

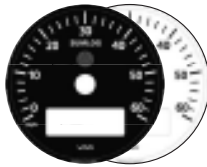
0 – 140 mph / 0 – 220 kmh 											
A2C59510124	Black	12/24 Volt	Double scale	0 mph	140 mph	0 km/h	220 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510523	Black	12/24 Volt	Double scale	0 mph	140 mph	0 km/h	220 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510819	Black	12/24 Volt	Double scale	0 mph	140 mph	0 km/h	220 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk

0 – 220 mph / 0 – 360 kmh 											
A2C59510125	Black	12/24 Volt	Double scale	0 mph	220 mph	0 km/h	360 km/h	Ind, Hall, Blocking Oscillator	Single lens	No bezel	Bulk
A2C59510524	Black	12/24 Volt	Double scale	0 mph	220 mph	0 km/h	360 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Individual
A2C59510820	Black	12/24 Volt	Double scale	0 mph	220 mph	0 km/h	360 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black	Bulk

Sumlog
85 mm

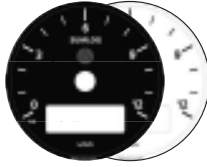
0 – 12 kn / 											
A2C59510100	Black	12/24 Volt	Single scale	0 kn	12 kn	None	None	Hall, NMEA	Double lens	No bezel	Bulk
A2C59510499	Black	12/24 Volt	Single scale	0 kn	12 kn	None	None	Hall, NMEA	Double lens	Round, black	Individual
A2C59510795	Black	12/24 Volt	Single scale	0 kn	12 kn	None	None	Hall, NMEA	Double lens	Round, black	Bulk
A2C59510103	White	12/24 Volt	Single scale	0 kn	12 kn	None	None	Hall, NMEA	Double lens	No bezel	Bulk
A2C59510502	White	12/24 Volt	Single scale	0 kn	12 kn	None	None	Hall, NMEA	Double lens	Round, white	Individual
A2C59510798	White	12/24 Volt	Single scale	0 kn	12 kn	None	None	Hall, NMEA	Double lens	Round, white	Bulk

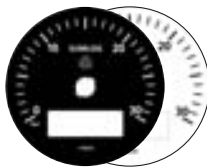
Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 50 kn / 											
A2C59510101	Black	12/24 Volt	Single scale	0 kn	50 kn	None	None	Hall, NMEA	Double lens	No bezel	Bulk
A2C59510500	Black	12/24 Volt	Single scale	0 kn	50 kn	None	None	Hall, NMEA	Double lens	Round, black	Individual
A2C59510796	Black	12/24 Volt	Single scale	0 kn	50 kn	None	None	Hall, NMEA	Double lens	Round, black	Bulk
A2C59510104	White	12/24 Volt	Single scale	0 kn	50 kn	None	None	Hall, NMEA	Double lens	No bezel	Bulk
A2C59510503	White	12/24 Volt	Single scale	0 kn	50 kn	None	None	Hall, NMEA	Double lens	Round, white	Individual
A2C59510799	White	12/24 Volt	Single scale	0 kn	50 kn	None	None	Hall, NMEA	Double lens	Round, white	Bulk

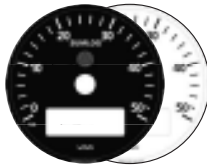
0 – 60 mph / 											
A2C59510102	Black	12/24 Volt	Single scale	0 mph	60 mph	None	None	Hall, NMEA	Double lens	No bezel	Bulk
A2C59510501	Black	12/24 Volt	Single scale	0 mph	60 mph	None	None	Hall, NMEA	Double lens	Round, black	Individual
A2C59510797	Black	12/24 Volt	Single scale	0 mph	60 mph	None	None	Hall, NMEA	Double lens	Round, black	Bulk
A2C59510105	White	12/24 Volt	Single scale	0 mph	60 mph	None	None	Hall, NMEA	Double lens	No bezel	Bulk
A2C59510504	White	12/24 Volt	Single scale	0 mph	60 mph	None	None	Hall, NMEA	Double lens	Round, white	Individual
A2C59510800	White	12/24 Volt	Single scale	0 mph	60 mph	None	None	Hall, NMEA	Double lens	Round, white	Bulk

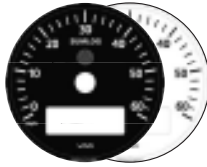
Sumlog with compass function

85 mm

0 – 12 kn 											
A2C59501381	Black	12/24 Volt	Single scale	0 kn	12 kn	None	None		Double lens	No bezel	Bulk
A2C59501384	White	12/24 Volt	Single scale	0 kn	12 kn	None	None		Double lens	No bezel	Bulk

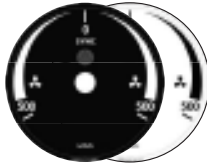
0 – 30 kn 											
A2C59501226	Black	12/24 Volt	Single scale	0 kn	30 kn	None	None		Double lens	No bezel	Bulk
A2C59501227	White	12/24 Volt	Single scale	0 kn	30 kn	None	None		Double lens	No bezel	Bulk

0 – 50 kn 											
A2C59501382	Black	12/24 Volt	Single scale	0 kn	50 kn	None	None		Double lens	No bezel	Bulk
A2C59501385	White	12/24 Volt	Single scale	0 kn	50 kn	None	None		Double lens	No bezel	Bulk

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 60 mph / 											
A2C59501383	Black	12/24 Volt	Single scale	0 mph	60 mph	None	None		Double lens	No bezel	Bulk
A2C59501386	White	12/24 Volt	Single scale	0 mph	60 mph	None	None		Double lens	No bezel	Bulk

Synchronizer

85 mm

-500 – +500 rpm / 											
A2C59510098	Black	12/24 Volt	Single scale	-500 rpm	+500 rpm	None	None	W, 1, Ind	Double lens	No bezel	Bulk
A2C59510497	Black	12/24 Volt	Single scale	-500 rpm	+500 rpm	None	None	W, 1, Ind	Double lens	Round, black	Individual
A2C59510793	Black	12/24 Volt	Single scale	-500 rpm	+500 rpm	None	None	W, 1, Ind	Double lens	Round, black	Bulk
A2C59510099	White	12/24 Volt	Single scale	-500 rpm	+500 rpm	None	None	W, 1, Ind	Double lens	No bezel	Bulk
A2C59510498	White	12/24 Volt	Single scale	-500 rpm	+500 rpm	None	None	W, 1, Ind	Double lens	Round, white	Individual
A2C59510794	White	12/24 Volt	Single scale	-500 rpm	+500 rpm	None	None	W, 1, Ind	Double lens	Round, white	Bulk

Tachometer

85 mm

0 – 1800 rpm, with LCD / 											
A2C59510044	Black	12/24 Volt	Single scale	0 rpm	1800 rpm	None	None	W, Ind, Generator, Hall	Single lens	No bezel	Bulk
A2C59510443	Black	12/24 Volt	Single scale	0 rpm	1800 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black	Individual
A2C59510739	Black	12/24 Volt	Single scale	0 rpm	1800 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black	Bulk
0 – 2500 rpm, with LCD / 											
A2C59510045	Black	12/24 Volt	Single scale	0 rpm	2500 rpm	None	None	W, Ind, Generator, Hall	Single lens	No bezel	Bulk
A2C59510444	Black	12/24 Volt	Single scale	0 rpm	2500 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black	Individual
A2C59510740	Black	12/24 Volt	Single scale	0 rpm	2500 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black	Bulk

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				

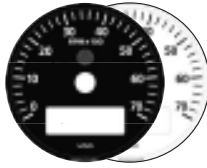
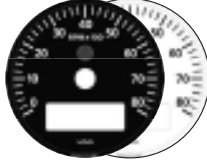
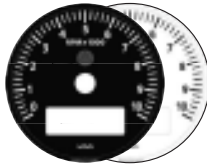
0 – 3000 rpm, with LCD / –											
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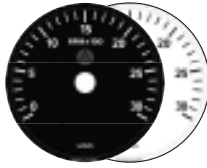
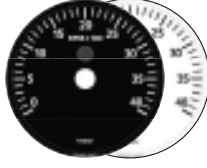
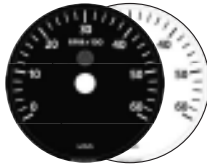
A2C59510046	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Single lens	No bezel	Bulk
A2C59510086	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Double lens	No bezel	Bulk
A2C59510445	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black	Individual
A2C59510741	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black	Bulk
A2C59510485	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Double lens	Round, black	Individual
A2C59510781	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Double lens	Round, black	Bulk
A2C59510053	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Single lens	No bezel	Bulk
A2C59510092	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Double lens	No bezel	Bulk
A2C59510452	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, chrome	Individual
A2C59510748	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, chrome	Bulk
A2C59510491	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Double lens	Round, white	Individual
A2C59510787	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Double lens	Round, white	Bulk

0 – 4000 rpm, with LCD / –											
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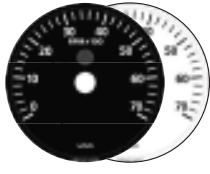
A2C59510047	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Single lens	No bezel	Bulk
A2C59510087	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Double lens	No bezel	Bulk
A2C59510446	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black	Individual
A2C59510742	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black	Bulk
A2C59510486	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, black	Individual
A2C59510782	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, black	Bulk
A2C59510054	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Single lens	No bezel	Bulk
A2C59510093	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Double lens	No bezel	Bulk
A2C59510453	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, chrome	Individual
A2C59510492	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, white	Individual
A2C59510749	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, chrome	Bulk
A2C59510788	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, white	Bulk

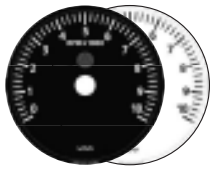
Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 5000 rpm, with LCD / 											
A2C59510048	Black	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Single lens	No bezel	Bulk
A2C59510088	Black	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Double lens	No bezel	Bulk
A2C59510447	Black	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black	Individual
A2C59510743	Black	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black	Bulk
A2C59510487	Black	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, black	Individual
A2C59510783	Black	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, black	Bulk
A2C59510055	White	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Single lens	No bezel	Bulk
A2C59510094	White	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Double lens	No bezel	Bulk
A2C59510454	White	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, chrome	Individual
A2C59510750	White	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, chrome	Bulk
A2C59510493	White	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, white	Individual
A2C59510789	White	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, white	Bulk
0 – 6000 rpm, with LCD / 											
A2C59510049	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Single lens	No bezel	Bulk
A2C59510089	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Double lens	No bezel	Bulk
A2C59510448	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black	Individual
A2C59510744	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black	Bulk
A2C59510488	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, black	Individual
A2C59510784	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, black	Bulk
A2C59510056	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Single lens	No bezel	Bulk
A2C59510095	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Double lens	No bezel	Bulk
A2C59510455	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, chrome	Individual
A2C59510751	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, chrome	Bulk
A2C59510494	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, white	Individual
A2C59510790	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, white	Bulk

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 7000 rpm, with LCD / 											
A2C59510050	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	1	Single lens	No bezel	Bulk
A2C59510090	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Double lens	No bezel	Bulk
A2C59510449	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	1	Single lens	Triangular, black	Individual
A2C59510745	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	1	Single lens	Triangular, black	Bulk
A2C59510489	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Double lens	Round, black	Individual
A2C59510785	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Double lens	Round, black	Bulk
A2C59510057	White	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	1	Single lens	No bezel	Bulk
A2C59510096	White	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Double lens	No bezel	Bulk
A2C59510456	White	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	1	Single lens	Triangular, chrome	Individual
A2C59510752	White	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	1	Single lens	Triangular, chrome	Bulk
A2C59510495	White	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Double lens	Round, white	Individual
A2C59510791	White	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Double lens	Round, white	Bulk
0 – 8000 rpm, with LCD / 											
A2C59510051	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	1	Single lens	No bezel	Bulk
A2C59510091	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	Light coil	Double lens	No bezel	Bulk
A2C59510450	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	1	Single lens	Triangular, black	Individual
A2C59510746	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	1	Single lens	Triangular, black	Bulk
A2C59510490	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	Light coil	Double lens	Round, black	Individual
A2C59510786	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	Light coil	Double lens	Round, black	Bulk
A2C59510097	White	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	Light coil	Double lens	No bezel	Bulk
A2C59510058	White	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	1	Single lens	No bezel	Bulk
A2C59510457	White	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	1	Single lens	Triangular, chrome	Individual
A2C59510753	White	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	1	Single lens	Triangular, chrome	Bulk
A2C59510496	White	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	Light coil	Double lens	Round, white	Individual
A2C59510792	White	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	Light coil	Double lens	Round, white	Bulk
0 – 10000 rpm, with LCD / 											
A2C59510052	Black	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	1	Single lens	No bezel	Bulk
A2C59510451	Black	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	1	Single lens	Triangular, black	Individual
A2C59510747	Black	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	1	Single lens	Triangular, black	Bulk
A2C59510059	White	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	1	Single lens	No bezel	Bulk
A2C59510458	White	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	1	Single lens	Triangular, chrome	Individual
A2C59510754	White	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	1	Single lens	Triangular, chrome	Bulk


Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 3000 rpm, ohne LCD / – 											
A2C59510209	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Single lens	No bezel	Bulk
A2C59510203	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Double lens	No bezel	Bulk
A2C59510531	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Single lens	Triangular, black	Individual
A2C59510827	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Single lens	Triangular, black	Bulk
A2C59510525	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Double lens	Round, black	Individual
A2C59510821	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Double lens	Round, black	Bulk
A2C59510213	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Single lens	No bezel	Bulk
A2C59510206	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Double lens	No bezel	Bulk
A2C59510535	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Single lens	Triangular, chrome	Individual
A2C59510831	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Single lens	Triangular, chrome	Bulk
A2C59510528	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Double lens	Round, white	Individual
A2C59510824	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Double lens	Round, white	Bulk
0 – 4000 rpm, ohne LCD / – 											
A2C59510210	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Single lens	No bezel	Bulk
A2C59510204	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Double lens	No bezel	Bulk
A2C59510532	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Single lens	Triangular, black	Individual
A2C59510828	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Single lens	Triangular, black	Bulk
A2C59510526	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Double lens	Round, black	Individual
A2C59510822	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Double lens	Round, black	Bulk
A2C59510214	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Single lens	No bezel	Bulk
A2C59510207	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Double lens	No bezel	Bulk
A2C59510536	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Single lens	Triangular, chrome	Individual
A2C59510832	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Single lens	Triangular, chrome	Bulk
A2C59510529	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Double lens	Round, white	Individual
A2C59510825	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Double lens	Round, white	Bulk
0 – 6000 rpm, ohne LCD / – 											
A2C59510205	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	Light coil	Double lens	No bezel	Bulk
A2C59510527	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	Light coil	Double lens	Round, black	Individual
A2C59510823	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	Light coil	Double lens	Round, black	Bulk
A2C59510208	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	Light coil	Double lens	No bezel	Bulk
A2C59510530	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	Light coil	Double lens	Round, white	Individual
A2C59510826	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	Light coil	Double lens	Round, white	Bulk


Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				







0 – 7000 rpm, ohne LCD / – 											
A2C59510211	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Single lens	No bezel	Bulk
A2C59510533	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Single lens	Triangular, black	Individual
A2C59510829	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Single lens	Triangular, black	Bulk
A2C59510215	White	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Single lens	No bezel	Bulk
A2C59510537	White	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Single lens	Triangular, chrome	Individual
A2C59510833	White	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Single lens	Triangular, chrome	Bulk




0 – 10000 rpm, ohne LCD / – 											
A2C59510212	Black	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	Light coil	Single lens	No bezel	Bulk
A2C59510534	Black	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	Light coil	Single lens	Triangular, black	Individual
A2C59510830	Black	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	Light coil	Single lens	Triangular, black	Bulk
A2C59510216	White	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	Light coil	Single lens	No bezel	Bulk
A2C59510538	White	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	Light coil	Single lens	Triangular, chrome	Individual
A2C59510834	White	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	Light coil	Single lens	Triangular, chrome	Bulk

110 mm

0 – 1800 rpm, with LCD / – 											
A2C59510108	Black	12/24 Volt	Single scale	0 rpm	1800 rpm	None	None	W, Ind, Generator, Hall	Single lens	No bezel	Bulk
A2C59510507	Black	12/24 Volt	Single scale	0 rpm	1800 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black	Individual
A2C59510803	Black	12/24 Volt	Single scale	0 rpm	1800 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black	Bulk

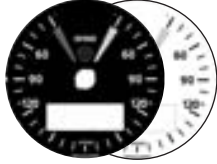
0 – 3000 rpm, with LCD / – 											
A2C59510109	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Single lens	No bezel	Bulk
A2C59510508	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black	Individual
A2C59510804	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black	Bulk

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 4000 rpm, with LCD / – 											
A2C59510110	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Single lens	No bezel	Bulk
A2C59510509	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black	Individual
A2C59510805	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black	Bulk
0 – 5000 rpm, with LCD / – 											
A2C59510111	Black	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Single lens	No bezel	Bulk
A2C59510510	Black	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black	Individual
A2C59510806	Black	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black	Bulk
0 – 6000 rpm, with LCD / – 											
A2C59510112	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Single lens	No bezel	Bulk
A2C59510511	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black	Individual
A2C59510807	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black	Bulk
0 – 7000 rpm, with LCD / – 											
A2C59510113	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	1	Single lens	No bezel	Bulk
A2C59510512	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	1	Single lens	Triangular, black	Individual
A2C59510808	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	1	Single lens	Triangular, black	Bulk
0 – 8000 rpm, with LCD / – 											
A2C59510114	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	1	Single lens	No bezel	Bulk
A2C59510513	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	1	Single lens	Triangular, black	Individual
A2C59510809	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	1	Single lens	Triangular, black	Bulk
0 – 3000 rpm, ohne LCD / – 											
A2C59510217	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Single lens	No bezel	Bulk
A2C59510835	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Single lens	Triangular, black	Bulk

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				
0 – 4000 rpm, ohne LCD / – 											
A2C59510218	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Single lens	No bezel	Bulk
A2C59510540	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Single lens	Triangular, black	Individual
A2C59510836	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Single lens	Triangular, black	Bulk
0 – 7000 rpm, ohne LCD / – 											
A2C59510219	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Single lens	No bezel	Bulk
A2C59510541	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Single lens	Triangular, black	Individual
A2C59510837	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Single lens	Triangular, black	Bulk
0 – 10000 rpm, ohne LCD / – 											
A2C59510220	Black	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	Light coil	Single lens	No bezel	Bulk
A2C59510542	Black	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	Light coil	Single lens	Triangular, black	Individual
A2C59510838	Black	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	Light coil	Single lens	Triangular, black	Bulk

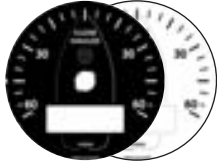
Wind display

85 mm

30 – 180° BB / STB 											
A2C59501319	Black	12/24 Volt	Single scale	30° BB/STB	180° BB/STB	None	None		Double lens	No bezel	Bulk
A2C59501322	White	12/24 Volt	Single scale	30° BB/STB	180° BB/STB	None	None		Double lens	No bezel	Bulk

Close hauled wind display

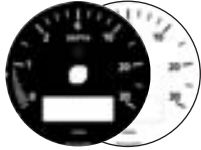
85 mm

0 – 60° BB / STB (x2) 											
A2C59501320	Black	12/24 Volt	Single scale	0° BB/STB	60° BB/STB	None	None		Double lens	No bezel	Bulk
A2C59501323	White	12/24 Volt	Single scale	0° BB/STB	60° BB/STB	None	None		Double lens	No bezel	Bulk

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel	Packaging
				Min.	Max.	Min.	Max.				

Echo sounder

85 mm

<div style="display: flex; align-items: center;"> <div style="background-color: #333; color: white; padding: 5px; margin-right: 10px;">0 – 30 m —</div>  </div>											
A2C59501321	Black	12/24 Volt	Single scale	0 m	30 m	None	None		Double lens	No bezel	Bulk
A2C59501324	White	12/24 Volt	Single scale	0 m	30 m	None	None		Double lens	No bezel	Bulk

1.1.1.c Viewline instrument line | 110 mm X in 1 OE-Version

Part Number	Dial color	Operating voltage	Scale	Lens	Bezel	Packaging
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2 in 1 Tachometer / Trim

0 – 6000 rpm –										
	A2C59501200	Black	12 Volt	0–6000 rpm	up–down	–	–	Double lens	No bezel	Bulk
	A2C59501201	White	12 Volt	0–6000 rpm	up–down	–	–	Double lens	No bezel	Bulk

0 – 7000 rpm –										
	A2C59501203	Black	12 Volt	0–7000 rpm	up–down	–	–	Double lens	No bezel	Bulk
	A2C59501204	White	12 Volt	0–7000 rpm	up–down	–	–	Double lens	No bezel	Bulk

0 – 8000 rpm –										
	A2C59501206	Black	12 Volt	0–8000 rpm	up–down	–	–	Double lens	No bezel	Bulk
	A2C59501207	White	12 Volt	0–8000 rpm	up–down	–	–	Double lens	No bezel	Bulk

4 in 1 Temperature/Voltmeter/Pressure/Tank



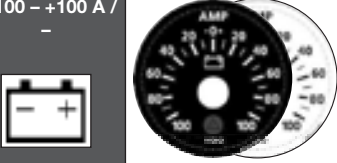

0–5 bar 40–120 °C 8–16 V 0–1/1										
	A2C59501209	Black	12 Volt	0–5 bar	40–120 °C	8–16 V	0–1/1	Double lens	No bezel	Bulk
	A2C59501210	White	12 Volt	0–5 bar	40–120 °C	8–16 V	0–1/1	Double lens	No bezel	Bulk

1.1.1.d Viewline instrument line | 52 mm Aftermarket-Version

In contrast to the rest of the Viewline program, Viewline Aftermarket is aimed at end customers who wish to replace existing instruments in their boat or vehicle. Each blister-packed set comprises the instrument plus bezel, fastening nut, installation instructions, and wiring harness. Tachometer and speedometers also come with a button.

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			

Ammeter

<p>-30 - +30 A /</p> 										
A2C59512306	Black	12/24 Volt	Single scale	-30 A	+30 A	None	None	60 mV	Single lens	Triangular, black
A2C59512310	White	12/24 Volt	Single scale	-30 A	+30 A	None	None	60 mV	Single lens	Triangular, chrome
<p>-60 - +60 A /</p> 										
A2C59512307	Black	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Single lens	Triangular, black
A2C59512328	Black	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Double lens	Round, black
A2C59512311	White	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Single lens	Triangular, chrome
A2C59512330	White	12/24 Volt	Single scale	-60 A	+60 A	None	None	60 mV	Double lens	Round, white
<p>-100 - +100 A /</p> 										
A2C59512308	Black	12/24 Volt	Single scale	-100 A	+100 A	None	None	60 mV	Single lens	Triangular, black
A2C59512312	White	12/24 Volt	Single scale	-100 A	+100 A	None	None	60 mV	Single lens	Triangular, chrome
<p>-150 - +150 A /</p> 										
A2C59512309	Black	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Single lens	Triangular, black
A2C59512329	Black	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Double lens	Round, black
A2C59512313	White	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Single lens	Triangular, chrome
A2C59512331	White	12/24 Volt	Single scale	-150 A	+150 A	None	None	60 mV	Double lens	Round, white

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			

Part Number	Ampere	Volt	Packaging
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Ammeter Shunts

A2C59514041	30 A	60 mV	Individual
A2C59514042	30 A	60 mV	Bulk
A2C59514043	60 A	60 mV	Individual
A2C59514044	60 A	60 mV	Bulk
A2C59514045	100 A	60 mV	Individual
A2C59514046	100 A	60 mV	Bulk
A2C59514047	150 A	60 mV	Individual
A2C59514048	150 A	60 mV	Bulk


Pyrometer

100 – 900 °C /
—



A2C59512314	Black	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Single lens	Triangular, black
A2C59512332	Black	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Double lens	Round, black
A2C59512315	White	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Single lens	Triangular, chrome
A2C59512333	White	12/24 Volt	Single scale	100 °C	900 °C	None	None	37 mV	Double lens	Round, white

250 – 1650 °F /
—




A2C59512316	Black	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Single lens	Triangular, black
A2C59512334	Black	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Double lens	Round, black
A2C59512317	White	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Single lens	Triangular, chrome
A2C59512335	White	12/24 Volt	Single scale	250 °F	1650 °F	None	None	37 mV	Double lens	Round, white

Temperature

Cylinder temperature

60 – 200 °C /
—



A2C59514156	Black	12/24 Volt	Single scale	60 °C	200 °C	None	None	482.5 – 14.3 Ω	Double lens	Triangular, black
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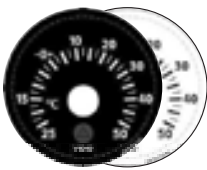
150 – 400 °F /
—

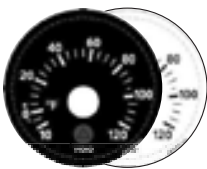


A2C59514157	Black	12/24 Volt	Single scale	150 °F	400 °F	None	None	482.5 – 14.3 Ω	Double lens	Triangular, black
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Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			

Outside temperature



<p>-25 – +50 °C / -</p> 										
A2C59512318	Black	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Single lens	Triangular, black
A2C59512336	Black	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Double lens	Round, black
A2C59512320	White	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Single lens	Triangular, chrome
A2C59512338	White	12/24 Volt	Single scale	-25 °C	+50 °C	None	None	2 kΩ	Double lens	Round, white


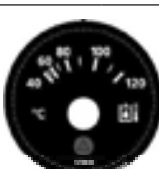
<p>-10 – +120 °F / -</p> 										
A2C59512319	Black	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Single lens	Triangular, black
A2C59512337	Black	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Double lens	Round, black
A2C59512321	White	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Single lens	Triangular, chrome
A2C59512339	White	12/24 Volt	Single scale	-10 °F	+120 °F	None	None	2 kΩ	Double lens	Round, white

Transmission temperature


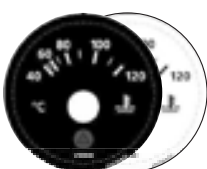
<p>50 – 150 °C / -</p>  										
A2C59514169	Black	12/24 Volt	Single scale	50 °C	150 °C	None	None	322.8–18.6 Ω	Double lens	Triangular, black




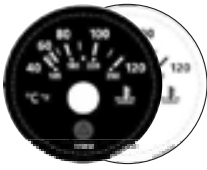



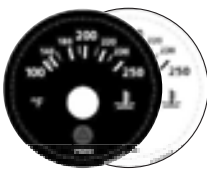
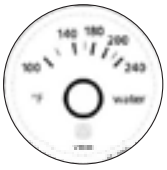

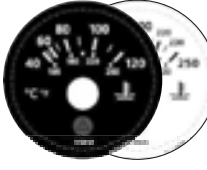
Hydraulic temperature

<p>20 – 100 °C / -</p>  										
A2C59514158	Black	12/24 Volt	Single scale	20 °C	100 °C	None	None	287.4–22.7 Ω	Double lens	Triangular, black

<p>40 – 120 °C / -</p>  										
A2C59514159	Black	12/24 Volt	Single scale	40 °C	120 °C	None	None	287.4–22.7 Ω	Double lens	Triangular, black


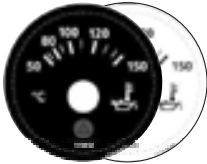







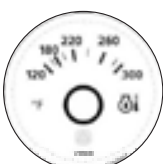


Coolant temperature

<p>40 – 120 °C / -</p>  										
A2C59514174	Black	12/24 Volt	Single scale	40 °C	120 °C	None	None	287.4–22.7 Ω	Double lens	Triangular, black
A2C59514239	White	12/24 Volt	Single scale	40 °C	120 °C	None	None	287.4–22.7 Ω	Double lens	Triangular, chrome

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
<div style="display: flex; align-items: center;"> <div style="text-align: center; width: 15%;"> <p>40 – 120 °C / –</p>  </div> <div style="text-align: center; width: 15%;">  </div> </div>										
A2C59514173	Black	12/24 Volt	Single scale	40 °C	120 °C	None	None	287.4–22.7 Ω	Double lens	Triangular, black
<div style="display: flex; align-items: center;"> <div style="text-align: center; width: 15%;"> <p>40 – 120 °C / 105 – 250 °F</p>  </div> <div style="text-align: center; width: 15%;">  </div> </div>										
A2C59514170	Black	12/24 Volt	Double scale	40 °C	120 °C	105 °F	250 °F	287.4–22.7 Ω	Double lens	Round, black
A2C59514171	Black	12/24 Volt	Double scale	40 °C	120 °C	105 °F	250 °F	287.4–22.7 Ω	Double lens	Triangular, chrome
A2C59514172	Black	12/24 Volt	Double scale	40 °C	120 °C	105 °F	250 °F	287.4–22.7 Ω	Double lens	Triangular, black
A2C59514237	White	12/24 Volt	Double scale	40 °C	120 °C	105 °F	250 °F	287.4–22.7 Ω	Double lens	Round, white
A2C59514238	White	12/24 Volt	Double scale	40 °C	120 °C	105 °F	250 °F	287.4–22.7 Ω	Double lens	Triangular, chrome
<div style="display: flex; align-items: center;"> <div style="text-align: center; width: 15%;"> <p>100 – 240 °F / –</p>  </div> <div style="text-align: center; width: 15%;">  </div> </div>										
A2C59514175	Black	12/24 Volt	Single scale	100 °F	240 °F	None	None	384–29 Ω	Double lens	Triangular, black
<div style="display: flex; align-items: center;"> <div style="text-align: center; width: 15%;"> <p>105 – 250 °F / –</p>  </div> <div style="text-align: center; width: 15%;">  </div> </div>										
A2C59514179	Black	12/24 Volt	Single scale	105 °F	250 °F	None	None	287.4–22.7 Ω	Double lens	Triangular, black
A2C59514243	White	12/24 Volt	Single scale	105 °F	250 °F	None	None	287.4–22.7 Ω	Double lens	Triangular, chrome
<div style="display: flex; align-items: center;"> <div style="text-align: center; width: 15%;"> <p>100 – 240 °F / –</p> <p>WATER</p> </div> <div style="text-align: center; width: 15%;">  </div> </div>										
A2C59514240	White	12/24 Volt	Single scale	100 °F	240 °F	None	None	384–29 Ω	Double lens	Triangular, chrome
<div style="display: flex; align-items: center;"> <div style="text-align: center; width: 15%;"> <p>105 – 250 °F / 40 – 120 °C</p>  </div> <div style="text-align: center; width: 15%;">  </div> </div>										
A2C59514176	Black	12/24 Volt	Double scale	105 °F	250 °F	40 °C	120 °C	287.4–22.7 Ω	Double lens	Round, black
A2C59514177	Black	12/24 Volt	Double scale	105 °F	250 °F	40 °C	120 °C	287.4–22.7 Ω	Double lens	Triangular, chrome
A2C59514178	Black	12/24 Volt	Double scale	105 °F	250 °F	40 °C	120 °C	287.4–22.7 Ω	Double lens	Triangular, black
A2C59514241	White	12/24 Volt	Double scale	105 °F	250 °F	40 °C	120 °C	287.4–22.7 Ω	Double lens	Round, white
A2C59514242	White	12/24 Volt	Double scale	105 °F	250 °F	40 °C	120 °C	287.4–22.7 Ω	Double lens	Triangular, chrome

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			


Engine oil temperature


<p>50 – 150 °C / -</p>  										
A2C59514164	Black	12/24 Volt	Single scale	50 °C	150 °C	None	None	322.8–18.6 Ω	Double lens	Triangular, black
A2C59514233	White	12/24 Volt	Single scale	50 °C	150 °C	None	None	322.8–18.6 Ω	Double lens	Triangular, chrome
<p>50 – 150 °C / -</p>  										
A2C59514163	Black	12/24 Volt	Single scale	50 °C	150 °C	None	None	322.8–18.6 Ω	Double lens	Triangular, black
<p>50 – 150 °C / 120 – 300 °F</p>  										
A2C59514160	Black	12/24 Volt	Double scale	50 °C	150 °C	120 °F	300 °F	322.8–18.6 Ω	Double lens	Round, black
A2C59514161	Black Black	12/24 Volt	Double scale	50 °C	150 °C	120 °F	300 °F	322.8–18.6 Ω	Double lens	Triangular, chrome
A2C59514162	Black Black	12/24 Volt	Double scale	50 °C	150 °C	120 °F	300 °F	322.8–18.6 Ω	Double lens	Triangular, black
A2C59514231	White	12/24 Volt	Double scale	50 °C	150 °C	120 °F	300 °F	322.8–18.6 Ω	Double lens	Round, white
A2C59514232	White	12/24 Volt	Double scale	50 °C	150 °C	120 °F	300 °F	322.8–18.6 Ω	Double lens	Triangular, chrome
<p>120 – 300 °F / -</p>  										
A2C59514168	Black	12/24 Volt	Single scale	120 °F	300 °F	None	None	322.8–18.6 Ω	Double lens	Triangular, black
<p>120 – 300 °F / -</p>  										
A2C59514236	White	12/24 Volt	Single scale	120 °F	300 °F	None	None	322.8–18.6 Ω	Double lens	Triangular, chrome
<p>120 – 300 °F / 50 – 150 °C</p>  										
A2C59514165	Black	12/24 Volt	Double scale	120 °F	300 °F	50 °C	150 °C	322.8–18.6 Ω	Double lens	Round, black
A2C59514166	Black	12/24 Volt	Double scale	120 °F	300 °F	50 °C	150 °C	322.8–18.6 Ω	Double lens	Triangular, chrome
A2C59514167	Black	12/24 Volt	Double scale	120 °F	300 °F	50 °C	150 °C	322.8–18.6 Ω	Double lens	Triangular, black
A2C59514234	White	12/24 Volt	Double scale	120 °F	300 °F	50 °C	150 °C	322.8–18.6 Ω	Double lens	Round, white
A2C59514235	White	12/24 Volt	Double scale	120 °F	300 °F	50 °C	150 °C	322.8–18.6 Ω	Double lens	Triangular, chrome

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			

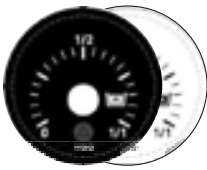
Freshwater/blackwater

Freshwater

<p>0 – 1/1 / — WATER</p> 										
A2C59514097	Black	12/24 Volt	Single scale	0	1/1	None	None	3–180 Ω	Double lens	Round, black
A2C59514098	Black	12/24 Volt	Single scale	0	1/1	None	None	3–180 Ω	Double lens	Triangular, chrome
A2C59514603	Black	12/24 Volt	Single scale	0	1/1	None	None	4–20 mA	Double lens	Round, black
A2C59514192	White	12/24 Volt	Single scale	0	1/1	None	None	3–180 Ω	Double lens	Round, white
A2C59514604	White	12/24 Volt	Single scale	0	1/1	None	None	4–20 mA	Double lens	Round, white

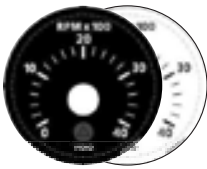
<p>E – F / — WATER</p> 										
A2C59514099	Black	12/24 Volt	Single scale	E	F	None	None	3–180 Ω	Double lens	Round, black
A2C59514100	Black	12/24 Volt	Single scale	E	F	None	None	3–180 Ω	Double lens	Triangular, chrome
A2C59514193	White	12/24 Volt	Single scale	E	F	None	None	3–180 Ω	Double lens	Round, white

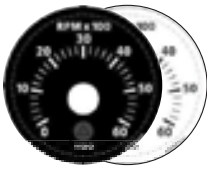
Blackwater

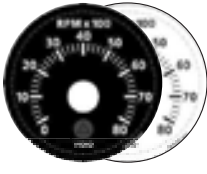
<p>0 – 1/1 / —</p> 										
A2C59512342	Black	12/24 Volt	Single scale	0	1/1	None	None	4–20 mA	Double lens	Round, black
A2C59512343	White	12/24 Volt	Single scale	0	1/1	None	None	4–20 mA	Double lens	Round, white

Tachometer

Engine speed


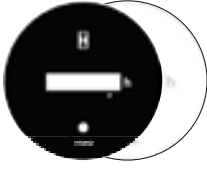
<p>0 – 4000 rpm / —</p> 										
A2C59512322	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	None	Single lens	Triangular, black
A2C59512344	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	None	Double lens	Round, black
A2C59512325	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	None	Single lens	Triangular, chrome
A2C59512347	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	None	Double lens	Round, white

<p>0 – 6000 rpm / —</p> 										
A2C59512323	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	None	Single lens	Triangular, black
A2C59512345	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	None	Double lens	Round, black
A2C59512326	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	None	Single lens	Triangular, chrome
A2C59512348	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	None	Double lens	Round, white


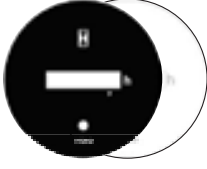
Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
0 – 8000 rpm / 										
A2C59512324	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	None	Single lens	Triangular, black
A2C59512346	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	None	Double lens	Round, black
A2C59512327	White	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	None	Single lens	Triangular, chrome
A2C59512349	White	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	None	Double lens	Round, white

Engine Hours Counter (EHC)

Non-illuminated



 										
A2C59512448	Black	12/24 Volt		None	None	None	None	None	Single lens	Triangular, chrome
A2C59512449	White	12/24 Volt		None	None	None	None	None	Single lens	Triangular, chrome


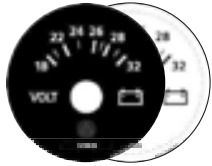
Illuminated

 										
A2C59512450	Black	12/24 Volt		None	None	None	None	None	Single lens	Triangular, chrome
A2C59512452*	Black	12/24 Volt		None	None	None	None	None	Double lens	Triangular, chrome
A2C59512453	Black	12/24 Volt		None	None	None	None	None	Double lens	Round, black
A2C59512451	White	12/24 Volt		None	None	None	None	None	Single lens	Triangular, chrome
A2C59512454	White	12/24 Volt		None	None	None	None	None	Double lens	Round, white


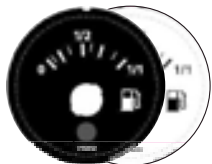
*Supplied on request – limited availability


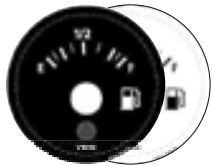
Voltmeter

8 – 16 V /  										
A2C59512543	Black	12 Volt	Single scale	8 V	16 V	None	None	None	Single lens	Triangular, black
A2C59512545	Black	12 Volt	Single scale	8 V	16 V	None	None	None	Double lens	Round, black
A2C59512544	White	12 Volt	Single scale	8 V	16 V	None	None	None	Single lens	Triangular, chrome
A2C59512546	White	12 Volt	Single scale	8 V	16 V	None	None	None	Double lens	Round, white

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
<div style="display: flex; align-items: center;"> <div style="text-align: center; margin-right: 20px;"> <p>18 – 32 V /</p>  </div>  </div>										
A2C59512455	Black	24 Volt	Single scale	18 V	32 V	None	None	None	Single lens	Triangular, black
A2C59512457	Black	24 Volt	Single scale	18 V	32 V	None	None	None	Double lens	Triangular, chrome
A2C59512458	Black	24 Volt	Single scale	18 V	32 V	None	None	None	Double lens	Round, black
A2C59512456	White	24 Volt	Single scale	18 V	32 V	None	None	None	Single lens	Triangular, chrome
A2C59512459	White	24 Volt	Single scale	18 V	32 V	None	None	None	Double lens	Round, white

Fuel

<div style="display: flex; align-items: center;"> <div style="text-align: center; margin-right: 20px;"> <p>0 – 1/1 /</p>  </div>  </div>										
A2C59514082	Black	12/24 Volt	Single scale	0	1/1	None	None	3–180 Ω	Double lens	Round, black
A2C59514083	Black	12/24 Volt	Single scale	0	1/1	None	None	3–180 Ω	Double lens	Triangular, chrome
A2C59514084	Black	12/24 Volt	Single scale	0	1/1	None	None	3–180 Ω	Double lens	Triangular, black
A2C59514079	Black	12/24 Volt	Single scale	0	1/1	None	None	90°–0.5 Ω	Double lens	Round, black
A2C59514080	Black	12/24 Volt	Single scale	0	1/1	None	None	90°–0.5 Ω	Double lens	Triangular, chrome
A2C59514081	Black	12/24 Volt	Single scale	0	1/1	None	None	90°–0.5 Ω	Double lens	Triangular, black
A2C59514184	White	12/24 Volt	Single scale	0	1/1	None	None	3–180 Ω	Double lens	Round, white
A2C59514185	White	12/24 Volt	Single scale	0	1/1	None	None	3–180 Ω	Double lens	Triangular, chrome
A2C59514182	White	12/24 Volt	Single scale	0	1/1	None	None	90°–0.5 Ω	Double lens	Round, white
A2C59514183	White	12/24 Volt	Single scale	0	1/1	None	None	90°–0.5 Ω	Double lens	Triangular, chrome

<div style="display: flex; align-items: center;"> <div style="text-align: center; margin-right: 20px;"> <p>E – F /</p>  </div>  </div>										
A2C59514091	Black	12/24 Volt	Single scale	E	F	None	None	3–180 Ω	Double lens	Round, black
A2C59514092	Black	12/24 Volt	Single scale	E	F	None	None	3–180 Ω	Double lens	Triangular, chrome
A2C59514093	Black	12/24 Volt	Single scale	E	F	None	None	3–180 Ω	Double lens	Triangular, black
A2C59514094	Black	12/24 Volt	Single scale	E	F	None	None	240–33.5 Ω	Double lens	Round, black
A2C59514095	Black	12/24 Volt	Single scale	E	F	None	None	240–33.5 Ω	Double lens	Triangular, chrome
A2C59514096	Black	12/24 Volt	Single scale	E	F	None	None	240–33.5 Ω	Double lens	Triangular, black
A2C59514085	Black	12/24 Volt	Single scale	E	F	None	None	0–90 Ω	Double lens	Round, black
A2C59514086	Black	12/24 Volt	Single scale	E	F	None	None	0–90 Ω	Double lens	Triangular, chrome
A2C59514087	Black	12/24 Volt	Single scale	E	F	None	None	0–90 Ω	Double lens	Triangular, black
A2C59514088	Black	12/24 Volt	Single scale	E	F	None	None	90°–0.5 Ω	Double lens	Round, black
A2C59514089	Black	12/24 Volt	Single scale	E	F	None	None	90°–0.5 Ω	Double lens	Triangular, chrome
A2C59514090	Black	12/24 Volt	Single scale	E	F	None	None	90°–0.5 Ω	Double lens	Triangular, black
A2C59514190	White	12/24 Volt	Single scale	E	F	None	None	240–33.5 Ω	Double lens	Round, white
A2C59514191	White	12/24 Volt	Single scale	E	F	None	None	240–33.5 Ω	Double lens	Triangular, chrome
A2C59514186	White	12/24 Volt	Single scale	E	F	None	None	0–90 Ω	Double lens	Round, white
A2C59514187	White	12/24 Volt	Single scale	E	F	None	None	0–90 Ω	Double lens	Triangular, chrome
A2C59514188	White	12/24 Volt	Single scale	E	F	None	None	90°–0.5 Ω	Double lens	Round, white
A2C59514189	White	12/24 Volt	Single scale	E	F	None	None	90°–0.5 Ω	Double lens	Triangular, chrome

*adjustable

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			

Pressure

Pressure

0 – 100 psi /
—



A2C59514101	Black	12/24 Volt	Single scale	0 psi	100 psi	None	None	10–184 Ω	Double lens	Triangular, black
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0 – 150 psi /
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A2C59514194	White	12/24 Volt	Single scale	0 psi	150 psi	None	None	10–184 Ω	Double lens	Triangular, chrome
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Turbo pressure

0 – 2 bar /
—






A2C59514152	Black	12/24 Volt	Single scale	0 bar	2 bar	None	None	10–184 Ω	Double lens	Triangular, black
A2C59514227	White	12/24 Volt	Single scale	0 bar	2 bar	None	None	10–184 Ω	Double lens	Round, white
A2C59514228	White	12/24 Volt	Single scale	0 bar	2 bar	None	None	10–184 Ω	Double lens	Triangular, chrome

0 – 2 bar /
0 – 30 psi



A2C59514149	Black	12/24 Volt	Double scale	0 bar	2 bar	0 psi	30 psi	10–184 Ω	Double lens	Round, black
A2C59514150	Black	12/24 Volt	Double scale	0 bar	2 bar	0 psi	30 psi	10–184 Ω	Double lens	Triangular, chrome
A2C59514151	Black	12/24 Volt	Double scale	0 bar	2 bar	0 psi	30 psi	10–184 Ω	Double lens	Triangular, black
A2C59514225	White	12/24 Volt	Double scale	0 bar	2 bar	0 psi	30 psi	10–184 Ω	Double lens	Round, white
A2C59514226	White	12/24 Volt	Double scale	0 bar	2 bar	0 psi	30 psi	10–184 Ω	Double lens	Triangular, chrome

0 – 30 psi /
—

A2C59514153	Black	12/24 Volt	Single scale	0 psi	30 psi	None	None	10–184 Ω	Double lens	Triangular, black
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0 – 80 psi /
—





A2C59514229	White	12/24 Volt	Single scale	0 psi	80 psi	None	None	10–184 Ω	Double lens	Triangular, chrome
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Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			


Engine oil pressure

0 – 5 bar / –




A2C59514126	Black	12/24 Volt	Single scale	0 bar	5 bar	None	None	10–184 Ω	Double lens	Triangular, black
A2C59514213	White	12/24 Volt	Single scale	0 bar	5 bar	None	None	10–184 Ω	Double lens	Triangular, chrome

0 – 5 bar / 0 – 80 psi



A2C59514123	Black	12/24 Volt	Double scale	0 bar	5 bar	0 psi	80 psi	10–184 Ω	Double lens	Round, black
A2C59514124	Black	12/24 Volt	Double scale	0 bar	5 bar	0 psi	80 psi	10–184 Ω	Double lens	Triangular, chrome
A2C59514125	Black	12/24 Volt	Double scale	0 bar	5 bar	0 psi	80 psi	10–184 Ω	Double lens	Triangular, black
A2C59514211	White	12/24 Volt	Double scale	0 bar	5 bar	0 psi	80 psi	10–184 Ω	Double lens	Round, white
A2C59514212	White	12/24 Volt	Double scale	0 bar	5 bar	0 psi	80 psi	10–184 Ω	Double lens	Triangular, chrome

0 – 10 bar / –



A2C59514114	Black	12/24 Volt	Single scale	0 bar	10 bar	None	None	10–184 Ω	Double lens	Triangular, black
A2C59514201	White	12/24 Volt	Single scale	0 bar	10 bar	None	None	10–184 Ω	Double lens	Triangular, chrome

0 – 10 bar / 0 – 150 psi



A2C59514111	Black	12/24 Volt	Double scale	0 bar	10 bar	0 psi	150 psi	10–184 Ω	Double lens	Round, black
A2C59514112	Black	12/24 Volt	Double scale	0 bar	10 bar	0 psi	150 psi	10–184 Ω	Double lens	Triangular, chrome
A2C59514113	Black	12/24 Volt	Double scale	0 bar	10 bar	0 psi	150 psi	10–184 Ω	Double lens	Triangular, black
A2C59514199	White	12/24 Volt	Double scale	0 bar	10 bar	0 psi	150 psi	10–184 Ω	Double lens	Round, white
A2C59514200	White	12/24 Volt	Double scale	0 bar	10 bar	0 psi	150 psi	10–184 Ω	Double lens	Triangular, chrome

0 – 25 bar / 0 – 350 psi

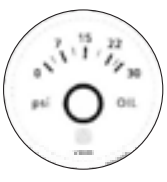



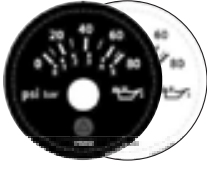







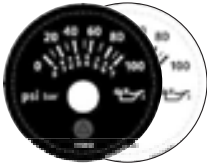








A2C59514206	White	12/24 Volt	Double scale	0 bar	25 bar	0 psi	350 psi	10–184 Ω	Double lens	Round, white
A2C59514207	White	12/24 Volt	Double scale	0 bar	25 bar	0 psi	350 psi	10–184 Ω	Double lens	Triangular, chrome



0 – 30 bar / 0 – 435 psi





A2C59514208	White	12/24 Volt	Double scale	0 bar	30 bar	0 psi	435 psi	10–184 Ω	Double lens	Round, white
A2C59514209	White	12/24 Volt	Double scale	0 bar	30 bar	0 psi	435 psi	10–184 Ω	Double lens	Triangular, chrome



Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>0 – 30 psi / –</p> <p>OIL</p> </div> <div style="flex: 2;">  </div> </div>										
A2C59514210	White	12/24 Volt	Single scale	0 psi	30 psi	None	None	10–184 Ω	Double lens	Triangular, chrome
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>0 – 80 psi / –</p>  </div> <div style="flex: 2;">  </div> </div>										
A2C59514134	Black	12/24 Volt	Single scale	0 psi	80 psi	None	None	10–184 Ω	Double lens	Triangular, black
A2C59514135	Black	12/24 Volt	Single scale	0 psi	80 psi	None	None	240–33.5 Ω	Double lens	Triangular, black
A2C59514218	White	12/24 Volt	Single scale	0 psi	80 psi	None	None	10–184 Ω	Double lens	Triangular, chrome
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>0 – 80 psi / 0 – 5 bar</p>  </div> <div style="flex: 2;">  </div> </div>										
A2C59514132	Black	12/24 Volt	Double scale	0 psi	80 psi	0 bar	5 bar	240–33.5 Ω	Double lens	Triangular, black
A2C59514128	Black	12/24 Volt	Double scale	0 psi	80 psi	0 bar	5 bar	10–184 Ω	Double lens	Round, black
A2C59514129	Black	12/24 Volt	Double scale	0 psi	80 psi	0 bar	5 bar	10–184 Ω	Double lens	Triangular, chrome
A2C59514130	Black	12/24 Volt	Double scale	0 psi	80 psi	0 bar	5 bar	10–184 Ω	Double lens	Triangular, black
A2C59514216	White	12/24 Volt	Double scale	0 psi	80 psi	0 bar	5 bar	240–33.5 Ω	Double lens	Round, white
A2C59514217	White	12/24 Volt	Double scale	0 psi	80 psi	0 bar	5 bar	240–33.5 Ω	Double lens	Triangular, chrome
A2C59514214	White	12/24 Volt	Double scale	0 psi	80 psi	0 bar	5 bar	10–184 Ω	Double lens	Round, white
A2C59514215	White	12/24 Volt	Double scale	0 psi	80 psi	0 bar	5 bar	10–184 Ω	Double lens	Triangular, chrome
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>0 – 80 psi / 0 – 5 kpa</p> <p>ENGINE OIL</p> </div> <div style="flex: 2;">  </div> </div>										
A2C59514131	Black	12/24 Volt	Double scale	0 psi	80 psi	0 kpa	5 kpa	10–184 Ω	Double lens	Triangular, black
A2C59514133	Black	12/24 Volt	Double scale	0 psi	80 psi	0 kpa	5 kpa	240–33.5 Ω	Double lens	Triangular, black
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>0 – 100 psi / –</p>  </div> <div style="flex: 2;">  </div> </div>										
A2C59514110	Black	12/24 Volt	Single scale	0 psi	100 psi	None	None	240–33.5 Ω	Double lens	Triangular, black
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>0 – 100 psi / –</p> <p>OIL</p> </div> <div style="flex: 2;">  </div> </div>										
A2C59514198	White	12/24 Volt	Single scale	0 psi	100 psi	None	None	10–184 Ω	Double lens	Triangular, chrome

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 100 psi / 0 – 7 bar</p>  </div> <div style="width: 15%; text-align: center;">  </div> </div>										
A2C59514107	Black	12/24 Volt	Double scale	0 psi	100 psi	0 bar	7 bar	240–33.5 Ω	Double lens	Round, black
A2C59514108	Black	12/24 Volt	Double scale	0 psi	100 psi	0 bar	7 bar	240–33.5 Ω	Double lens	Triangular, chrome
A2C59514109	Black	12/24 Volt	Double scale	0 psi	100 psi	0 bar	7 bar	240–33.5 Ω	Double lens	Triangular, black
A2C59514196	White	12/24 Volt	Double scale	0 psi	100 psi	0 bar	7 bar	240–33.5 Ω	Double lens	Round, white
A2C59514197	White	12/24 Volt	Double scale	0 psi	100 psi	0 bar	7 bar	240–33.5 Ω	Double lens	Triangular, chrome
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 100 psi / 0 – 7 kpa</p> <p>ENGINE OIL</p> </div> <div style="width: 15%; text-align: center;">  </div> </div>										
A2C59514106	Black	12/24 Volt	Double scale	0 psi	100 psi	0 kpa	7 kpa	10–184 Ω	Double lens	Triangular, black
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 150 psi / –</p>  </div> <div style="width: 15%; text-align: center;">  </div> </div>										
A2C59514121	Black	12/24 Volt	Single scale	0 psi	150 psi	None	None	10–184 Ω	Double lens	Triangular, black
A2C59514122	Black	12/24 Volt	Single scale	0 psi	150 psi	None	None	240–33.5 Ω	Double lens	Triangular, black
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 150 psi / 0 – 10 bar</p>  </div> <div style="width: 15%; text-align: center;">  </div> </div>										
A2C59514117	Black	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	10–184 Ω	Double lens	Triangular, black
A2C59514118	Black	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	240–33.5 Ω	Double lens	Round, black
A2C59514119	Black	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	240–33.5 Ω	Double lens	Triangular, chrome
A2C59514120	Black	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	240–33.5 Ω	Double lens	Triangular, black
A2C59514202	White	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	10–184 Ω	Double lens	Round, white
A2C59514203	White	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	10–184 Ω	Double lens	Triangular, chrome
A2C59514204	White	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	240–33.5 Ω	Double lens	Round, white
A2C59514205	White	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	240–33.5 Ω	Double lens	Triangular, chrome
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 150 psi / 0 – 10 bar</p> <p>ENGINE OIL</p> </div> <div style="width: 15%; text-align: center;">  </div> </div>										
A2C59514116	Black	12/24 Volt	Double scale	0 psi	150 psi	0 bar	10 bar	10–184 Ω	Double lens	Triangular, black
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 5 kpa / –</p>  </div> <div style="width: 15%; text-align: center;">  </div> </div>										
A2C59514127	Black	12/24 Volt	Single scale	0 kpa	5 kpa	None	None	10–184 Ω	Double lens	Triangular, black



Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>0 – 10 kPa /</p>  </div>  </div>										
A2C59514115	Black	12/24 Volt	Single scale	0 kPa	10 kPa	None	None	10–184 Ω	Double lens	Triangular, black

Brake pressure


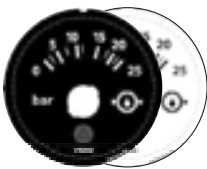
<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>0 – 10 bar /</p>  </div>  </div>										
A2C59514104	Black	12/24 Volt	Single scale	0 bar	10 bar	None	None	10–184 Ω	Double lens	Triangular, black
A2C59514195	White	12/24 Volt	Single scale	0 bar	10 bar	None	None	10–184 Ω	Double lens	Triangular, chrome



<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>0 – 150 psi / 0 – 10 kPa</p>  </div>  </div>										
A2C59514105	Black	12/24 Volt	Double scale	0 psi	150 psi	0 kPa	10 kPa	10–184 Ω	Double lens	Triangular, black










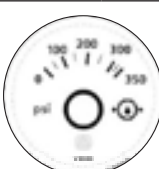


Air pressure

<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>0 – 150 psi / 0 – 10 kPa</p> <p>AIR</p>  </div>  </div>										
A2C59514103	Black	12/24 Volt	Double scale	0 psi	150 psi	0 kPa	10 kPa	10–184 Ω	Double lens	Triangular, black


Transmission pressure


<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>0 – 25 bar /</p>  </div>  </div>										
A2C59514139	Black	12/24 Volt	Single scale	0 bar	25 bar	None	None	10–184 Ω	Double lens	Triangular, black
A2C59514219	White	12/24 Volt	Single scale	0 bar	25 bar	None	None	10–184 Ω	Double lens	Triangular, chrome

<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>0 – 25 bar / 0 – 350 psi</p>  </div>  </div>										
A2C59514136	Black	12/24 Volt	Double scale	0 bar	25 bar	0 psi	350 psi	10–184 Ω	Double lens	Round, black
A2C59514137	Black	12/24 Volt	Double scale	0 bar	25 bar	0 psi	350 psi	10–184 Ω	Double lens	Triangular, chrome
A2C59514138	Black	12/24 Volt	Double scale	0 bar	25 bar	0 psi	350 psi	10–184 Ω	Double lens	Triangular, black



Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 30 bar / 0 – 435 psi</p>  </div>  </div>										
A2C59514141	Black	12/24 Volt	Double scale	0 bar	30 bar	0 psi	435 psi	10–184 Ω	Double lens	Round, black
A2C59514142	Black	12/24 Volt	Double scale	0 bar	30 bar	0 psi	435 psi	10–184 Ω	Double lens	Triangular, chrome
A2C59514143	Black	12/24 Volt	Double scale	0 bar	30 bar	0 psi	435 psi	10–184 Ω	Double lens	Triangular, black
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 400 psi / –</p>  </div>  </div>										
A2C59514148	Black	12/24 Volt	Single scale	0 psi	400 psi	None	None	10–184 Ω	Double lens	Triangular, black
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 400 psi / – TRANS</p>  </div>  </div>										
A2C59514102	Black	12/24 Volt	Single scale	0 psi	400 psi	None	None	10–184 Ω	Double lens	Triangular, black
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 400 psi / 0 – 25 bar</p>  </div>  </div>										
A2C59514145	Black	12/24 Volt	Double scale	0 psi	400 psi	0 bar	25 bar	10–184 Ω	Double lens	Round, black
A2C59514146	Black	12/24 Volt	Double scale	0 psi	400 psi	0 bar	25 bar	10–184 Ω	Double lens	Triangular, chrome
A2C59514147	Black	12/24 Volt	Double scale	0 psi	400 psi	0 bar	25 bar	10–184 Ω	Double lens	Triangular, black
A2C59514223	White	12/24 Volt	Double scale	0 psi	400 psi	0 bar	25 bar	10–184 Ω	Double lens	Round, white
A2C59514224	White	12/24 Volt	Double scale	0 psi	400 psi	0 bar	25 bar	10–184 Ω	Double lens	Triangular, chrome
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 350 psi / –</p>  </div>  </div>										
A2C59514222	White	12/24 Volt	Single scale	0 psi	350 psi	None	None	10–184 Ω	Double lens	Triangular, chrome
<div style="display: flex; align-items: center;"> <div style="width: 15%; padding-right: 10px;"> <p>0 – 350 psi / 0 – 25 kpa</p>  </div>  </div>										
A2C59514144	Black	12/24 Volt	Double scale	0 psi	350 psi	0 kpa	25 kpa	10–184 Ω	Double lens	Triangular, black

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			



0 – 350 psi / 0 – 25 bar 										
	A2C59514220	White	12/24 Volt	Double scale	0 psi	350 psi	0 bar	25 bar	10–184 Ω	Double lens
A2C59514221	White	12/24 Volt	Double scale	0 psi	350 psi	0 bar	25 bar	10–184 Ω	Double lens	Triangular, chrome

0 – 25 kPa / — 										
	A2C59514140	White	12/24 Volt	Single scale	0 kPa	25 kPa	None	None	10–184 Ω	Double lens

Rudder angle

40° Port – 40° Stb / — 											
	A2C59514154	Black	12/24 Volt	Single scale	40° Port	40° Stb	None	None	3–180 Ω	Double lens	Round, black
	A2C59514155	Black	12/24 Volt	Single scale	40° Port	40° Stb	None	None	3–180 Ω	Double lens	Triangular, chrome
	A2C59514230	White	12/24 Volt	Single scale	40° Port	40° Stb	None	None	3–180 Ω	Double lens	Round, white

Trimmung

TRIM 											
	A2C59514180	Black	12/24 Volt	Single scale	Up	Down	None	None	167–10 Ω	Double lens	Round, black
	A2C59514181	Black	12/24 Volt	Single scale	Up	Down	None	None	167–10 Ω	Double lens	Triangular, chrome
	A2C59514244	White	12/24 Volt	Single scale	Up	Down	None	None	167–10 Ω	Double lens	Round, white



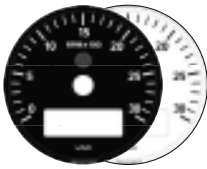
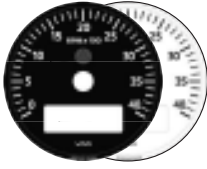

1.1.1.e Viewline instrument line | 85 & 110 mm Aftermarket-Version

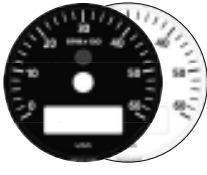
In contrast to the rest of the Viewline program, Viewline Aftermarket is aimed at end customers who wish to replace existing instruments in their boat or vehicle. Each blister-packed set comprises the instrument plus bezel, fastening nut, installation instructions, and wiring harness. Tachometer and speedometers also come with a button.

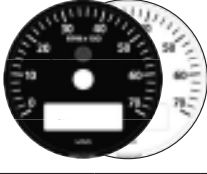
Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			

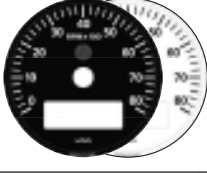
Tachometer

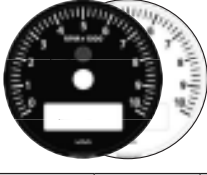
85 mm / with LCD

0 – 1800 rpm / 										
A2C59512350	Black	12/24 Volt	Single scale	0 rpm	1800 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black
0 – 2500 rpm / 										
A2C59512351	Black	12/24 Volt	Single scale	0 rpm	2500 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black
0 – 3000 rpm / 										
A2C59512352	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black
A2C59512390	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Double lens	Round, black
A2C59512359	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, chrome
A2C59512396	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Double lens	Round, white
0 – 4000 rpm / 										
A2C59512353	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black
A2C59512391	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, black
A2C59512360	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, chrome
A2C59512397	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, white
0 – 5000 rpm / 										
A2C59512354	Black	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black
A2C59512392	Black	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, black
A2C59512361	White	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, chrome
A2C59512398	White	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, white


Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
0 – 6000 rpm / 										
A2C59512355	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black
A2C59512393	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, black
A2C59512362	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, chrome
A2C59512399	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Double lens	Round, white


0 – 7000 rpm / 										
A2C59512356	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	1	Single lens	Triangular, black
A2C59512394	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Double lens	Round, black
A2C59512363	White	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	1	Single lens	Triangular, chrome
A2C59512400	White	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Double lens	Round, white





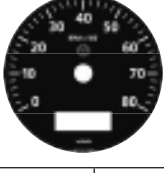

0 – 8000 rpm / 										
A2C59512357	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	1	Single lens	Triangular, black
A2C59512395	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	Light coil	Double lens	Round, black
A2C59512364	White	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	1	Single lens	Triangular, chrome
A2C59512401	White	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	Light coil	Double lens	Round, white

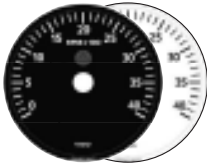
0 – 10000 rpm / 										
A2C59512358	Black	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	1	Single lens	Triangular, black
A2C59512365	White	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	1	Single lens	Triangular, chrome

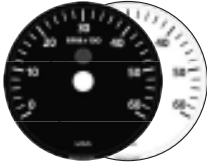
110 mm / with LCD

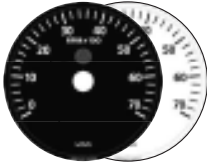
0 – 1800 rpm / 										
A2C59512412	Black	12/24 Volt	Single scale	0 rpm	1800 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black

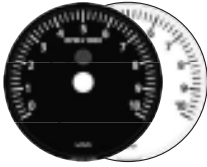
0 – 3000 rpm / 										
A2C59512413	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	W, Ind, Generator, Hall	Single lens	Triangular, black

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
0 – 4000 rpm / –										
A2C59512414	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black
0 – 5000 rpm / –										
A2C59512415	Black	12/24 Volt	Single scale	0 rpm	5000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black
0 – 6000 rpm / –										
A2C59512416	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	W, 1, Ind, Hall	Single lens	Triangular, black
0 – 7000 rpm / –										
A2C59512417	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	1	Single lens	Triangular, black
0 – 8000 rpm / –										
A2C59512418	Black	12/24 Volt	Single scale	0 rpm	8000 rpm	None	None	1	Single lens	Triangular, black
85 mm / none LCD										
0 – 3000 rpm / –										
A2C59512436	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Single lens	Triangular, black
A2C59512430	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Double lens	Round, black
A2C59512440	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Single lens	Triangular, chrome
A2C59512433	White	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Double lens	Round, white


Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
0 – 4000 rpm / 										
A2C59512437	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Single lens	Triangular, black
A2C59512431	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Double lens	Round, black
A2C59512441	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Single lens	Triangular, chrome
A2C59512434	White	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Double lens	Round, white


0 – 6000 rpm / 										
A2C59512432	Black	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	Light coil	Double lens	Round, black
A2C59512435	White	12/24 Volt	Single scale	0 rpm	6000 rpm	None	None	Light coil	Double lens	Round, white



0 – 7000 rpm / 										
A2C59512438	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Single lens	Triangular, black
A2C59512442	White	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Single lens	Triangular, chrome

0 – 10000 rpm / 										
A2C59512439	Black	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	Light coil	Single lens	Triangular, black
A2C59512443	White	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	Light coil	Single lens	Triangular, chrome

110 mm / none LCD


0 – 3000 rpm / 										
A2C59512444	Black	12/24 Volt	Single scale	0 rpm	3000 rpm	None	None	Light coil	Single lens	Triangular, black

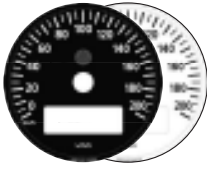


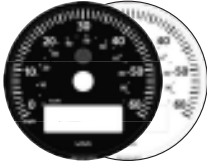
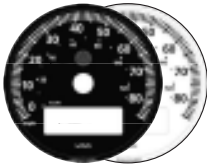

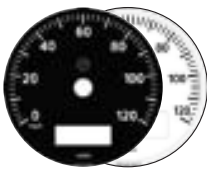
0 – 4000 rpm / 										
A2C59512445	Black	12/24 Volt	Single scale	0 rpm	4000 rpm	None	None	Light coil	Single lens	Triangular, black

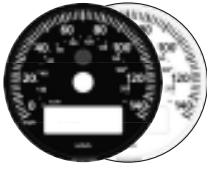
Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
0 – 7000 rpm / -										
A2C59512446	Black	12/24 Volt	Single scale	0 rpm	7000 rpm	None	None	Light coil	Single lens	Triangular, black
0 – 10000 rpm / -										
A2C59512447	Black	12/24 Volt	Single scale	0 rpm	10000 rpm	None	None	Light coil	Single lens	Triangular, black

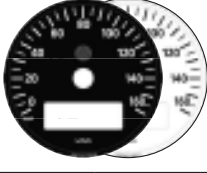
Speedometer

85 mm


0 – 25 kmh / -										
A2C59512366	Black	12/24 Volt	Single scale	0 km/h	25 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
0 – 60 kmh / -										
A2C59512367	Black	12/24 Volt	Single scale	0 km/h	60 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
A2C59512379	White	12/24 Volt	Single scale	0 km/h	60 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome
0 – 80 kmh / -										
A2C59512368	Black	12/24 Volt	Single scale	0 km/h	80 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
A2C59512380	White	12/24 Volt	Single scale	0 km/h	80 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome
0 – 120 kmh / -										
A2C59512369	Black	12/24 Volt	Single scale	0 km/h	120 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
A2C59512381	White	12/24 Volt	Single scale	0 km/h	120 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome


Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
0 – 200 km/h / – 										
A2C59512370	Black	12/24 Volt	Single scale	0 km/h	200 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
A2C59512382	White	12/24 Volt	Single scale	0 km/h	200 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome
0 – 300 km/h / – 										
A2C59512371	Black	12/24 Volt	Single scale	0 km/h	300 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
0 – 30 mph / 0 – 50 km/h 										
A2C59512372	Black	12/24 Volt	Double scale	0 mph	30 mph	0 km/h	50 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
A2C59512385	White	12/24 Volt	Double scale	0 mph	30 mph	0 km/h	50 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome
0 – 60 mph / 0 – 95 km/h 										
A2C59512373	Black	12/24 Volt	Double scale	0 mph	60 mph	0 km/h	95 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
A2C59512386	White	12/24 Volt	Double scale	0 mph	60 mph	0 km/h	95 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome
0 – 85 mph / 0 – 140 km/h 										
A2C59512374	Black	12/24 Volt	Double scale	0 mph	85 mph	0 km/h	140 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
A2C59512387	White	12/24 Volt	Double scale	0 mph	85 mph	0 km/h	140 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome
0 – 120 mph / 0 – 200 km/h 										
A2C59512375	Black	12/24 Volt	Double scale	0 mph	120 mph	0 km/h	200 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
A2C59512388	White	12/24 Volt	Double scale	0 mph	120 mph	0 km/h	200 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome
0 – 120 mph / – 										
A2C59512377	Black	12/24 Volt	Single scale	0 mph	120 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
A2C59512383	White	12/24 Volt	Single scale	0 mph	120 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome


Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
0 – 140 mph / 0 – 220 kmh										
A2C59512376	Black	12/24 Volt	Double scale	0 mph	140 mph	0 km/h	220 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
A2C59512389	White	12/24 Volt	Double scale	0 mph	140 mph	0 km/h	220 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome


0 – 160 mph / -										
A2C59512378	Black	12/24 Volt	Single scale	0 mph	160 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
A2C59512384	White	12/24 Volt	Single scale	0 mph	160 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, chrome


110 mm

0 – 25 kmh / -										
A2C59512419	Black	12/24 Volt	Single scale	0 km/h	25 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black

0 – 60 kmh / -										
A2C59512420	Black	12/24 Volt	Single scale	0 km/h	60 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black

0 – 80 kmh / -										
A2C59512421	Black	12/24 Volt	Single scale	0 km/h	80 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black

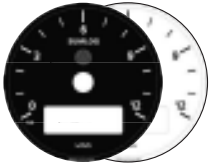
0 – 120 kmh / -										
A2C59512422	Black	12/24 Volt	Single scale	0 km/h	120 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black

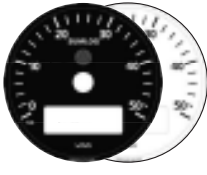
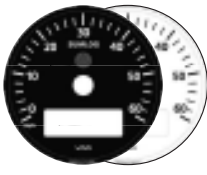
0 – 200 kmh / -										
A2C59512423	Black	12/24 Volt	Single scale	0 km/h	200 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
0 – 300 km/h / –										
A2C59512424	Black	12/24 Volt	Single scale	0 km/h	300 km/h	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
0 – 120 mph / –										
A2C59512425	Black	12/24 Volt	Single scale	0 mph	120 mph	None	None	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
0 – 60 mph / 0 – 95 km/h										
A2C59512426	Black	12/24 Volt	Double scale	0 mph	60 mph	0 km/h	95 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
0 – 85 mph / 0 – 140 km/h										
A2C59512427	Black	12/24 Volt	Double scale	0 mph	85 mph	0 km/h	140 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
0 – 140 mph / 0 – 220 km/h										
A2C59512428	Black	12/24 Volt	Double scale	0 mph	140 mph	0 km/h	220 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black
0 – 220 mph / 0 – 360 km/h										
A2C59512429	Black	12/24 Volt	Double scale	0 mph	220 mph	0 km/h	360 km/h	Ind, Hall, Blocking Oscillator	Single lens	Triangular, black

Sumlog

85 mm

0 – 12 kn / –										
A2C59512404	Black	12/24 Volt	Single scale	0 kn	12 kn	None	None	Hall, NMEA	Double lens	Round, black
A2C59512407	White	12/24 Volt	Single scale	0 kn	12 kn	None	None	Hall, NMEA	Double lens	Round, white

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			
0 – 50 kn / 										
A2C59512405	Black	12/24 Volt	Single scale	0 kn	50 kn	None	None	Hall, NMEA	Double lens	Round, black
A2C59512408	White	12/24 Volt	Single scale	0 kn	50 kn	None	None	Hall, NMEA	Double lens	Round, white
0 – 60 mph / 										
A2C59512406	Black	12/24 Volt	Single scale	0 mph	60 mph	None	None	Hall, NMEA	Double lens	Round, black
A2C59512409	White	12/24 Volt	Single scale	0 mph	60 mph	None	None	Hall, NMEA	Double lens	Round, white

Sumlog with compass function

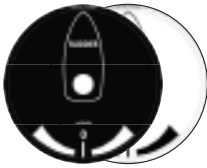
85 mm

0 – 12 kn 										
A2C59514251	Black	12/24 Volt	Single scale	0 kn	12 kn	None	None		Double lens	Round, black
A2C59514255	White	12/24 Volt	Single scale	0 kn	12 kn	None	None		Double lens	Round, white
0 – 30 kn 										
A2C59514252	Black	12/24 Volt	Single scale	0 kn	30 kn	None	None		Double lens	Round, black
A2C59514256	White	12/24 Volt	Single scale	0 kn	30 kn	None	None		Double lens	Round, white
0 – 50 kn 										
A2C59514253	Black	12/24 Volt	Single scale	0 kn	50 kn	None	None		Double lens	Round, black
A2C59514257	White	12/24 Volt	Single scale	0 kn	50 kn	None	None		Double lens	Round, white
0 – 60 mph / 										
A2C59514254	Black	12/24 Volt	Single scale	0 mph	60 mph	None	None		Double lens	Round, black
A2C59514258	White	12/24 Volt	Single scale	0 mph	60 mph	None	None		Double lens	Round, white

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			

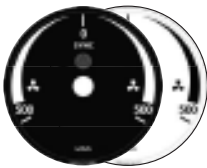
Rudder angle

85 mm

-45° - +45° / —										
										
A2C59512410	Black	12/24 Volt	Single scale	-45°	+45°	None	None	0-180 Ohm	Double lens	Round, black
A2C59512411	White	12/24 Volt	Single scale	-45°	+45°	None	None	0-180 Ohm	Double lens	Round, white

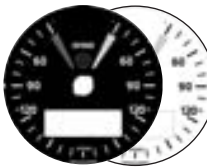
Synchronizer

85 mm

-500 - +500 rpm / —										
										
A2C59512402	Black	12/24 Volt	Single scale	-500 rpm	+500 rpm	None	None	W, 1, Ind	Double lens	Round, black
A2C59512403	White	12/24 Volt	Single scale	-500 rpm	+500 rpm	None	None	W, 1, Ind	Double lens	Round, white

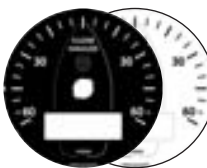
Wind display

85 mm

30 - 180° BB / STB —										
										
A2C59514245	Black	12/24 Volt	Single scale	30° BB/ STB	180° BB/ STB	None	None		Double lens	Round, black
A2C59514248	White	12/24 Volt	Single scale	30° BB/ STB	180° BB/ STB	None	None		Double lens	Round, white

Close hauled wind display

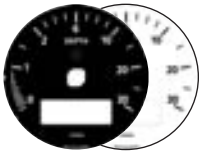
85 mm

0 - 60° BB / STB (x2) —										
										
A2C59514246	Black	12/24 Volt	Single scale	0° BB/ STB	60° BB/ STB	None	None		Double lens	Round, black
A2C59514249	White	12/24 Volt	Single scale	0° BB/ STB	60° BB/ STB	None	None		Double lens	Round, white

Part Number	Dial color	Operating voltage	Dial scale	Outer scale		Inner scale		Input	Lens	Bezel
				Min.	Max.	Min.	Max.			

Echo sounder

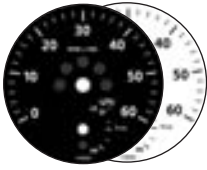
85 mm

0 – 30 m —										
A2C59514247	Black	12/24 Volt	Single scale	0 m	30 m	None	None		Double lens	Round, black
A2C59514250	White	12/24 Volt	Single scale	0 m	30 m	None	None		Double lens	Round, white


1.1.1.f Viewline instrument line | 110 mm X in 1 Aftermarket-Version

Part Number	Dial color	Operating voltage	Scale				Lens	Bezel
-------------	------------	-------------------	-------	--	--	--	------	-------

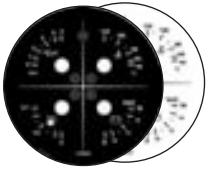
2 in 1 Tachometer / Trim

0 – 6000 rpm – 	A2C59514259	Black	12 Volt	0–6000 rpm	up–down	–	–	Double lens	Triangular, chrome
	A2C59514260	White	12 Volt	0–6000 rpm	up–down	–	–	Double lens	Round, white

0 – 7000 rpm – 	A2C59514261	Black	12 Volt	0–7000 rpm	up–down	–	–	Double lens	Triangular, chrome
	A2C59514262	White	12 Volt	0–7000 rpm	up–down	–	–	Double lens	Round, white

0 – 8000 rpm – 	A2C59514263	Black	12 Volt	0–8000 rpm	up–down	–	–	Double lens	Triangular, chrome
	A2C59514264	White	12 Volt	0–8000 rpm	up–down	–	–	Double lens	Round, white

4 in 1 Temperature/Voltmeter/Pressure/Tank

0–5 bar 40–120 °C 8–16 V 0–1/1 	A2C59514265	Black	12 Volt	0–5 bar	40–120 °C	8–16 V	0–1/1	Double lens	Triangular, chrome
	A2C59514266	White	12 Volt	0–5 bar	40–120 °C	8–16 V	0–1/1	Double lens	Round, white

1.1.1.g Viewline instrument line | Accessories

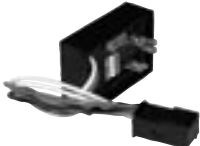


Viewline accessories are additional items to the standard range and are mainly intended for the purpose of installing or protecting instruments.

Part Number	Description
52 mm gauges	
A2C59510846	Socket contacts, 0.25–0.5 mm ²
A2C59510847	Socket housing, 8-pin
A2C59510854	Bracket assembly mounting set
A2C59510864	Flush mount fixing bracket
A2C53215640	Flush mount seal
A2C53186040	Bezel, flat; black
A2C53186022	Bezel, flat; white
A2C53186023	Bezel, flat; chrome
A2C53186024	Bezel, triangular; black
A2C53186025	Bezel, triangular; white
A2C53186026	Bezel, triangular; chrome
A2C53186027	Bezel, round; black
A2C53186028	Bezel, round; white
A2C53186029	Bezel, round; chrome
A2C53324664	Protective connector cap, 8-pin
A2C59510850	Connector set, 8-pin


Part Number	Description
85 mm gauges	
A2C59510846	Socket contacts, 0.25–0.5 mm ²
A2C59510847	Socket housing, 8-pin
A2C59510848	Socket housing, 14-pin
A2C59510854	Bracket assembly mounting set
A2C59510864	Flush mount fixing bracket
A2C53215641	Flush mount seal
A2C53212238	Fastening nut
A2C53192911	Bezel, flat; black
A2C53192912	Bezel, flat; white
A2C53192910	Bezel, flat; chrome
A2C53192917	Bezel, triangular; black
A2C53192920	Bezel, triangular; white
A2C53192918	Bezel, triangular; chrome
A2C53192913	Bezel, round; black
A2C53192916	Bezel, round; white
A2C53192914	Bezel, round; chrome
A2C53324664	Protective connector cap, 8-pin
A2C53324671	Protective connector cap, 14-pin
A2C59510850	Connector set, 8-pin
A2C59510851	Connector set, 14-pin

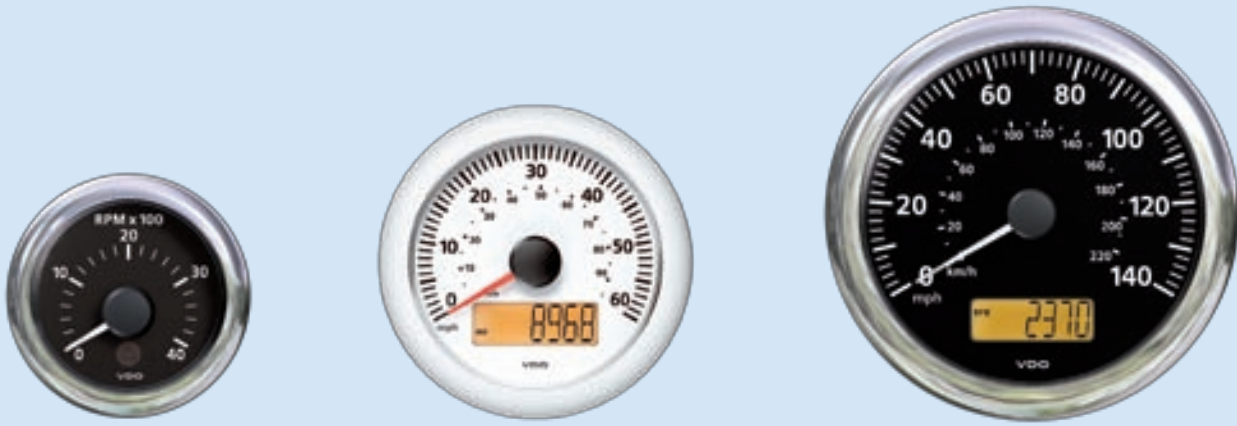
Part Number	Description
110 mm gauges	
A2C59510846	Socket contacts, 0.25–0.5 mm ²
A2C59510847	Socket housing, 8-pin
A2C59510848	Socket housing, 14-pin
A2C59510854	Bracket assembly mounting set
A2C59510864	Flush mount fixing bracket
A2C53215642	Flush mount seal
A2C53238881	Fastening nut
A2C53210745	Bezel, flat; black
A2C53210746	Bezel, flat; white
A2C53210747	Bezel, flat; chrome
A2C53210763	Bezel, triangular; black
A2C53210764	Bezel, triangular; white
A2C53210765	Bezel, triangular; chrome
A2C53210749	Bezel, round; black
A2C53210760	Bezel, round; white
A2C53210761	Bezel, round; chrome
A2C53324664	Protective connector cap, 8-pin
A2C53324671	Protective connector cap, 14-pin
A2C59510850	Connector set, 8-pin
A2C59510851	Connector set, 14-pin

Accessories: 52 / 85 / 100 mm

Part Number	Product	Description
		
A2C59510886	Makepoint switch	52 mm: Temperature, pressure, tank, trim, rudder angle 85/110 mm: For optional warning lights – temperature, pressure, tank
		
A2C59510221	Series resistor for 24 volt	Gauges: Temperature, tank, pressure, trim, rudder angle
		
A2C59510853	Series resistor for 24 volt with connector	Gauges: Temperature, tank, pressure, trim, rudder angle

Cables

Part Number	Product	Description
		
A2C59510852	Adapter cable for 52 mm Ocean Line, Cockpit International 2 Cockpit Version	With 5 x AMP taps, 6.3 mm With 2 x AMP taps, 2.8 mm (Ocean Line warning lamps)
A2C59512947	Cable, 8-pin	For temperature, pressure, level, trim, pyro, outside temperature, freshwater, blackwater, tachometer, speedo, Sumlog
A2C59512948	Cable, 8-pin	For voltmeter
A2C59512949	Cable, 8-pin	For ammeter
A2C59512950	Cable, 14-pin	For Tachometer with LCD



Customer-Specific Solutions

In addition to the standard range, the new Viewline instruments also offer OEMs the opportunity to implement solutions to meet their own specific requirements.

Multifunction instruments*

Complementing our tried and tested standard solutions, the Viewline range now also offers the option of multifunction instruments:

- Integration of up to four display gauges in a single 110 mm instrument
- Choose exactly the gauges required
- Integration of up to five warning lights

Generic gauges

The advanced technology used in Viewline makes it possible to process and display a wide variety of sensor sources and mappings, e.g.:

- Current and resistor inputs
- Frequency inputs
- Voltage inputs

Using a second optional frequency input, the combi-instrument can present speedometer and tachometer information in either analog (dial) or digital form (display).
Optionally available for:

- 85 mm instruments
- 110 mm instruments

Combi-instruments*

* On request

Small Series Program

As an alternative to our OE programme, custom solutions can be offered.

Portfolio

Availability of OE portfolio

- Available in a number of variants
- Exception: Viewline EHC (possibly following later)

Differences to OE portfolio

- 52 mm with a deflection angle of 90° are linearized and spread over 240°



Further facts in a glance

- Minimum order quantity per variant: 50 pcs.
- Just 10-packs (bulk)
- There are no one-off costs for the customer
- Not changeable:
 - Hardware components
 - Firm-/Software (while manufacturing)

Individualization

Back color of the dial

- Selectable out of a predetermined range of RAL and Pantone color codes
- Hint: Please inform your customer regarding the UV instability of light and neon colors! Those color codes have been removed from the list.



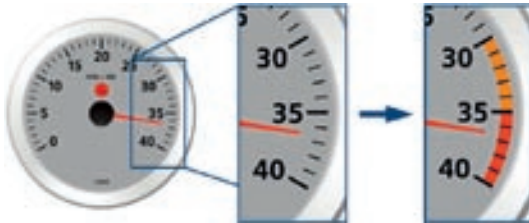
Adding a customer logo

- The size must conform to the size of the VDO logo
- Up to three colours are possible at one time



Colored fields in scale (1st Alternative)

- Up to three different color fields are possible, each in a different color
- The fields can be defined by start and end value in the scale
- No backlit



Pointer

Selectable pointer:

- Red
- White



Red colored scale (2nd Alternative)

- Up to three red areas are possible (fix color: Pantone 192c)
- The fields can be defined by start and end value in the scale
- Backlit



For more information, please get in touch with your usual contact person.



1.1.2 Modulcockpit II

1.1.2.a Dual-Instrument Units –
Vertical

1.1.2.b Dual-Instrument Units –
Horizontal

1.1.2.c Quad-Instrument Unit –
Vertical

1.1.2.d Tachometer with Engine
Hours Counter

1.1.2.e Electronic Speedometer



Modulcockpit II

Versatile and adaptable






VDO Modulcockpit II is a modular system designed with real-world requirements in mind that can be adapted for many different types of applications. The instruments in this series can be installed in any combination with a choice of dual- or quad-instrument housings. Transmitted light technology enables the best possible contrast, even at night. The housings are made of rugged black plastic with low-reflection, scratch-resistant lenses.






VDO Modulcockpit II can be connected quickly and easily via a central connector. Available in 12 and 24 volt versions, it is equally suitable for both on-road and off-road use.










Modulcockpit II:
Dual- and quad-instrument housings in rugged plastic allow flexible combinations of instruments


1.1.2.a Modulcockpit II | Dual-Instrument Units – Vertical

Part Number	Voltage	Graphics overlay 84-438-532-00 ...			
		Item 1	Item 2	Item 3	Item 4
Indicator lights / Engine hours counter					
110-008-984-001G	12 V	 31	 04	 08	 09


Part Number	Voltage	Single system
Single system / operating hours counter		 Lever-arm sender  Tubular sender
110-008-983-005C	12 V	Level indicator 301-291-980-003C  

Part Number	Voltage	Single system I	Single system II
Single system / single system		 Lever-arm sender  Tubular sender	
110-008-981-014C	24 V	301-292-980-004C  	310-284-980-011C  120 °C






Part Number	Voltage	Graphics overlay 84-438-532-00 ...				Single system I
		Item 1	Item 2	Item 3	Item 4	
Indicator lights / Single system						
110-008-982-004C	12 V	08	09	40	10	310-284-980-011C 120 °C
110-008-982-005C	12 V	01	02	04	07	301-291-980-003C

Part Number	Voltage	Graphics overlay 84-438-532-00 ...							
		Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8
Indicator lights / indicator lights									
113-000-980-002G ¹	24 V	01	06	07	08	09	10	11	13
113-000-980-004C	24 V	Without graphics overlay							
113-000-980-014C	12 V	01	02	07	06	08	10	09	31
¹ discontinued (but still available)									

1.1.2.b Modulcockpit II | Dual-Instrument Units – Horizontal

Part Number	Voltage	Graphics overlay 84-438-532-00 ...								
		Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	
Indicator lights / indicator lights										
	113-000-980-003C	12 V	Without graphics overlay							
113-000-980-004C	24 V	Without graphics overlay								

1.1.2.c Modulcockpit II | Quad-Instrument Units

Part Number	Voltage	Item	Single system	Item	Single system
110-008-980-013C	24 V	I	301-292-980-004C  	III	310-284-980-011C  120 °C
		II	332-305-980-004C  32 V	IV	350-272-980-011C  0 bar

4x single system



I III
II IV Lever-arm sender

1.1.2.d Modulcockpit II | Tachometer with Engine Hours Counter

Overview of instruments

Part Number	Measuring range	2 socket lamps
333-251-980-003C	0–3,000 min ⁻¹	24 volts, 1.2 watts
333-251-980-004C	0–4,000 min ⁻¹	24 volts, 1.2 watts

1.1.2.e Modulcockpit II | Electronic Tachometer**Overview of instruments**

Part Number	Measuring range	Special feature	Voltage
437-260-980-001C	0 ... 60 km/h, 0 ... 37 mph	–	12/24
437-260-980-002C	0 ... 125 km/h, 0 ... 77 mph	–	12/24
437-809-980-004C	0 ... 60 km/h, 0 ... 37 mph	PWM output	12/24
437-809-980-005C	0 ... 125 km/h, 0 ... 77 mph	PWM output	12/24



Analog Clusters*

* Only available for series production applications on request

1.2.1 Centrobases 300

1.2.2 Centrobases 500



*Only available for series production applications on request

Analog Clusters*

Centrobase 300 and 500

The VDO Centrobase 300 and Centrobase 500 instrument clusters allow all relevant engine data (analog and digital) to be presented clearly on a central display, thus enabling greater convenience and enhanced ergonomics in the driver's cab. Products in the Centrobase family are continuously adapted and updated to meet customer requirements. Dials can be adapted to meet individual customer requirements in terms of scaling, icons, and design.

VDO Centrobase instrument clusters stand out for their efficiency, flexibility, quality, reliability, and ease of use.



Centrobase instruments with LCD and up to 12 warning lights





Intelligent instrument cluster with central connector and compact housing

*Only available for series production applications on request

1.2.1 Analog Clusters* | Centrobases 300

Centrobases 300 / analog display / warning lamp display

<p>Analog display</p>		<p>Description:</p> <ul style="list-style-type: none"> • Analog display: choice of rpm, speed, pressure, temperature or tank level • Digital display for operating hours • Bar graph display for battery voltage, fuel level, temperature or pressure • Display with up to 8 indicator light symbols • Programming via diagnostics interface (K-line)
<p>Warning lamp display</p>		<p>Description:</p> <ul style="list-style-type: none"> • Display with 12 indicator light symbols • Digital display for operating hours • Bar graph display for battery voltage, fuel level, temperature or pressure • Display with up to 12 indicator light symbols • Programming via diagnostics interface (K-line)

Centrobases 300 accessories / analog display / warning lamp display

Part Number	Description
	
A2C53117229	Housing with lever
	
A2C53117227	Socket housing
	
A2C53117623	Socket contact

*Only available for series production applications on request

1.2.2 Analog Clusters* | **Centrobases 500**

Centrobases 500

Analog display



Description:

- Analog display for rpm, speed, temperature and fuel level
- Digital display: choice of operating hours, total mileage, trip counter, trip operating hours, time of day, and current gear
- Display includes up to 15 indicator lights
- Self-test for 5 indicator lights
- Programming via diagnostics interface (K-line)

Centrobases 500 accessories

Part Number	Description
A2C53117228	Socket housing
A2C53117260	Socket contact
A2C53117261	Socket contact



CAN Instruments

* Only for trained partners

1.3.1 CANcockpit*

1.3.2 Ocean Link

1.3.3 Accessories



*Only for trained partners

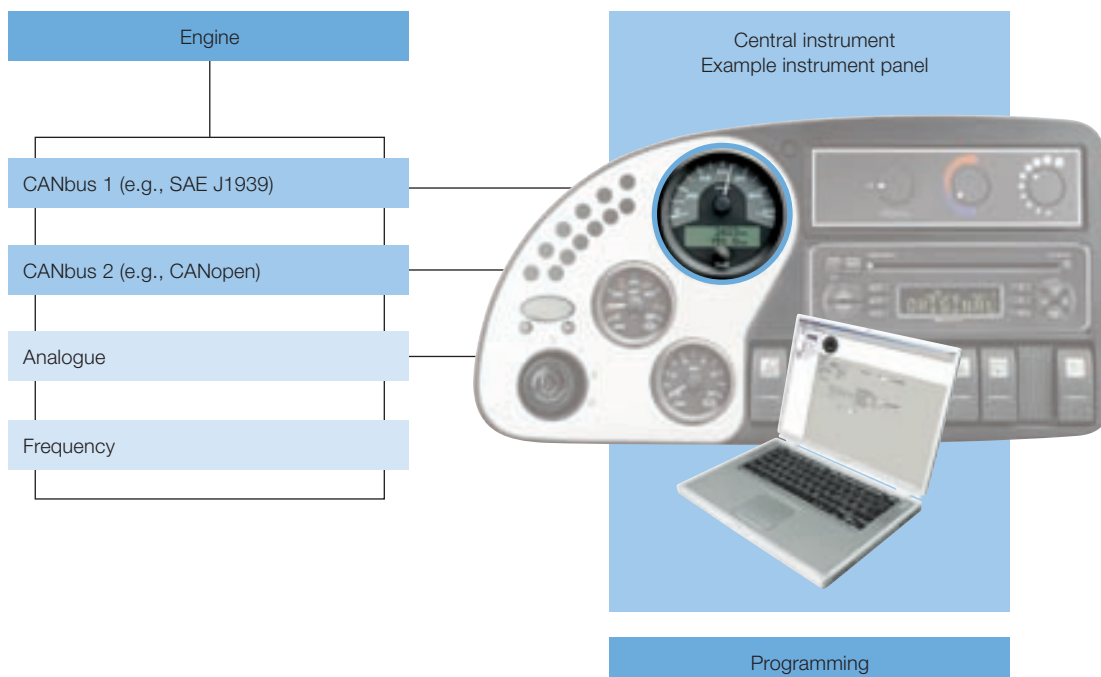
CANcockpit*

Handle complex requirements with ease.

The VDO brand is synonymous with customised solutions that handle sophisticated technical tasks while offering maximum ease of operation. VDO products are deployed in a wide range of applications from construction vehicles, agricultural and forestry equipment to stationary machines, sports cars and boats.

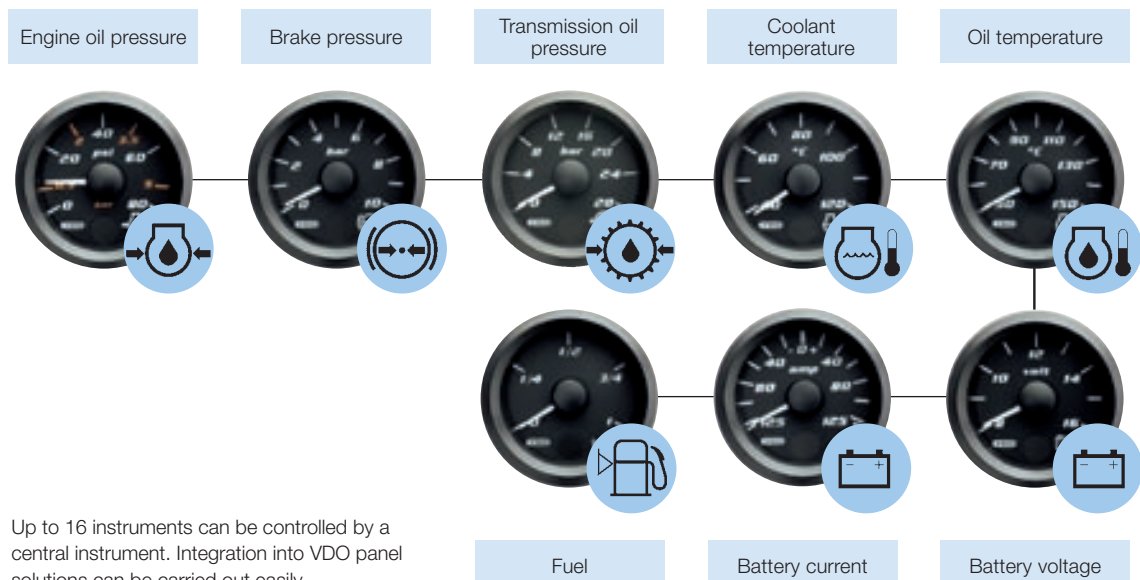
CANcockpit is the flexible system solution for processing data from various analogue and digital sensors via

a central instrument connected to a CANbus. It can be precision configured to meet specific needs, and is simple to expand whenever required. In addition, this modular instrumentation solution may be integrated into existing VDO panel solutions. Thanks to the powerful WINgauge software it is exceptionally easy to program. CANcockpit is also capable of processing two CAN protocols (e.g. SAE J1939 and CANopen) simultaneously.



CANcockpit – harness the benefits.

- **Flexibility** – Data from up to two CANbuses running different protocols (e.g. SAE J1939 and CANopen) can be processed simultaneously.
- **Safety** – Easy DTC (diagnostic trouble code) handling of the protocol defined by J1939 through comprehensive functionality and setting options.
- **Diagnostic support** – Configuration checking, plus online recording of selected measurement values via recorder function for subsequent download onto PC and evaluation using standard tools.
- **Compatibility** – Analogue, frequency and CAN inputs are available.
- **Integration** – CANcockpit can easily be incorporated into existing VDO panel solutions.
- **Programmability** – Specific thresholds can be set and programmed so that an alarm triggers when they are exceeded.
- **Modularity** – Simple cabling requirements and straightforward subsequent expansion.
- **Convenience** – Automatic plausibility check for the parameters entered and various functional checks carried out by special WINgauge software during input phase.
- **Personalisation** – Flexible LC-display options allow icons to be defined and corporate logos to be displayed.
- **Readability** – Instrumentation designed for maximum clarity.



*** Only for trained partners**

Variable configuration options.

CANcockpit, the flexible solution for a wide range of applications, offers numerous configuration and expansion options. It is based around a central instrument which can be either a tachometer or a speedometer. The central instrument features two CAN inputs supporting different CAN protocols, two frequency inputs,

three resistive inputs, one 4–20 mA input, plus one 0–5 V input. In addition, it is equipped with two switched outputs, a configurable digital display field, and more.

Three sample standard applications are shown below:

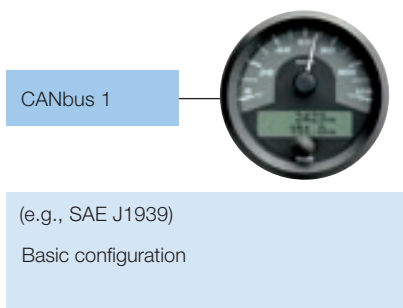
Basic configuration

Sample requirement:

A generator is to be fitted with a tachometer measuring up to 3,000 rpm. There is only one CANbus; the threshold values and settings are clearly defined.

CANcockpit provides the solution:

Once the tachometer has been set up as the central instrument you will have access to the desired tachometer display and the option of viewing other data, e.g. as part of an inspection routine, as and when required. All data can be displayed on the central instrument, allowing you to monitor current engine data at any time without the need for other satellite instruments.



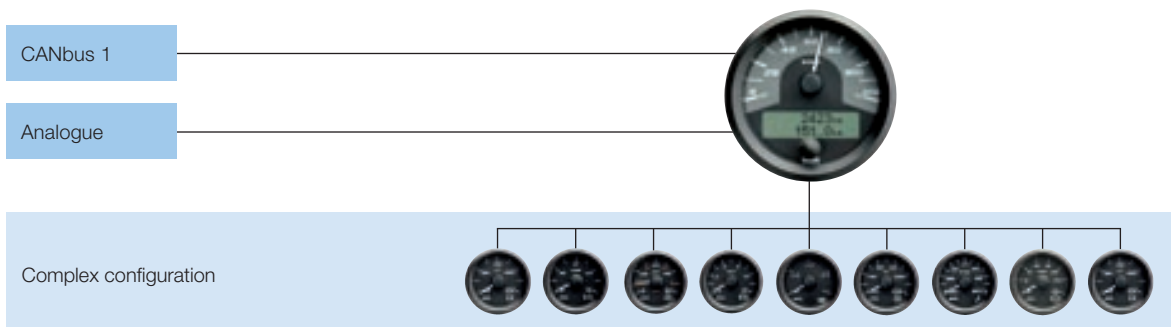
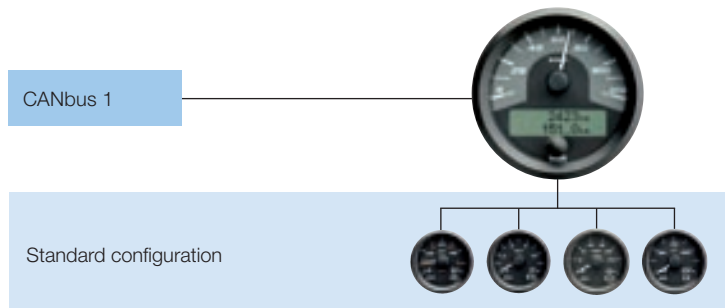
Standard configuration

Sample requirement:

Instrumentation for a digger is one example of a standard configuration using CANcockpit. A tachometer and four more instruments need to be added to a CANbus.

CANcockpit provides the solution:

Once the instrumentation solution has been programmed (a simple procedure), key engine data such as coolant/engine oil/transmission oil temperatures will be displayed alongside rpm and operating hours, plus fuel level – giving you a clear overview of crucial information at all times.



Complex configuration

Sample requirement:
Rigorous safety requirements and different vehicle deployment scenarios (construction sites and public roads) often require complex configurations. One example is a mobile crane, the central instrument of which is to be hooked up to manage nine more instruments. All data comes from analogue sensors and frequency sensors via a CANbus.

CANcockpit provides the solution:
CANcockpit can cover even this complex configuration with ease. The instruments are connected and set, allowing a wide range of physical engine data to be displayed at all times, as well as e.g. hydraulic data (CANopen). For you, this means maximum choice when it comes to putting together the required display instruments.

Technical data

Movement	Stepper motor
Installation diameter [mm]	Central instrument 80, 85, 100; satellite instruments 52, 80, 100
Illumination	Transmitted light, LED, white as standard
Protection rating	IP65 IEC 60.529, front side
Front lens	Glass, anti-reflective
Bezel	Plastic, black, triangular as standard
	Options (not yet available): Triangular profile in chrome, round profile in black
Connectors	Central instrument: Mate-N-Lok 4-pin and MODU II 26-pin
	Satellite instruments: Mate-N-Lok 6-pin
Viewing angle	Approx 210° for central instrument, 240° for satellite instruments
Warning lights	In each satellite instrument
CAN inputs	2 x (e.g., SAE J1939, CANopen)
Frequency inputs	1 x Hall, 1 x universal
Analogue inputs	3 x resistors, 1 x 4–20 mA, 1 x 0–5 volts
Outputs	2 x switching outputs, 0.5 A
Operating voltage	12–24 volts (min. 10.5 volts, max. 32 volts)
Installation position	Central instrument no restrictions, satellite instruments 0–85°
Operating temperature	-40 °C ... +85 °C, LCD has limited readability below -20 °C and above +70 °C
Storage temperature	-40 °C ... +85 °C

For further information about VDO, please visit our website: www.vdo.com

*Only for trained partners

WINgauge – flexible configuration software

WINgauge has been specially developed for CANcockpit. This software enables the convenient and flexible configuration of individual instruments or a complete series of instruments. In addition to maximum functionality and customisable programming, WINgauge offers maximum ease of operation. VDO

also offers training to help you program a CANcockpit solution. This training tells users everything they need to know about the innovative features, such as how to personalise the system and integrate corporate logos and symbols into the central instruments display.



Selecting the central instrument and basic settings



Setting the basic CAN settings (if applicable)



Sensor database and mapping adjustments for optimum performance



Setting warnings and alarms including choice of response and priorities



DTC handling and personal configuration with individual messages and symbols



Programming of requests, e.g. query operating hours



Adding satellite instruments



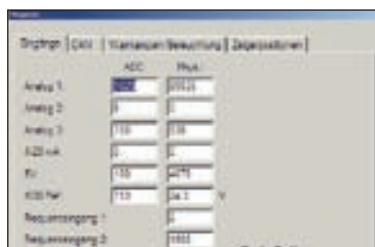
Adding display gauges



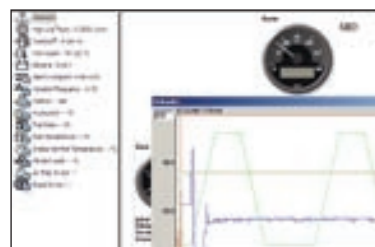
Programming the central instrument, e.g. with a proprietary logo or symbol



The individual project is now programmed



Numerous diagnostic options are available



Capturing, storing and processing selected data by connecting to a PC

* Only for trained partners

1.3.1 CAN Instruments | CANcockpit*

VDO CANcockpit is a flexible system solution for processing data from various analogue and digital sensors via a master instrument. It can be configured specifically to suit individual requirements and easily expanded or integrated into existing VDO panel solutions whenever required. The instrumentation boasts a modular design and is particularly easy to program thanks to the powerful WINgauge software. VDO CANcockpit is capable of processing two CAN protocols (e.g. SAE J1939 and CANopen) at the same time, and can control up to 16 instruments via a central instrument.

Part Number	Description
-------------	-------------

Central instrument 80 mm

A2C60000020	CCM 80 Tacho 0-3*1000/min S tb
A2C60000021	CCM 80 Tacho 0-4*1000/min S tb
A2C60000022	CCM 80 Speedo 0-60km/h S tb
A2C60000023	CCM 80 Speedo 0-120km/h S tb
A2C60000024	CCM 80 Speedo 0-200km/h S tb
A2C60000025	CCM 80 Speedo 0-80mph D tb
A2C60000026	CCM 80 Speedo 0-30km/h S tb
A2C60000027	CCM 80 Tacho 0-8*1000/min S tb

Central instrument 85 mm

A2C60000070	CCM 85 Tacho 0-3*1000rpm S tb
A2C60000071	CCM 85 Tacho 0-4*1000rpm S tb
A2C60000072	CCM 85 Speedo 0-120km/h S tb
A2C60000073	CCM 85 Speedo 0-80mph S tb
A2C60000074	CCM 85 Speedo 0-100mph S tb
A2C60000075	CCM 85 Speedo 0-120mph S tb
A2C60000076	CCM 85 Tacho 0-5*1000rpm S tb

Central instrument 100 mm

A2C60000126	CCM 100 Tacho 0-30*100/min S tb
A2C60000127	CCM 100 Tacho 0-40*100/min S tb
A2C60000128	CCM 100 Speedo 0-60km/h S tb
A2C60000129	CCM 100 Speedo 0-120km/h S tb
A2C60000130	CCM 100 Speedo 0-200km/h S tb
A2C60000131	CCM 100 Speedo 0-50mph D tb
A2C60000132	CCM 100 Speedo 0-140mph D tb
A2C60000133	CCM 100 Speedo 0-200km/h D tb
A2C60000134	CCM 100 Speedo 0-120mph D tb

Black Box

A2C60500641	CCM Black Box
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Satellite instrument 52 mm

A2C60000251	CCS 52 PressOil 0-5bar S tb
A2C60000252	CCS 52 PressOil 0-10bar S tb
A2C60000253	CCS 52 PressOil 0-500kPa S tb
A2C60000254	CCS 52 PressOil 0-1000kPa S tb
A2C60000255	CCS 52 PressOil 0-80psi D tb
A2C60000256	CCS 52 PressOil 0-100psi D tb
A2C60000257	CCS 52 PressOil 0-150psi D tb
A2C60000258	CCS 52 PressBr 0-10bar S tb
A2C60000259	CCS 52 PressBr1 0-10bar S tb
A2C60000260	CCS 52 PressBr2 0-10bar S tb
A2C60000261	CCS 52 Press1 0-250bar S wo tb
A2C60000262	CCS 52 Press2 0-250bar S wo tb

Part Number	Description
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A2C60000263	CCS 52 PressBr 0-150psi D tb
A2C60000264	CCS 52 PressBr 0-16bar S tb
A2C60000265	CCS 52 PressTr 0-28bar S tb
A2C60000266	CCS 52 PressTr 0-400psi D tb
A2C60000267	CCS 52 PressTu 0-2bar S tb
A2C60000268	CCS 52 TempOil 50-150C S tb
A2C60000269	CCS 52 TempTr 50-150C S tb
A2C60000270	CCS 52 TempTr 50-150C D tb
A2C60000271	CCS 52 TempTr 120-300F D tb
A2C60000272	CCS 52 Temp 60-200C S wo tb
A2C60000273	CCS 52 TempWa 40-120C S tb
A2C60000274	CCS 52 TempWa 40-120C D tb
A2C60000275	CCS 52 TempWa 100-280F D tb
A2C60000276	CCS 52 TempHy 20-120C S tb
A2C60000277	CCS 52 TempPyro 100-900C S tb
A2C60000278	CCS 52 LevelFuel 0-1 S tb
A2C60000279	CCS 52 LevelFuel E-F S tb
A2C60000280	CCS 52 LevelFw 0-1 S tb
A2C60000281	CCS 52 LevelWw 0-1 S tb
A2C60000282	CCS 52 Volt 8-16V S tb
A2C60000283	CCS 52 Volt 10-18V S tb
A2C60000284	CCS 52 Volt 18-32V S tb
A2C60000285	CCS 52 Am -125/+125A S tb
A2C60000286	CCS 52 Tacho 0-3*1000/min S tb
A2C60000287	CCS 52 Speedo 0-60km/h S tb
A2C60000288	CCS 52 TempOil 120-300F D tb
A2C60000289	CCS 52 Volt 20-34V S tb
A2C60000296	CCS 52 RearW L-1/2-0-1/2-R S tb
A2C60000297	CCS 52 PressBr1 0-150psi D tb
A2C60000298	CCS 52 PressBr2 0-150psi D tb
A2C60000299	CCS 52 LevelAdBlue 0-1 S tb
A2C60000354	CCS 52 PressOil 0-10bar S on tb
A2C60000355	CCS 52 TempWa 40-120C S on tb

Satellite instrument 80 mm

A2C60000356	CCS 80 Tacho 0-3*1000/min S tb
A2C60000357	CCS 80 Speedo 0-60km/h S tb
A2C60000358	CCS 80 Speedo 0-80mph D tb
A2C60000359	CCS 80 Speedo 0-60km/h D tb

Satellite instrument 100 mm

A2C60000360	CCS 100 Tacho 0-3*1000/min S tb
A2C60000361	CCS 100 Speedo 0-120km/h S tb



Ocean Link

Plug & play – the fastest way to access precision engine data.

Engines on modern sports and leisure boats increasingly feature electronic management. To meet these new requirements, VDO now boasts a modular instrumentation concept for marine application: Ocean Link. The main element and information powerhouse is a multifunctional tachometer with direct access to the CANbus controlling the engine. The instrument can display and forward all available data to up to 20 additional satellite instruments. Installation follows the practical plug & play principle, making further system expansion particularly convenient, with no need for complicated programming. Ocean Link has already established a successful track record with leading engine manufacturers.

Ocean Link – Explore the data horizon

The central instrument automatically presents all the key data – up to 256 standard measurement values ranging from oil pressure and fuel consumption to operating hours – on a generously proportioned digital display. Besides a CAN interface with SAE J1939 data protocol it features two inputs for analogue sensors. The innovative Easy Link data connection renders complicated cabling unnecessary. The CAN interface also allows a second central instrument to be hooked up for positioning on the flybridge, for example. Satel-

ite instruments for further dynamic measurement values receive updates from the central instrument every 20 ms. Ocean Link is available in various designs, including a range of installation dimensions and metric and imperial scales. The instruments can also be conveniently integrated into customer-specific panel solutions.

Ocean Link benefits

<p>Straightforward system expansion</p> <ul style="list-style-type: none"> • Easy Link connector • Up to 20 other satellite instruments per central instrument • Minimal cabling 	<p>Plug & play principle</p> <ul style="list-style-type: none"> • Easy installation • No reprogramming 	<p>Customer-specific integration</p> <ul style="list-style-type: none"> • Combined instruments • Panel solutions 	<p>All Ocean Link benefits</p> <ul style="list-style-type: none"> • Double lens system • Flush mounting possibility
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Engine data



VDO Easy Link instrument bus



Technical data

Specification	Central instrument (85 mm)	Satellite instrument (52 mm)
Housing	Plastic (flame-retardant) according to UL94-V0	Plastic (flame-retardant) according to UL94 - V0
Bezel	Plastic, coloured	Plastic, coloured, clipable
Lens	Plastic, double lens, anti-reflection	Plastic, double lens, anti-reflection
Illumination	Transmitted light, red LED, 8 dimmer steps	Transmitted light, red LED, 8 dimmer steps, adjustable via master
Display	132 x 33 pixel	
Connections	DELPHI connector, GT 150 Series	Super Seal 1.5 Series AMP connector 282105-1
Installation	Housing nut, nut jam high 0-17mm	Mounted from the front, housing nut, nut jam height 0-12 mm, studs 12-25 mm flush mount: for 3 mm panel thickness with mounting angle, screws and studs on panel gasket
Indication area	3,000 or 4,000	270° (depending on slave functionality)
Nominal voltage	12/24 volts	
Nominal position	0-90°	any
Operating temperature	-20 °C to +70 °C (at nominal voltage)	-20 °C to +70 °C (at nominal voltage)
Storage temperature	-30 °C to +85 °C	-30 °C to +85 °C
EMC	DIN EN 61000-6-2 & 6-3 according to EMC Directive 2004/108/EEC	CE according to EMC directive
Protection class	IP65, mounted, front side to IEC 529	IP65, mounted, front side
Max. no. Satellites		Max. 20 gauges and 20 m cable length connected to central instrument
Current consumption	120 mA without, 140 mA with illumination	<70 mA with illumination
CANbus	SAE J1939 protocol	Easy Link bus uni-directional from central instrument to satellite
Power supply	10 V - 30 V	

1.3.2 CAN Instruments | Ocean Link

Important data is displayed automatically on the large digital display. As many as 20 different parameters, such as oil pressure, fuel consumption, and operating hours, can be displayed on additional peripheral instruments. In addition to a CAN interface running the SAE J1939 data protocol, the master instrument also features two inputs for analog sensors. The innovative serial data link makes complex cabling a thing of the past. All instruments can be easily integrated into customer-specific instrument panel solutions.

Part Number	Dial color	Range
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52 mm satellite**Boost pressure**

N02-140-508	Black	0–3 bar
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Engine coolant temperature

N02-311-056	Black	40–120 °C
N02-311-552	Black	100–250 °F
N02-311-060	White	40–120 °C / 100–250 °F

Engine oil pressure

N02-140-156	Black	0–10 bar
N02-140-512	Black	0–150 psi
N02-140-160	White	0–10 bar / 145 psi

Engine oil temperature

N02-311-054	Black	50–150 °C
N02-311-542	Black	100–300 °F
N02-311-058*	White	50–150 °C / 120–300 °F

Exhaust gas temperature

N02-311-540	Black	100–900 °C
N02-311-546	Black	200–1,700 °F

Fuel flow rate

N02-270-040*	Black	0–100 l/h
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Fuel level

N02-224-080	Black	0–4/4
N02-224-082	White	0–4/4

Transmission oil pressure

N02-140-154	Black	0–25 bar
N02-140-516	Black	0–360 psi
N02-140-158	White	0–25 bar / 0–360 psi

Transmission oil temperature

N02-311-536	Black	50–150 °C
N02-311-544*	Black	120–300 °F

Turbo inlet temperature gauge A

N02-311-554	Black	100–900 °F
N02-311-548*	Black	200–1,700 °F

Turbo inlet temperature gauge B

N02-311-556	Black	100–900 °C
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* Supplied on request – limited availability

Part Number	Dial color	Range
N02-311-550	Black	200–1,700 °F

Voltmeter

N02-413-066	Black	8–16 V
N02-413-058	Black	18–32 V
N02-413-074	White	8–16 V
N02-413-060	White	18–32 V

85 mm central instrument**Tachometer**

N02-012-920	Black	0–3,000 min ⁻¹
N02-012-922	Black	0–4,000 min ⁻¹
A2C59500012	Black	0–5,000 min ⁻¹
N02-012-928	White	0–3,000 min ⁻¹
N02-012-930	White	0–4,000 min ⁻¹

1.3.3 CAN Instruments | Accessories

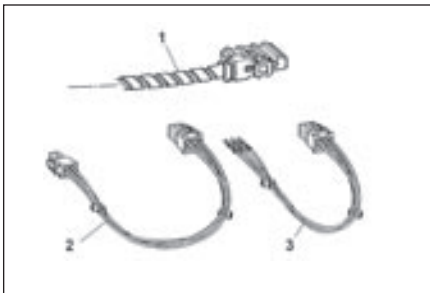
CANcockpit

Software



Part Number	Description	Units per pack
X11-602-000-009	CANcockpit Interface (WINgauge CMD Line)	1

Wiring harnesses



Part Number	Description	Units per pack
A2C53041729	Harness Type A (Central instrument)	10
A2C53344035	CCH Type B Gold (Central-Satellite)	10
A2C53344036	CCH Type C Gold (Satellite-2-Satellite)	100
Accessories		
X10-110-397-006	Demo Case	1

Ocean Link



Part Number	Description	Units per pack
X11-719-000-037	Connector, complete	1



Display Solutions



Display Solutions

VDO ViewGate:

Gateway instrumentation for commercial and special-purpose vehicles

An information center for drivers: VDO ViewGate

Showing the full range of vehicle functions that modern commercial vehicle drivers must “keep an eye on” presents a challenge, because many drivers doesn’t see a cockpit cluttered with individual instruments as the ideal solution. Modern electronic systems, such as navigation and telematics, for example, or Bluetooth connections, support the driver, but they must be operated as well – posing new tasks for bus or truck drivers.

In this respect, special-purpose vehicles are also demanding when it comes to instrumentation. Often, they confront the driver with two tasks simultaneously: In addition to the fundamental driving job of taking the vehicle to the site, the driver must also operate the machine’s hydraulically-controlled equipment either while driving, upon arrival, or alternate between driving and working the hydraulics. Depending on the type of vehicle and its design, that means the driver has either a combined workplace or two workplaces within the cab.

Clear visuals meet increased performance presentation

As a result, the situation can raise visual complexity at the Human-Machine Interface (HMI) in the cab. We have developed a new solution in order to integrate various data sources and present them on a Thin-Film-Transistor (TFT) color display because today’s commercial vehicles, heavy equipment and tractors have such a wide range of functions. This gateway

family called VDO ViewGate supports many current development goals for commercial and special-purpose vehicles.

As a flexible, modular and scalable system with a gateway as the central hardware component, VDO ViewGate is a freely programmable, centralized source of information for the driver and offers several decisive advantages: Great deal of freedom to configure individual display functions visually provides flexible support even for vehicles with a high degree of specialization. In addition, the range of possible display functions goes far beyond conventional multi-function displays.

The display screen can be dynamically configured with just the right indicators to meet the demands of specific sites (i.e. according to context). The principle of multiple, variable configuration facilitates using the VDO ViewGate even in cabs that are generally crowded or where there is no room to install larger technical systems.

Using active alarms

Combined with a logically designed alarm hierarchy, the VDO ViewGate can alert the driver to situation-relevant operating conditions: The warning display is triggered when programmed thresholds are exceeded or an alarm is activated. This aids the driver, enhancing driver performance and efficiency and increasing operational safety as well.

HMI technical basics

Seen from a technical point of view, the VDO ViewGate is a graphics-capable computer controlling and feeding data through an 800 x 480 pixel resolution TFT display and a 152.4 x 91.4 mm (7 inch) touchscreen. For instrumentation of commercial vehicles a refined mechanical design featuring aluminum housing is a must. The display is optimally suited to this kind of use due to its mechanical stability and broad operating temperature range (-20 °C to 70 °C) together with a high-contrast feature and a wide viewing angle.

VDO ViewGate is available in two versions because the HMI requirements differ depending on vehicle type: the Highline for commercial vehicles and the Multiline for construction equipment and agricultural machines.

A display backlight with white LEDs ensures good readability even in rapidly changing ambient light. Installation options are flush with the instrument panel or with a bezel (polycarbonate or ABS) in various colors and shapes.

Software solutions provide great freedom of presentation and the high level of information quality of the display and offer advantages that are already being used increasingly in other areas of application, such as passenger cars.



The VDO ViewGate can process input signals from the vehicle using manufacturer specific protocols or conventional CAN 2.0b protocols as well. This gives drivers an opportunity to use VDO ViewGate to display more than just the essential, conventional data alone. Navigation information can also be presented on the display as well. And above and beyond that, mobile devices, such as MP3 players can be connected to the VDO ViewGate to render whatever is on the playlist. Several USB ports (host and client) plus an SD card slot are available for this purpose. And the video CVBS interface makes the attachment of a reversing camera easy. Digital and analogue inputs are, of course, present as well.

Highly ergonomic

Thanks to vast flexibility in presentation forms, the VDO ViewGate enables drivers to choose visual displays that are particularly well-suited to the corresponding reference data. This makes the VDO ViewGate a suitable monitoring instrument for numerous systems, which in addition to engine functions, can also include communication and telematic data.

The graphics capability of the VDO ViewGate also offers wide-ranging possibilities for integrating the display in a way that is harmonious and consistent with the appearance of the cab interior. On the other hand, when it comes to what makes ergonomic sense, it is also possible to use manufacturer-specified color schemes (colorimetry) and designs for the display.

The VDO ViewGate also offers maximum flexibility when it comes to operation: In addition to the keys, operating the ViewGate is also possible via a sensitive touchscreen. As a modern operational option, the VDO ViewGate can also be connected to a rotational actuator. As a result, the HMI can be optimally tailored to suit the manufacturer's philosophies of vehicle operation and indication.

2. Sensors and Switches

* Only available for series production applications on request

2.1 Speed and RPM Sensors

- 2.1.1 Blocking Oscillator Sensor
- 2.1.2 Inductive Sensor
- 2.1.3 Generator Sensor
- 2.1.4 Active Wheel Speed Sensor

2.2 Pressure Sensors

- 2.2.1 Pressure Sensor, Single-Pole, Common Ground
- 2.2.2 Pressure Sensor with Warning Contact, Common Ground
- 2.2.3 Pressure Sensor, Insulated Return
- 2.2.4 Pressure Sensor with Warning Contact, 3 Connections

2.3 Pressure Switches

- 2.3.1 Pressure Switch, Single-Pole, Common Ground
- 2.3.2 Pressure Switch, Insulated Return

2.4 Temperature Sensors

- 2.4.1 Temperature Sensor, Single-Pole, Common Ground
- 2.4.2 Temperature Sensor, Dual-Pole, Insulated Return
- 2.4.3 Temperature Sensor with Warning Contact
- 2.4.4 Temperature Sensor for Air Temperature

2.5 Temperature Switches

- 2.5.1 Temperature Switch, Single-Pole, Common Ground
- 2.5.2 Temperature Switch, Dual-Pole, Insulated Return

2.6 Liquid Level Switches

- 2.6.1 Liquid Level Switch, Linear Type, Oil / Diesel
- 2.6.2 Liquid Level Switch, Lever Type, Oil
- 2.6.3 Liquid Level Switch, Lever Type, Water

2.7 UniNO_x

Customer-Specific Solutions Sensors for Engine Management Systems*

- Intake Air Pressure Sensors (MAP, T-MAP)
- Mass Airflow Sensor (MAF)
- Knock Sensor
- Crankshaft Position Sensor
- Camshaft Position Sensor
- High_temperatur Sensor
- Differential pressure Sensor



Sensors and Switches

Sensing and forwarding information

A wide variety of information is required to ensure reliable, safe and efficient vehicle operation. Sensors capture and transmit the necessary data. To fulfil this task, they need to be resistant to temperature, moisture, dirt and chemicals.

So that the information provided is as reliable as possible the sensors also need to function perfectly with electromagnetic fields and in the presence of other sensors, in addition to offering a long service life. Sensors can help cut fuel consumption and harmful emissions. They play a part in boosting engine efficiency and vehicle safety to enable greater driving comfort and enjoyment.

Detective sensors can lead to engine management faults and in worstcase scenarios cause engine damage.



Speed and RPM Sensors

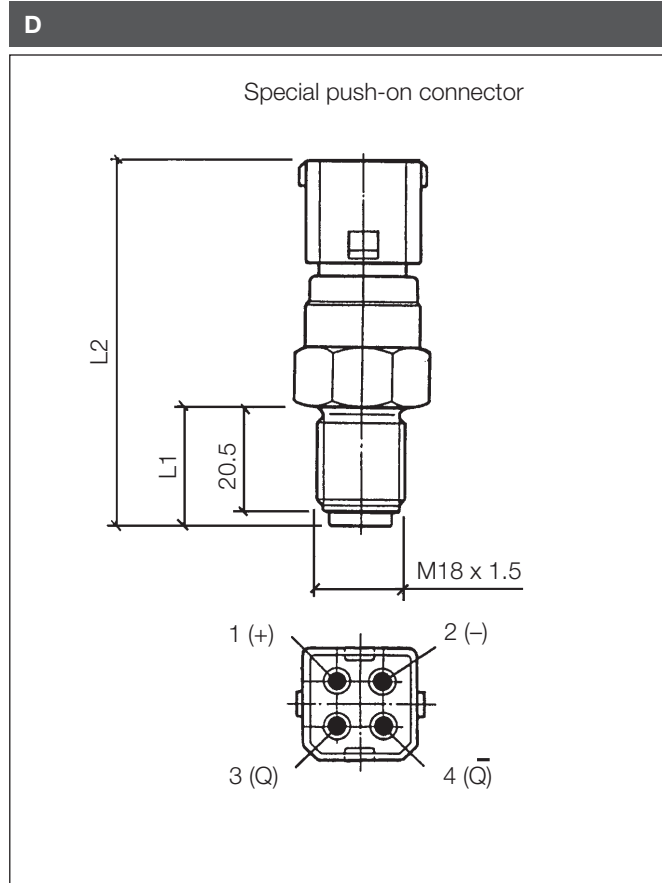
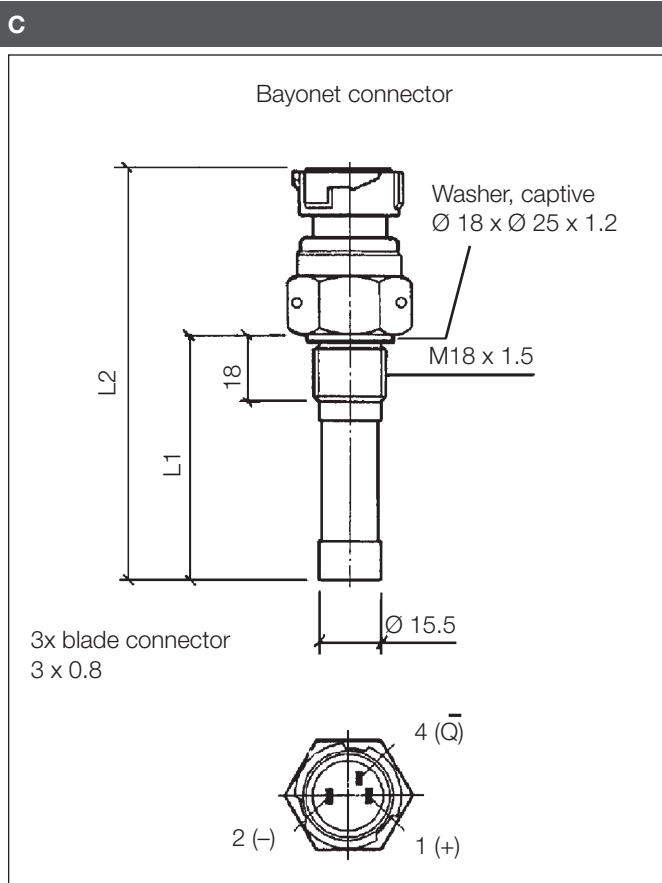
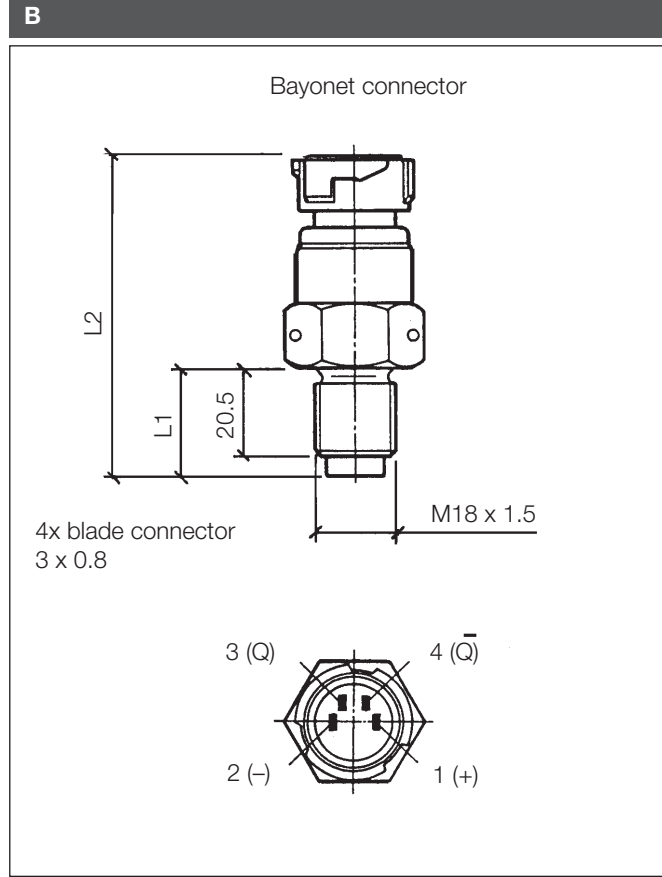
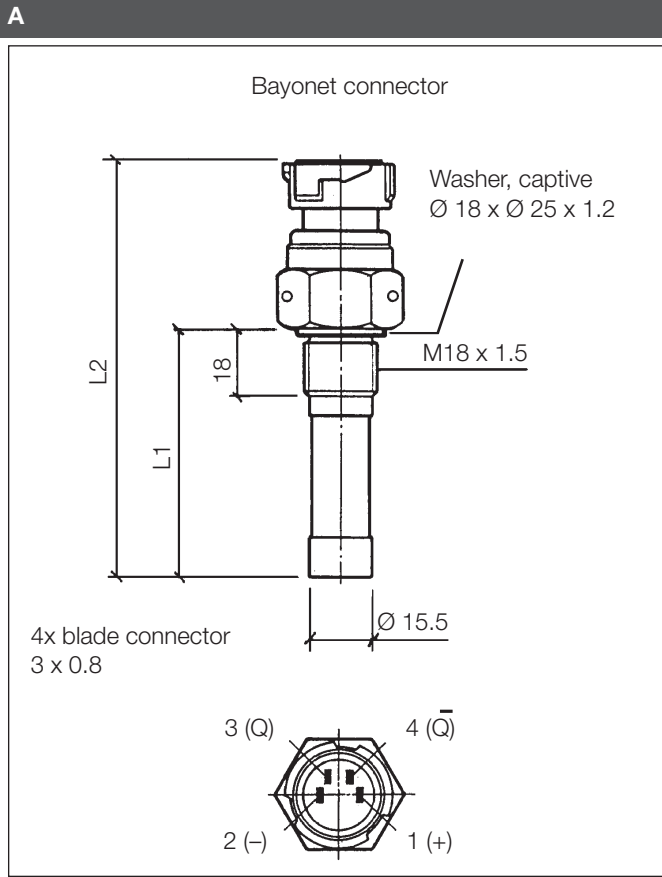
2.1.1 Blocking Oscillator Sensor

2.1.2 Inductive Sensor

2.1.3 Generator Sensor

2.1.4 Active Wheel Speed Sensor

2.1.1 Sensors and Switches | Speed and Revolution Sensors | **Blocking Oscillator Sensor**



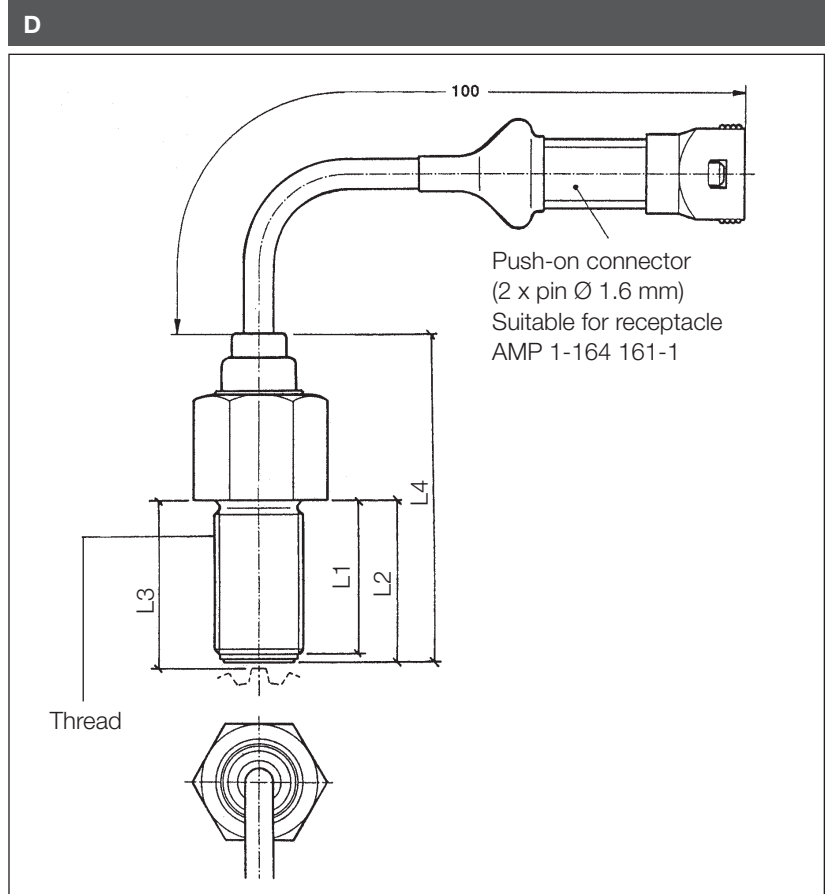
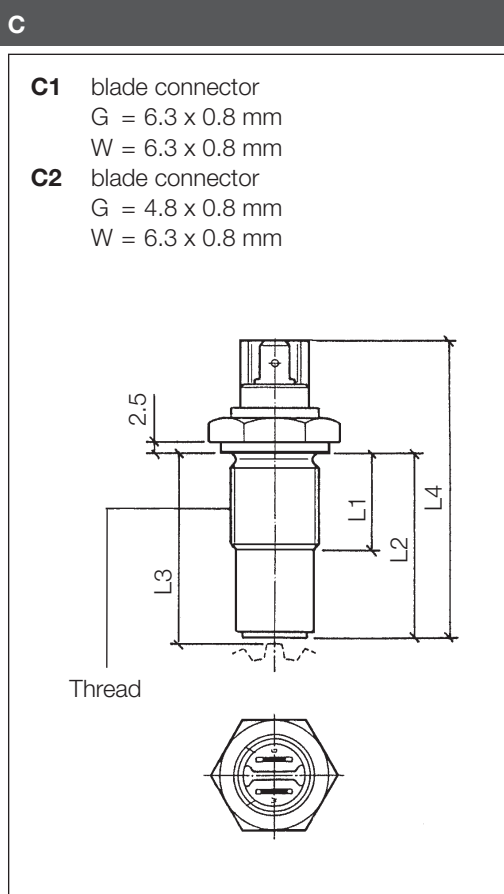
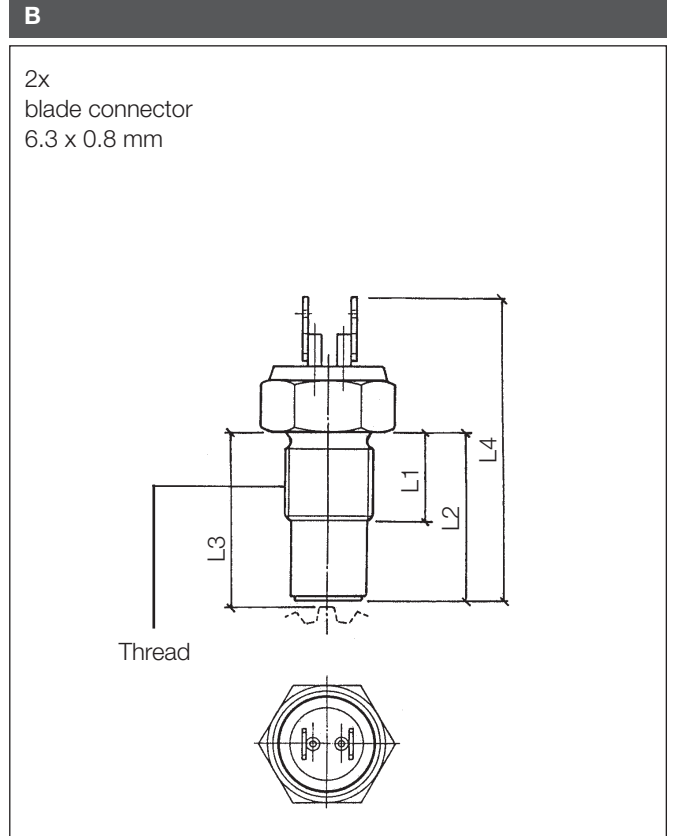
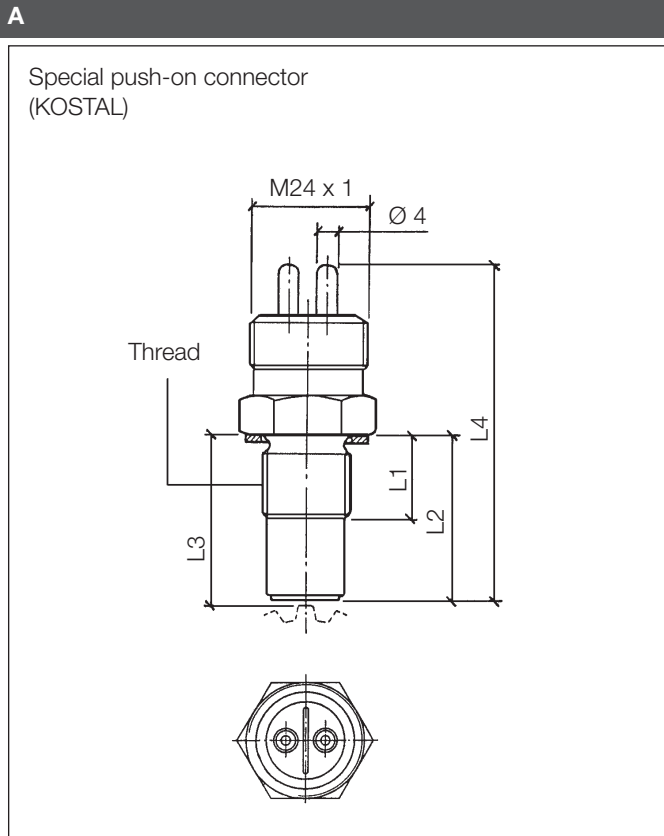
Part Number	Design	Length [mm]	
		L1	L2
340-216-010-003C	D	25	78.3
340-216-005-002C	A	63.2	106
A2C59513983	B	25	74
340-216-005-001C	A	90.2	133

Technical data	
Electrical connection	4-pole, insulated return
Sensor power supply	
Voltage	8–15 V
Current	12 mA
Operating temperature	-40 °C to +130 °C
Tooth repetition frequency	400 Hz
Distance sensor – pulse wheel	0.3 mm to 1.4 mm

Part Number	Design	Length [mm]	
		L1	L2
340-216-010-004C	C	90.2	133

Technical data	
Electrical connection	4-pole, insulated return
Sensor power supply	
Voltage	30 V
Current	14 mA
Operating temperature	-40 °C to +130 °C
Tooth repetition frequency	400 Hz
Distance sensor – pulse wheel	0.3 mm to 1.4 mm

2.1.2 Speed and Revolution Sensors | Inductive Sensor



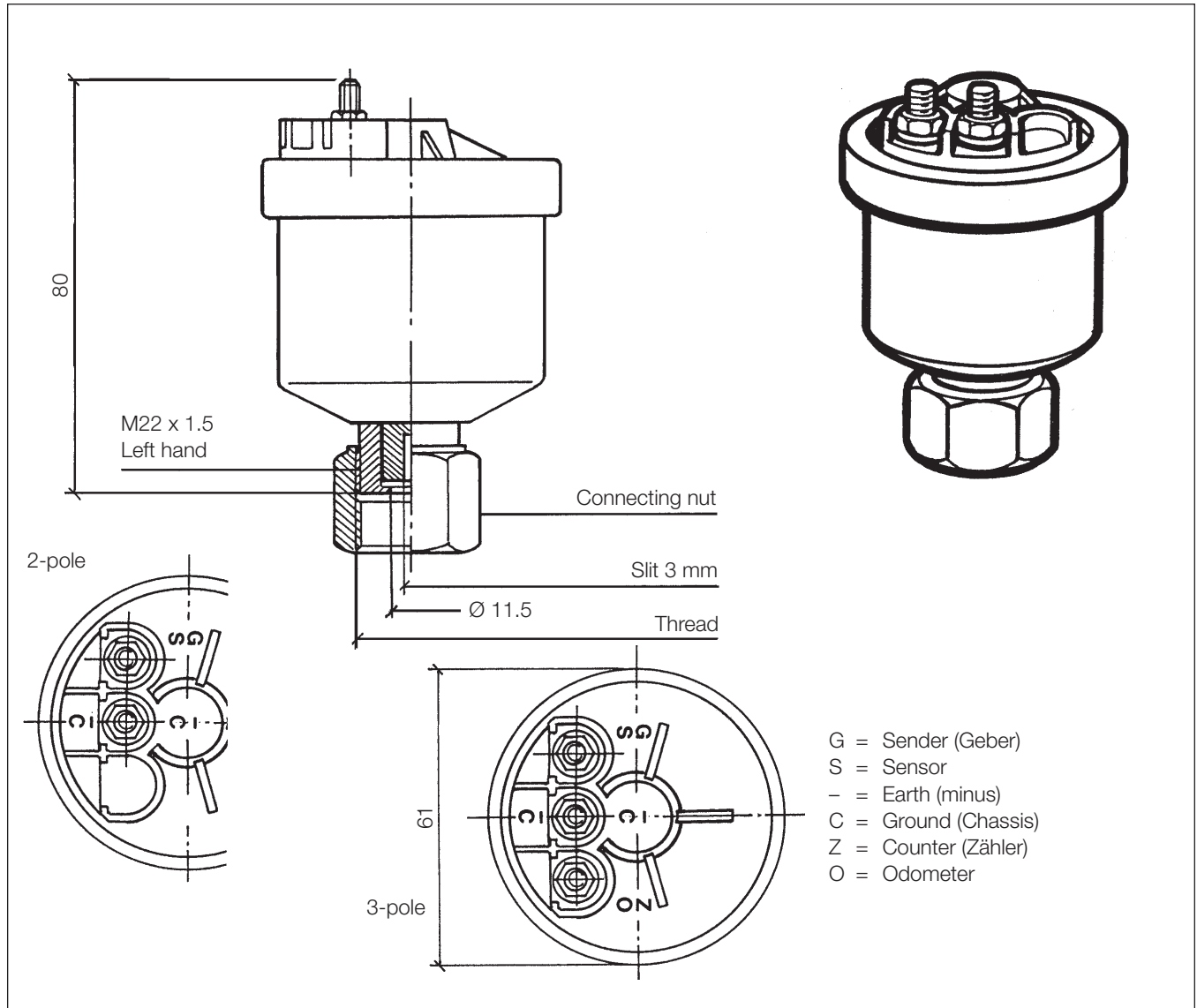
Part Number	Thread	Length [mm]				Design	min. [°C]	RI [Ω]
		L1	L2	L3	L4			
340-804-005-007C	M18 x 1.5	15	35	36.1 \pm 0.1	71.5	A	-25	1,050
340-804-005-001C	M18 x 1.5	18	35	36.15–35.80	71.5	A	-30	1,050
340-804-005-012A*	M18 x 1.5 ¹	18	31.4	32.63–32.20	67.9	A	-30	1,050
340-804-005-013A	M18 x 1.5 ¹	18	71.4	72.63–72.20	107.9	A	-30	1,050
340-804-005-015C	M18 x 1.5	18	99.1	101.15–100.55	135.6	A	-30	1,050
340-804-005-016C*	M18 x 1.5 ¹	18	37.3	38.45–38.10	73.8	A	-30	1,050
340-804-005-018C	M18 x 1.5 ¹	18	45.7	46.95–46.45	82.2	A	-30	1,050
340-804-005-020C*	M18 x 1.5 ¹	18	37.3	38.45–38.1	73.8	A	-30	1,050
340-804-006-002C	M18 x 1.5	18	35	36.1 \pm 0.1	63.5	B	-30	1,050
340-804-007-019C	M18 x 1.5 ^{8,9}	18.2	70.7	71.8 \pm 0.1	79.7	C2	-25	1,050
340-804-030-006B	M18 x 1.5	18.2	70.7	71.8 \pm 0.1	93.5	D	-25	1,050
340-804-007-020C	M18 x 1.5 ^{8,9}	20	39	40.1 \pm 0.1	62	C2	-25	1,050
340-804-030-005B	M18 x 1.5	23.3	25	26.1 \pm 0.1	67	D	-25	1,050
340-804-005-002C	M18 x 1.5	24.9	26.5	27.65–27.30	63	A	-30	1,050
340-804-005-028C	M18 x 1.5	24.9	63.4	64.55–64.20	99.9	A	-30	1,050
340-804-005-033C	M18 x 1.5	24.9	26.5	27.5 ^{+0.15} _{-0.2}	63	A	-30	1,050
340-804-007-002A	M18 x 1.5	27.5	28.5	29.6 \pm 0.1	70	C1	-25	1,050
340-804-007-004C	3/4" - 16 UNF-2A ⁸	27.5	28.5	29.6 \pm 0.1	70	C1	-25	1,050
340-804-007-013C	M18 x 1.5 ⁸	27.5	28.5	29.6 \pm 0.1	70	C1	-25	1,050
340-804-006-007C	M18 x 1.5	33	34	35.1 \pm 0.1	62	B	-30	1,050
340-804-007-001C	M18 x 1.5 ⁹	33	34	35.1 \pm 0.1	70	C1	-25	1,050
340-804-007-003C	M18 x 1.5	33	34	35.1 \pm 0.1	64.5	B	-25	1,050
340-804-007-011C/G	M18 x 1.5	33	34	35.1 \pm 0.1	70	C1	-25	1,050

¹ With sealing washer, captive
⁸ With collar
⁹ With hexagonal nut M18 x 1.5
* Supplied on request – limited availability

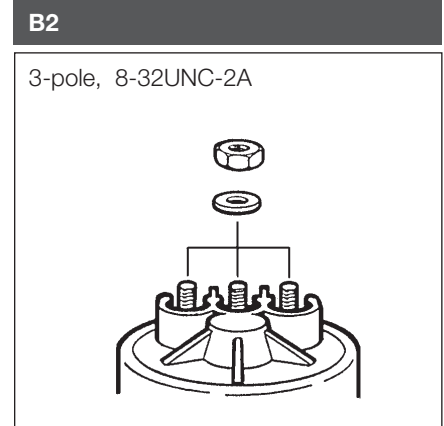
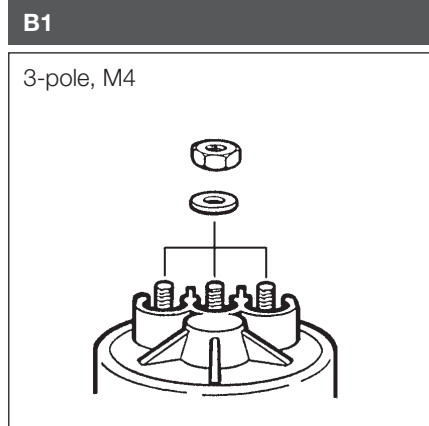
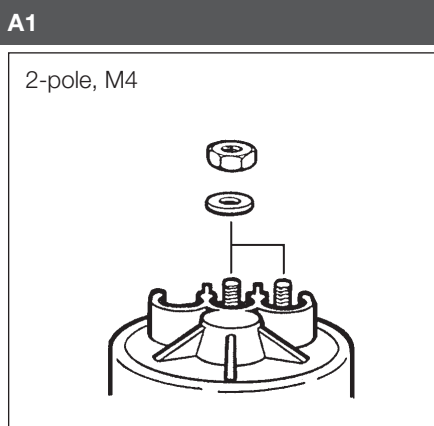
Technical data	
Electrical connection	2-pole, insulated return
Voltage independent	
Operating temperature	-25 °C to +140 °C
Internal resistance, Ri	1,050 Ω \pm 100 Ω
Test conditions	
Gear	36 teeth
Diametral pitch	2.75
Rotational speed	416.6 min ⁻¹
Frequency	250 Hz
Tooth width	7.5 mm
Load	47 k Ω
Gear centered	

2.1.3 Speed and Revolution Sensors | **Generator Sensor**

Dimensions [mm]



Type of connection

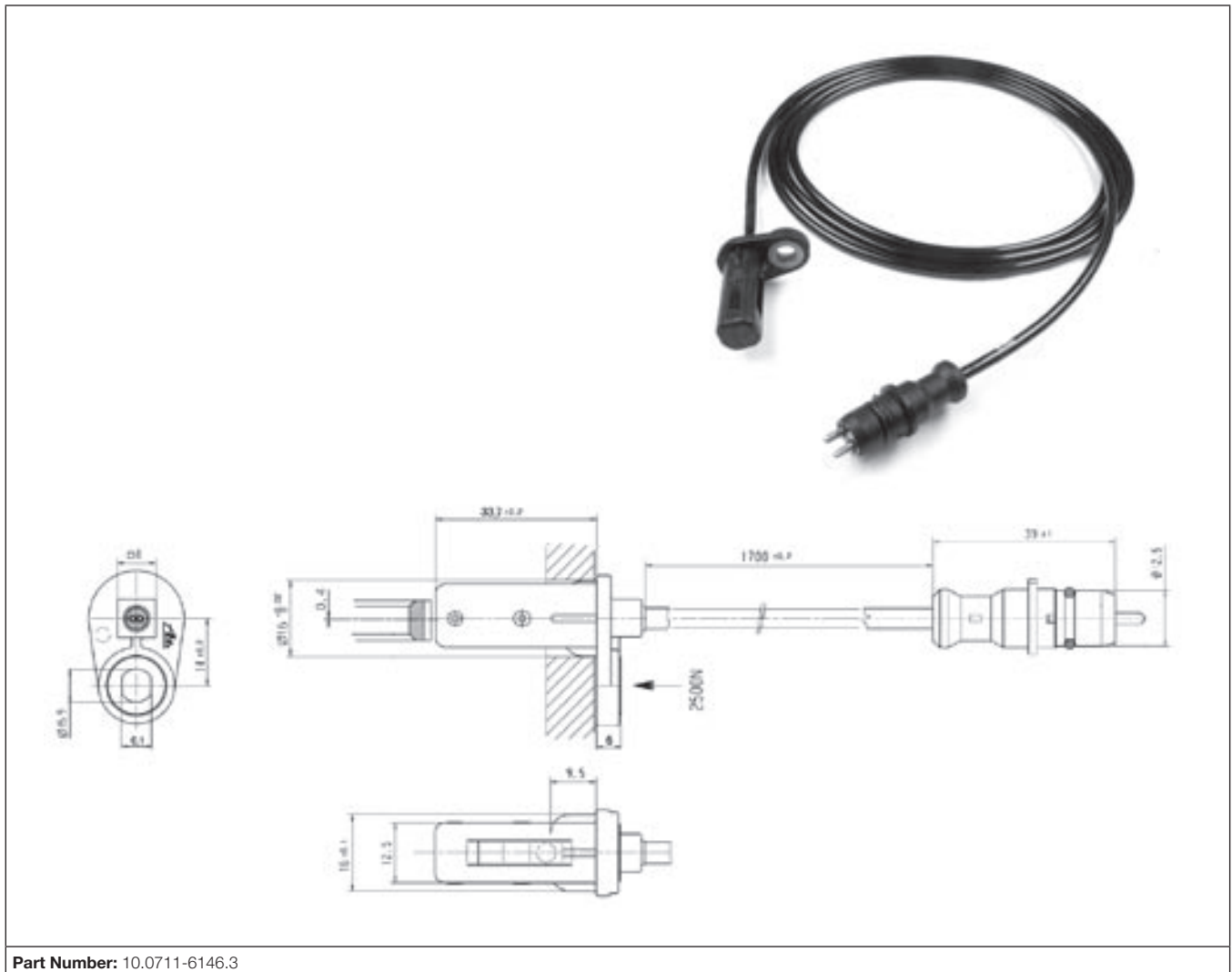


Part Number	Thread	Type of connection
340-808-001-002C/G	M22 x 1.5	A1
340-807-001-001C	M22 x 1.5	B1
340-808-001-004G	7/8" - 18NS-2A	A1
340-807-001-003C	7/8" - 18UNS-2B	B2

Technical data	
Electrical connection	2-pole, 3-pole, insulated return
Rotational speed	Max. 3,000 min ⁻¹
No-load voltage	19.3 V at 2,000 min ⁻¹
Operating temperature	-25 °C to +90 °C
Protection rating	IP54 as per DIN 40050

2.1.4 Speed and Revolution Sensors | Active Wheel Speed Sensor

Dimensions [mm]



Part Number: 10.0711-6146.3

Technical data	
Voltage	-40 °C to +60 °C: 7,5 V–20 V +60 °C to +150 °C: 7,5 V–16 V
Operating temperature	Sensor body: -40 °C to +150 °C Cable/Plug: -40 °C to +115 °C
Plug Swoboda	IP 67 according to DIN 40050 part 9
Current	I_{low} : 7 mA (+20%/-16%) I_{high} : 14 mA (+20%/-16%)
Cable length	1.700 mm (Other lengths available on request)

Description
<p>This active sensor, derived from the large series production, features high reliability and robustness. Due to its large air tolerance it can be fitted to the vehicle with little effort.</p> <ul style="list-style-type: none"> • Pulse generator in form of a pole wheel • Suitable cable harness interface in form of a so-called „Swoboda“ plug • Fastened as shown

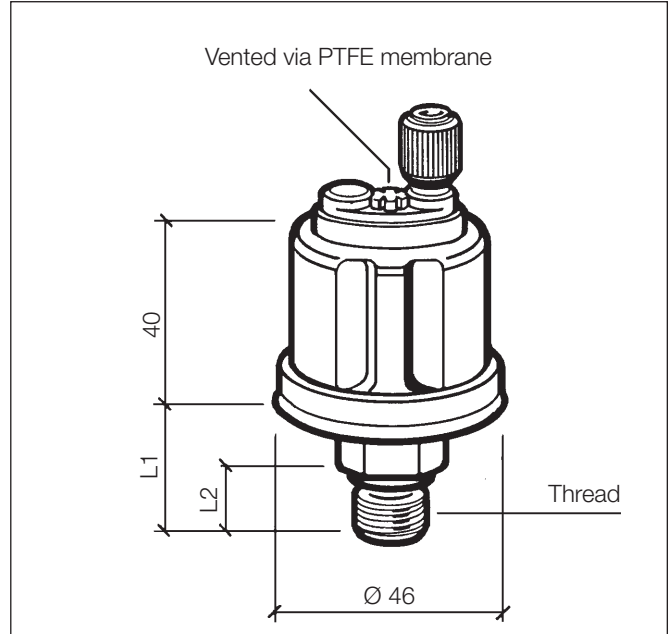
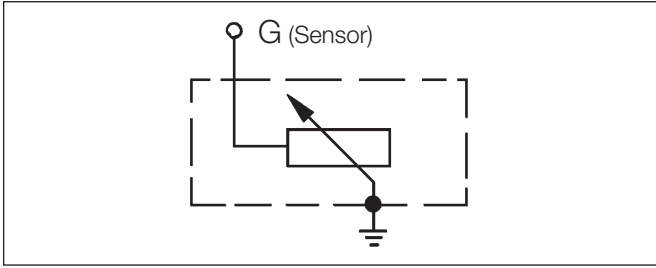


Pressure Sensors







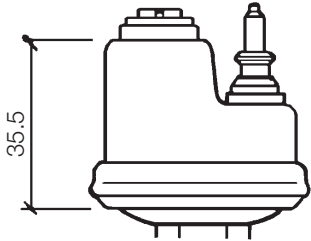
- 2.2.1 Pressure Sensor, Single-Pole, Common Ground
- 2.2.2 Pressure Sensor with Warning Contact, Common Ground
- 2.2.3 Pressure Sensor, Insulated Return
- 2.2.4 Pressure Sensor with Warning Contact, 3 Connections

2.2.1 Pressure Sensors | **Pressure Sensor, Single-Pole, Common Ground**

Circuit diagram



Type of connection

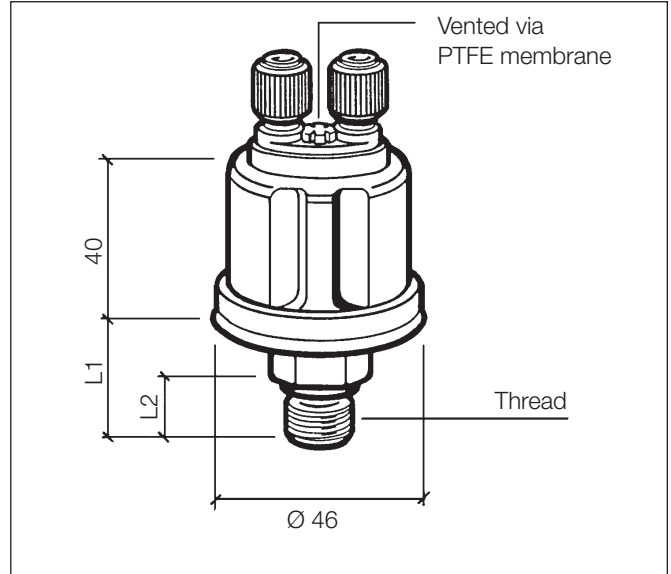
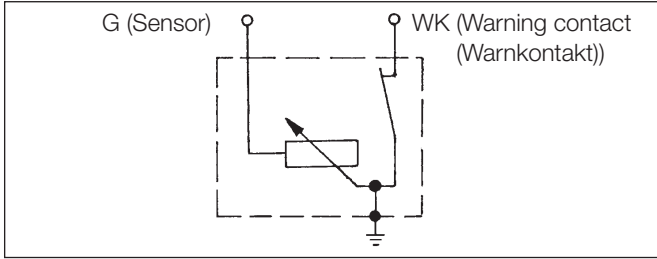
A	B	C	D	E
<p>Knurled nut</p> <p>M4</p> 	<p>Hexagonal nut</p>  M4	<p>6.3 x 0.8 mm</p> <p>50°</p>  M4	<p>6.3 x 0.8 mm</p>  <p>90°</p>  M4	<p>Connector pin Ø 4 mm</p>  M4
F				
 <p>35.5</p> <p>Connector pin Ø 4 mm</p>				

Part Number	Measuring range	Thread	Dimension		Type	bar
			L1 [mm]	L2 [mm]		
	[bar]					[max. 2 sec.]
360-081-029-087C	3	M12 x 1.5	20.5	12	E	30
360-081-052-003C	3	M12 x 1.5	20.5	12	F	30
360-081-029-001C/K/B	5	M10 x 1 tapered, short	19.5	11	A	30
360-081-029-004C/B	5	1/8" - 27 NPTF	19.5	11	A	30
360-081-029-008C	5	1/4" - 18 NPTF	23.8	15.3	A	30
360-081-029-025C/K**	5	M18 x 1.5 ¹	20.5	12	A	30
360-081-029-026C/K	5	M14 x 1.5	20.5	12	A	30
360-081-029-041C	5	1/8" - 27 NPTF	19.5	11	D	30
360-081-029-059C	5	M18 x 1.5 ¹	20.5	12	B	30
360-081-029-065C	5	M14 x 1.5	25.5	12	B	30
360-081-029-085C	5	M12 x 1.5	20.5	12	A	30
360-081-029-099C**	5	M12 x 1.25	19.5	10	A	30
360-081-029-010C/K	10	M10 x 1 tapered, short	19.5	11	A	30
360-081-029-012C/K	10	1/8" - 27 NPTF	19.5	11	A	30
360-081-029-013C/K	10	M12 x 1.5	20.5	12	A	30
360-081-029-020C	10	1/4" - 18 NPTF	23.8	15.3	A	30
360-081-029-033C	10	M14 x 1.5	20.5	12	A	30
360-081-029-038C	10	M14 x 1.5	20.5	12	C	30
360-081-029-042C	10	1/8" - 27 NPTF	19.5	11	C	30
360-081-029-062C	10	R 1/8 DIN 2999	19.5	11	C	30
360-081-037-006C	16	M14 x 1.5	20.5	12	B ²	40
360-081-037-007C	16	1/8" - 27 NPTF ³	20.5	12	D	40
360-081-037-019C	16	M12 x 1.5	20.5	12	B	40
360-081-037-003C	25	M18 x 1.5	20.8	12	D	50
360-081-037-008C	25	M10 x 1 tapered, short	19.5	11	C	50
360-081-037-010C	25	1/8" - 27 NPTF	19.5	11	D	50
360-081-037-011C	25	M10 x 1 tapered, short ³	19.5	11	C	50
360-081-037-013C	25	M14 x 1.5	20.5	12	D	50
360-081-037-017C	25	M14 x 1.5	20.5	12	D	50
360-081-037-018C	25	M18 x 1.5	20.5	12	D	50
For dual units (identifier "D")						
362-081-003-002K*	10	1/8" - 27 NPTF	19.5	11	C	30
362-081-004-001C*	25	1/8" - 27 NPTF	19.5	11	C	50
¹ With sealing washer, captive ² Without M4 hexagonal nut ³ With restrictor * Half characteristic map values ** Supplied on request – limited availability						

Technical data	
Rated voltage	6–24 V
Operating temperature	-25 °C to +100 °C
Resistor range	10 Ω to 184 Ω

2.2.2 Pressure Sensors | Pressure Sensor with Warning Contact, Common Ground

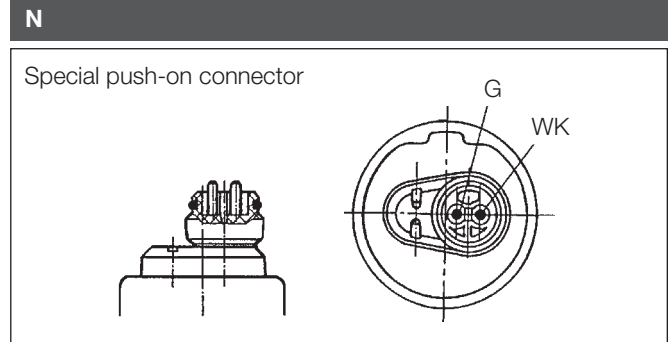
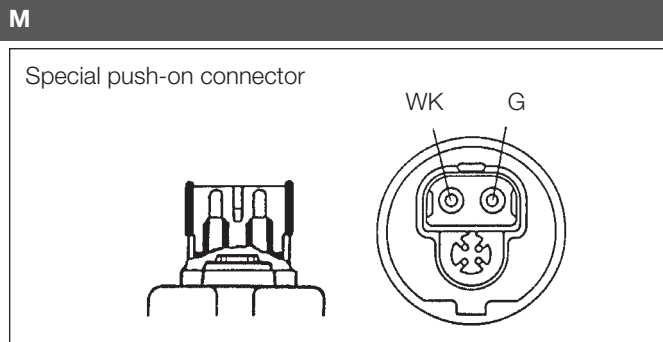
Circuit diagram



Type of connection

<p>A</p> <p>(2x) Knurled nut, M4</p>	<p>B</p> <p>(2x) 6.3 x 0.8 mm (50°)</p>	<p>C</p> <p>WK 6.3 x 0.8 mm (50°) G 4.8 x 0.8 mm (50°)</p>	<p>D</p> <p>WK 4.8 x 0.8 mm (50°) G 6.3 x 0.8 mm (50°)</p>
<p>E</p> <p>(2x) Hexagonal nut, M4</p>	<p>F</p> <p>WK 6.3 x 0.8 mm (90°) G M4</p>	<p>G</p> <p>G 6.3 x 0.8 mm (50°)</p>	<p>H</p> <p>(2x) 6.3 x 0.8 mm</p>
<p>J</p> <p>WK 4.8 x 0.8 mm (90°) G 6.3 x 0.8 mm (90°)</p>	<p>K</p> <p>WK 6.3 x 0.8 mm (90°) G 4.8 x 0.8 mm (90°)</p>	<p>L</p> <p>Hexagonal nut, M5</p>	

Type of connection



Part Number	Measuring range	Thread	Warning contact	Dimension		Type	bar
				L1 [mm]	L2 [mm]		
	[bar]		[bar]				[max. 2 sec.]
360-081-030-001C/K	5	M10 x 1 tapered, short	0.25 ± 0.15	19.5	11	A	30
360-081-030-002C/K	5	M10 x 1 tapered, short	0.5 ± 0.15	19.5	11	A	30
360-081-030-004C	5	M10 x 1 tapered, short	0.7 ± 0.15	19.5	11	A	30
360-081-030-008C	5	M12 x 1.5	0.5 ± 0.15	20.5	12	A	30
360-081-030-010C	5	1/8" - 27 NPTF	1.4 ± 0.3	19.5	11	A	30
360-081-030-014C	5	M10 x 1 tapered, short	0.6 ± 0.15	19.5	11	A	30
360-081-030-018C	5	M10 x 1 tapered, short	1.2 ± 0.15	19.5	11	A	30
360-081-030-025C	5	M18 x 1.5 ¹	0.4 ± 0.2	20.5	12	B	30
360-081-030-028C/K	5	M14 x 1.5	0.5 ± 0.15	20.5	12	A	30
360-081-030-033C	5	M14 x 1.5 ¹	0.4 ± 0.1	20.5	12	F	30
360-081-030-036C/K	5	M18 x 1.5 ¹	0.5 ± 0.15	20.5	12	A	30
360-081-030-049C/K	5	1/8" - 27 NPTF	0.4 ± 0.1	19.5	11	A	30
360-081-030-053C	5	M18 x 1.5 ⁴	0.25 ± 0.15	20.5	12	B	30
360-081-030-065K	5	R 1/8 DIN 2999	0.4 ± 0.15	19.5	11	B	30
360-081-030-071C	5	M14 x 1.5 ¹	0.4 ± 0.15	20.5	12	F	30
360-081-030-085C	5	M18 x 1.5 ¹	0.4 ^{+0.2}	20.5	12	C	30
360-081-030-086C	5	1/8" - 27 NPTF	0.5 ^{+0.2} -0.1	19.5	11	C	30
360-081-030-097C	5	M14 x 1.5	0.5 ± 0.15	20.5	12	B	30
360-081-030-119C	5	1/8" - 27 NPTF	1.4 ± 0.3	19.5	11	H	30
360-081-030-157C	5	M18 x 1.5 ¹	0.5 ^{+0.15}	20.5	12	F	30
360-081-034-002C	5	M14 x 1.5	0.25 ± 0.15	20.5	12	L	30
360-081-034-004C	5	M18 x 1.5	0.25 ± 0.15	20.5	12	L	30
360-081-062-002A	5	M14 x 1.5 ¹	0.4 ^{+0.2}	20.5	12	N	30
360-081-062-004A	5	M14 x 1.5 ¹	1.0 ^{+0.2}	20.5	12	N	30
360-081-030-154C*	7	1/8" - 27 NPTF	0.7 ± 0.15	19.5	10	L	30
360-081-030-009C/K	10	M10 x 1 tapered, short	0.5 ± 0.15	19.5	11	A	30
360-081-030-015C	10	1/8" - 27 NPTF	0.8 ± 0.3	19.5	12	A	30
360-081-030-017C	10	M10 x 1 tapered, short	0.9 ± 0.15	19.5	11	A	30
360-081-030-019C	10	M12 x 1.5	1.5 ± 0.15	20.5	12	A	30
360-081-030-022C	10	M12 x 1.5	0.5 ± 0.15	20.5	12	A	30
360-081-030-030C	10	M14 x 1.5	0.7 ± 0.15	20.5	12	A	30
360-081-030-031C	10	M10 x 1 tapered, short	0.5 ± 0.15	19.5	11	B	30
360-081-030-032C	10	M14 x 1.5	0.5 ± 0.15	20.5	12	A	30
360-081-030-037C	10	M18 x 1.5 ¹	0.75 ± 0.15	20.5	12	A	30
360-081-030-039C	10	M10 x 1 tapered, short	0.75 ± 0.15	19.5	11	B	30

Part Number	Measuring range	Thread	Warning contact	Dimension		Type	bar
				L1 [mm]	L2 [mm]		
	[bar]		[bar]				[max. 2 sec.]
360-081-030-041C	10	M10 x 1 tapered, short	2.0 ±0.3	19.5	11	A	30
360-081-030-052C	10	1/8" - 27 NPTF	0.5 ^{+0.2} _{-0.1}	19.5	11	A	30
360-081-030-063C	10	M14 x 1.5	1.0 ±0.15	20.5	12	B	30
360-081-030-070C	10	M18 x 1.5 ¹	0.5 ±0.15	20.5	12	B	30
360-081-030-074C	10	M18 x 1.5 ¹	0.5 ±0.15	20.5	12	A	30
360-081-030-075C	10	M14 x 1.5	5.0 ±0.3	20.5	12	H	30
360-081-030-078C	10	M14 x 1.5	1.0 ±0.15	20.5	12	E ²	30
360-081-030-100C	10	1/8" - 27 NPTF	4.0 ^{+0.5}	19.5	11	B	30
360-081-030-107C	10	M16 x 1.5	5.5 ±0.3	20.5	12	D	30
360-081-030-112C	10	M10 x 1 ¹	1.35 ±0.15	18.5	10	K	30
360-081-030-122C	10	M18 x 1.5 ¹	0.75 ±0.15	20.5	12	D	30
360-081-030-138C	10	1/8" - 27 NPTF	1.25 ^{-0.3}	19.5	11	J	30
360-081-030-152C	10	M10 x 1 tapered, short	5.2 ±0.5	19.5	11	H	30
360-081-061-002C	10	M14 x 1.5	0.7 ±0.15	20.5	12	M	30
360-081-061-003C	10	M14 x 1.5	1.0 ±0.15	20.5	12	M	30
360-081-061-006C	10	M12 x 1.5 tapered, short	5.0 ±0.3	21.5	13	M	30
360-081-062-003C	10	M14 x 1.5 ¹	5.5 ±0.3	20.5	12	N	30
360-081-062-005A	10	M14 x 1.5	3.0 ±0.3	20.5	12	N	30
360-081-053-001C	25	1/8" - 27 NPTF ³	15.5 ^{+1.5} _{-0.5}	19.5	11	J	50
360-081-053-003C	25	M18 x 1.5	5.5 ^{+1.0} _{-0.5}	20.5	12	E	50
360-081-053-004C	25	1/8" - 27 NPTF ³	14.5 ^{+1.5} _{-0.5}	19.5	11	B	50

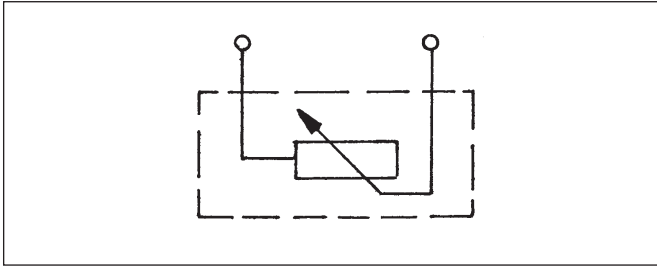
¹ With sealing washer, captive
² Without M4 hexagonal nut
³ With restrictor
⁴ With attachment plate
*Supplied on request – limited availability

Part Number	Measuring range	Thread	Warning contact	Dimension		Type	bar
				L1 [mm]	L2 [mm]		
	[PSI]		[PSI]				[max. 2 sec.]
360-081-030-020C	80	1/4" - 18 NPTF	8 ±2	23.8	15.3	A	30
360-081-030-023C	80	1/8" - 27 NPTF	6 ±2	19.5	11	A	30

Technical data	
Rated voltage	6–24 V
Warning contact	Closes with falling pressure
Switching capacity of warning contact	Max. 5 W non-inductive
Operating temperature	-25 °C to +100 °C
Resistor range	10 Ω to 184 Ω

2.2.3 Pressure Sensors | Pressure Sensor, Insulated Return

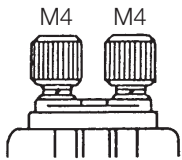
Circuit diagram



Type of connection

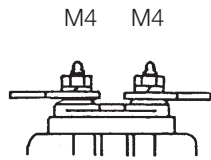
A

(2x)
Knurled nut



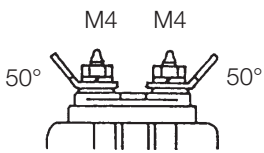
B

(2x)
6.3 x 0.8 mm



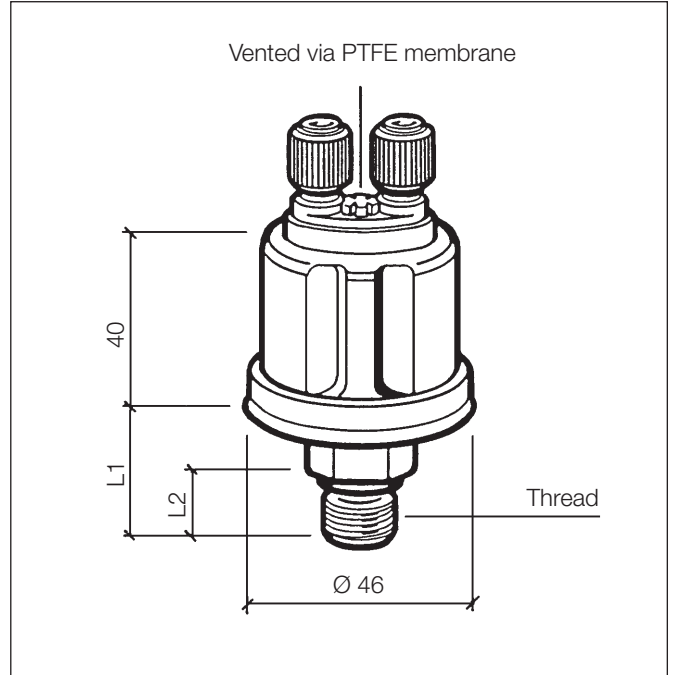
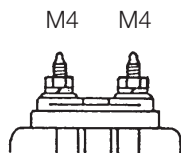
C

(2x)
6.3 x 0.8 mm



D

(2x)
Hexagonal nut

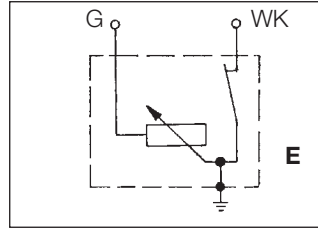
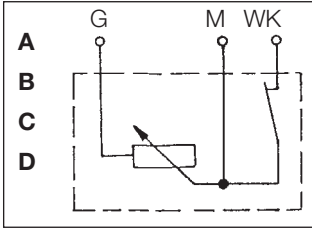


Part Number	Measuring range	Thread	Dimension		Type	bar
			L1 [mm]	L2 [mm]		
	[bar]					[max. 2 sec.]
360-081-032-011C	2	M12 x 1.5	20.5	12	C	30
360-081-032-025C	2	1/8" - 27 NPTF	19.5	11	C	30
360-081-032-058C	2	M18 x 1.5	20.5	12	A	30
360-081-032-001C	5	1/8" - 27 NPTF	19.5	11	A	30
360-081-032-002C	5	M10 x 1 tapered, short	19.5	11	A	30
360-081-032-007C	5	1/8" - 27 NPTF	19.5	11	B	30
360-081-032-013C	5	M18 x 1.5	20.8	12	A	30
360-081-032-016C	5	1/4" - 18 NPTF	23.8	15.3	A	30
360-081-032-059C	5	M18 x 1.5	20.5	12	D ¹	30
360-081-032-060C	5	M14 x 1.5	20.5	12	D ¹	30
360-081-032-003C	10	M10 x 1 tapered, short	19.5	11	A	30
360-081-032-004C	10	M12 x 1.5	20.5	12	A	30
360-081-032-006C	10	M14 x 1.5	20.5	12	A	30
360-081-032-008C	10	M18 x 1.5	20.5	12	A	30
360-081-032-014C	10	1/8" - 27 NPTF	19.5	11	A	30
360-081-032-053C	10	M12 x 1.5	20.5	12	A	30
360-081-032-057C	10	R1/8 DIN 2999	40	10	A	30
360-081-038-014C	16	M14 x 1.5	20.5	12	D ¹	30
360-081-038-001C	25	M14 x 1.5	20.5	12	D	50
360-081-038-002C	25	3/8" - 18 Dryseal NPTF	23.8	15.3	B	50
360-081-038-003C	25	1/8" - 27 NPTF	19.5	11	D	50
360-081-038-005C	25	M18 x 1.5	20.5	12	A	50
360-081-038-008C	28	1/8" - 27 NPTF	19.5	11	A	50
For dual units (identifier "D")						
362-081-001-001K*	5	1/8" - 27 NPTF	19.5	11	B	30
362-081-001-002C/K*	10	1/8" - 27 NPTF	19.5	11	B	30
362-081-002-001K*	25	1/8" - 27 NPTF	19.5	11	B	50
362-081-002-003C*	28	1/8" - 27 NPTF	19.5	11	A	50
362-081-002-004C*	28	1/8" - 27 NPTF	19.5	11	D	50
*Half characteristic map values						
¹ Without M4 hexagonal nut						

Technical data	
Rated voltage	6–24 V
Operating temperature	-25 °C to +100 °C
Resistor range	10 Ω to 184 Ω

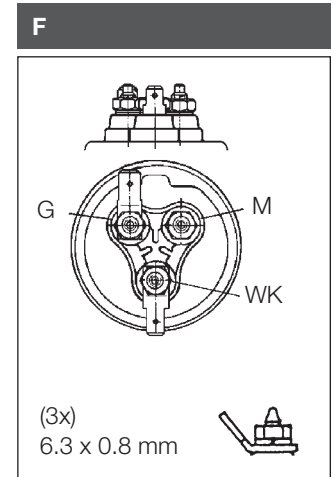
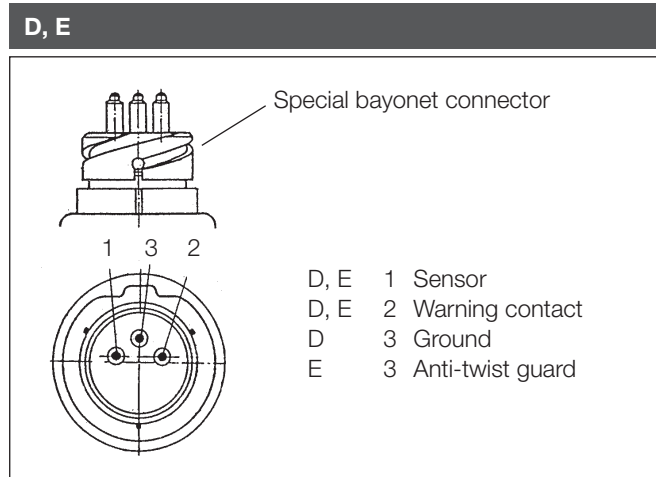
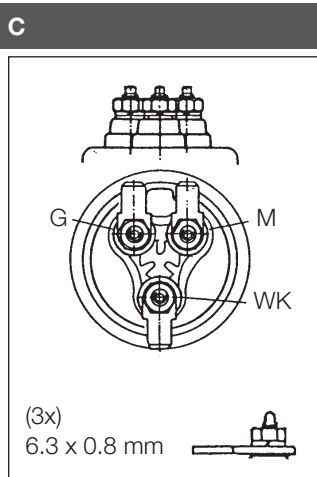
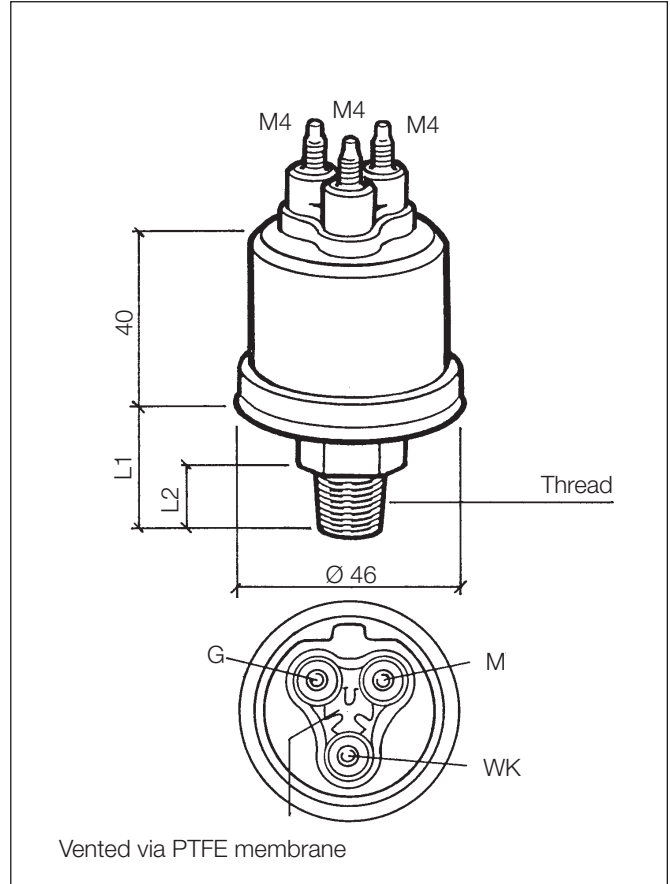
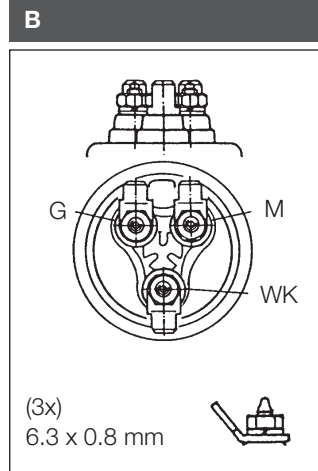
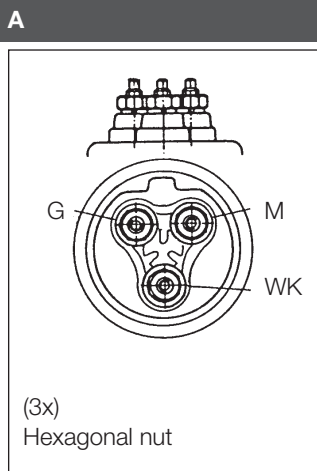
2.2.4 Pressure Sensors | **Pressure Sensor with Warning Contact (3 Connections)**

Circuit diagram



G = Sensor
 M = Ground (Masse)
 WK = Warning contact (Warnkontakt)

Type of connection



Part Number	Measuring range	Thread	Warning contact	Dimension		Type	bar
				L1 [mm]	L2 [mm]		
	[bar]		[bar]				[max. 2 sec.]
360-081-039-002C	5	1/8" - 27 Dryseal NPTF	0.8 ± 0.15	19.5	11	B	30
360-081-039-015C	5	1/8" - 27 Dryseal NPTF	0.25 ^{+0.15}	19.5	11	B	30
360-081-064-001C	5	M18 x 1.5	0.25 ^{+0.15}	20.5	12	E	30
360-081-064-003C	5	M18 x 1.5	0.25 ± 0.15	20.5	12	D, E	30
360-081-039-003C	10	1/8" - 27 Dryseal NPTF	0.8 ± 0.15	19.5	11	B	30
360-081-039-007C	10	M14 x 1.5	1.0 ± 0.15	20.5	12	A ¹	30
360-081-039-008C*	10	M14 x 1.5	5.0 ± 0.3	20.5	12	F	30
360-081-063-001C	10	M12 x 1.5	5.2 ± 0.3	20.5	12	D	30
360-081-064-004C	10	M18 x 1.5	0.6 ^{+0.3}	20.5	12	E	30

*Supplied on request – limited availability

Part Number	Measuring range	Thread	Warning contact	Dimension		Type	bar
				L1 [mm]	L2 [mm]		
	[PSI]		[PSI]				[max. 2 sec.]
360-081-039-004C	80	1/8" - 27 Dryseal NPTF	10 ± 2	19.5	11	C	30

¹Without M4 hexagonal nut

Technical data	
Rated voltage	6–24 V
Warning contact	Closes with falling pressure
Switching capacity of warning contact	Max. 5 W non-inductive
Operating temperature	-25 °C to +100 °C
Resistor range	10 Ω to 184 Ω



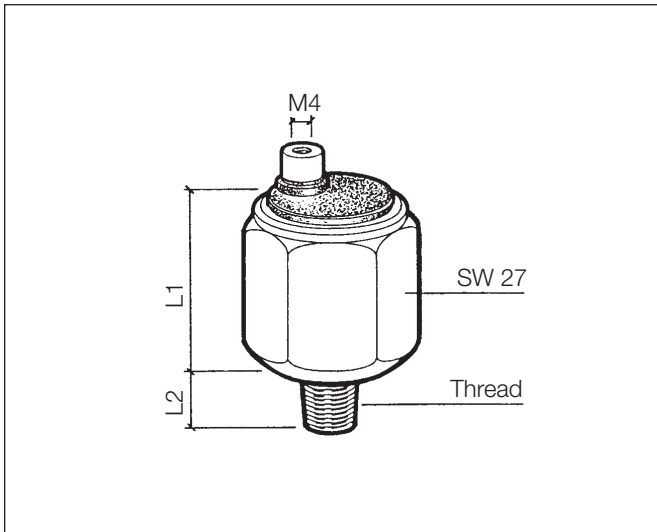
Pressure Switches

2.3.1 Pressure Switch, Single-Pole,
Common Ground

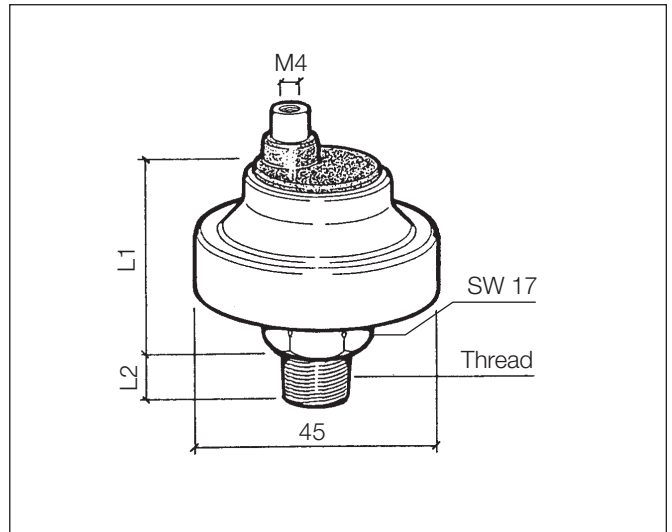
2.3.2 Pressure Switch, Insulated Return

2.3.1 Pressure Switches | **Pressure Switch, Single-Pole, Common Ground**

Design 1



Design 2



Type of connection

A

Single-Pole,
common ground

Screw
M4 x 5

B

Single-Pole,
common ground

Screw
M4 x 5

6.3 x 0.8 mm

C

Single-Pole,
common ground

6.3 x 0.8 mm
Riveted

Part Number	Switch point		Thread	Dimension		Design / Type	Measuring range	bar
	[bar]			L1 [mm]	L2 [mm]			
230-112-005-004C	0.3 ± 0.3	SF	M10 x 1 tapered, short	26	10	1B	12	60
230-112-001-004C	0.4 ± 0.3	SS	M10 x 1 tapered, short	26	11	1A ²	12	30
230-113-001-004C	0.4 ± 0.2	SF	M10 x 1 tapered, short	39	11	2A ¹	12	30
230-112-003-015C	0.5 ± 0.1	SF	M10 x 1 tapered, short	26	11	1A ¹	12	30
230-112-005-005C	0.8 ± 0.2	SF	M10 x 1 tapered, short	26	10	1B	12	30
230-112-001-015C	0.9 ± 0.15	OF	M10 x 1 tapered, short	26	11	1A ²	12	30
230-112-003-022C	0.9 ± 0.15	SF	M10 x 1 tapered, short	26	11	1A ²	12	30
230-112-001-001C	1.0 ± 0.2	SS	M10 x 1 tapered, short	26	11	1A ²	12	30
230-112-005-001C	1.0 ± 0.2	SF	M10 x 1 tapered, short	26	10	1B	12	30
230-112-001-005C	2.5 ± 0.3	SS	M10 x 1 tapered, short	26	11	1A ²	12	30
230-113-001-008C	5.5 ± 0.2	SF	M12 x 1.5	39	12	2C ²	10	30
230-213-001-021C	8.0 ± 0.5	SF	M10 x 1 tapered, short	39	11	2A ²	25	50
230-213-001-011C	12.0 ± 0.4	SF	1/8" - 27 NPTF	39	11	2B ²	18	40

¹Contact chamber, vented
²Contact chamber, unvented

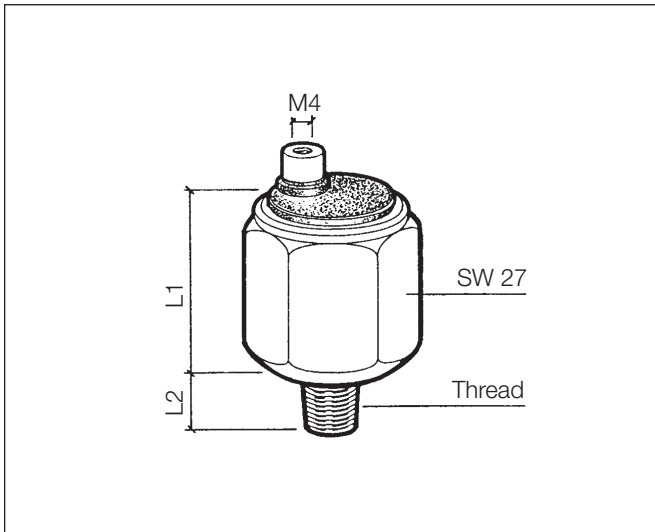
Part Number	Switch point		Thread	Dimension		Type	Measuring range	PSI
	[PSI]			L1 [mm]	L2 [mm]			
230-112-003-012C	6	SF	1/8" - 27 NPTF	26	11	1A ¹	12	30
230-112-001-002C	10	SS	1/8" - 27 NPTF	26	11	1A ¹	12	30
230-112-003-013C	10	SF	1/8" - 27 NPTF	26	11	1A ¹	12	30

¹Contact chamber, unvented

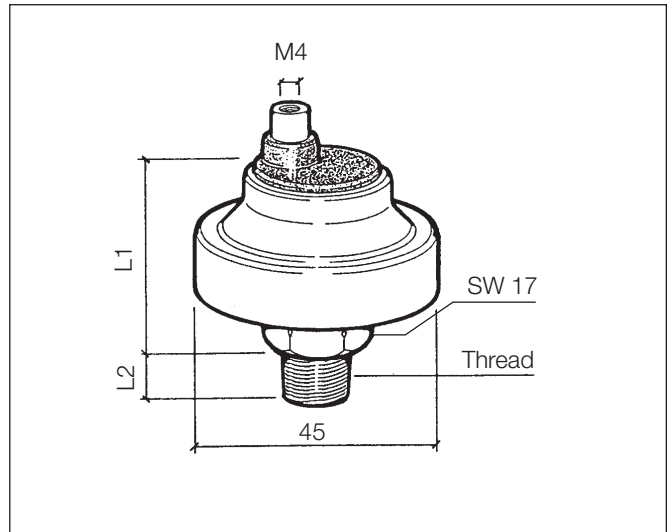
Technical data	
Rated voltage	6–24 V
Switching capacity	Max. 5 W non-inductive
Contacting mode	Slow-acting
Operating temperature	-25 °C to +120 °C
Switch point	SF = Contact closes with falling pressure SS = Contact closes with rising pressure OF = Contact opens with falling pressure OS = Contact opens with rising pressure

2.3.2 Pressure Switches | Pressure Sensor, Insulated Return

Design 1



Design 2



Type of connection

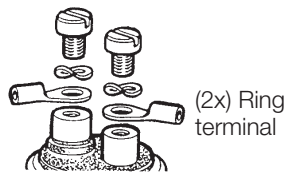
D

Insulated return
(2x) Screws M4 x 5



E

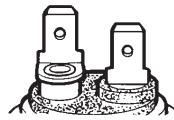
Insulated return
(2x) Screws M4 x 5



(2x) Ring terminal

F

Insulated return
(2x) 6.3 x 0.8 mm
Riveted (90°)



Part Number	Switch point		Thread	Dimension		Design / Type	Measuring range	bar
	[bar]			L1 [mm]	L2 [mm]			
230-112-007-005C	0.3 ±0.15	OS	M14 x 1.5 ¹	24.5	12	1F ³	12	30
230-112-002-001C	0.5 ±0.2	SS	1/8" - 27 NPTF	26	11	1D ³	12	30
230-112-005-006C	0.5 ±0.2	SF	M10 x 1 tapered, short	26	11	1F	12	30
230-112-005-005C	0.8 ±0.2	SF	M10 x 1 tapered, short	26	11	1D ²	12	30
230-112-005-001C	1.0 ±0.2	SF	M10 x 1 tapered, short	26	11	1D ²	12	30
230-112-005-012C	1.2 ±0.2	SF	M10 x 1	24.5	10.5	1F	12	30
230-112-005-011C	1.5 ±0.2	SF	M10 x 1 tapered, short	26	11	1E ²	12	30
230-112-005-003C	1.8 ±0.2	SF	M10 x 1 tapered, short	26	11	1E ²	12	30
230-112-005-004C	3.0 ±0.4	SF	M10 x 1 tapered, short	26	11	1D ²	10	30
230-213-002-004C	4.5 ±0.3	SF	M10 x 1 tapered, short	38	11	2D ²	10	30
230-213-002-001C	7.0 ±0.3	SF	1/8" - 27 NPTF	39	11	2E ²	12	30
230-213-002-003C	10.5 ±0.3	SF	1/8" - 27 Dryseal NPTF	39	11	2F	12	30
230-213-004-002C*	12.5 ±0.4	SS	M14 x 1.5	39	12	1F	12	40

¹With sealing washer, captive
²Contact chamber, vented
³Contact chamber, unvented
*Supplied on request – limited availability

Part Number	Switch point		Thread	Dimension		Type	Measuring range	PSI
	[PSI]			L1 [mm]	L2 [mm]			
230-112-005-010C	7 ±0.2	SF	1/8" - BSPF	26	10	1D ¹	12	30

¹Contact chamber, vented

Technical data	
Rated voltage	6–24 V
Switching capacity	Max. 5 W non-inductive
Contacting mode	Slow-acting
Operating temperature	-25 °C to +120 °C
Switch point	SF = Contact closes with falling pressure SS = Contact closes with rising pressure OF = Contact opens with falling pressure OS = Contact opens with rising pressure


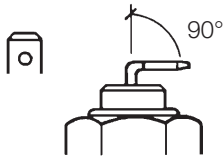
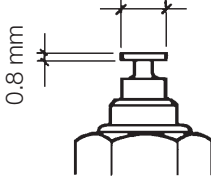
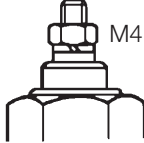


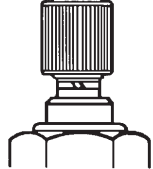
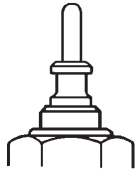
Temperature Sensors

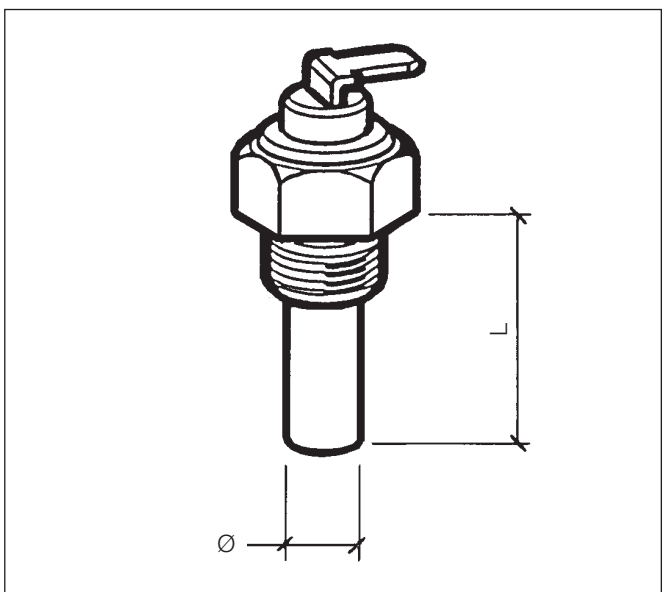
- 2.4.1 Temperature Sensor, Single-Pole, Common Ground
- 2.4.2 Temperature Sensor, Dual-Pole, Insulated Return
- 2.4.3 Temperature Sensor with Warning Contact
- 2.4.4 Temperature Sensor for Air Temperature

2.4.1 Temperature Sensors | **Temperature Sensor, Single-Pole, Common Ground**

Type of connection

<p>A</p> <p>Single-Pole, common ground 6.3 x 0.8 mm</p> 	<p>B</p> <p>Single-Pole, common ground 6.3 x 0.8 mm</p> 	<p>C</p> <p>Single-Pole, common ground Ø 6.3 mm</p> 	<p>D</p> <p>Single-Pole, common ground Hexagonal nut M4</p> 
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<p>E</p> <p>Single-Pole, common ground Knurled nut, M4</p> 	<p>F</p> <p>Single-Pole, common ground Ø 4 mm</p> 
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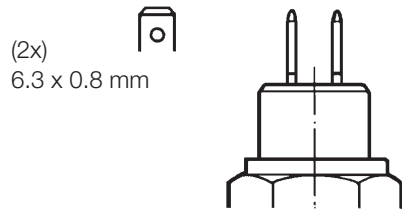


Technical data	
Type	Thermistor (NTC)
Rated voltage	6–24 V
Temperature response time	Min. 3 minutes after operating current switched on

Part Number	T max. [°C]	Thread	Type	L [mm]	Ø [mm]
323-801-001-006K/N	120	M14 x 1.5	A	29	9
323-801-001-007N	120	3/8" - 18 NPTF	A	29	9
323-801-001-008N	120	5/8" - 18 UNF-3A	A	29	9
323-801-001-009N	120	1/4" - 18 NPTF	A	29	9
323-801-001-010K/N	120	1/2" - 14 NPTF	A	29	9
323-801-001-015N*	120	3/8" - 18 Dryseal NPTF	A	29	9
323-801-001-026K/N	120	M14 x 1.5	E	29	9
323-801-001-029N	120	M16 x 1.5	E	29	9
323-801-001-040B*/N	120	M16 x 1.5	A	29	9
323-801-001-054D	120	M14 x 1.5	D	29	9
323-801-001-058C	120	R 3/8" (DIN 2999, tapered)	E	29	9
323-801-005-001D	120	1/8" - 27 NPTF	C	22	8.5
323-801-005-005D	120	M10 x 1	C	22	8.5
323-801-008-002D	120	M10 x 1	D	22	8.5
323-801-017-001K/N	120	M10 x 1 tapered, short	C	10.5	8.4
323-801-020-002D	120	M14 x 1.5	F	24	9
323-804-015-005D*	120	1/8" - 27 Dryseal NPTF	C	22	8.2
323-801-028-001C	Probe: 250, hex.: 150	M14 x 1.5-6e	C	57	11.8
323-801-004-002N	150	M14 x 1.5	A	29	9
323-801-004-003D	150	R 1/2	A	29	9
323-801-004-006D	150	1/2" - 14 NPTF	D	29	9
323-801-004-007D	150	1/2" - 14 NPTF	A	29	9
323-801-004-012C	150	M16 x 1.5	E	29	9
323-801-004-017D	150	1/4" - 18 NPTF	D	29	9
323-801-004-036K*	150	M24 x 1.5	B	29	9
323-801-004-039D/K	150	M14 x 1.5	B	29	9
323-801-009-001D	150	1/8" - 27 NPTF	C	22	8.2
323-801-009-003D	150	M10 x 1 tapered, short	C	22	8.2
323-801-010-001D	150	M10 x 1.5	C	22	6.9
323-801-010-003K	150	M12 x 1.5	C	22	6.9
323-801-012-001D	150	M16 x 1.5	B	15	9
323-801-012-002D/K	150	M14 x 1.5	B	15	9
323-801-012-003D	150	M18 x 1.5	B	15	9
323-801-003-001D	200	M10 x 1.5	C	22	6.9
323-801-018-001D	200	1/8" - 27 NPTF	C	10.5	8.4
323-801-013-001D	200–230	1/8" - 27 NPTF	C	22	8.2
For dual units (identifier "D")					
*Supplied on request – limited availability					

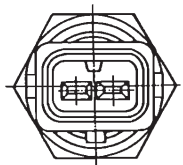
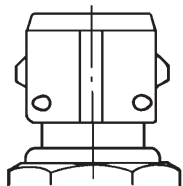
2.4.2 Temperature Sensors | Temperature Sensor, Dual-Pole, Insulated Return**Type of connection****G**

Insulated return

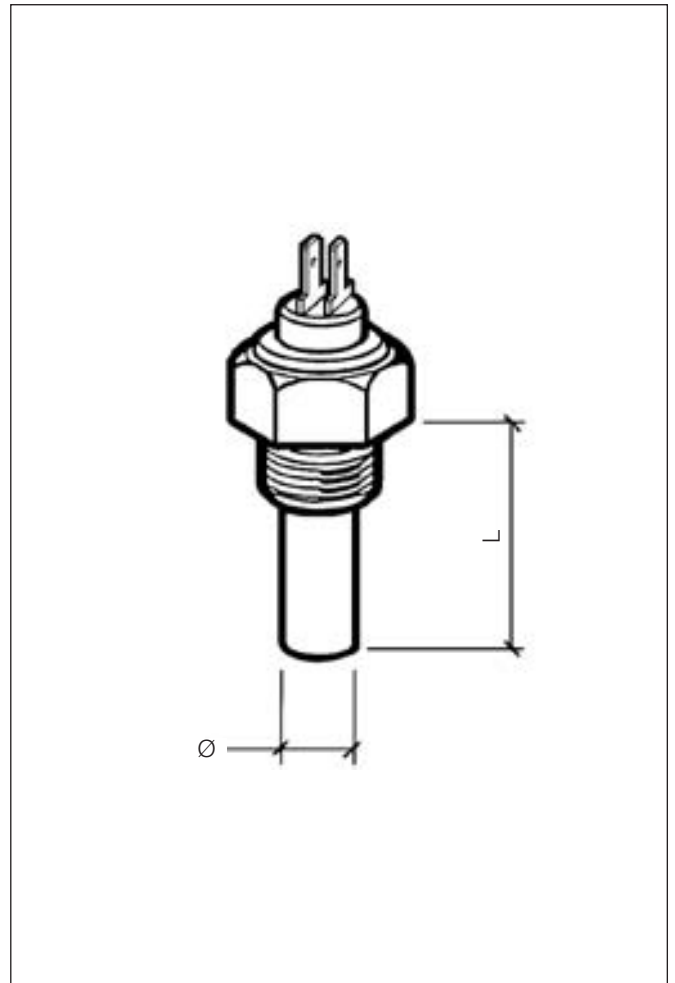
**H**

Insulated return

Special push-on connector (Bosch)



(2x)
2.8 x 0.8 mm



Part Number	T max.	Thread	Type	L	Ø
	[°C]			[mm]	[mm]
323-805-001-001K/N	120	M14 x 1.5	G	29	11
323-805-001-002C	120	5/8" - 18 UNF-2A	G	24	11
323-805-001-004K/N	120	1/2" - 14 NPTF	G	29	11
323-805-001-005N	120	3/8" - 18 Dryseal NPTF	G	29	11
323-805-001-015N	120	M18 x 1.5	G	29	9
323-805-034-002B	120	M14 x 1.5	H	29	7.5
323-805-039-001C	120	M14 x 1.5	H	29	8.5
323-805-042-001C	120	M14 x 1.5	H	29	8.5
323-808-002-003D*	120	M14 x 1.5	A (90°)	22	9
325-805-003-001C	120	1/4" - 18 NPTF	G	29	10.9
325-805-003-003C	120	3/8" - 18 NPTF	G	29	10.9
323-805-017-002C	130	M14 x 1.5		29	8.5
323-805-003-001N	150	M14 x 1.5	G	29	11
323-805-003-002N	150	1/4" - 18 NPTF	G	29	11
323-805-003-003N	150	5/8" - 18 UNF-2A with sealing cone	G	29	11
For dual units (identifier "D")					
*Supplied on request – limited availability					

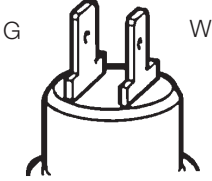
Technical data	
Type	Thermistor (NTC)
Rated voltage	6–24 V
Temperature response time	Min. 3 minutes after operating current switched on

2.4.3 Temperature Sensors | **Temperature Sensor with Warning Contact**

Type of connection

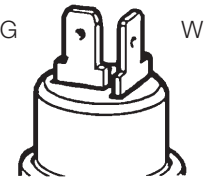
A

G = Blade connector /
6.3 x 0.8 mm
W = Blade connector /
4.8 x 0.8 mm



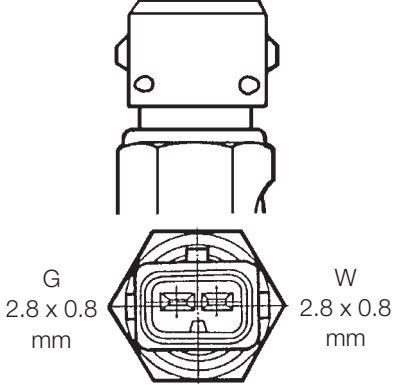
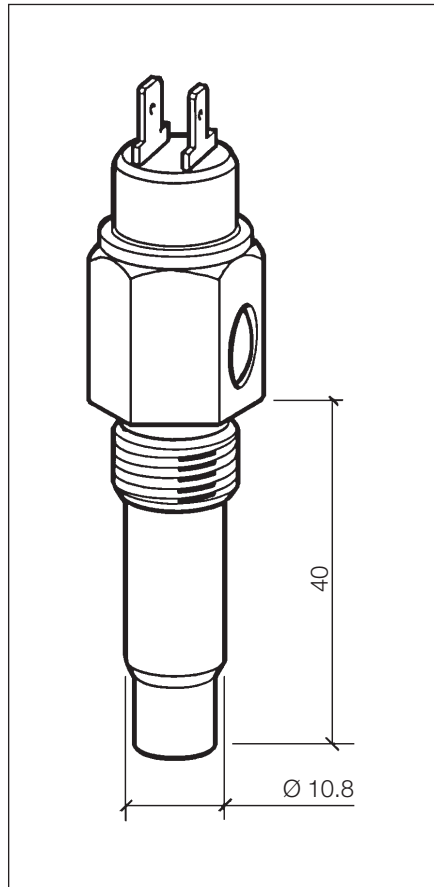
B

2-way blade connector in
T configuration
6.3 x 0.8 mm



C

Special push-on connector (Bosch)

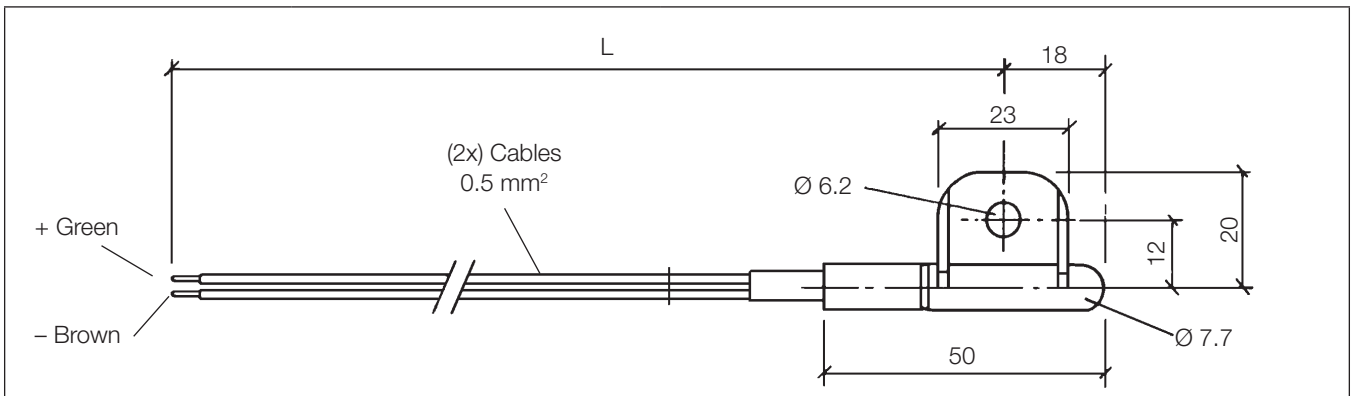



G = Sensor terminal
W = Warning contact terminal

Technical data	
Type	Thermistor (NTC)
Rated voltage	6–24 V
Temperature response time	Min. 3 minutes after operating current switched on
Switching capacity	1.2 W to 3 W, non-inductive
Switch-off point	Max. 5 °C below switch-on point
Contacting mode	Slow-acting
Contact type	Normally open
	Contact closes with rising temperature

Part Number	T max.	Thread	Switch-on point	Type
	[°C]		[°C]	
323-803-001-001D	120	M14 x 1.5	100 ±3	A
323-803-001-002D	120	5/8" - 18 NF-3	98 ±3	A
323-803-001-004D	120	M14 x 1.5	90 ±3	A
323-803-001-006D	120	M14 x 1.5	96 ±3	A
323-803-001-007D	120	M14 x 1.5	110 ±3	A
323-803-001-008D	120	M14 x 1.5	110 ±3	A
323-803-001-009D	120	M14 x 1.5	102 ±3	A
323-803-001-011D	120	5/8" - 18 NF-3	95 ±3	A
323-803-001-012D	120	5/8" - 18 NF-3	100 ±3	A
323-803-001-013D	120	M14 x 1.5	106 ±3	A
323-803-001-016D	120	M14 x 1.5	94 ±3	A
323-803-001-019D	120	1/2" - 14 NPTF	95 ±3	A
323-803-001-020D	120	M14 x 1.5	115 ±3	A
323-803-001-022D	120	M14 x 1.5	118 ±3	A
323-803-001-023D	120	M14 x 1.5	80 ±3	A
323-803-001-025D	120	1/2" - 14 NPTF	103 ±3	A
323-803-001-028D	120	M14 x 1.5	98 ±3	A
323-803-001-030D	120	1/2" - 14 NPTF	100 ±3	A
323-803-001-032D	120	1/2" - 14 NPTF	108 ±3	A
323-803-001-036D	120	5/8" - 18 NF-3	103 ±3	A
323-803-001-059D	120	5/8" - 18 NF-3	105 ±3	A
323-803-001-060D	120	1/2" - 14 NPTF	105 ±3	A
323-803-001-062C*	120	1/2" - 14 NTPF	114 ±3	A
323-803-001-064C	120	M14 x 1.5	112 ±3	A
323-803-004-001D	120	M14 x 1.5	100 ±2.5	B
323-803-004-002D	120	M14 x 1.5	105 ±3	B
323-803-004-003D	120	M14 x 1.5	95 ±2.5	B
323-803-004-007D	120	M14 x 1.5	100 ⁺⁶	B
323-803-004-009D*	120	5/8" - 18 NF-3	105 ±3	B
323-803-004-011D	120	M14 x 1.5	105 ±3	A (90°)
323-803-002-002D	150	M14 x 1.5	120 ±3	A
323-803-002-007D	150	M14 x 1.5	130 ±3	A
323-803-002-010C	150	M14 x 1.5	135 ±3	A
323-803-002-016D	150	M14 x 1.5	130 ±3	A
323-803-002-017D	150	M14 x 1.5 ¹	120 ±3	A
323-803-002-019D	150	M14 x 1.5	135 ±3	A
323-803-002-020D	150	M14 x 1.5	110 ±3	A
323-803-006-002C	150	M14 x 1.5	130 ±4	B
323-803-014-002D	150	M14 x 1.5	130 ±3	A
323-803-014-007C	150	M14 x 1.5 ¹	108 ±3	D
¹ With sealing ring, captive				
*Supplied on request – limited availability				

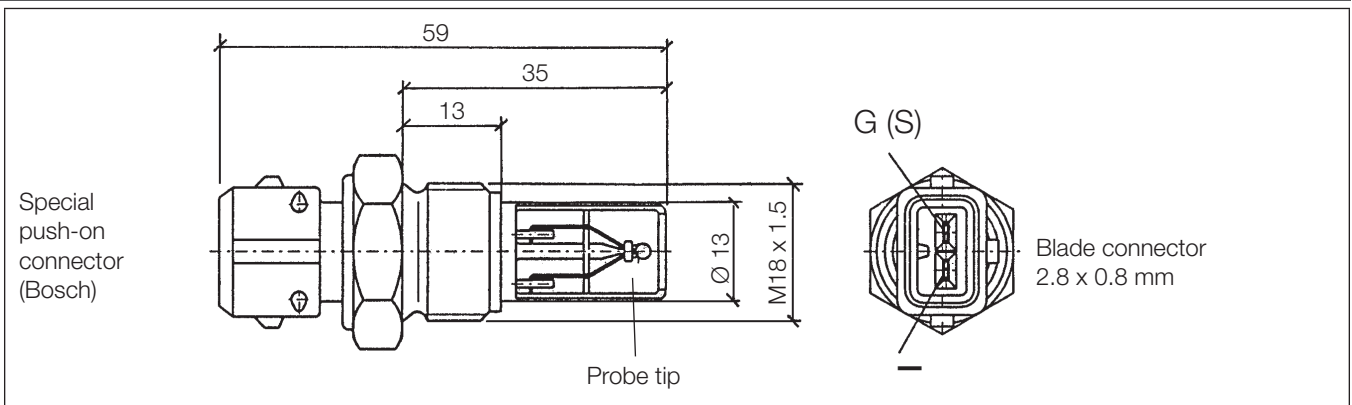
2.4.4 Temperature Sensors | **Temperature Sensor for Air Temperature**



Part Number	Products
323-809-010-005C	Cable length L: 3,000 mm
323-809-010-006C	Cable length L: 4,500 mm

Technical data	
Type	Thermistor (NTC), insulated return
Rated voltage	6–24 V
Operating temperature	-40 °C to +85 °C max.
Temperature response time	Min. 3 minutes after operating current switched on

With probe tip



Part Number: 323-809-019-003A

Technical data	
Type	Thermistor (NTC), insulated return
Rated voltage	6–24 V
Operating temperature	-40 °C to +150 °C max. at probe tip
Temperature response time	Min. 3 minutes after operating current switched on



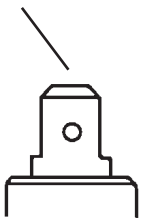
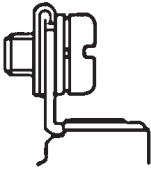
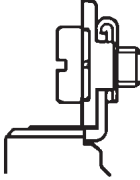
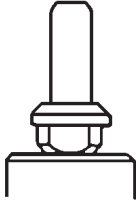

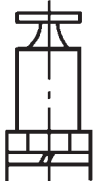
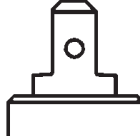
Temperature Switches

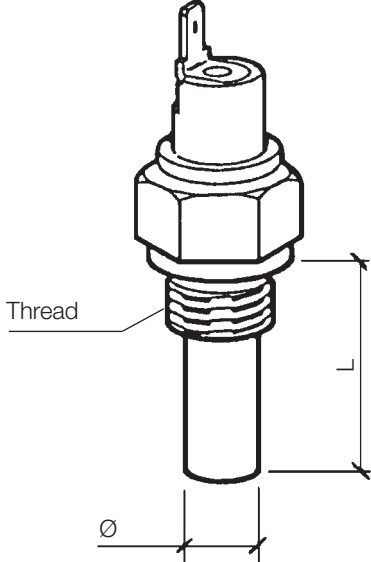
2.5.1 Temperature Switch, Single-Pole,
Common Ground

2.5.2 Temperature Switch, Dual-Pole,
Insulated Return

2.5.1 Temperature Switches | Temperature Switch, Single-Pole, Common Ground

Type of connection

A	B	C	D
<p>6.3 x 0.8 mm</p> 	 <p>M4</p>	<p>With cable shoe holder</p>  <p>M4</p>	<p>Ø 4 mm</p> 
E	F	G	
<p>Hexagonal nut</p>  <p>M4</p>	<p>Ø 6.3 x 0.8 mm</p> 	<p>4.8 x 0.8 mm</p> 	



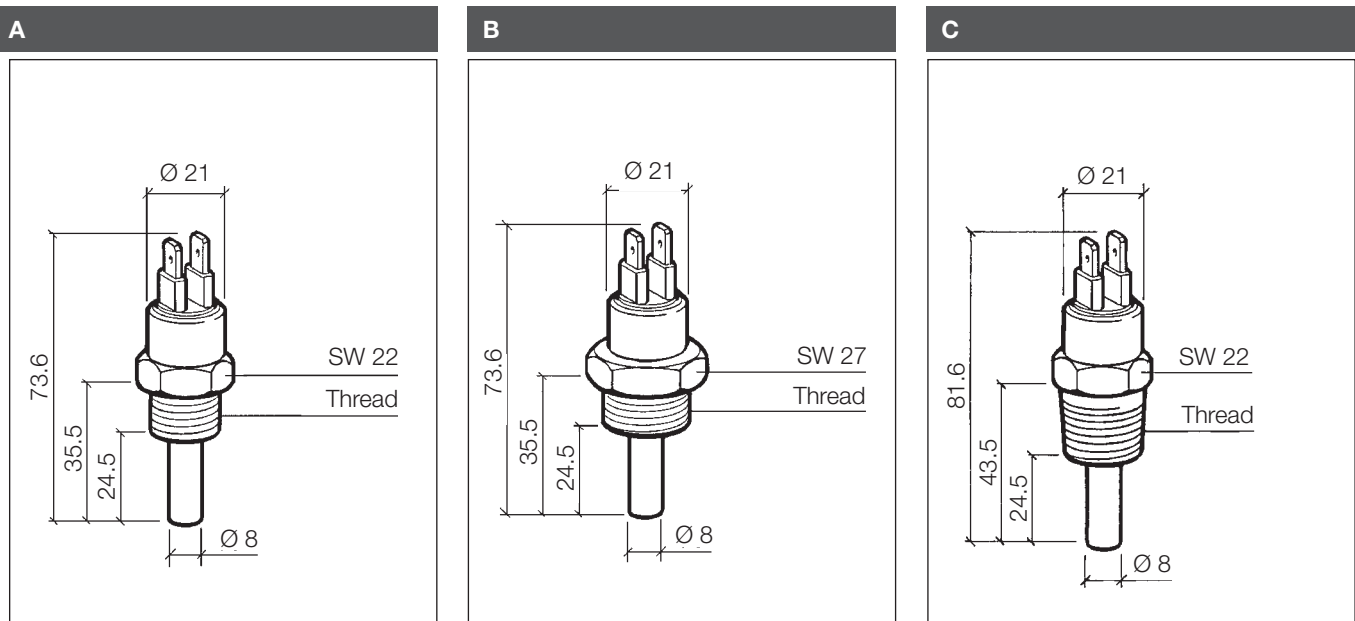
Part Number	Switch-on point	Thread	T max.	Type	L	Ø
	[+ °C]		[°C]			
232-011-020-022E	16 ±3 (normally closed, NC)	M14 x 1.5	120	D	29	10
232-011-020-006E	25 ±3 (normally closed, NC)	M14 x 1.5	120	D	29	10
232-011-017-141D	28 ±3 (normally closed, NC)	M14 x 1.5	120	A	29	9.7
232-011-017-129D	35 ±3	M14 x 1.5	120	A	29 ±0.2	10 ^{-0.5}
232-011-005-019D	96 ±3	1/8" - 27 Dryseal NPFT	120	E	33 ±0.5	12 ±0.3
232-011-017-148D	35 ±3	M14 x 1.5	120	A	29	10
232-011-017-087D	40 ±3	M14 x 1.5	120	D	29	10
232-011-017-038D	55 ±3	M14 x 1.5	120	A	29	10
232-011-017-040D	70 ±3	M14 x 1.5	120	A	29	10
232-011-017-078D	80 ±3	M14 x 1.5 tapered, short	120	A	29	10
232-011-017-017D	85 ±3	M14 x 1.5	120	A	29	10
232-011-005-003D	90 ±3	M14 x 1.5	120	E	38.5	6.9
232-011-017-013D	90 ±3	M10 x 1.5 tapered, short	120	A	29	10
232-011-017-033D	92 ±3	M14 x 1.5	120	A	29	10
232-011-017-147D	94 ±3	M14 x 1.5	120	D	29	10
232-011-017-016D	95 ±3	M14 x 1.5	120	A	29	10
232-011-017-039D	95 ±3	1/2" - 14 NPTF	120	A	29	10
232-011-017-080D	97 ±3	M14 x 1.5	120	A	29	10
232-011-017-099D*	98 ±3	5/8" - 18 UNF-2A	120	A	29	10
232-011-017-034D	100 ±3	M14 x 1.5	160	A	29	10
232-011-017-058D*	102 ±6	M14 x 1.5	120	C	29	10
232-011-017-135D	102 ±3	M14 x 1.5	150	D	29 ±0.2	9 ±0.2
232-011-017-131D*	103 ±3	1/2" - 14 NPTF	120	A	29	10
232-011-017-139D	103 ±3	3/8" - 18 NPTF	120	A	29	10
232-011-017-037D	105 ±3	M14 x 1.5	120	A	29	10
232-011-017-041D	105 ±3	1/2" - 14 NPTF	120	A	29	10
232-011-017-145D*	105 ±3	3/8" - 18 NPTF	120	G	29	10
232-011-017-010D	110 ±3	M14 x 1.5	160	A	29	10
232-011-017-076D	115 ±3	M14 x 1.5	130	A	29	10
232-011-017-005D	120 ±3	1/2" - 14 NPTF	130	B	29	10
232-011-017-118D	120 ±3	3/8" - BSPF medium	130	A	29	10
232-011-017-032D	120 ±3	M14 x 1.5	130	A	29	10
232-011-017-118D	120 ±3	3/8" - BSPF medium	130	A	29	10
232-011-017-143D	120 ±3.3	3/4" - 16 UNF-2A	150	A	27.1 ±0.2	9.7 ±0.2
232-011-017-103D	130 ±3	M14 x 1.5	150	A	29	10
232-011-005-004D	140 ±10	M14 x 1.5	160	A	29	10
232-011-017-004D	140 ±10	M14 x 1.5	160	A	29	10
232-011-005-017D	150 ±5	M10 x 1.5	200	E	38.5	6.9
232-011-005-027D	150 ±5	M10 x 1.5	200	F	38.5	6.9

Part Number	Switch-on point [+ °C]	Thread	T max.	Type	L [mm]	Ø [mm]
			[°C]			
232-011-005-004D	170 ± 5	M10 x 1.5	220	E	38.5	6.9
232-011-005-028D	170 ± 5	M10 x 1.5	220	F	38.5	6.9
232-011-005-030D	185 ± 5	M10 x 1.5	230	F	38.5	6.9
232-011-019-003D	195 ⁺¹⁰	M10 x 1.5	250	E	38.5	6.9
*Supplied on request – limited availability						

Technical data	
Switching capacity	1.2 W to 3 W, non-inductive
For monitoring various fluids	
Rated voltage	6–24 V
Contact type	Normally open
Switch-off point	Max. 5 °C below switch-on point
Contacting mode	Slow-acting

2.5.2 Temperature Switches | Temperature Switch, Dual-Pole, Insulated Return

Design



Part Number	Switch-on point [+ °C]	Switch-off point [+ °C]	Thread	Design
232-036-002-014D*	35 ± 3 (normally closed, NC)		M14 x 1.5	
232-036-005-019C*	35 ± 4 (normally closed, NC)		M14 x 1.5	
X10-232-001-001	64 ± 3	60 ± 3	M14 x 1.5	A
X10-232-001-002	82 ± 3	74 ± 3	M18 x 1.5	A
X10-232-001-003	86 ± 3	81 ± 3	M18 x 1.5	A
X10-232-001-004	92 ± 3	85 ± 3	M18 x 1.5	A
X10-232-001-005	96 ± 3	92 ± 3	M18 x 1.5	A
X10-232-001-006	96 ± 3	91 ± 3	1/2" - 14 NPTF	C
X10-232-001-007	96 ± 3	92 ± 3	M14 x 1.5	A
X10-232-001-008	96 ± 3	92 ± 3	M22 x 1.5	B
X10-232-001-009	100 ± 3	95 ± 3	M18 x 1.5	A
X10-232-001-010	105 ± 3	100 ± 3	M18 x 1.5	A

*Supplied on request – limited availability

Technical data	
Switching capacity:	100 W
For monitoring various fluids	
Operating temperature	Max. 110 °C
Rated voltage	6–24 V
Switch-on point	Normally open Contact closes with rising temperature
Switch-off point	Max. 5 °C below switch-on point
2-way blade connector	A 6.3 x 0.8 mm, DIN 46244



Liquid Level Switches

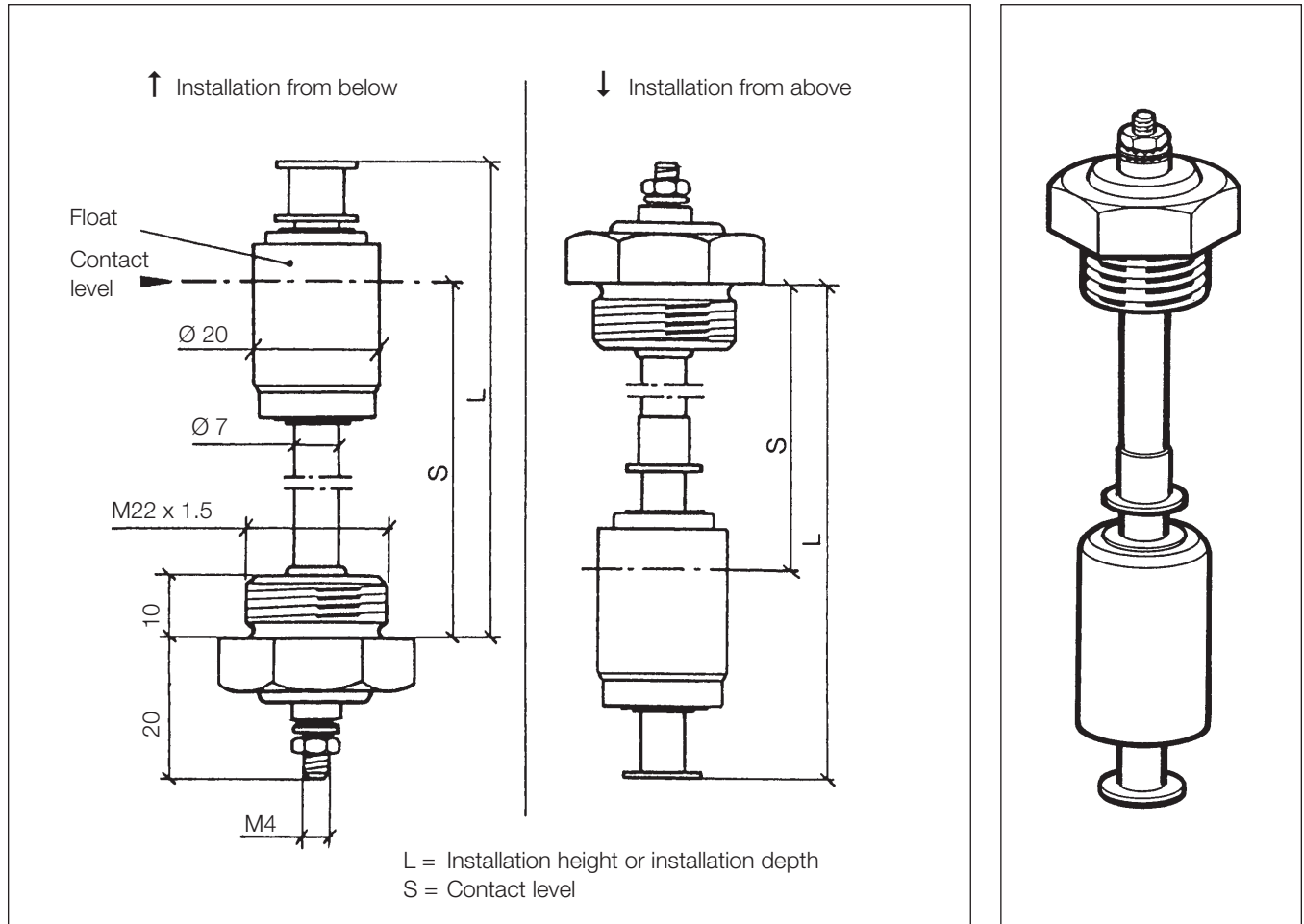
2.6.1 Liquid Level Switch, Linear Type, Oil/Diesel

2.6.2 Liquid Level Switch, Lever Type, Oil

2.6.3 Liquid Level Switch, Lever Type, Water

2.6.1 Liquid Level Switches | **Liquid Level Switch, Linear Type, Oil/Diesel**

Dimensions [mm]



Type of connection

A

Hexagonal nut
Serrated washer

Diagram A shows a hexagonal nut and a serrated washer being used to secure the top of the switch. The nut is placed over the top of the switch, and the serrated washer is placed over the nut and the top of the switch.

B

Hexagonal nut
Serrated washer
Blade connector
6.3 x 0.8 mm

Diagram B shows a hexagonal nut, a serrated washer, and a blade connector being used to secure the top of the switch. The nut is placed over the top of the switch, the serrated washer is placed over the nut and the top of the switch, and the blade connector is inserted into the top of the switch. The blade connector is shown at a 50-degree angle.

C

Hexagonal nut
Washer
Blade connector
6.3 x 0.8 mm

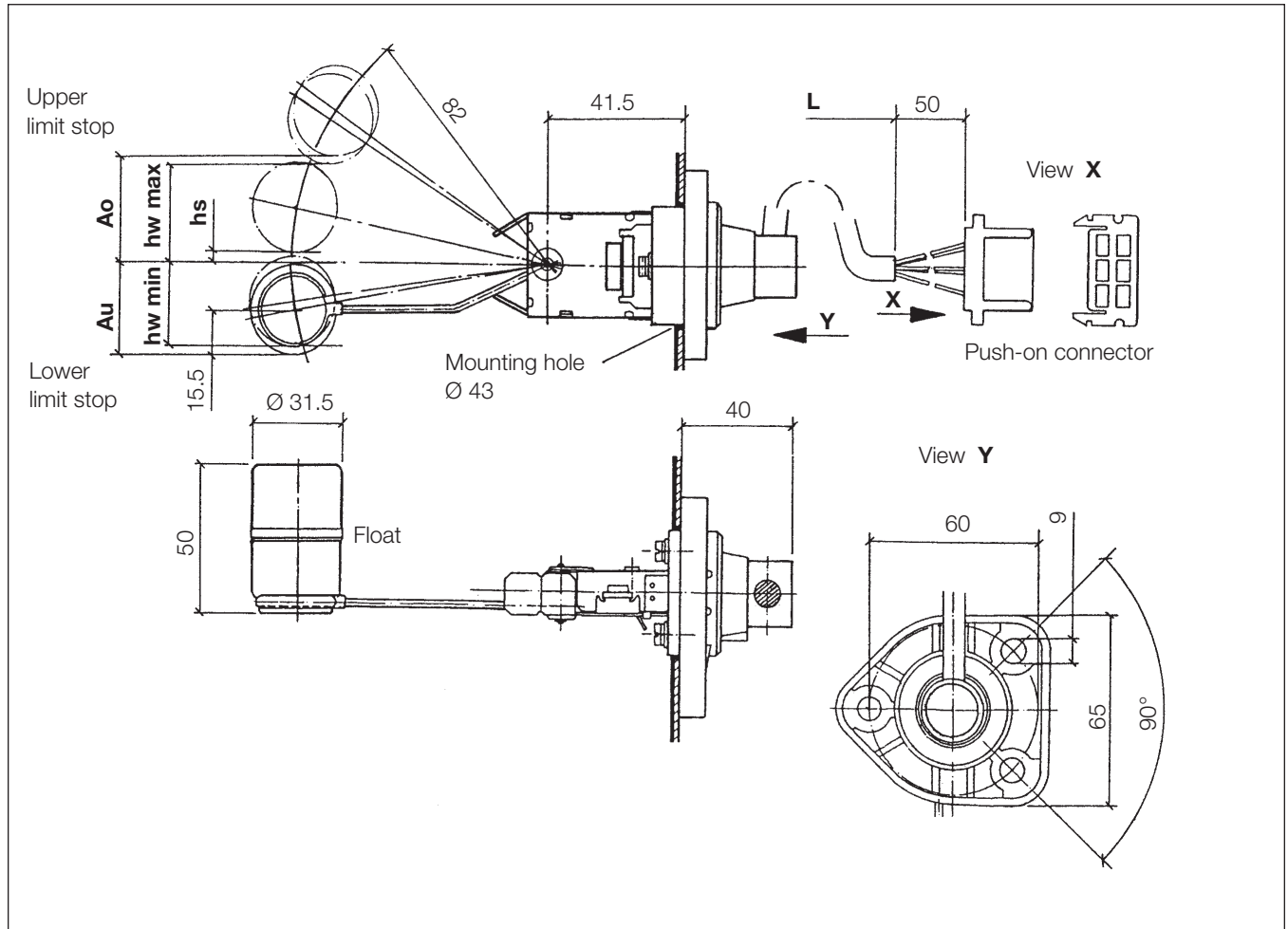
Diagram C shows a hexagonal nut, a washer, and a blade connector being used to secure the top of the switch. The nut is placed over the top of the switch, the washer is placed over the nut and the top of the switch, and the blade connector is inserted into the top of the switch. The blade connector is shown at a 50-degree angle.

Part Number	Installation	L [± 1.5 mm]	S [± 3 mm]	Voltage	Switching capacity	Type	Fluid
395-462-001-001G	↓	184	158	24 V	3 W	A	Diesel/transmission oil
395-262-001-007C	↓	196	170	12 V	2 W	B	Diesel
395-262-001-023C	↓	275	249	12 V	2 W	B	Diesel
395-462-001-006G	↓	311	285	24 V	3 W	C	Diesel
395-262-001-013G	↓	346	320	12 V	2 W	B	Diesel
395-462-001-002G	↑	60.6	35.6	24 V	3 W	A	Diesel
395-262-001-005G	↑	75	50	12 V	2 W	B	Diesel
395-262-001-016G	↑	77.5	52.5	12 V	2 W	B	Diesel
395-262-001-015G	↑	98	73	12 V	2 W	A	Diesel
395-462-001-004G	↑	145	120	24 V	3 W	B	Diesel
395-462-001-005C	↑	175	150	24 V	3 W	B	Diesel

Technical data	
Electrical connection	Single pole, common ground
Rated voltage	12 V or 24 V
Switching capacity	2 W or 3 W
Contacting mode	Contact closes with falling pressure
Limiting current value	150 mA
Operating temperature	-30 °C to +100 °C

2.6.2 Liquid Level Switches | **Liquid Level Switch, Lever Type, Oil**

Dimensions [mm]



Part Number	Warning contact		Contact (load)	Upper limit stop	Lower stop	Cable length
	hw	hw min.	hs	A0	Au	L [mm]
395-024-004-008C*	29 ± 1.5	23 ± 4.5	0 ⁺¹ ₋₂	34 ⁺²	20 ± 2	920
395-024-004-005C	35 ⁺¹ ₋₂	26 ⁺⁵ ₋₁	6 ⁺² ₋₁	37 ⁻¹	32 ± 1	1,500

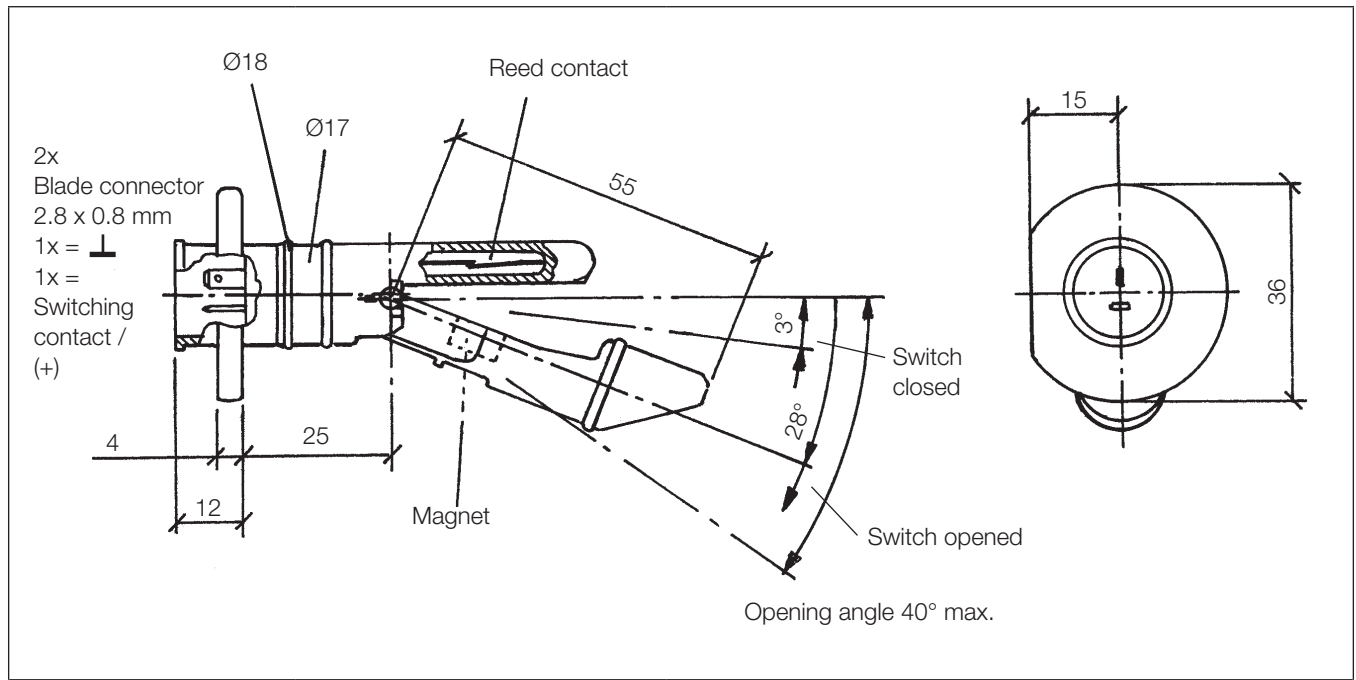
* Supplied on request – limited availability

Technical data	
Electrical connection	Insulated return
Rated voltage	6–24 V
Switching capacity	Max. 3 W non-inductive
Contacting mode	Slow-acting, normally open
Operating temperature	-25 °C to +110 °C
Storage temperature	-30 °C to +110 °C (up to +120 °C, max. 1 h)

Terminal assignment	
1	Warning contact max (green)
2	Ground (brown-white)
3	Not connected
4	Warning contact min. (yellow)
5	Load contact (white)
6	Ground (brown-blue)

2.6.3 Liquid Level Switches | **Liquid Level Switch, Lever Type, Water**

Dimensions [mm]



Part Number	Products
395-060-017-002C	Liquid level switch
X11-000-002-173	Accessories: Sealing sleeve

Technical data	
Rated voltage	24 V
Switching capacity	3 W
Contacting mode	Normally closed
Operating temperature	-30 °C to +100 °C
Fluid	Screenwash/coolant
Resistant to	50 % ethanol + 50 % H ₂ O
or	50 % methanol + 50 % H ₂ O
or	50 % anti-freeze (e.g., Glysantin) + 50 % H ₂ O
Pressure tight to 1.5 bar max.	



UniNO_x



UniNO_x

Our innovative sensor is helping to meet global demand for increased performance in the face of current and future emissions regulations. UniNO_x sensor technology represents a welcome aid to automotive manufacturers confronted with ever stricter emissions legislation and the simultaneous need to reduce fuel consumption. This sensor is the product of collaborative development between Continental and NGK Insulators, which leveraged the specific expertise of the two companies in the fields of electronics (Continental) and sensor technology (NGK).

Concept

The UniNO_x sensor comprises a zirconia multi-layer ceramic sensing element in a metal housing, connected to an ECU by a 600 mm long cable.

Like in a linear wideband lambda sensor, electrochemical pumps are used to establish the oxygen concentration in the sensing element. NO_x concentration in the exhaust gas is proportional to the pump current in the sensor element.

Based on the measured physical values, the ECU calculates three output signals (NO_x, binary λ, linear λ). These signals are then transmitted to the engine ECU over the CAN bus.

Benefits

- Modular, stand-alone NO_x sensor
 - Communicates via standard CAN bus interface
 - No ties to suppliers of catalytic converters, electronic control units, and engine management systems.
 - Heating element control and driver stages integrated into ECU
 - Self-diagnostics for short circuit and cable break

- High-precision, calibrated UniNO_x sensor
 - Outstanding combined skills base in electronics and sensor technology thanks to collaboration between NGK Insulators and Continental
 - Over 20 years of experience in sensor technology
 - Designed by experts in sensor calibration and control techniques

- Experienced in series production
 - Used in gasoline engines since 2001
 - Used in diesel engines since 2005

Applications

Manufacturers seeking to comply with existing and forthcoming emissions standards and the associated legislation, such as Euro 5, 6, V, VI, US07 and US10, can rely on the UniNO_x sensor to support them in implementing various types of exhaust treatment system for both gasoline and diesel engines.

Gasoline engines for cars

UniNO_x sensors are used to control the regeneration cycle of NO_x storage catalysts (NSC) in conjunction with lean-burn engines (GDI/FSI/HPDI).



Diesel engines

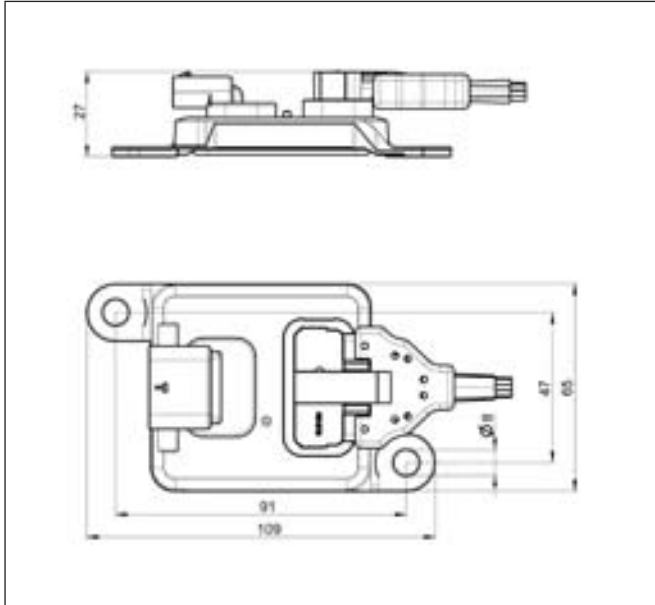
- Cars and vans
 - Control of DEF metering in SCR systems
 - Control of NSC regeneration cycle
 - Can be used for OBD with all exhaust gas treatment systems
- Medium and heavy duty trucks
 - Control of DEF metering in SCR systems
 - Can be used for OBD with all exhaust gas treatment systems

General specification

Measurement	ZrO ₂ -based multi-layer sensor with integrated heater and 3 oxygen pumps
Three output signals	NO _x , binary λ, linear λ or O ₂ concentration
Electrical system	12 V or 24 V
Data link	SAE J-1939
Self-diagnostics	Short circuit and cable break
Operating temperature (gas)	100–800 °C
Measuring range	NO _x : 0–1,500 ppm λ: 0.75

UniNO_x 12 Volts

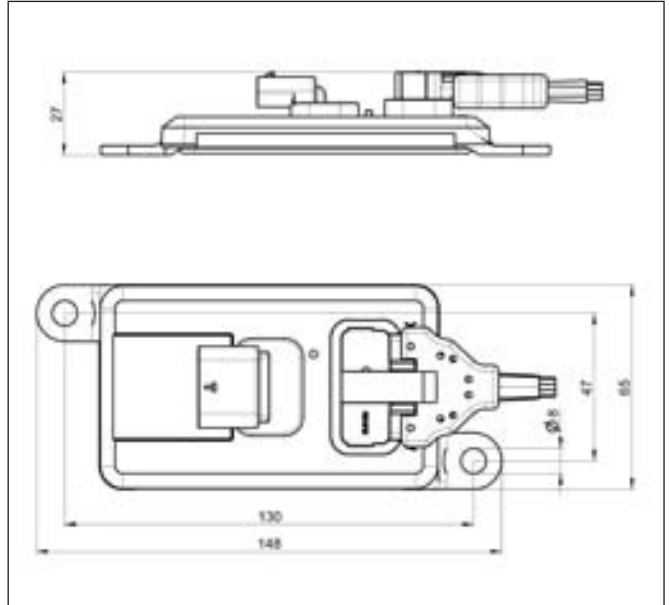
Dimensions [mm]



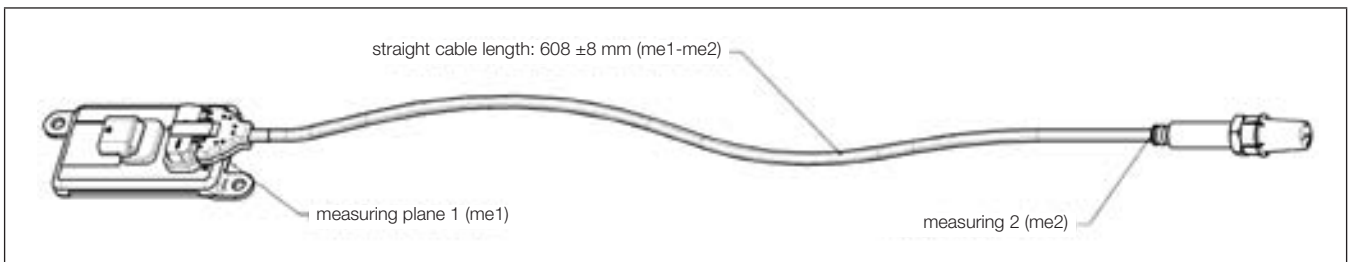
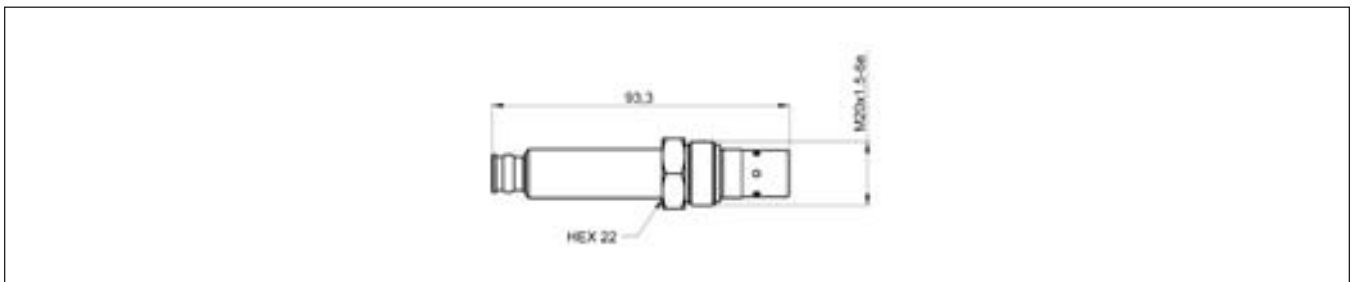
Part Number: 5WK96622

UniNO_x 24 Volts

Dimensions [mm]



Part Number: A2C53255626



Accessories: Mating-Plug-Kit 12/24 Volts

Part Number	Product	Qty.
A2C59512190	Mating-Plug-Kit 12/24 Volt	10 pc.



Customer-Specific Solutions Sensors for Engine Management Systems*

* Only available for series
production applications
on request

Intake Air Pressure Sensors (MAP, T-MAP)

Mass Airflow Sensor (MAF)

Knock Sensor

Crankshaft Position Sensor

Camshaft Position Sensor

High temperatur Sensor

Differential pressure Sensor

* Only available for series production applications on request

Intake Air Pressure Sensors (MAP, T-MAP)

Temperature and absolute pressure sensors, 1 to 5 bar

Our innovative sensors help to meet increased global requirements with regard to enhanced performance, as well as current and future emissions regulations. Absolute pressure sensors are used to measure air pressure in different applications throughout the vehicle.

Operating principle

Our absolute pressure sensors are based on micro-machined silicon sensing elements, which deflect under load to generate a ratiometric voltage that corresponds to the incident pressure. This signal is in turn amplified and temperature-compensated according to a fully configurable digital calibration.

Applications

- MAP (**M**anifold **A**bsolute **P**ressure Sensor): Measurement of intake air pressure in order to measure air flow, which is an important variable in calculating the volume of fuel to be injected and, in turn, for optimization of the air-fuel mixture.
- T-MAP (**M**AP Sensor with integral Temperature Sensor): Measurement of intake air pressure and temperature in order to measure air flow, which is an important variable in calculating the volume of fuel to be injected and, in turn, for optimization of the air-fuel mixture.
- Turbo MAP (**M**anifold **A**bsolute **P**ressure Sensor for Turbocharged engines): Measures air pressure, for example, downstream of the turbocharger
- Turbo T-MAP (**Turbo MAP** Sensor with integral Temperature Sensor): Measures air pressure and temperature, for example, downstream of the turbocharger
- BAP (**B**arometric **A**bsolute **P**ressure Sensor): Measures barometric air pressure
- BPS (**B**rake **P**ressure **S**ensor): Measures air pressure in brake servo systems



MAP sensor



BAP sensor



T-MAP sensor



BPS sensor



* Only available for series production applications on request

Mass airflow sensor

A growing focus on reducing CO₂ emissions means that mass airflow sensors are becoming increasingly important in ensuring the optimum air fuel ratio. Mass airflow sensors are positioned directly after the air filter in the intake manifold and supply information on temperature, humidity, and intake air volume.

Despite their highly compact construction they feature precision technology to capture information which – , together with other engine data – enables optimum engine management.

This data includes:

- Intake air temperature
- Intake air humidity
- Intake air volume

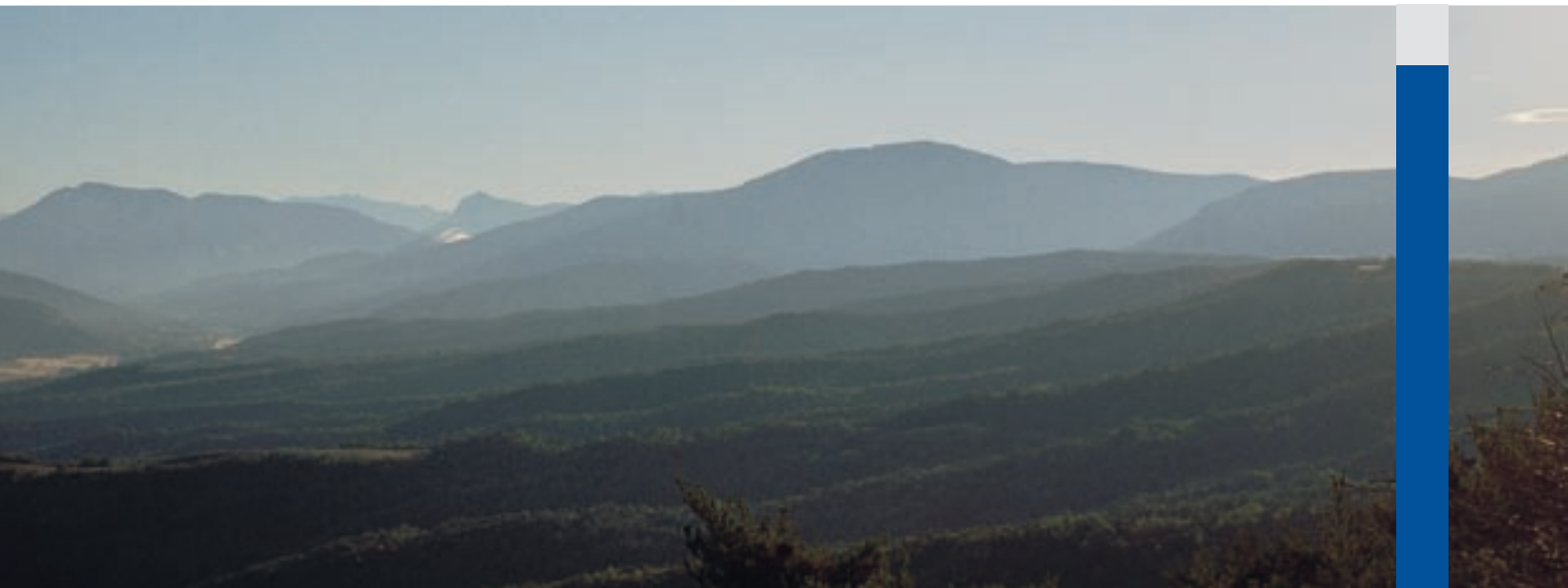
In gasoline engines, mass airflow measurement is used in conjunction with other sensor readings to regulate the supply of fuel to the engine.

In diesel engines, mass airflow sensors are used to regulate the exhaust gas recirculation rate and calculate the maximum injection quantity.

VDO mass airflow sensors are exceptionally reliable and highly capable of withstanding environmental factors. Their dynamic measurement ability makes an important contribution to reducing vehicle emissions.



Mass airflow sensor



* Only available for series production applications on request

Knock sensor

Modern engines which allow high compression ratios have a distinct disadvantage: their design leads to increased knocking, which can damage the engine. Knock sensors reliably measure the vibration of the engine block that is characteristic of engine knocking. This allows the firing angle and other parameters to be set such that the engine continues to function correctly close to the knock threshold. This not only protects the engine but also reduces fuel consumption.

To ensure maximum precision, VDO knock sensors deploy groundbreaking bandwidth technology.



Knock sensor



* Only available for series production applications on request

Crankshaft Position Sensor

The crankshaft position sensor supplies information on the crankshaft's current position, which the engine management system can then use to calculate rpm. These values make it possible to determine the most economical fuel injection and ignition timing for a vehicle.



Crankshaft Position Sensor



* Only available for series production applications on request

Camshaft Position Sensor

The camshaft position sensor is located in the cylinder head and reads the camshaft sprocket to determine the position of the camshaft. This information is required for functions such as initiating injection on sequential injection engines, the trigger signal for the magnet valve on pump valve injection systems and for cylinder-specific knock control.



Camshaft Position Sensor



* Only available for series production applications on request

High temperature sensor

The high temperature sensor from VDO also performs a key role in the exhaust gas after-treatment process. It delivers impressive long-term stability and provides high accuracy temperature measurements with good linearity. The heat-resistant temperature probe has many applications in innovative systems, including:

- Measurement of exhaust gas temperature for optimization of the combustion process
- Measurement of exhaust gas temperature for protection of various components
- Control and monitoring of diesel particulate filter systems

The measurement range extends up to 1200 °C. Thanks to its ability to generate a reliable measurement signal under such harsh conditions, this sensor makes it possible to deliver a perfectly controlled fuel supply for combustion in the diesel particulate filter.



High temperature sensor

Product benefits:

- High precision
- Minimal signal aging across the entire life cycle
- Compact construction allows optional fitment
- Low thermal inertia ensures rapid response characteristics

Technical data:	
Response time T63:	4–13 s (20 m/s gas flow)
Temperature range:	-40 °C ... + 1200 °C
Working temperature for the cable:	200 °C (250 °C short time)
Working temperature electronics:	-40 °C to 125 °C (140 °C optional)
Accuracy low temp. (< 500 °C):	± 2 °C + 0.75 % FSO
Accuracy high temp. (> 500 °C):	± 7.5 °C
Refreshing rate:	> 100 Hz to 12 bit
Supply voltage:	5 VDC (12 VDC, 24 VDC optional)
Resolution ADC:	14 bit
Connector:	3 pins
Thermocouple:	Type N
ASIC:	(16 bit C, instrumental amplifier, reference temperature)
Output:	PWM, 5 V, CAN



* Only available for series production applications on request

Differential pressure sensor

The 2-port pressure sensor for diesel particulate filters from VDO provides outstanding differential pressure measurement. This sensor is extremely precise and highly reliable under even the most demanding conditions, thanks to back-side sensing.

Using the differential pressure measured between the filter outlet (P1) and the filter intake (P2), the VDO pressure sensor is able to determine with a high degree of precision the actual exhaust gas flow through the diesel particulate filter and therefore the level of clogging in the filter. The sensor generates an analog output voltage proportional to the differential pressure, which is used as input by the electronic control unit (ECU).

If this voltage exceeds a predefined value stored in the ECU, the control unit initiates a regeneration process to burn off the residue in the particulate filter. This process restores gas flow to the original level, thereby allowing optimal performance to be achieved.



Differential pressure sensor

Product benefits:

- Direct pressure measurement
- Suitable for system-internal and emissions diagnostics
- Wide measurement range
- High accuracy, high thermal stability
- Excellent dynamic response
- Complies with the strictest EMC requirements
- Resistant to even highly aggressive media

Technical data:

Operating characteristics:

Response time:	< 2 ms
Temperature range:	-40 °C to +140 °C
Accuracy:	1 % FS (10 to 85 °C)
Supply voltage (Vs):	5.00 ± 0.5 VDC
Supply current at 5 V:	10 mA max.
Pressure range:	0 kPa to 125 kPa
Load resistance:	< 4.7 kΩ
Power on time:	< 10 ms
Weight:	< 45 g

Maximum ratings:

Overpressure:	500 kPa
Storage temperature:	-40 °C to +150 °C
Supply voltage:	16 VDC

3. Fuel Management Systems

3.1 Fuel Level Senders, Tubular Type

- 3.1.1 Tubular Fuel Level Sender, Metal, Standard
- 3.1.2 Tubular Fuel Level Sender, Metal, Robust
- 3.1.3 Tubular Fuel Level Sender, Plastic

3.2 Fuel Level Senders, Lever-Arm Type

- 3.2.1 Lever-Arm Fuel Level Sender, Plastic
- 3.2.2 Adjustable Lever-Arm Fuel Level Sender, Standard /ALAS I
- 3.2.3 Adjustable Lever-Arm Fuel Level Sender, ALAS II



Fuel Management Systems

Fuel level measurement for commercial and special vehicles

Little deviations can cause a serious full stop – that is certainly the challenge within fuel level systems. In order to support commercial and special vehicles effectively and efficiently, it is essential to provide reliable information about accurate fuel level at each time.

Innovative solutions

Our sensor systems are specifically optimized for a wide range of applications and the often extremely harsh operating conditions encountered. We have been active in this field for over 30 years and along our sensor innovations, like the MAgnetic Passive Position Sensor (MAPPS), we have been extremely successful in increasing the reliability of fuel level measurement systems, even those used with aggressive fuels.

For tanks of all shapes and sizes

Based on our huge range of different designs and measuring principles, we are able to offer solutions for all kind of tank geometries, flange mounting holes (e.g., EU bayonet flange), and fuel requirements. Thanks to the modular nature of the systems, we are also able to support customers who require only small product batches. For example, we can supply lever-arm senders in custom lengths with batch sizes as small as 2,000 units per year.

Scalable integration

Our extensive range of sender solutions includes classic designs, such as tubular and lever-arm senders, and includes sensors based on thick-film network technology

(DSN) and contactless and low-wear sensors. Depending on the requirements of the tank or vehicle manufacturer, we can provide anything from simple, and robust senders to complex solutions including fuel supply connections (feed and return lines for fuel injection system, auxiliary heating system) and tank ventilation, all integrated in the flange. All systems are built for long service life, regardless of the selected operating principle and design, and withstands many years of proven use in series production applications.

Thick-film network technology (DSN)

Thick-film network technology (DSN) has become an established standard for modern fuel level sensors due to its reliability of measurement and the option of adapting the resistance characteristic curve for asymmetric tank geometries. The numbers stand for themselves – just in 2008, we shipped roughly 30 million units.

We offer several different models of lever-arm senders using DSN technology, all of which are designed to specific standards along the required environments. The standard model provides a double AgNi20 wiper contact and is specified for one million cycles.

A three-finger system is also available with two sets of three contacts, with units designed for either one million cycles (material: Hera 649) or two million cycles (AuNi5), depending on material composition.

One sender, different tanks

Our range also includes an economical solution to cover a wide range of tank shapes by one sensor. The new ALAS II (Adjustable Lever Arm Sensor, 2nd generation) can be adjusted to measure fuel tanks depths between 100 and 400 mm. Vehicle manufacturers and tank system specialists now have the option of using a single type of sensor to equip a whole range of tanks with different depths. This solution is particularly beneficial for the small volume productions that are characteristic of special vehicles.



Plastic lever-arm sender (DSN technology)



Plastic lever-arm sender (MAPPS technology)



Adjustable ALAS II lever-arm sender



Metal tubular level sender

Contactless measurement in aggressive fuels

Conventional sensor technologies are well suited to meeting the required service life in gasoline and diesel applications, but this is not necessarily the case for new fuels, such as rapeseed methyl ester (RME, bio-diesel). Aggressive components in RME have been found to accelerate wear of contact surfaces in conventional thick-film sensors, even where high-quality contact materials are used. The most reliable way to ensure continued, trouble-free level measurement under these changed conditions is contactless measurement.

Our MAPPS product is able to meet the demands of this type of environment. Thanks to the operating principle employed, these sensors are capable of over ten million cycles. With this patented technology, the actual sensing element is contained in a hermetically sealed housing and never comes into contact with the fuel. Measurements are obtained using a lever-arm sender, which moves a small magnet in an arc across the outside of the sensor housing. The magnetic force actuates 52 individual metal reeds, causing them to touch a contact strip inside the sensor, which in turn creates a variable electrical resistance as the measurement output.



The hermetically sealed MAPPS element is a mere 4 cm long

MAPPS explained: The magnet on the lever arm attracts flexible contact reeds to a contact strip, thereby creating a characteristic resistance signal.



Fuel Level Senders, Tubular Type

3.1.1 Tubular Fuel Level Sender, Metal, Standard

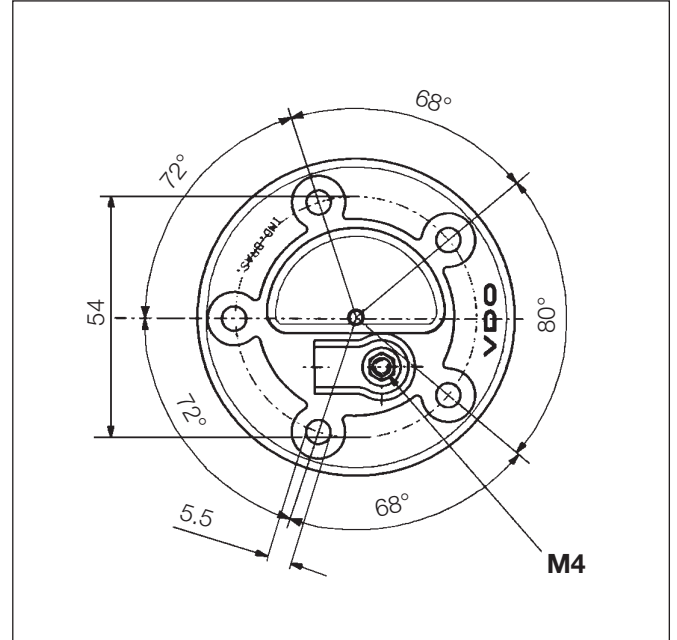
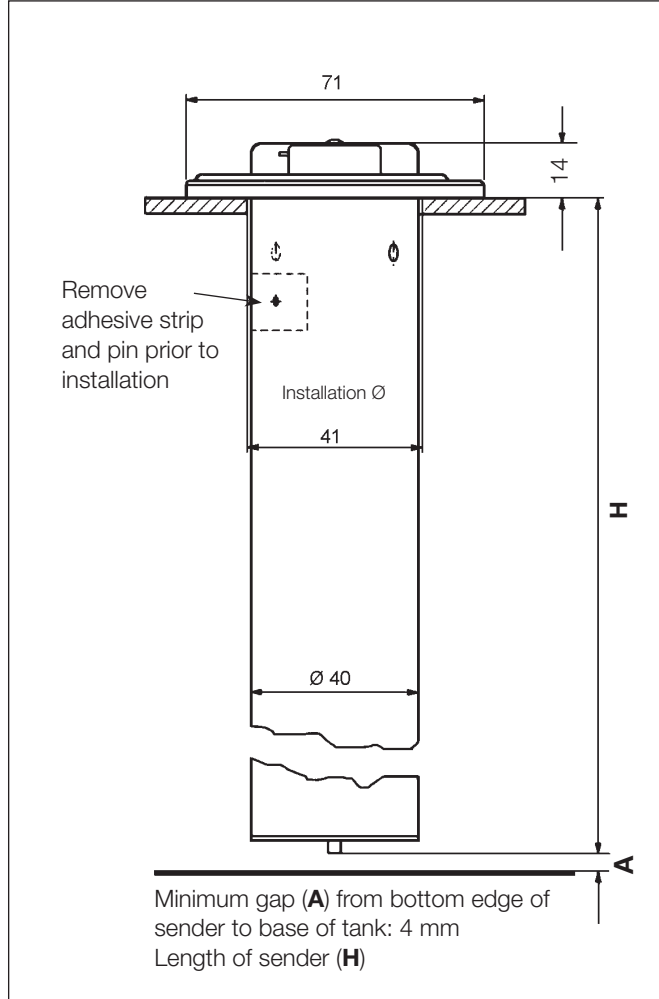
3.1.2 Tubular Fuel Level Sender, Metal, Robust

3.1.3 Tubular Fuel Level Sender, Plastic

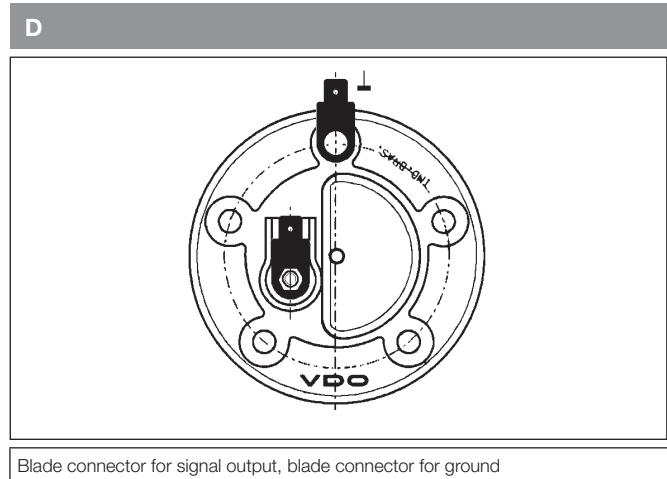
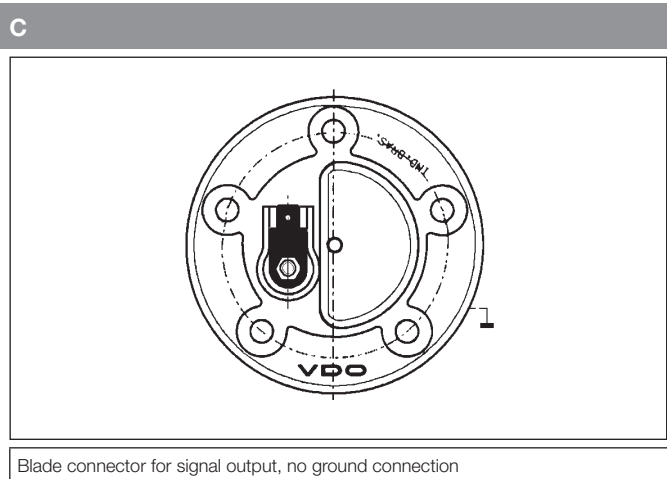
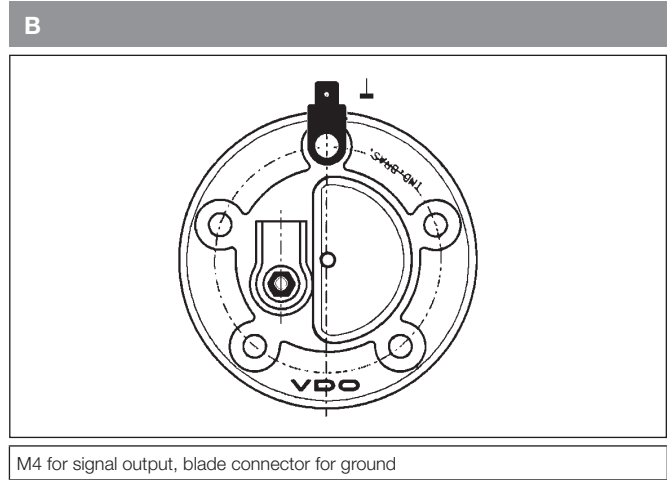
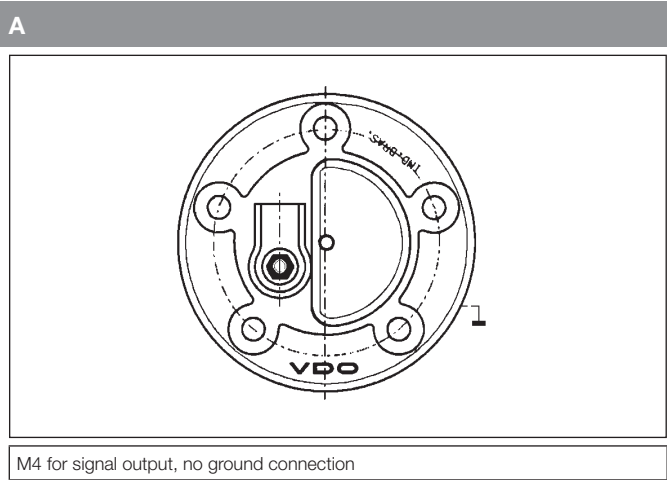
3.1.1 Fuel Level Senders, Tubular Type | **Tubular Fuel Level Sender, Metal, Standard**

Flange bolt hole circle \varnothing 54 mm

Dimensions [mm]



The electrical connection can be configured as follows using the two blade connectors (6.3 x 0.8 mm) supplied:



Part Number	H [mm]	Support spring	Electrical connection**	Ground connection
224-011-000-150G/X	150.0	No	1/2	Optional
224-011-000-160G/X	160.0	No	1/2	Optional
224-011-000-170G/X	170.0	No	1/2	Optional
224-011-000-180G/X*	180.0	No	1/2	Optional
224-011-000-190G/X*	190.0	No	1/2	Optional
224-011-000-200G/X	200.0	No	1/2	Optional
224-011-000-210G/X*	210.0	No	1/2	Optional
224-011-000-220G/X	220.0	No	1/2	Optional
224-011-020-221G/X	221.0	No	2	No
224-011-000-230G/X	230.0	No	1/2	Optional
224-011-000-240G/X	240.0	No	1/2	Optional
224-011-000-250G/X	250.0	No	1/2	Optional
224-011-010-251G/X	251.0	No	3	No
224-011-000-260G/X	260.0	No	1/2	Optional
224-011-000-270G/X	270.0	No	1/2	Optional
224-011-020-279G/X	279.0	No	2	No
224-011-000-280G/X	280.0	No	1/2	Optional
224-011-000-290G/X*	290.0	No	1/2	Optional
224-011-020-292G/X	292.0	No	2	No
224-011-000-300G/X	300.0	No	1/2	Optional
224-011-000-310G/X	310.0	No	1/2	Optional
224-011-010-311G/X	311.0	No	3	No
224-011-000-320G/X*	320.0	No	1/2	Optional
224-011-000-330G/X*	330.0	No	1/2	Optional
224-011-000-340G/X	340.0	No	1/2	Optional
224-011-010-341G/X*	341.5	No	3	No
224-011-010-345G/X*	345.0	No	3	No
224-011-000-350G/X	350.0	No	1/2	Optional
224-011-000-360G/X*	360.0	No	1/2	Optional
224-011-000-370G/X	370.0	No	1/2	Optional
224-011-010-372G/X	372.0	No	3	No
224-011-020-372G/X	372.0	No	2	No
224-011-000-380G/X	380.0	No	1/2	Optional
224-011-000-390G/X*	390.0	No	1/2	Optional
224-011-000-400G/X	400.0	No	1/2	Optional
224-011-010-404G/X	404.0	No	3	No
224-011-010-433G/X	433.0	No	3	No
224-011-110-442G/X	442.0	Yes	3	No
224-011-000-450G/X	450.0	No	1/2	Optional
224-011-010-463G/X	463.0	No	3	No
224-011-010-478G/X	478.0	No	3	No
224-011-110-498G/X	498.0	Yes	3	No
224-011-000-500G/X	500.0	No	1/2	Optional
224-011-022-521G/X*	521.0	No	2	ja
224-011-000-550G/X	550.0	No	1/2	Optional
224-011-010-590G/X	590.0	No	3	No
224-011-022-590G/X	590.0	No	2	ja
224-011-120-596G/X	596.0	Yes	2	No
224-011-000-600G/X	600.0	No	1/2	Optional
224-011-010-613G/X*	613.5	No	3	No
224-011-110-634G/X	634.0	Yes	3	No
224-011-000-650G/X*	650.0	No	1/2	Optional
224-011-110-650G/X	650.0	Yes	3	No

Part Number	H [mm]	Support spring	Electrical connection**	Ground connection
224-011-110-664G/X	664.0	Yes	3	No
224-011-010-691G/X	691.5	No	3	No
224-011-000-700G/X	700.0	No	1/2	Optional
224-011-000-750G/X*	750.0	No	1/2	Optional
224-011-010-786G/X	786.0	No	3	No
224-011-000-800G/X	800.0	No	1/2	Optional
224-011-110-810G/X	810.0	Yes	3	No
* Supplied on request – limited availability				
** 1 Terminal nut, 2 Blade connector, 3 Hexagonal nut				

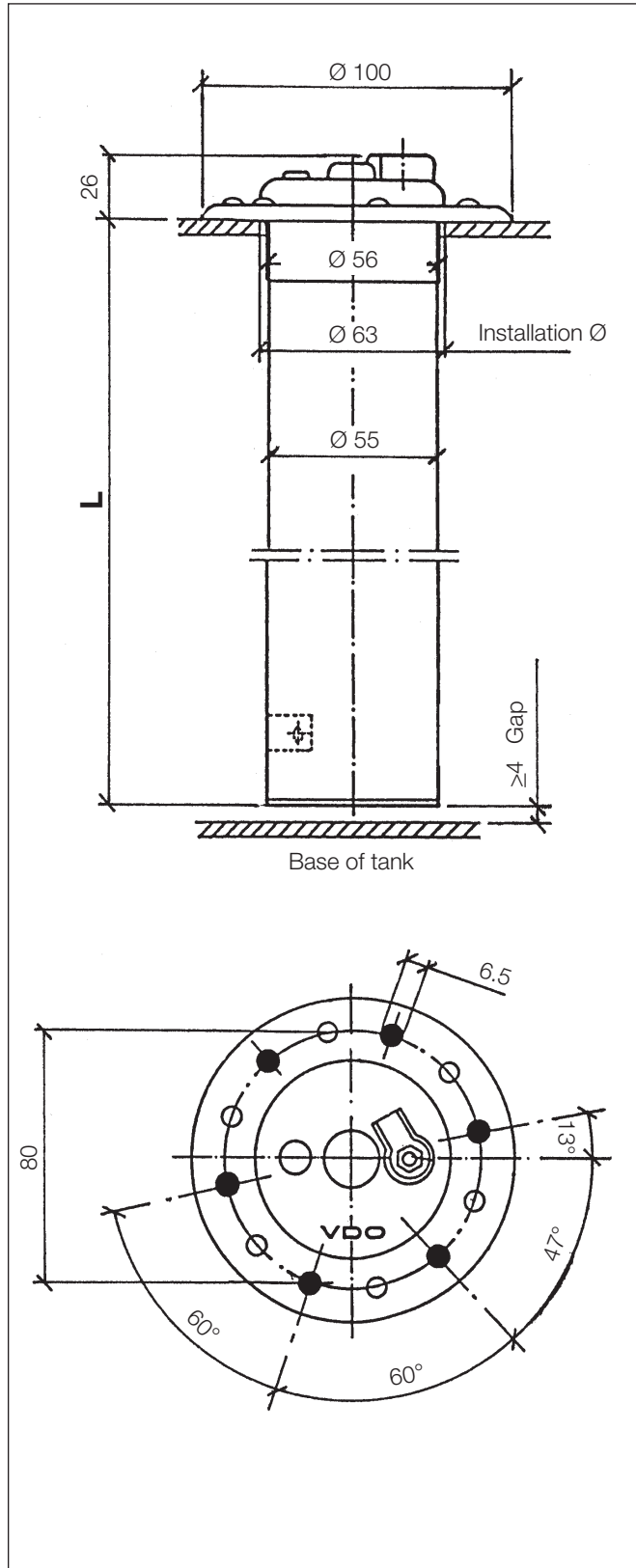
Accessories

Part Number	Description
890-225-012	Seal (Cork Rubber) Ø 66.5 x 4.5 mm
2-250-234	Seal (Cork) Ø 66.5 x 4.5 mm
2-251-243	Seal (Rubber) Ø 65.0 x 2.7 mm
2-250-264-1241	Flange, zinc plated, blue passivated

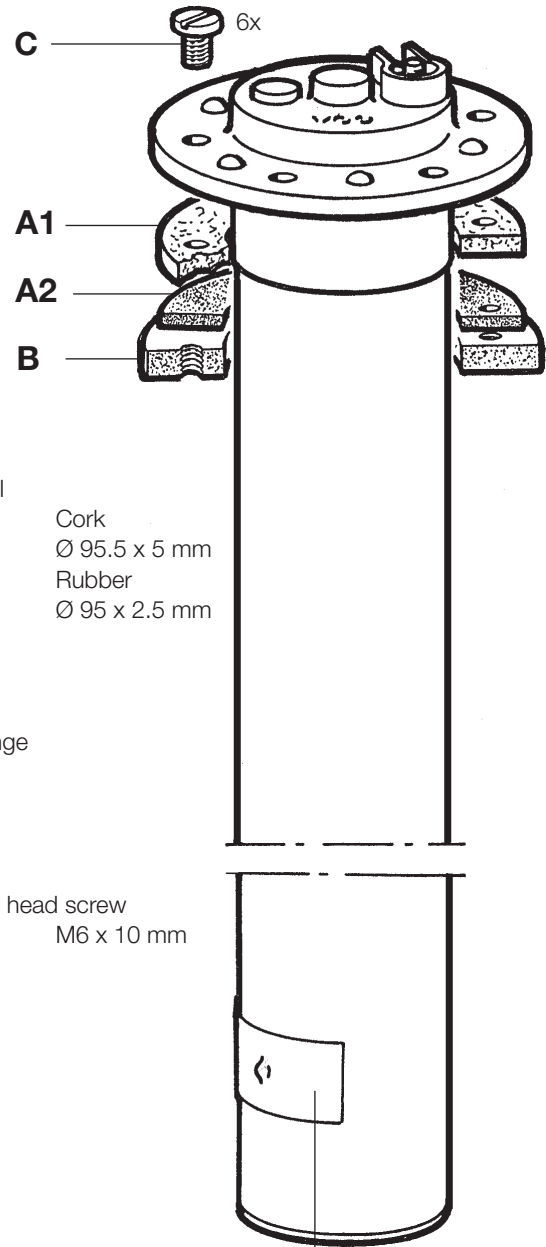
3.1.2 Fuel Level Senders, Tubular Type | Tubular Fuel Level Sender, Metal, Robust

Flange bolt hole circle \varnothing 80 mm

Dimensions [mm]

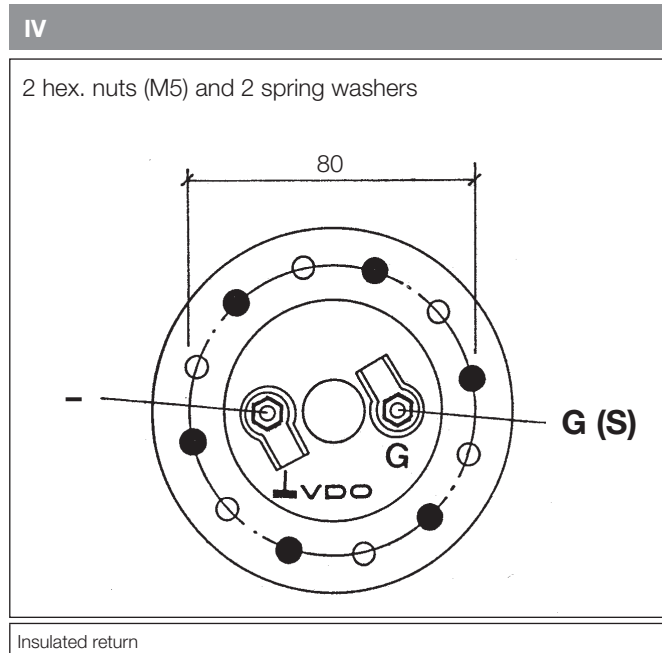
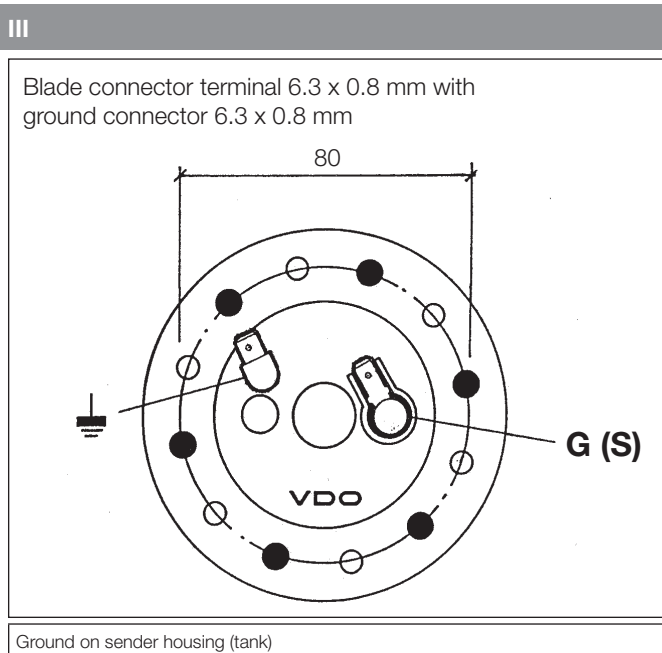
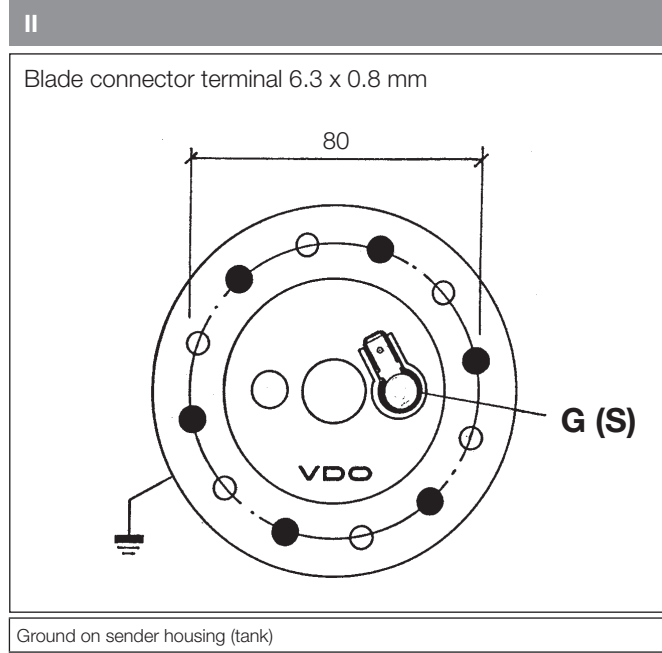
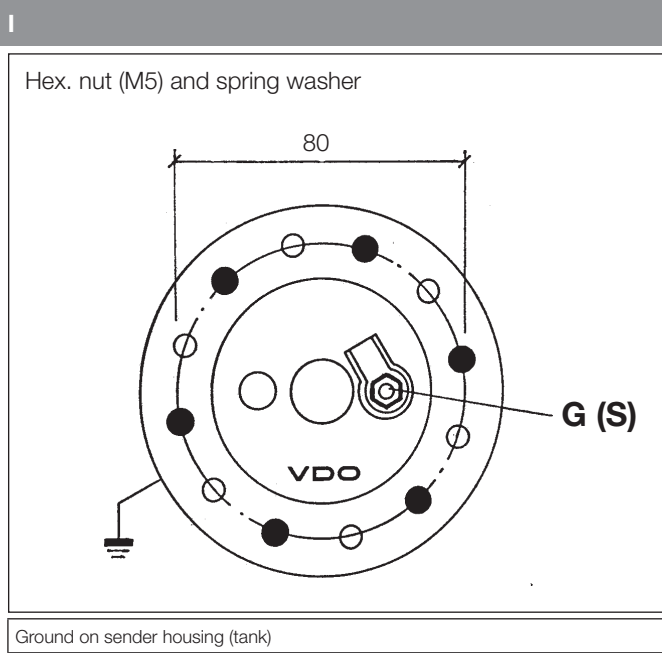


Special features:
(not included as standard)



- A** Seal
- A1** Cork
 $\varnothing 95.5 \times 5$ mm
- A2** Rubber
 $\varnothing 95 \times 2.5$ mm
- B** Flange
- C** Pan head screw
M6 x 10 mm

Remove adhesive strip and pin prior to installation



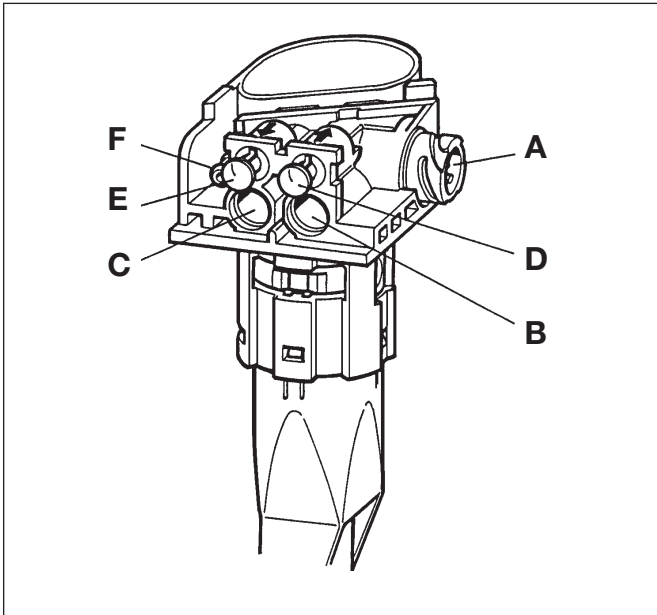
Part Number	Installation depth L [mm]	Resistance / float limit stop		Type	Special feature
		Top [Ω]	Bottom [Ω]		
X10-224-014-032	281	1.5 \pm 0.4	50.8 \pm 1.2	III	A2
X10-224-014-031	326	1.5 \pm 0.4	59.4 \pm 1.2	III	A2
X10-224-014-030	380	2.2 \pm 0.4	88.5 \pm 1.8	III	A2
X10-224-014-021	426	1.5 \pm 0.4	78.4 \pm 1.6	II	A2
X10-224-014-040	440	1.5 \pm 0.4	81.1 \pm 1.8	III	A2
X10-224-014-033	451	1.5 \pm 0.7	83.1 \pm 2.5	III	A2
X10-224-014-036	500	1.0 \pm 0.4	63.3 \pm 1.4	III	A2
X10-224-009-037	536	0.8 \pm 0.4	67.2 \pm 1.4	I	–
X10-224-021-001	536	1.0 \pm 0.4	67.9 \pm 1.4	IV	A1
X10-224-009-053	551	0.8 \pm 0.4	69.3 \pm 1.4	I	A1
X10-224-009-039	596	1.3 \pm 0.4	75.0 \pm 1.6	I	A2
X10-224-021-002	596	1.0 \pm 0.4	75.7 \pm 1.6	IV	A1
X10-224-009-052	601	0.8 \pm 0.4	75.7 \pm 1.6	I	A2
X10-224-014-022	616	1.0 \pm 0.4	78.3 \pm 1.6	II	A2
X10-224-009-048	641	0.8 \pm 0.4	81.0 \pm 1.8	I	A1
X10-224-014-014	671	0.7 \pm 0.4	59.2 \pm 1.3	II	A2
X10-224-009-045	681	0.8 \pm 0.7	86.0 \pm 2.7	I	–
X10-224-014-002	686	0.8 \pm 0.4	86.7 \pm 1.8	III	–
X10-224-009-016	716	0.6 \pm 0.4	69.7 \pm 1.4	I	A2, B
X10-224-009-029	741	0.5 \pm 0.4	65.0 \pm 1.4	I	A2, B, C
X10-224-014-047	741	1.0 \pm 0.4	94.6 \pm 2.0	III	–
X10-224-009-019	781	0.5 \pm 0.4	68.7 \pm 1.4	I	A2
X10-224-021-004	803	0.7 \pm 0.4	71.1 \pm 1.6	IV	A1
X10-224-009-026	831	0.6 \pm 0.4	82.8 \pm 1.8	I	A2, B, C
X10-224-021-006	846	0.7 \pm 0.4	75.0 \pm 1.6	IV	A1
X10-224-014-003	881	0.7 \pm 0.4	78.0 \pm 1.6	II	–
X10-224-014-011	916	0.7 \pm 0.4	81.2 \pm 1.8	II	A2
X10-224-009-057	946	0.7 \pm 0.4	83.9 \pm 1.8	I	A1
X10-224-014-023	946	0.7 \pm 0.7	83.9 \pm 2.5	II	A1
X10-224-014-015	996	0.5 \pm 0.4	59.0 \pm 1.2	II	A2
X10-224-009-022	1,001	0.5 \pm 0.4	88.4 \pm 1.8	I	A2, B, C
X10-224-009-021	1,045	0.5 \pm 0.4	92.5 \pm 2.0	I	A2, B, C
X10-224-021-005	1,045	0.7 \pm 0.4	92.9 \pm 2.0	IV	A1
X10-224-009-040	1,086	0.4 \pm 0.4	64.0 \pm 1.4	I	A2, B
X10-224-014-044	1,250	0.5 \pm 0.4	74.2 \pm 1.6	II	A2
X10-224-009-072	1,387	0.5 \pm 0.4	82.4 \pm 1.8	I	A2, B, C

Technical data	
Rated voltage	6–24 V
Operating temperature	-25 °C to +70 °C
Installation from above	

Accessories

Part Number	Description
2-251-006	Seal (Cork) \varnothing 95.5 x 5.0 mm
2-251-016	Seal (Rubber) \varnothing 95.0 x 2.5 mm
11-591-001-1401	Flange, brass plated

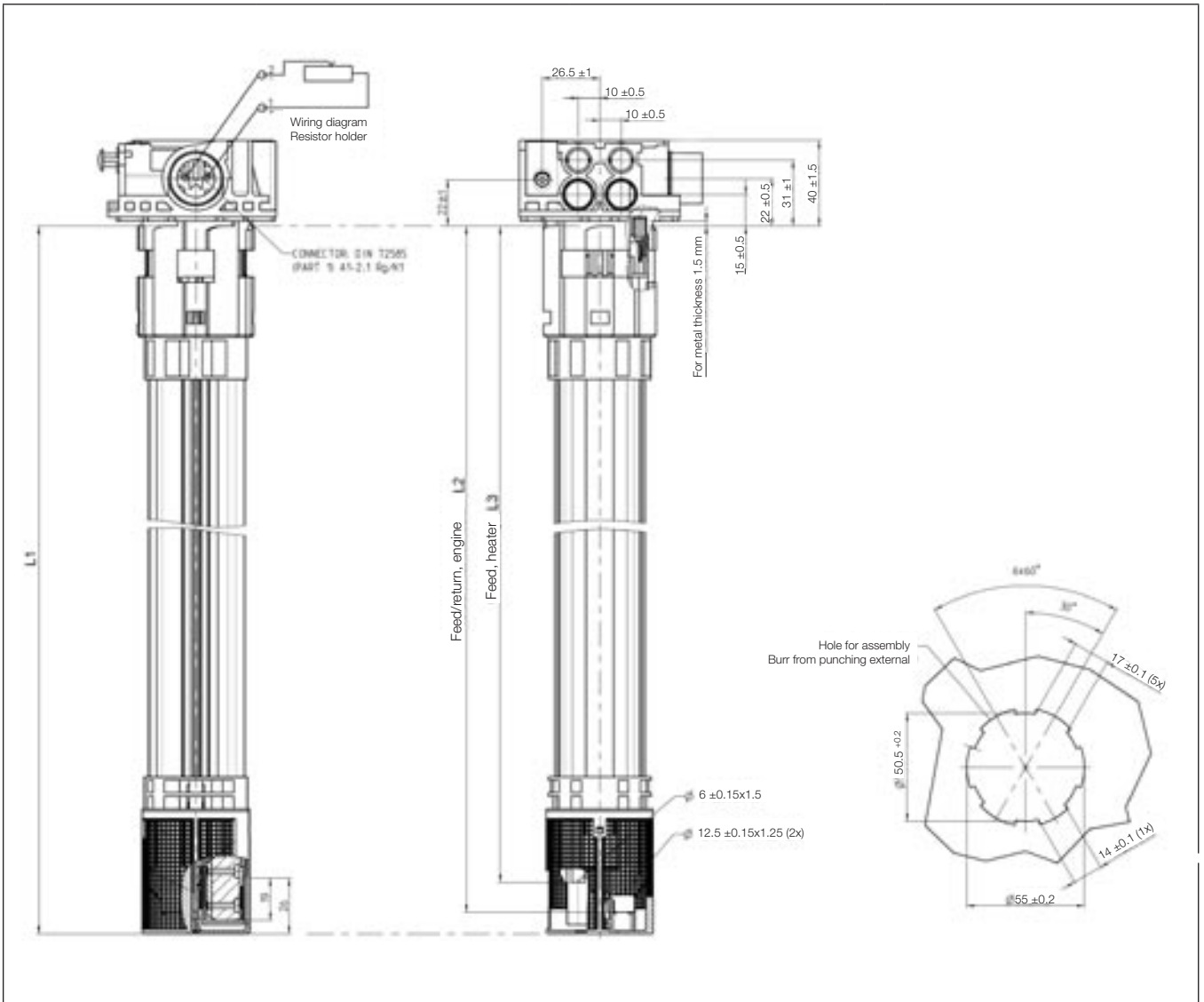
3.1.3 Fuel Level Senders, Tubular Type | **Tubular Fuel Level Sender, Plastic**



Technical data	
Rated voltage	6–24 V (insulated return)
Resistance	3 Ω (empty) to 180 Ω (full)
Current	20 mA to 120 mA
Operating temperature	-30 °C to +70 °C
Air inlet and outlet valves	Positive pressure up to 200 mbar corresponds to flow rate of less than 25 g/min diesel fuel. Positive pressure greater than 300 mbar corresponds to flow rate of more than 25 g/min diesel fuel. Negative pressure of 10–20 mbar corresponds to flow rate of more than 1.75
Service life	1 million full/empty cycles in super unleaded fuel
Vibration test	20 to 50 Hz PSD = 0.03 g ² /Hz 50 to 1,000 Hz PSD = -6 dB/oct 8 h / axial direction
Material	Flange, sender body, float: POM-C Float lever arm: X12CrNi 177k Tube: PA11 or PA12

Connectors	
A	Bayonet connector, DIN 72585 (A1-2.1RG/K1)
B	Outlet
C	Inlet
D	External heater outlet or pressure equalization with another tank
E	External heater inlet
F	Air outlet via valve

Dimensions [mm]



Part Number	Overall length L1	Length to inlet tube, L2	Length to heating tube, L3
	[mm]	[mm]	[mm]
A2C59510128	455 ± 2	446 ^{+2.5} _{-3.5}	432 ^{+2.5} _{-3.5}
A2C59510129	544 ± 2	535 ^{+2.5} _{-3.5}	519 ^{+2.5} _{-3.5}
A2C59510130	672 ± 2	663 ^{+2.5} _{-3.5}	654 ^{+2.5} _{-3.5}

Full: 180 Ω ± 3.7 Ω, empty: 3 Ω ± 1.05 Ω



Fuel Level Senders, Lever-Arm Type

3.2.1 Lever-Arm Fuel Level Sender, Plastic

3.2.2 Adjustable Lever-Arm Fuel Level Sender,
Standard / ALAS I

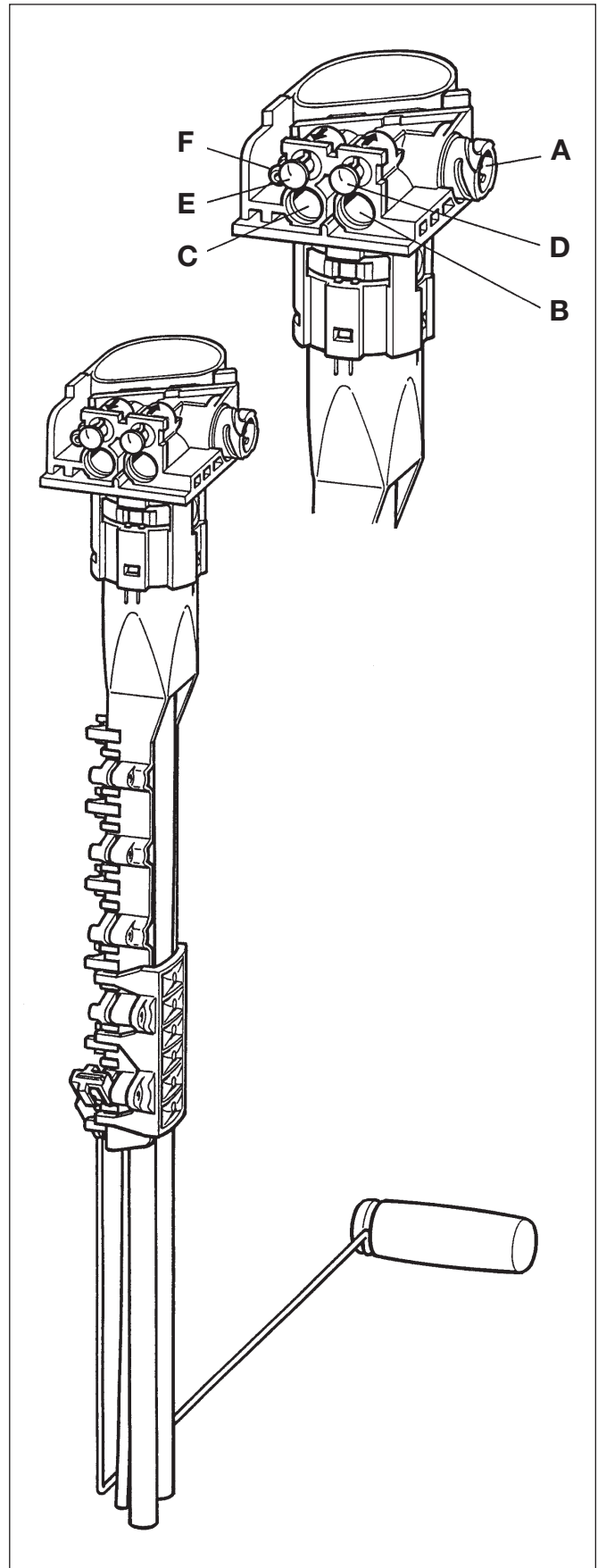
3.2.3 Adjustable Lever-Arm Fuel Level Sender,
ALAS II

3.2.1 Fuel Level Senders, Lever-Arm Type | **Lever-Arm Fuel Level Sender, Plastic**

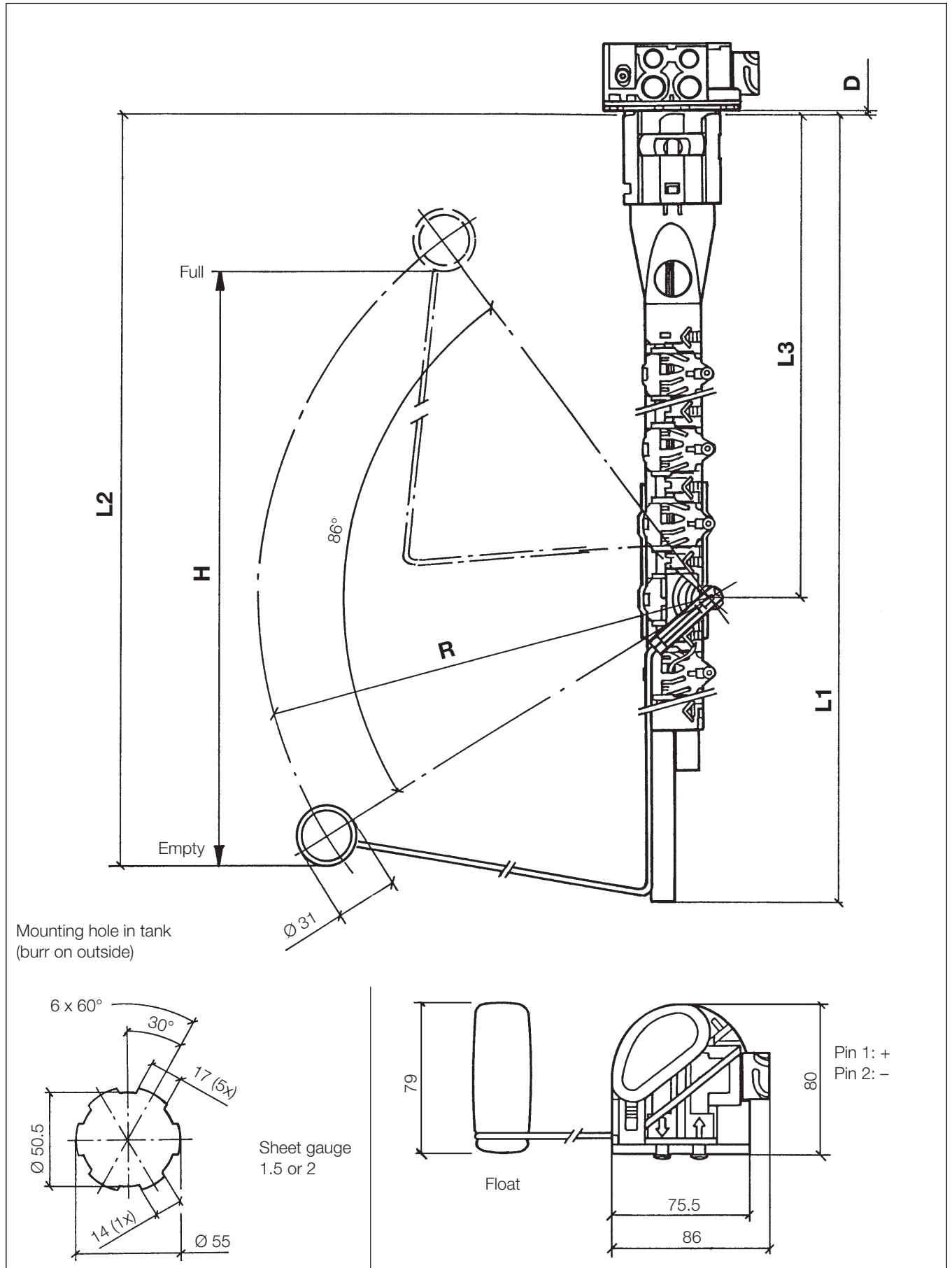


Technical data	
Rated voltage	6–24 V (insulated return)
Resistance	3 Ω (empty) to 180 Ω (full)
Current	20 mA to 120 mA
Operating temperature	-30 °C to +70 °C
Air inlet and outlet valves	Positive pressure up to 200 mbar corresponds to flow rate of less than 25 g/min diesel fuel. Positive pressure greater than 300 mbar corresponds to flow rate of more than 25 g/min diesel fuel. Negative pressure of 10–20 mbar corresponds to flow rate of more than 1.75 l/h diesel fuel.
Service life	1 million full/empty cycles in diesel fuel
Vibration test	20 to 50 Hz PSD = 0.03 g ² /Hz 50 bis 1,000 Hz PSD = -6 dB/oct 8 h / axial direction
Material	Flange, sender body, float: POM-C Float lever arm: X10CrNi 18-8 Tube: PA11 or PA12

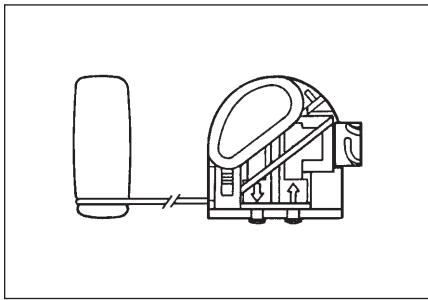
Connectors	
A	Bayonet connector, DIN 72585 (A1-2.1RG/K1)
B	Outlet
C	Inlet
D	External heater outlet or pressure equalization with another tank
E	External heater inlet
F	Air outlet via valve



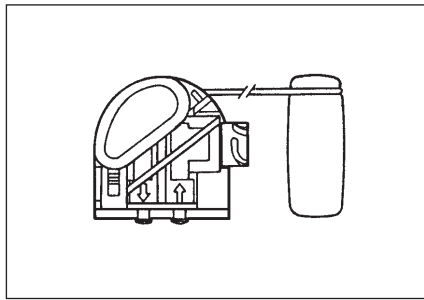
Dimensions [mm]



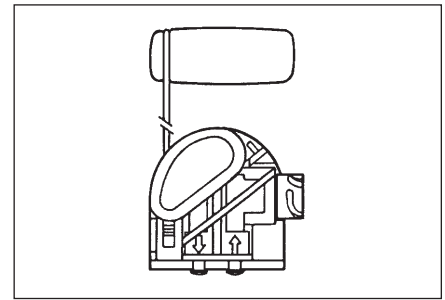
Version 1



Version 2



Version 3

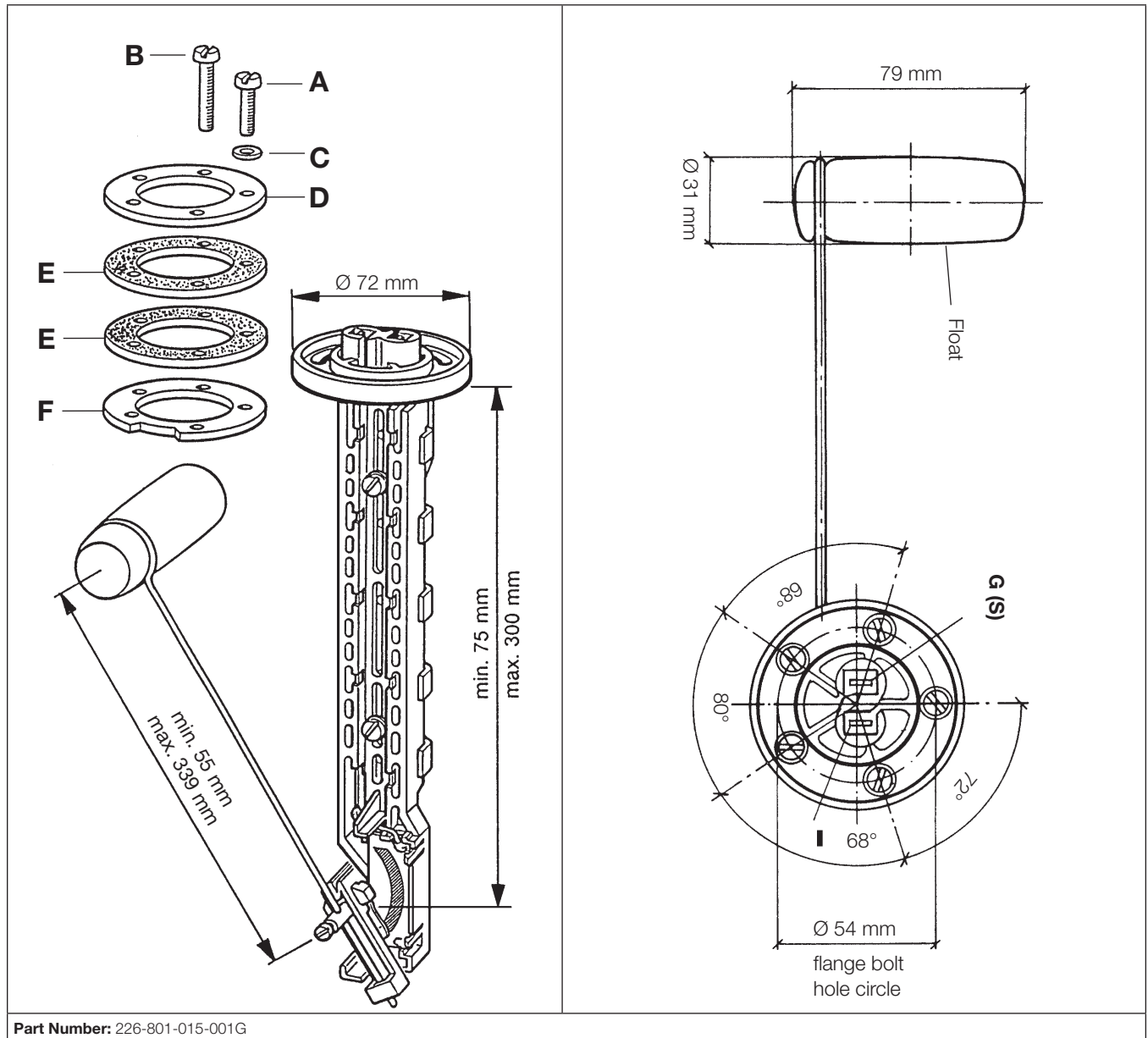


Part Number	Dimensions [mm]						Version
	L1	L2	L3	R	H	D	
	Depth required for installation Length to bottom edge of vacuum tube	Length to bottom edge of float	Length to lever pivot point	Lever arm radius excl. float	Stroke empty-full	Sheet gauge	
221-824-054-049C	405	393	274	238	310	1.5	2
221-824-054-050C	450	402	232	269	363	1.5	1
221-824-054-051C	492	482	190	325	430	1.5	3
221-824-054-056C	535	537	232	374	506	1.5	3
221-824-054-053C	568	485	274	311	423	2.0	1
221-824-054-052C	611	568	316	385	523	2.0	3
221-824-054-054C	670	625	316	418	570	1.5	3
221-824-054-055C	670	670	316	463	630	1.5	3
221-824-054-065C	611	568	316	385	523	2.0	1

Part Number	Accessories	Units per pack
89-356-017	O-ring (seal)	100
X11-221-001-002	Inlet/outlet connector	20
X11-221-001-003	Locking mechanism for inlet/outlet or external heater	10
X11-221-001-004	External heater connector	20
Standard	Electrical connector for bayonet connector DIN 72585 A1-2.1 SN/K1	

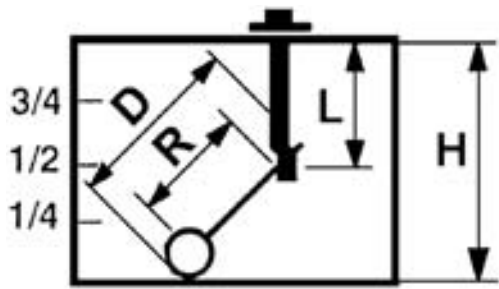
3.2.2 Fuel Level Senders, Lever-Arm Type | Adjustable Lever-Arm Fuel Level Sender, Standard/ALAS I

Standard adjustable lever arm sender with adjustable flange

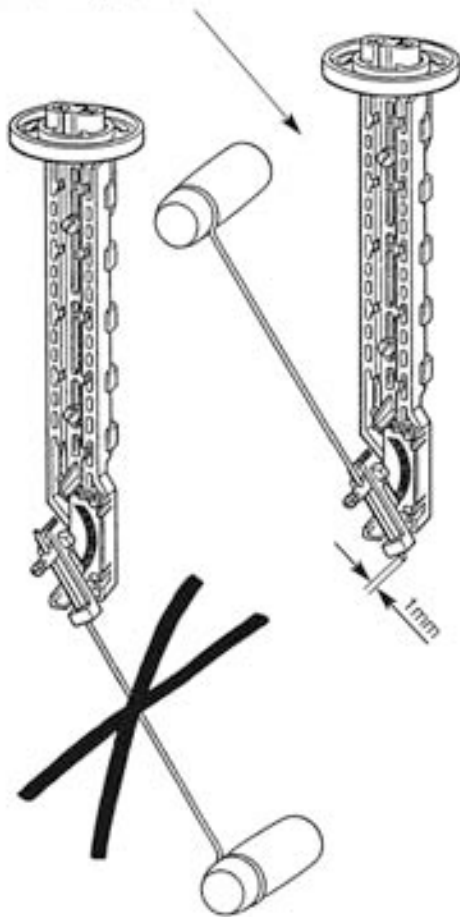


Part Number: 226-801-015-001G

Technical data	
Rated voltage	6–24 V (insulated return)
Resistance	Empty 3 Ω ± 1.5 Ω Full 180 Ω ± 12 Ω
Operating temperature	-20 °C to +65 °C
Blade connector terminal (2-way)	6.3 mm x 0.8 mm
Tank flange	A Screw M5 x 15 (4x) B Screw M5 x 30 (1x) C Sealing washer (5x) D Flange (1x) E Rubber seal (2x) F Slotted flange (1x)
For dual units (identifier "D")	N02-240-106



Lever mounting position:



H	L	R	D	H	L	R	D
150	75	55	109	380	190	199	253
155	77.5	58	112	385	192.5	202	256
160	80	61	115	390	195	205	259
165	82.5	64	118	395	197.5	208	262
170	85	67	121	400	200	211	265
175	87.5	70	124	405	202.5	214	268
180	90	73	127	410	205	217	271
185	92.5	76	130	415	207.5	220	274
190	95	80	134	420	210	224	278
195	97.5	83	137	425	212.5	227	281
200	100	86	140	430	215	230	284
205	102.5	89	143	435	217.5	232	286
210	105	92	146	440	220	235	289
215	107.5	95	149	445	222.5	238	292
220	110	98	152	450	225	242	296
225	112.5	101	155	455	227.5	245	299
230	115	105	159	460	230	249	303
235	117.5	108	162	465	232.5	252	306
240	120	111	165	470	235	255	309
245	122.5	114	168	475	237.5	258	312
250	125	118	172	480	240	261	315
255	127.5	121	175	485	242.5	264	318
260	130	124	178	490	245	267	321
265	132.5	127	181	495	247.5	271	325
270	135	130	184	500	250	274	328
275	137.5	133	187	505	252.5	277	331
280	140	136	190	510	255	280	334
285	142.5	139	193	515	257.5	283	337
290	145	142	196	520	260	286	340
295	147.5	145	199	525	262.5	289	343
300	150	148	202	530	265	292	346
305	152.5	152	206	535	267.5	296	350
310	155	155	209	540	270	299	353
315	157.5	158	212	545	272.5	302	356
320	160	161	215	550	275	305	359
325	162.5	164	218	555	277.5	308	362
330	165	167	221	560	280	311	365
335	167.5	170	224	565	282.5	314	368
340	170	173	227	570	285	317	371
345	172.5	177	231	575	287.5	321	375
350	175	180	234	580	290	324	378
355	177.5	183	237	585	292.5	327	381
360	180	186	240	590	295	330	384
365	182.5	189	243	595	297.5	333	387
370	185	192	246	600	300	336	390
375	187.5	195	249	605	302.5	339	393

Adjustment

Adjust the length (L) of the sender unit and the distance (D) of the lever arm according to the height (H) of the fuel tank.

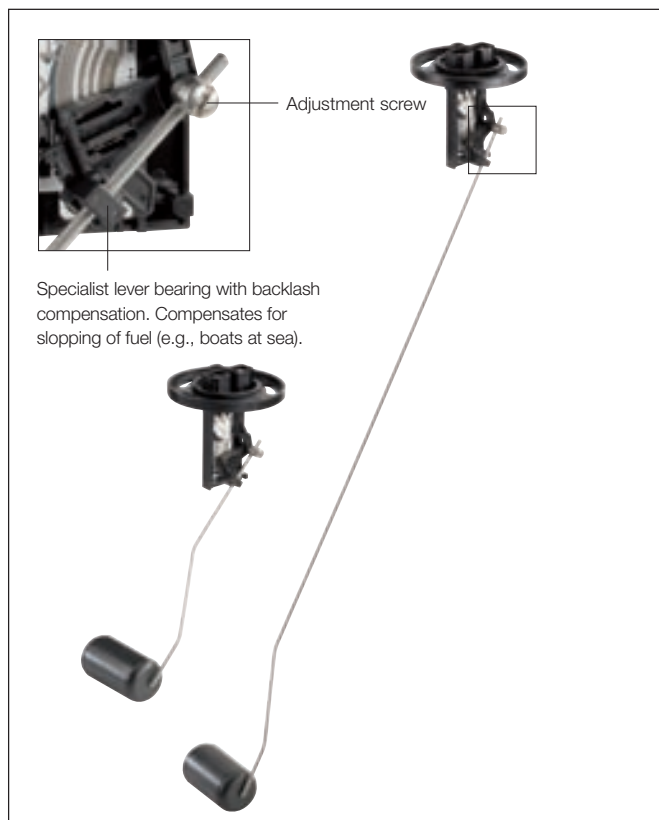
A new generation of lever-arm senders

Our new, specially developed lever-arm fuel senders now offer our customers an extremely flexible and robust way of ensuring reliable fuel measurement for various tank depths.

The system is based on a lever arm, which generates a signal corresponding to the current fuel level. The length of the lever arm can be adapted to specific requirements and shortened as needed. This makes it possible to equip various tank depths (145 mm to 400 mm) using just one system – something that is particularly advantageous with shallow tanks.

Two versions of the adjustable lever-arm fuel level sender are available, with and without a warning contact. The integrated warning contact version generates an additional control signal when the fuel level in the tank falls to a pre-defined level, which can be used to trigger an external reserve level indicator, for example. A specialized bearing with many years of proven marine use allows the lever arm to compensate for slopping of fuel in the tank. This reliable, rugged design delivers high accuracy read outs and is now available for a wide range of alternative applications, from small machines through agricultural vehicles to large stationary machines.

ALAS I



Flexible adjustment for tank depths from 145 to 400 mm.

Wide range of applications

- Small engines and construction machines (mini-excavators, dumpers, compressors, etc.)
- Processing and agricultural machinery
- Marine applications (sports and leisure boats, jet skis, etc.)
- Two-wheeled vehicles (motorcycles, scooters, etc.)
- Micro cars, quad bikes
- Stationary machines (mini-excavators, dumpers, compressors, etc.)

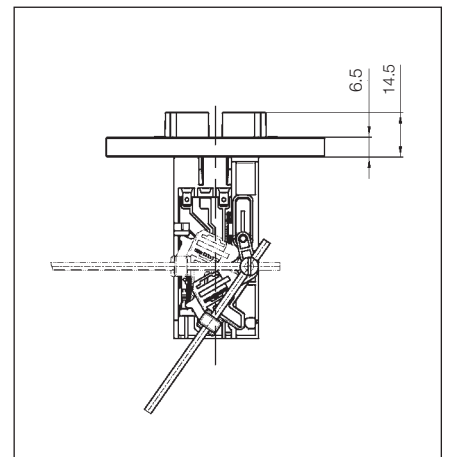
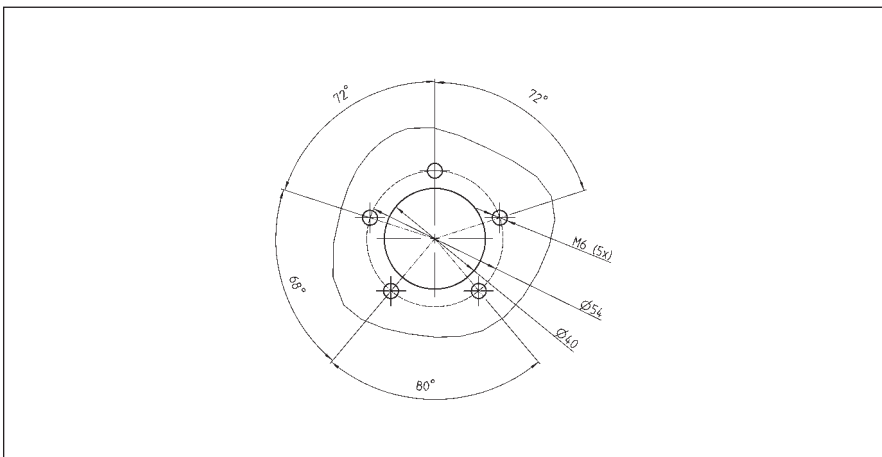
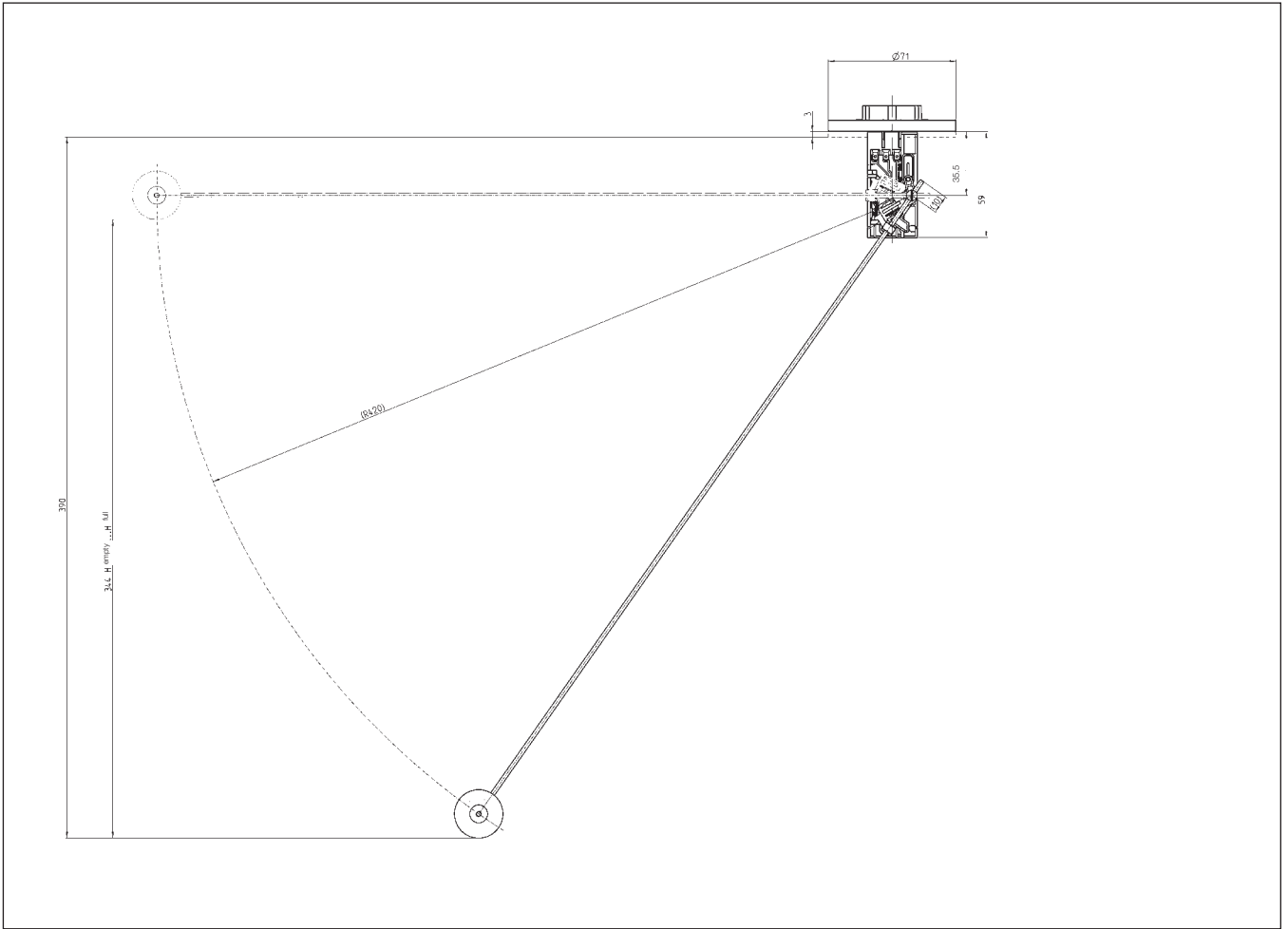


Mounting kit (available separately, not included as standard)

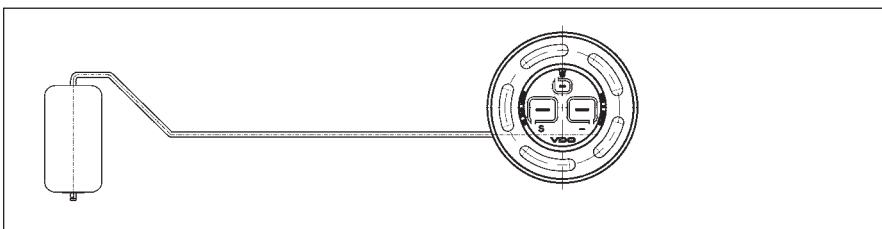
Benefits

- Adjustable lever-arm fuel-level sender
- Available with and without warning contact
- Ø 54 mm – standard flange
- 3 different resistance ranges (DSN thick-film technology) for use with standard gauges (alternative resistance ranges can be defined according to specific customer requirements)
- Straightforward adaptation to different tank depths thanks to easily adjusted lever arm
- Rugged design
- Long service life, redundant contact system
- All metal construction in stainless steel
- Nitrile rubber float – will not sink if damaged
- Electrical connections protected by connector housings
- Elongated holes for flexible installation
- Lever bearing with backlash compensation guarantees extended service life, continuously compensating for wave action affecting boats, for example
- Longlife resistive element (1 million “full/empty” cycles with super unleaded fuel)

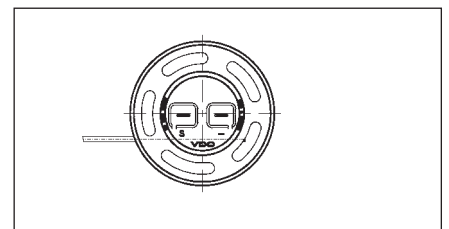
Dimensions [mm]



With warning contact



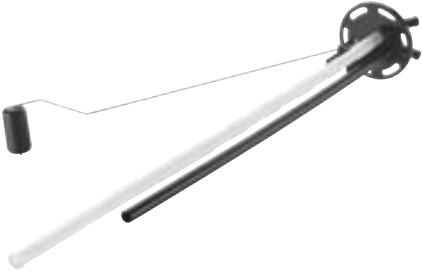

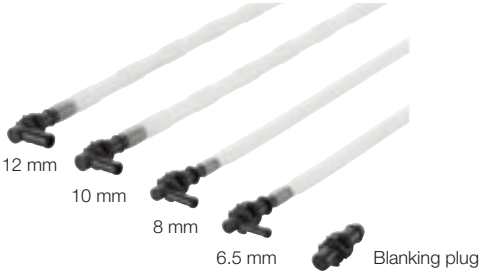
Without warning contact



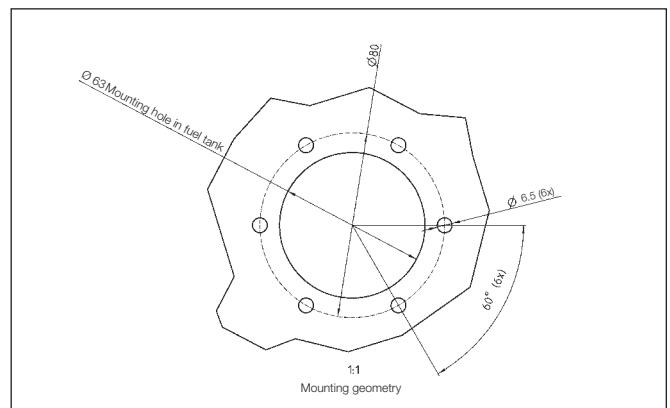
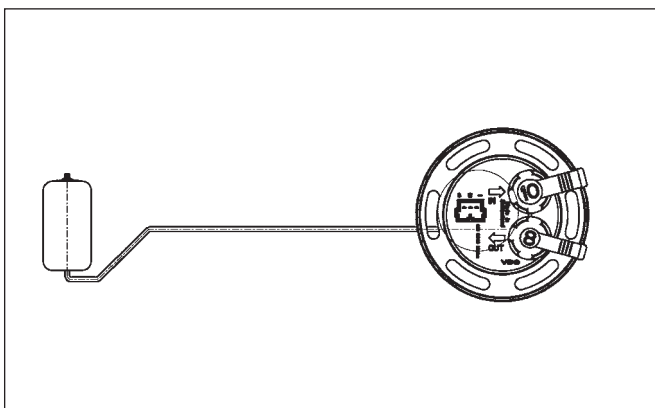
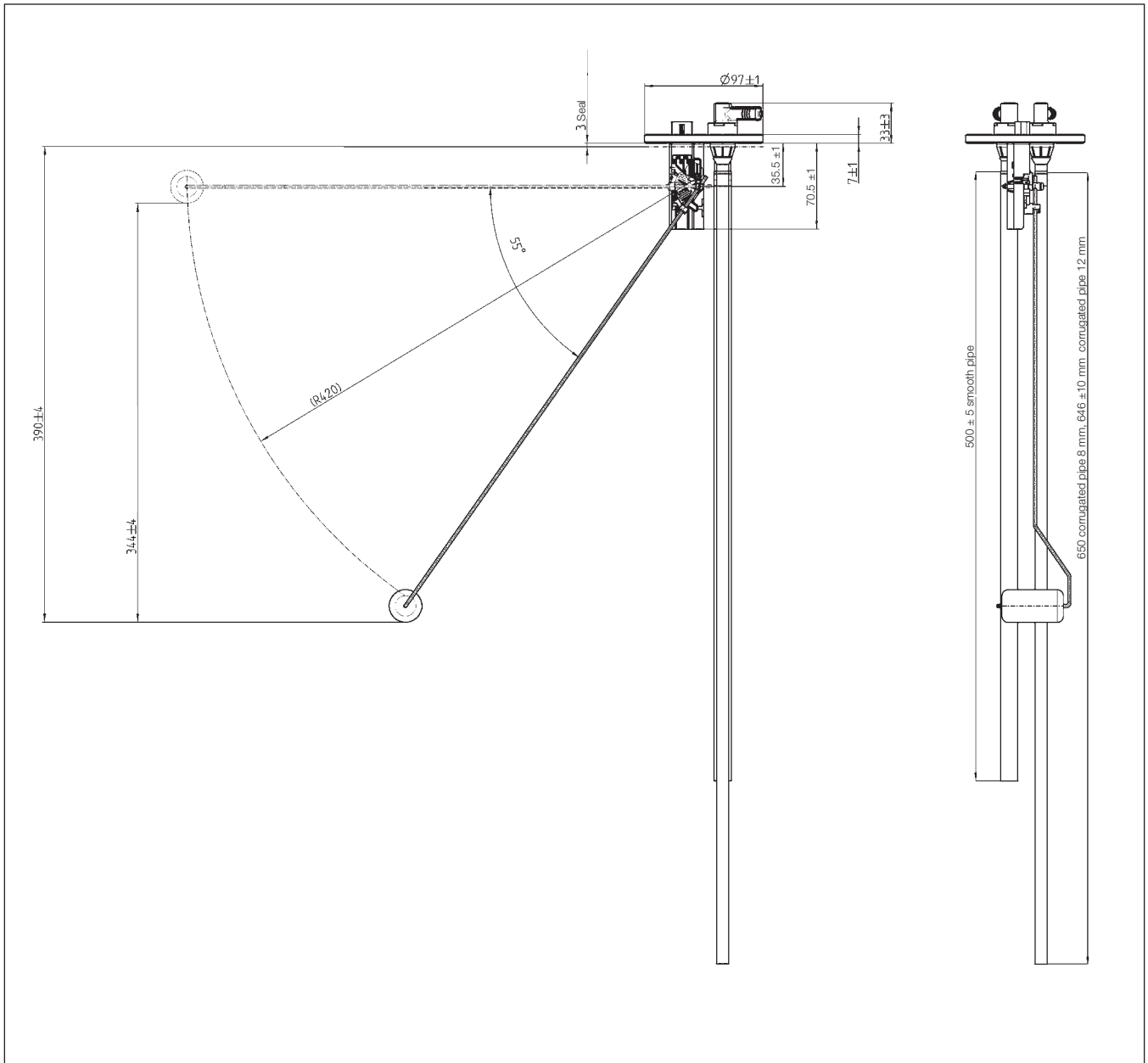
ALAS I characteristics (full-empty)	180-2.5 with warning contact	180-2.5 without warning contact	33.5-240 with warning contact	33.5-240 without warning contact	90-2 with warning contact	90-2 without warning contact
Order number, 1 unit/pack	A2C59510165	A2C59510171	A2C59510166	A2C59510172	A2C59510167	A2C59510173
Order number, 10 units/pack	A2C59510162	A2C59510168	A2C59510163	A2C59510169	A2C59510164	A2C59510170

Technical data	
Tank depth	For tank depths from 145 to 400 mm
Rated voltage	6–24 V, insulated return
Resistance ranges	<ul style="list-style-type: none"> • 3 Ω (empty) to 180 Ω (full) • 240 Ω (empty) to 33.5 Ω (full) • 2 Ω (empty) to 90 Ω (full) • Optional warning contact at 15% remaining volume • Measurement resolution of 39 discrete levels • Alternative resistance ranges can be defined according to specific customer requirements
Mounting geometry	5-hole flange with 54 mm diameter
Electrical connection	6.3 mm x 0.8 mm (2 x) 2.8 mm x 0.8 mm (1 x)* *Only on versions with warning contact

3.2.3 Fuel Level Senders, Lever-Arm Type | Adjustable Lever-Arm Fuel Level Sender, ALAS II

Item description	A2C5 number (packaging)	Contents
		
Adjustable lever-arm sender with inlet and outlet option, 180-2.5 ohms (generic, 10 units/pack)	A2C59510946	Sensor assy
Adjustable lever-arm sender with inlet and outlet option, 33.5-240 ohms (generic, 10 units/pack)	A2C59510973	Sensor assy
Adjustable lever-arm sender with inlet and outlet option, 90-2 ohms (generic, 10 units/pack)	A2C59510975	Sensor assy
Lever (generic, 10 per/pack), individually boxed with outer box	A2C59511479	Lever assy
		
Inlet, 12 mm (10 per/pack), individually boxed with outer box	A2C59510949	Connector assy
Inlet, 10 mm (10 per/pack), individually boxed with outer box	A2C59510951	Connector assy
Inlet, 8 mm (10 per/pack), individually boxed with outer box	A2C59510953	Connector assy
Inlet, 6.5 mm (10 per/pack), individually boxed with outer box	A2C59510955	Connector assy
		
Outlet, 12 mm (10 per/pack), individually boxed with outer box	A2C59510950	Connector assy
Outlet, 10 mm (10 per/pack), individually boxed with outer box	A2C59510952	Connector assy
Outlet, 8 mm (10 per/pack), individually boxed with outer box	A2C59510954	Connector assy
Outlet, 6.5 mm (10 per/pack), individually boxed with outer box	A2C59510956	Connector assy
Blanking plug (10 per/pack), multipack	A2C59510965	Blanking plug assy

Dimensions [mm]



4. Screen Washer Systems

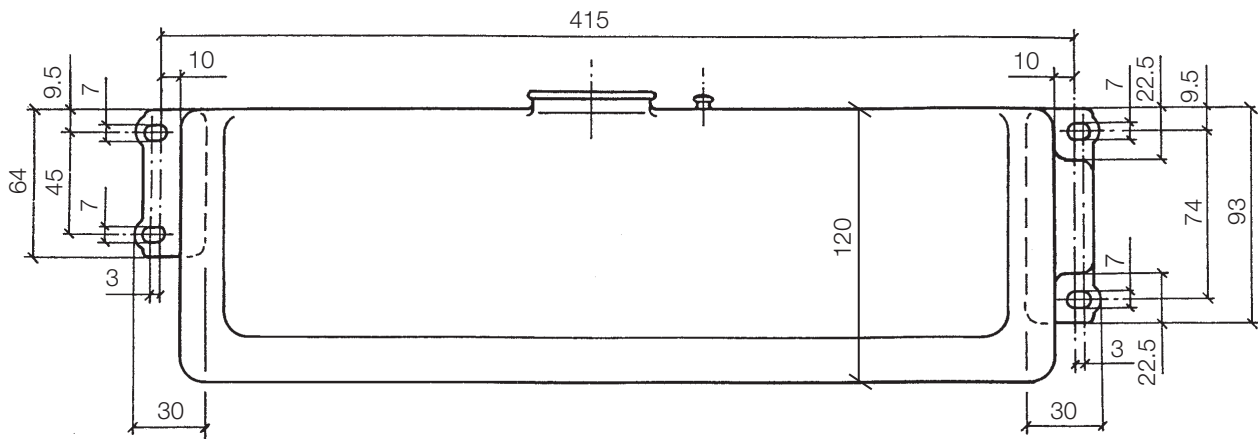
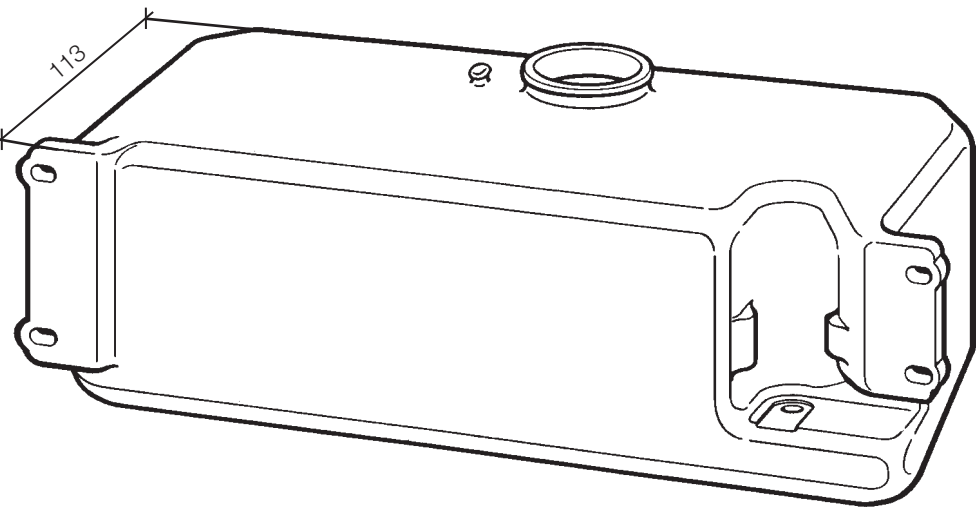


Screen Washer Systems

Container system, 4 liters

Comprises:

- 1 container, 4 l
- 1 container cap
- 1 bracket for container
- 1 filter
- 1 Mono Pump
or Dual Pump



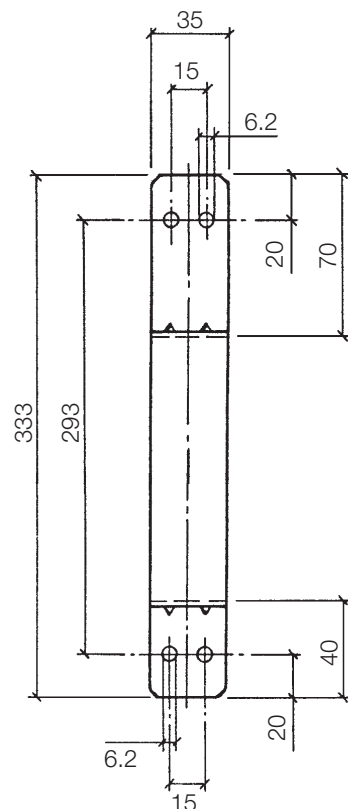
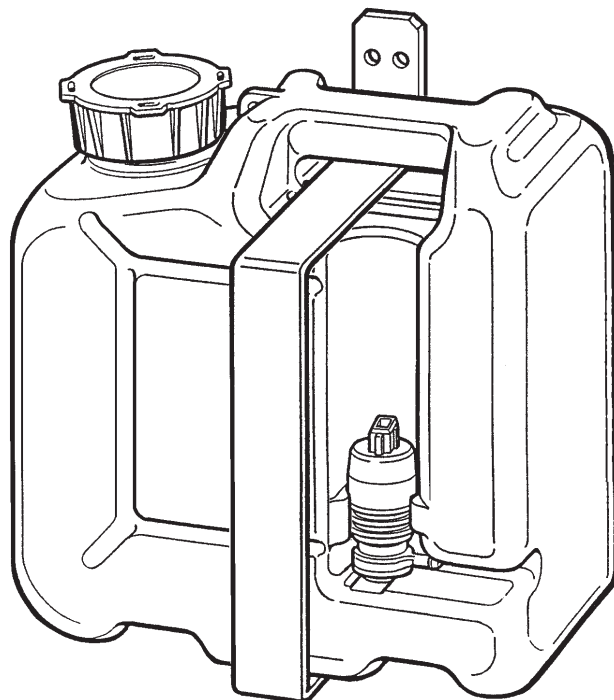
Part Number	Product	Units per pack
X10-246-001-012	VDO Mono Pump 12 V	6
X10-246-001-013	VDO Mono Pump 24 V	6
X10-246-001-014	VDO Dual Pump 12 V	6

Technical data	
Container	
Dimensions	120 x 442 x 113 mm
Volume	4 l
Material	Temperature resistant from -30 °C to +100 °C Weatherproof, ageing resistant
VDO Mono Pump 12 V	
Pressure	P = 2.2 bar
Flow rate	v = 2.0 l/min.
Current consumption	I max. = 4.5 A
VDO Mono Pump 24 V	
Pressure	P = 1.8 bar
Flow rate	v = 1.0 l/min.
Current consumption	I max. = 1.2 A
VDO Dual Pump 12 V	
Pressure	P = 2.1 bar
Flow rate	v = 2.0 l/min.
Current consumption	I max. = 4.5 A

Container system, 6 liters

Comprises:

- 1 container, 6 l
- 1 container cap
- 1 bracket for container
- 1 filter
- 1 Mono Pump
or Dual Pump



Part Number	Product	Units per pack
X10-246-001-015	VDO Mono Pump 12 V	10
X10-246-001-016	VDO Mono Pump 24 V	10
X10-246-001-017	VDO Dual Pump 12 V	10

Technical data	
Container	
Dimensions	270 x 270 x 130 mm
Volume	6 l
Material	Temperature resistant from -30 °C to +100 °C Weatherproof, ageing resistant
VDO Mono Pump 12 V	
Pressure	P = 2.2 bar
Flow rate	v = 2.0 l/min.
Current consumption	I max. = 4.5 A
VDO Mono Pump 24 V	
Pressure	P = 1.8 bar
Flow rate	v = 1.0 l/min.
Current consumption	I max. = 1.2 A
VDO Dual Pump 12 V	
Pressure	P = 2.1 bar
Flow rate	v = 2.0 l/min.
Current consumption	I max. = 4.5 A

5. Engine Management

5.1 Control Systems*

- 5.1.1 Pedal Interface II
- 5.1.2 AGB III
- 5.1.3 E-Gas® Compact**

5.2 Electromechanical Components

- 5.2.1 Pedals
 - 5.2.1.a Floor-Mounted Pedal
 - 5.2.1.b Suspended Pedal
 - 5.2.1.c Customer-Specific Solutions
- 5.2.2 Hand-Operated Accelerators and Pedal Sensors
- 5.2.3 Set Point Sender
- 5.2.4 Actuators

* Only for trained partners
** Only available for series
production applications
on request



Control Systems*

* Only for trained partners
** On request

5.1.1 Pedal Interface II

5.1.2 AGB III

5.1.3 E-Gas® Compact**

* Only for trained partners

5.1.1 Control Systems* | Pedal Interface II

Universal systems

Description	System		
	Standard	Enhanced	Premium

Components, Type 1, 3 analog channel

Description	Standard	Enhanced	Premium
Electronic controller, Type 1 (tempostat®)	X		
Electronic controller, Type 1 (tempostat® + speed and rev limiter)		X	
Electronic controller, Type 1 (tempostat® + speed and rev limiter + engine speed control)			X
Installation kit	X	X	X
Wiring harness	X	X	X
Operating instructions	X	X	X

Components, Type 2, 2 analog channel plus idle validation switch

Description	Standard	Enhanced	Premium
Electronic controller, Type 2 (tempostat®)	X		
Electronic controller, Type 2 (tempostat® + speed and rev limiter)		X	
Electronic controller, Type 2 (tempostat® + speed and rev limiter + engine speed control)			X
Installation kit	X	X	X
Wiring harness	X	X	X
Operating instructions	X	X	X

Components, Type 1 and Type 2

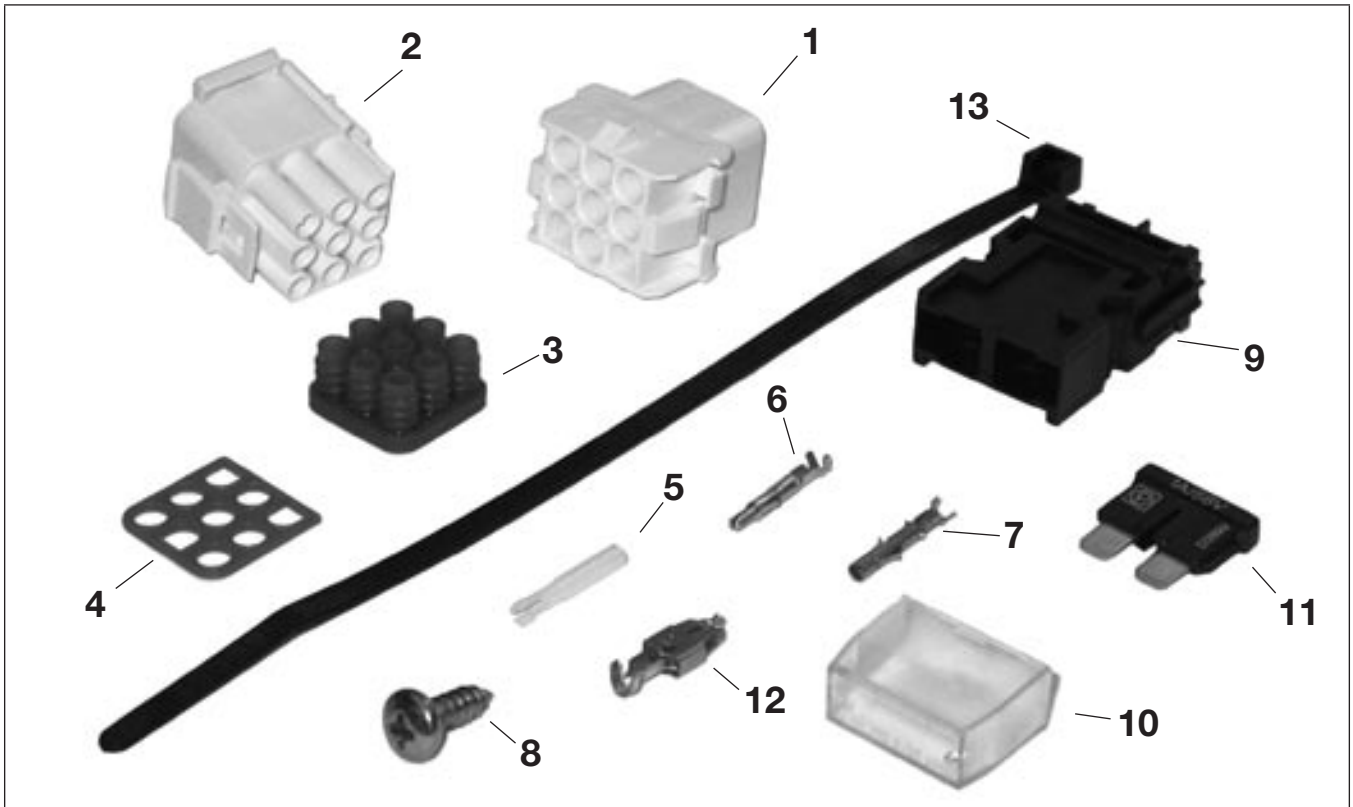
Part Number	Description	Type
X39-737-100-001	3-channel analog (tempostat®)	Type 1 Standard
X39-737-101-001	3-channel analog (tempostat® + speed and rev limiter)	Type 1 Enhanced
X39-737-102-001	3-channel analog (tempostat® + speed and rev limiter + engine speed controller)	Type 1 Premium
X39-737-200-001	2-channel analog + 2 switches (tempostat®)	Type 2 Standard
X39-737-201-001	2-channel analog + 2 switches (tempostat® + speed and rev limiter)	Type 2 Enhanced
X39-737-202-001	2-channel analog + 2 switches (tempostat® + speed and rev limiter + engine speed controller)	Type 2 Premium

Technical data	
Rated voltage	12 V / 24 V
Operating voltage	8–32 V
Current consumption	Tmnl. 15 < 1 mA; Tmnl. 30 < 80 mA (< 10 mA standby)
Operating temperature	-40 °C to +85 °C (IEC 68-2-38)

Test specifications	
Low and high temperature	<ul style="list-style-type: none"> • ISO 16750 Part 4, Section 5.1.1.2 and 5.1.2.2 • BS EN 60068-2: 1993 Test Ab • BS EN 60068-2: 1993 Test Bb
Random vibration test in temperature cycle	<ul style="list-style-type: none"> • ISO 16750-3: 2003 Electrical and electronic equipment – Mechanical loads • IEC 68-2-64: 1993, Vibration, broadband random: Method 2 • BS EN 60068-2-14: 2000 Test Nb, Environmental testing
Thermal shock	<ul style="list-style-type: none"> • ISO 16750 Part 4, Section 5.3.3 • BS EN 60068-2-14: 2000 Test Na
Temperature and humidity	<ul style="list-style-type: none"> • ISO 16750 Part 4, Section 5.6.2 • BS EN 60068-2-38: 1999
Temperature cycling	<ul style="list-style-type: none"> • ISO 16750 Part 4, Section 5.3.2 • BS EN 60068-2-14: 2000 Test Nb
Approval acc. to EU directives	Speed limitation devices 92/24 (Enhanced and Premium versions only) EMC 2006/96 EG
Official appointed expert	Tempostat functionality tested by a prescribed testing authority for the approval of motor vehicles and their systems, Germany

*Only for trained partners

Installation kit (replacement part)



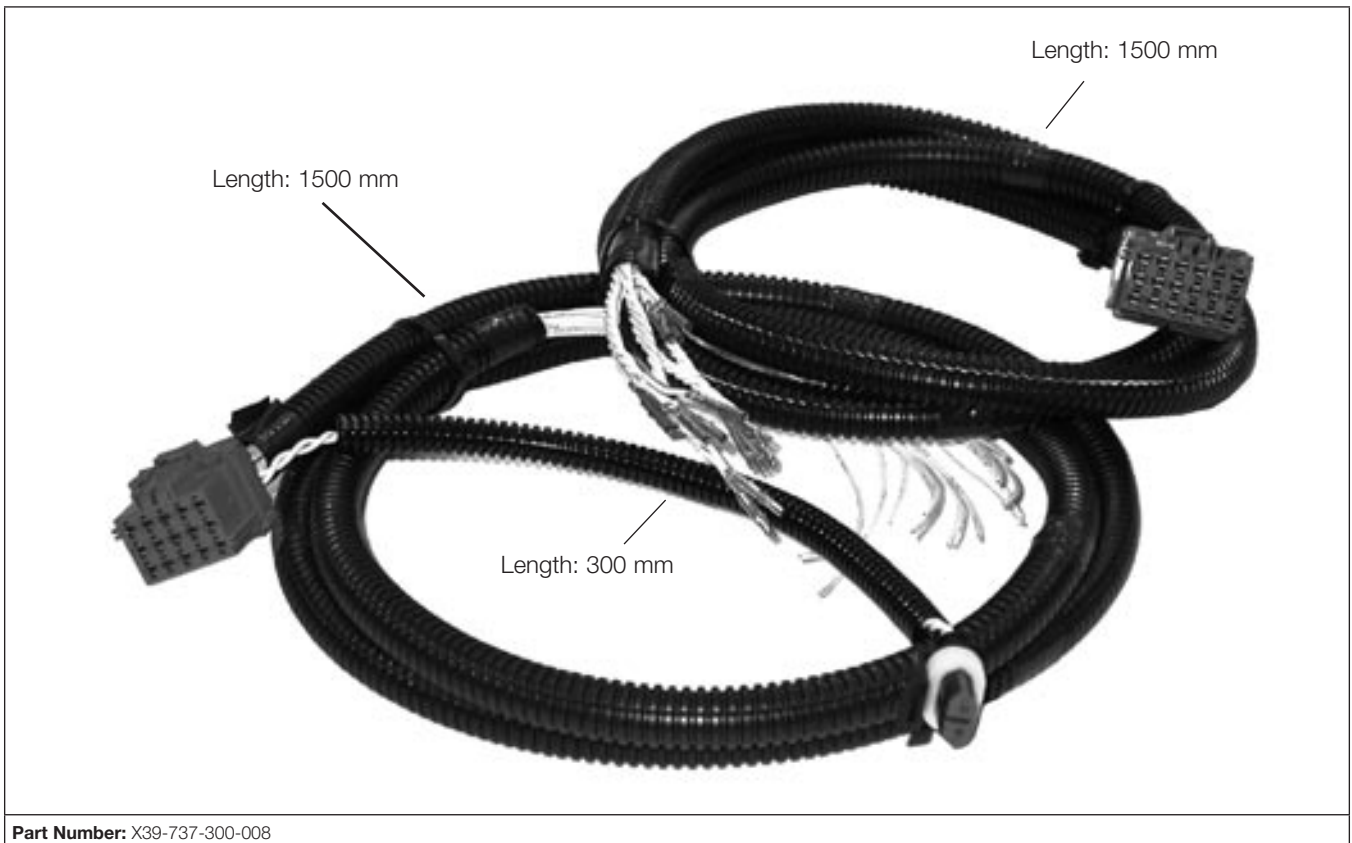
Part Number: X39-737-300-003

The installation kit comprises:

Part Number	Item	Description	Qty.	Min. units/order	
X11-737-002-002	1	Female connector housing	2	10	
X11-737-002-001	2	Male connector housing	2	10	
X11-737-002-004	3	Wire seal	4	20	
X11-737-002-003	4	Interface seal	2	10	
X11-737-002-005	5	Coding pin	10	50	
X11-737-002-006	6	Contact pin	9	100	
X11-737-002-007	7	Socket contact	9	100	
Not available individually, must be ordered as a set		8	Cross head screw, 4.8 x 13	2	
X11-737-002-009	9	Fuse housing	2	10	
X11-737-002-012	10	Fuse housing cover	2	10	
X11-737-002-010	11	Fuse, 1 A	2	10	
X11-737-002-011	12	Socket contact for fuse housing	4	20	
Not available individually, must be ordered as a set		13	Cable ties	10	

*Only for trained partners

Wiring harness (replacement part)

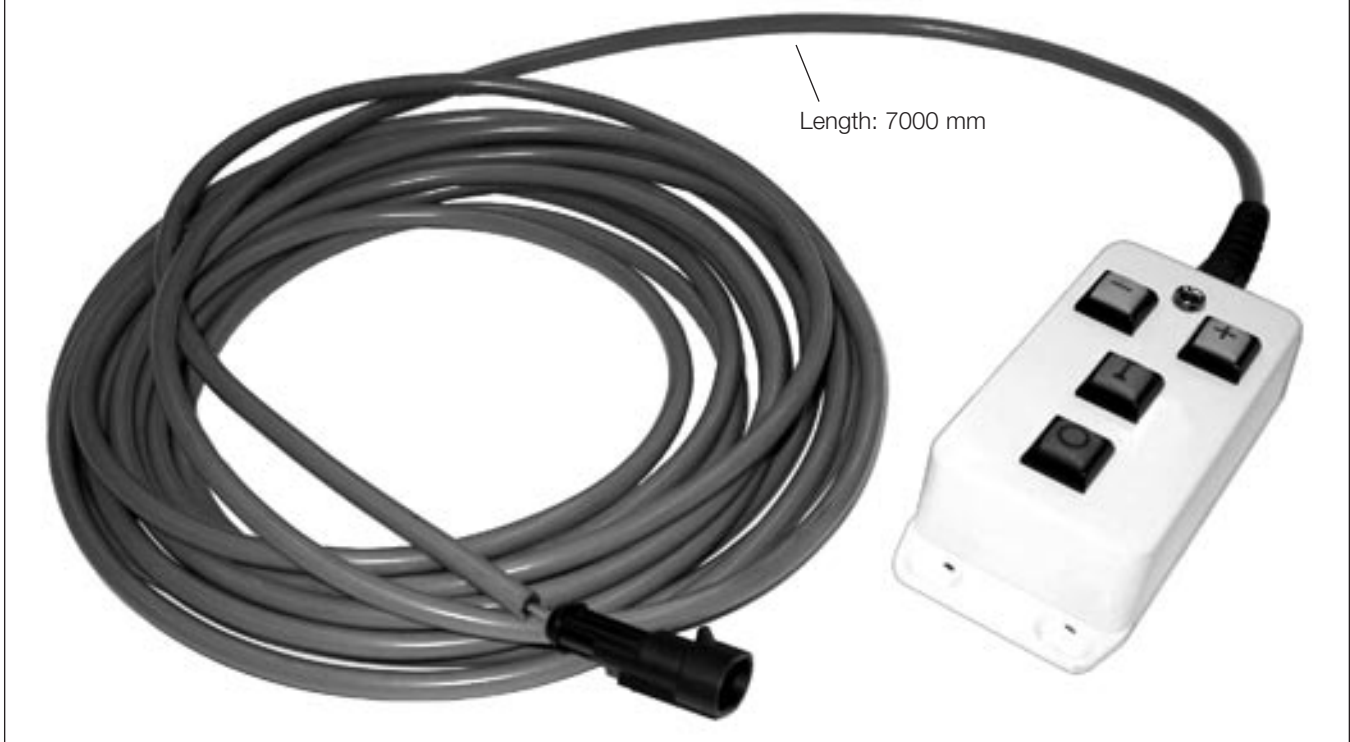


Technical data	
Max. load	5 A
Cable	B 0,5 as per DIN 72551
Operating temperature	-40 °C to +105 °C
Protection rating (pedal coupling point)	IP65 DIN 40050

*Only for trained partners

Manual control interface for engine speed controller (accessory)

Only for use under protected conditions



Length: 7000 mm

Part Number: X39-737-003-003

Technical data

Two-wire interface, serial

Operating temperature -40 °C to +85 °C

* Only for trained partners

Pedal Interface Dongle (test equipment)

Only for use under protected conditions



Dongle for workshops

Part Number	Name	Description
X12-737-100-002	Pedal Interface Dongle Level 2	Workshop dongle: Allows access to all functions, including maximum speed limiter.
X12-737-100-003	Pedal Interface Dongle Level 3	This dongle allows access to tempostat® functions and engine speed controller (fixed engine speed control, variable engine speed control, gas pedal position limiter)

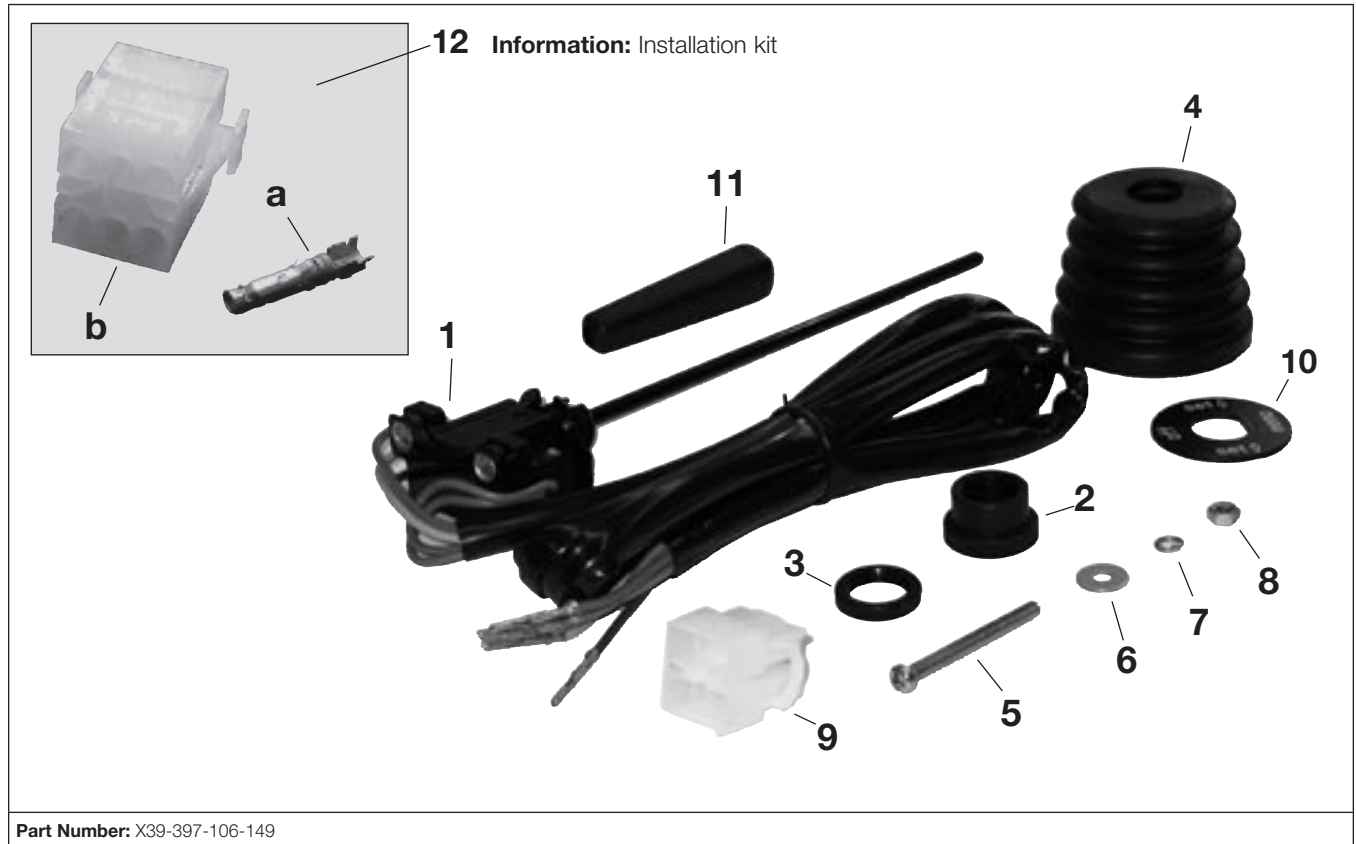
Technical data

Connects to	PC: USB
Operating temperature	0 °C to +50 °C

*Only for trained partners

Standard operating lever (accessory)

System component for tempostat® 12 V, AGB Komfort, E-Gas®, II E-Gas® compact, Pedal Interface II



The installation kit comprises:

Part Number	Item	Description	Qty.
Not available individually, must be ordered as a set	1	Operating lever	1
Not available individually, must be ordered as a set	2	Threaded sleeve (M14 x 1)	1
Not available individually, must be ordered as a set	3	Knurled nut (M14x1)	1
Not available individually, must be ordered as a set	4	Bellows	1
Not available individually, must be ordered as a set	5	Cylinder head bolt (M4 x 40 DIN 84)	2
Not available individually, must be ordered as a set	6	Washer (4.2 DIN 9021)	2
Not available individually, must be ordered as a set	7	Spring washer (4 DIN 127)	2
Not available individually, must be ordered as a set	8	Hexagonal nut (M4 DIN 934)	2
Not available individually, must be ordered as a set	9	Connector pin housing, 6-pin	1
Not available individually, must be ordered as a set	10	Cover	1
Not available individually, must be ordered as a set	11	Grip	1
X39-737-300-010	12	Information Installation kit for standard operating lever (not supplied as standard, order separately if required)	
X11-708-002-023	a	Socket contact	6
X11-708-002-027	b	Female connector housing	1

*Only for trained partners

LED operating lever, right – 12 V applications only (accessory)



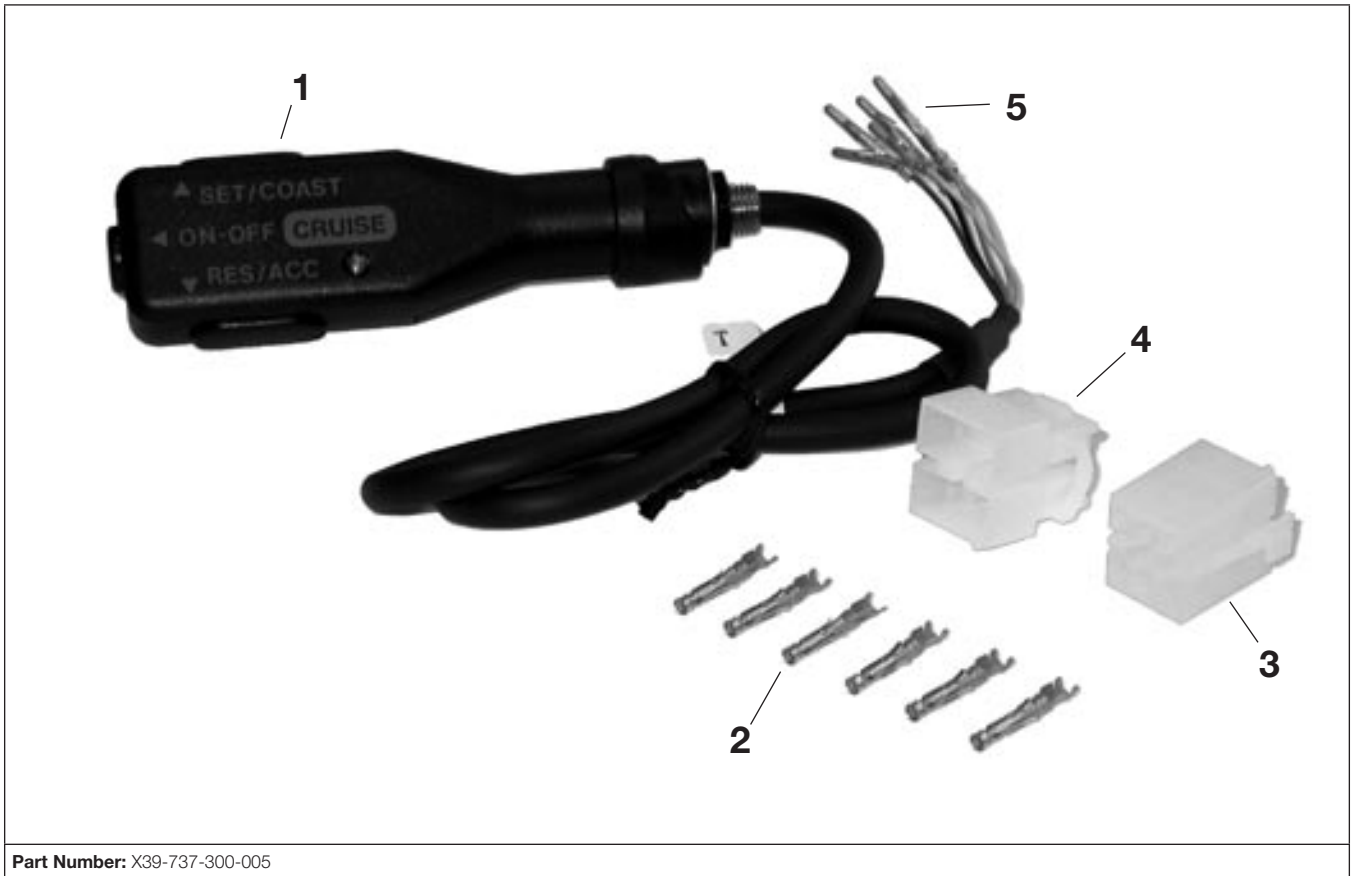
Part Number: X39-737-300-004

The installation kit comprises:

Part Number	Item	Description	Qty.
Not available individually, must be ordered as a set	1	LED operating lever	1
X11-708-002-023	2	Socket contact	6
X11-708-002-027	3	Female connector housing	1
X39-397-106-069	4	Male connector housing	1
X11-708-002-022	5	Contact pin	6

*Only for trained partners

LED operating lever, left – 12 V applications only (accessory)



Part Number: X39-737-300-005

The installation kit comprises:

Part Number	Item	Description	Qty.
Not available individually, must be ordered as a set	1	LED operating lever	1
X11-708-002-023	2	Socket contact	6
X11-708-002-027	3	Female connector housing	1
X39-397-106-069	4	Male connector housing	1
X11-708-002-022	5	Contact pin	6

*Only for trained partners

Operating lever, right, flexible (accessory)



Part Number: X39-737-300-006

The installation kit comprises:

Part Number	Item	Description	Qty.
Not available individually, must be ordered as a set	1	Flexible operating lever	1
X11-708-002-023	2	Socket contact	4
X11-708-002-027	3	Female connector housing	1
X39-397-106-069	4	Male connector housing	1
Not available individually, must be ordered as a set	5	Flat hexagonal nut, M10	1
Not available individually, must be ordered as a set	6	Serrated lock washer, 10.5	2
X11-708-002-022	7	Contact pin	4

*Only for trained partners

Operating lever, left, flexible (accessory)



Part Number: X39-737-300-007

The installation kit comprises:

Part Number	Item	Description	Qty.
Not available individually, must be ordered as a set	1	Flexible operating lever	1
X11-708-002-023	2	Socket contact	4
X11-708-002-027	3	Female connector housing	1
X39-397-106-069	4	Male connector housing	1
Not available individually, must be ordered as a set	5	Flat hexagonal nut, M10	1
Not available individually, must be ordered as a set	6	Serrated lock washer, 10.5	2
X11-708-002-022	7	Contact pin	4

*Only for trained partners

Type-specific system: Mitsubishi Colt 2004/2005



* Only for trained partners

Part Number	Item	Description
-------------	------	-------------

Mitsubishi Colt, 2004/05 Model, DI-D & CZT, 5 Gear Manual Transmission

X10-737-100-002		1.5 MPI Turbo: 1.5 L gasoline 110 kW (CZT) MT 1.5 DI-D Turbo: 1.5 L diesel 50 kW or 70 kW MT
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: Colt MTDID&CZT.P2U
X39-737-300-011	2	Wiring harness, power supply
X39-737-300-012	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-007	5	Operating lever

Mitsubishi Colt, 2004/05 Model, 6 Gear Allshift Transmission

X10-737-100-003		1.3 MPI: 1.3 L gasoline 70 kW 1.5 MPI: 1.5 L gasoline 80 kW 1.5 DI-D Turbo: 1.5 L turbodiesel 70 kW
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: Colt AS.P2U
X39-737-300-011	2	Wiring harness, power supply
X39-737-300-012	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-007	5	Operating lever

Mitsubishi Colt, 2004/05 Model, 5 Gear Manual Transmission

X10-737-100-004		1.1 MPI: 1.1 L gasoline 55 kW 1.3 MPI: 1.3 L gasoline 70 kW 1.5 MPI: 1.5 L gasoline 80 kW
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: Colt MT.P2U
X39-737-300-011	2	Wiring harness, power supply
X39-737-300-012	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-007	5	Operating lever
A2C59511557	6	Clutch switch

*Only for trained partners

Type-specific system: Ssang Yong Actyon, Kyron, Rodius 2006



* Only for trained partners

Part Number	Item	Description
-------------	------	-------------

Ssang Yong Kyron, 2006 Model

X10-737-100-005		200 xdi / 2.0 L diesel / 143 hp (105 kW), manual transmission
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: KyronFinal.P2U
X39-737-300-015	2	Wiring harness, power supply
X39-737-300-016	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever

Ssang Yong Actyon, 2006 Model

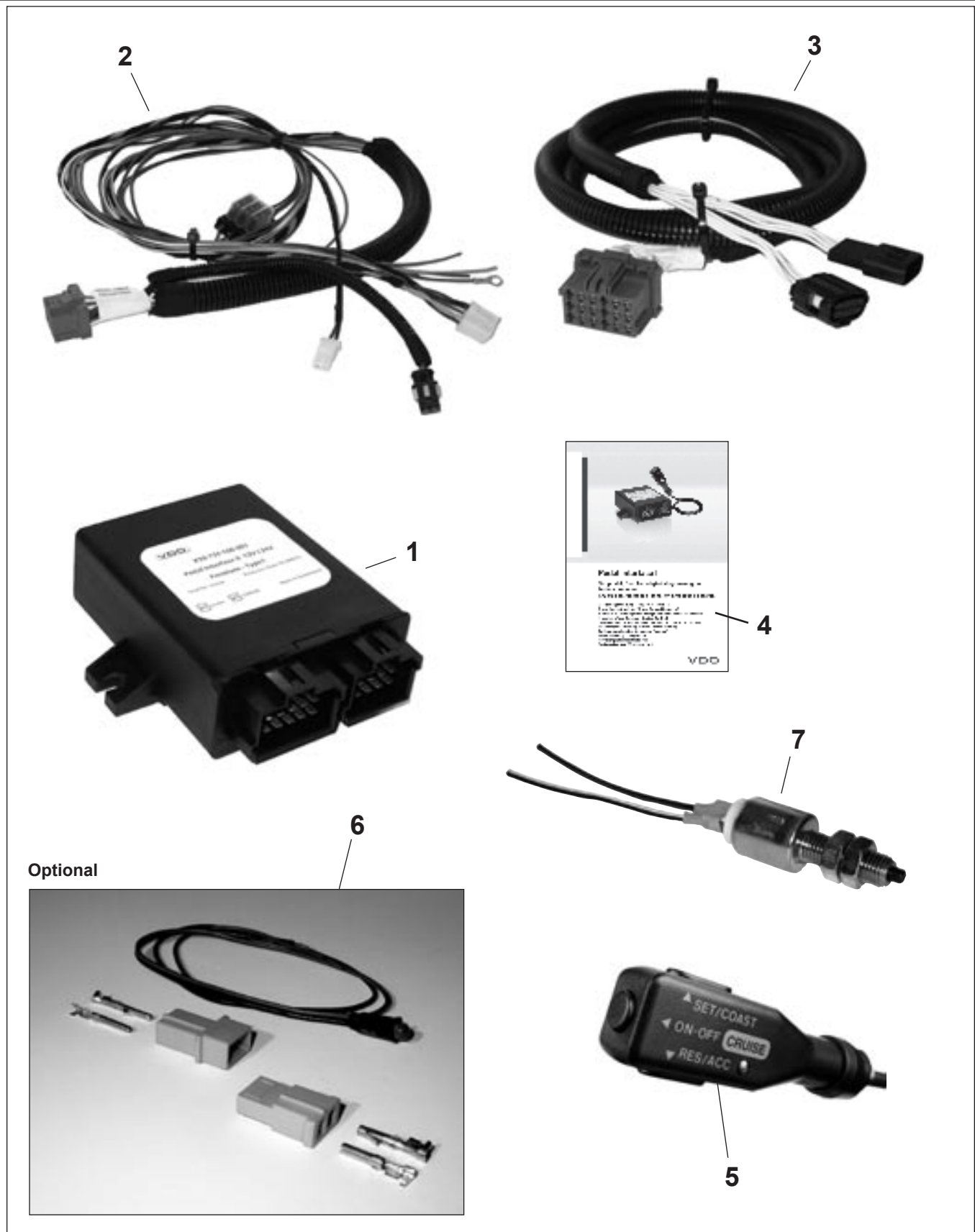
X10-737-100-007		200 xdi / 2.0 L diesel / 143 hp (105 kW), manual transmission
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: ActyonFinal.P2U
X39-737-300-015	2	Wiring harness, power supply
X39-737-300-016	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever

Ssang Yong Rodius, 2006 Model

X10-737-100-008		200 xdi / 2.0 L diesel / 143 hp (105 kW), manual transmission
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: ActyonFinal.P2U
X39-737-300-015	2	Wiring harness, power supply
X39-737-300-016	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever

*Only for trained partners

Type-specific system: Toyota Yaris, RAV 4 2006, Auris 2007



* Only for trained partners

Part Number	Item	Description
-------------	------	-------------

Toyota RAV4 (ALA30), 2006 Model

A2C59511490*		2.2 L diesel / 100 kW/(2AD), manual transmission
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: RAV4 D4D 2.2 L 100 kW MT MY06 Tempostat.P2U
A2C59510984	2	Wiring harness, power supply
A2C59510983	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever
A2C59511548	6	Installation kit, LED (Option)

Toyota RAV4 (ACA30), 2006 Model

A2C59511491*		2.0 L gasoline / 112 kW / (1AZ), manual transmission
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: RAV4 2.0 L Gasoline 112 kW MT MY06 Tempostat.P2U
A2C59510984	2	Wiring harness, power supply
A2C59510983	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever
A2C59511548	6	Installation kit, LED (Option)
A2C59511557	7	Clutch switch

Toyota RAV4 (ACA30), 2006 Model

A2C59511492*		2.0 L gasoline / 112 kW / (1AZ), automatic transmission
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: RAV4 2.0 L Gasoline 112 kW AT MY06 Tempostat.P2U
A2C59510984	2	Wiring harness, power supply
A2C59510983	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever
A2C59511548	6	Installation kit, LED (Option)

Toyota Auris DT 151, 2007 Model

A2C59511981*		2.0 L diesel / 93 kW / (1AD), manual transmission
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: Auris DT 151 2.0 L D4D 93 kW MT Tempostat MY07.P2U
A2C59510984	2	Wiring harness, power supply
A2C59510983	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever
A2C59511548	6	Installation kit, LED (Option)

Toyota Auris ZE 151, 2007 Model

A2C59511492		1.6 L gasoline / 91 kW / (1ZR), manual transmission + MMT
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: Auris ZE 151 1.6 L gasoline 91 kW, MT MY07 Tempostat.P2U File name: Auris ZE 151 1.6 L gasoline 91 kW MMT MY07 Tempostat.P2U
A2C59510984	2	Wiring harness, power supply
A2C59510983	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever
A2C59511548	6	Installation kit, LED (Option)

*Supplied on request – limited availability

* Only for trained partners

Part Number	Item	Description
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Toyota Yaris (KSP90), 2006 Model

A2C59511493*		1.0 L gasoline / 51 kW / (2SZ), manual transmission
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: Yaris KSP 90 1.0 L Gasoline 51 kW MT MY06 Tempostat.P2U
A2C59510984	2	Wiring harness, power supply
A2C59510983	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever
A2C59511548	6	Installation kit, LED (Option)
A2C59511557	7	Clutch switch

Toyota Yaris (SCP90), 2006 Model

A2C59511733*		1.3 L gasoline / 64 kW / (1SZ), manual transmission
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: Yaris SCP90 1.3 L Gasoline 64 kW MT MY06 Tempostat.P2U
A2C59510984	2	Wiring harness, power supply
A2C59510983	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever
A2C59511548	6	Installation kit, LED (Option)
A2C59511557	7	Clutch switch

Toyota Yaris (NLP90), 2006 Model

A2C59511495*		1.4 L diesel / 66 kW / (1ND), manual transmission
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: Yaris NLP90 D4D 1.4 L 66 kW MT MY06 Tempostat.P2U
A2C59510984	2	Wiring harness, power supply
A2C59510983	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever
A2C59511548*	6	Installation kit, LED (Option)

Toyota Yaris (NLP90), 2006 Model

A2C59511762*		1.4 L diesel / 66 kW / (1ND), MMT
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: Yaris NLP90 D4D 1.4 L 66 kW MMT MY06 Tempostat.P2U
A2C59510984	2	Wiring harness, power supply
A2C59510983	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever
A2C59511548	6	Installation kit, LED (Option)

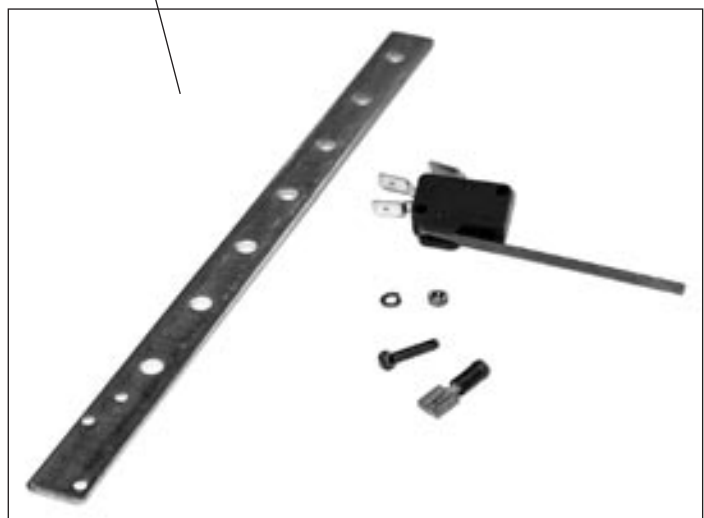
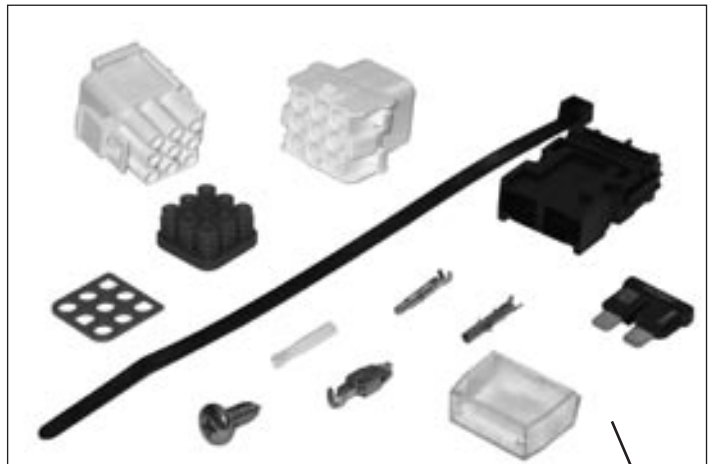
Toyota Yaris (ZSP90), 2006 Model

A2C59511494*		1.8 L gasoline / 98 kW / (1ZR), manual transmission
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: Yaris ZSP90 1.8 L Gasoline 98 kW MT MY06 Tempostat.P2U
A2C59510984	2	Wiring harness, power supply
A2C59510983	3	Wiring harness, pedal
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	Operating lever
A2C59511548	6	Installation kit, LED (Option)
A2C59511557	7	Clutch switch

* Supplied on request – limited availability

*Only for trained partners

Type-specific system: Toyota Hilux, 2005 model year onwards



* Only for trained partners

Part Number	Item	Description
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Toyota Hilux, 2005 Model

A2C59511734*		KUN15, 25, 26; 2.5 L D4D 88 kW
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: Hilux KUN25 2.5 L D4D 88 kW MY05.P2U
X39-737-300-008	2	Wiring harness, power supply
X39-737-300-003	3	Installation kit
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	LED operating lever, left
X39-397-106-152	6	Clutch switch

Toyota Hilux, 2006 Model

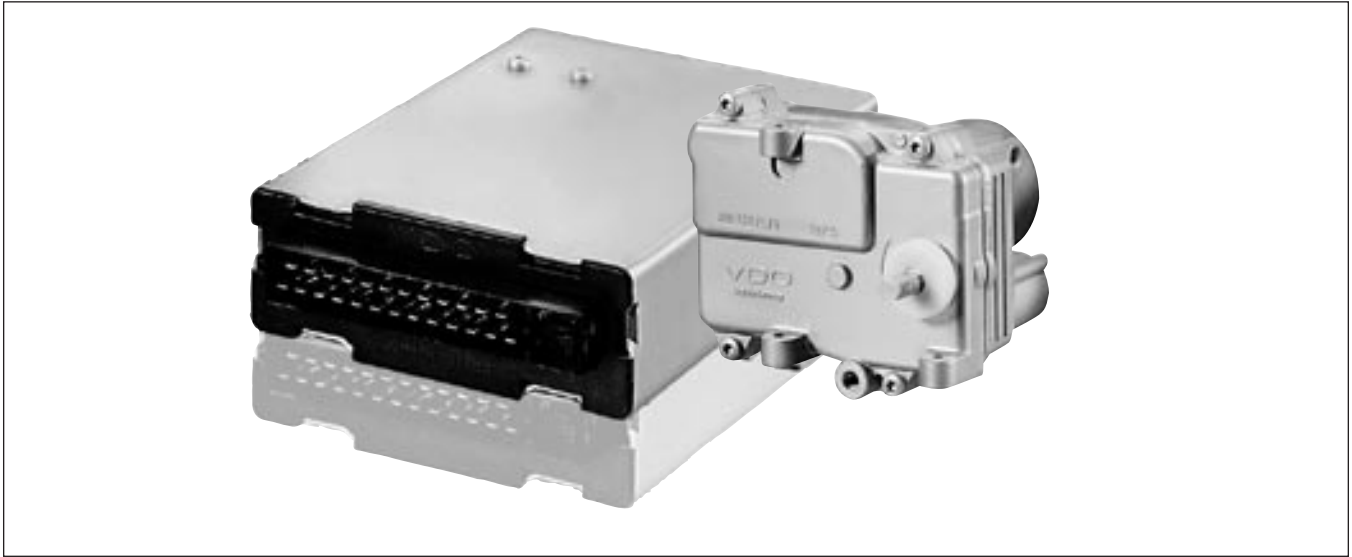
A2C59511735*		KUN15, 25, 26; 3.0 L D4D 126 kW
Replacement parts		
X39-737-100-001	1	Electronic controller: The controller must be programmed by an authorized party when used as a replacement part. File name: Hilux KUN26 3.0 L D4D 126 kW MT MY06.P2U
X39-737-300-008	2	Wiring harness, power supply
X39-737-300-003	3	Installation kit
TU00-0050-5110591	4	Operating instructions
X39-737-300-005	5	LED operating lever, left
X39-397-106-152	6	Clutch switch

*Supplied on request – limited availability

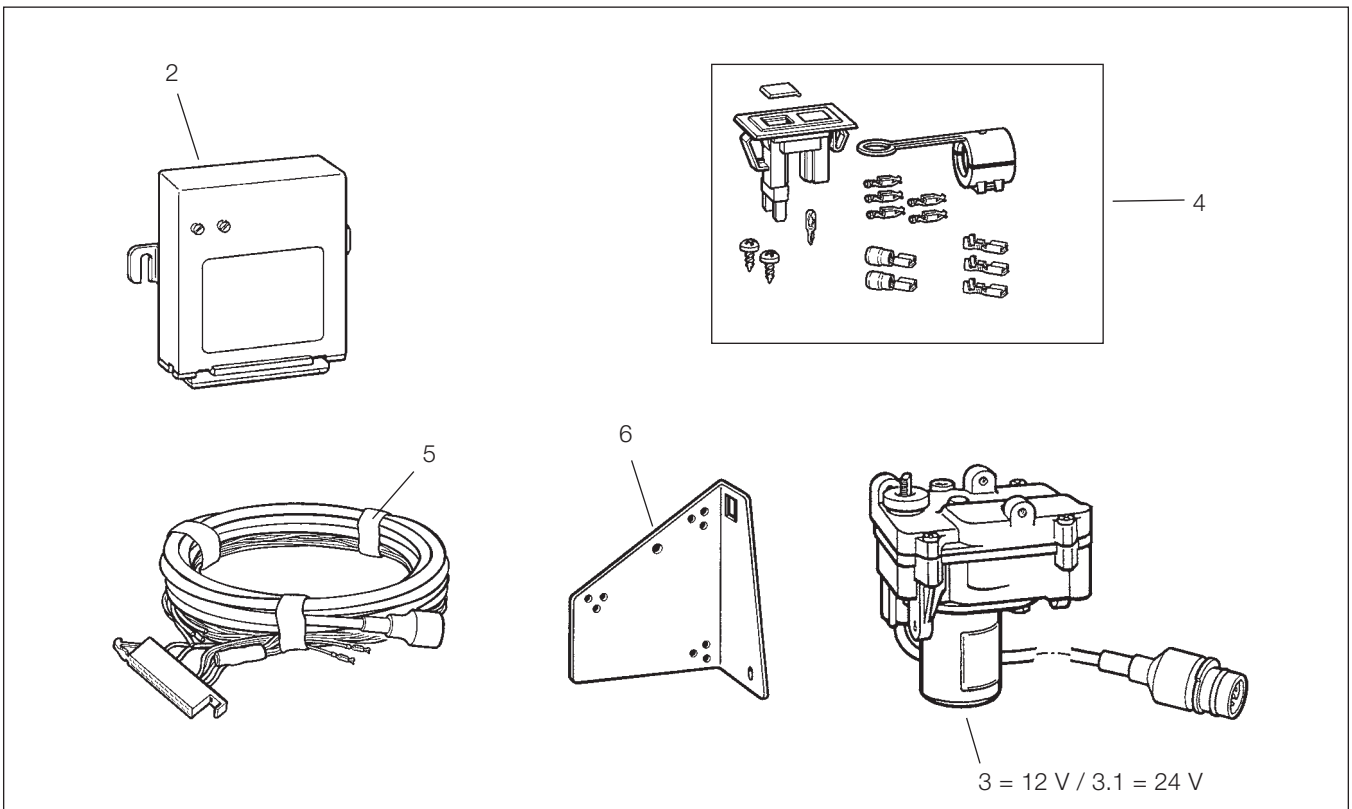
*Only for trained partners

5.1.2 Control Systems* | AGB III

Automatic Speed Limiter



Parts included (complete: 1 = 12 V / 1.1 = 24 V)



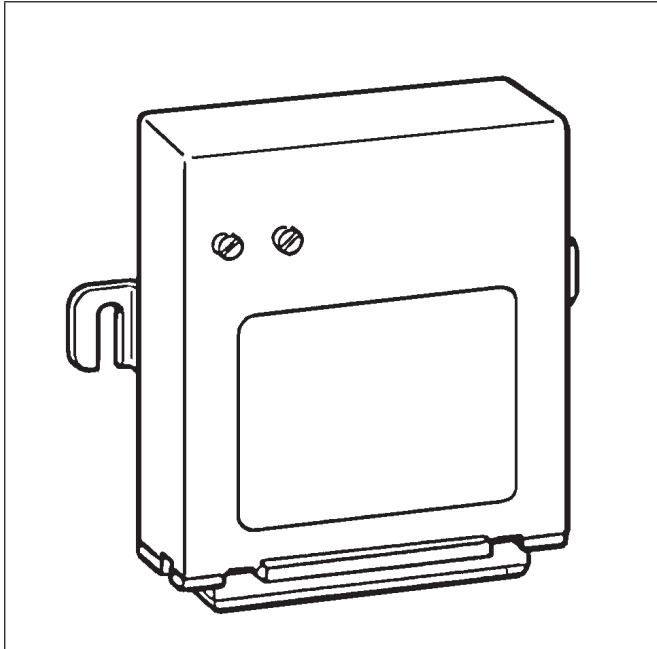
Part Number	Description	Item
X10-397-109-131	AGB III Basic Kit 12 V	1
X10-397-109-132	AGB III Basic Kit 24 V	1.1
Replacement parts		
A2C53091782	Electronic controller 12/24 V	2
408-221-001-001 P	Actuator 12 V	3
408-422-001-014 G	Actuator 24 V	3.1
X39-397-109-027	Electrical set	4
X39-397-109-030	Wiring harness	5
X11-397-001-033	Bracket, actuator	6

* Only for trained partners
** On request

5.1.3 Control Systems* | E-Gas® Compact**

Electronic controller

System component for E-Gas® Compact



Part Number: 412-413-011-002P*

*Supplied on request – limited availability

Description

This electronic controller has been designed for use in off-highway vehicles. The system operates the fuel control lever of an internal combustion engine by means of an actuator, which moves according to a set of pre-defined set points. All input and output signals are processed by an integrated 16-bit processor. Thanks to the flexibility of its design, the controller can be programmed to meet a wide range of requirements, such as:

- Pedal-by-wire
- Engine speed control and limitation
- Vehicle speed control and limitation
- Position limitation

A custom PC-based software tool allows the controller to be accessed as necessary via the diagnostics interface in order to change the calibration or read out diagnostic trouble codes.

The controller complies with the following standards:

- 2006/96/EC Automotive EMC Directive
- Directive 92/24/EEC relating to speed limitation devices
- DIN 40839 Interferences conducted along supply lines

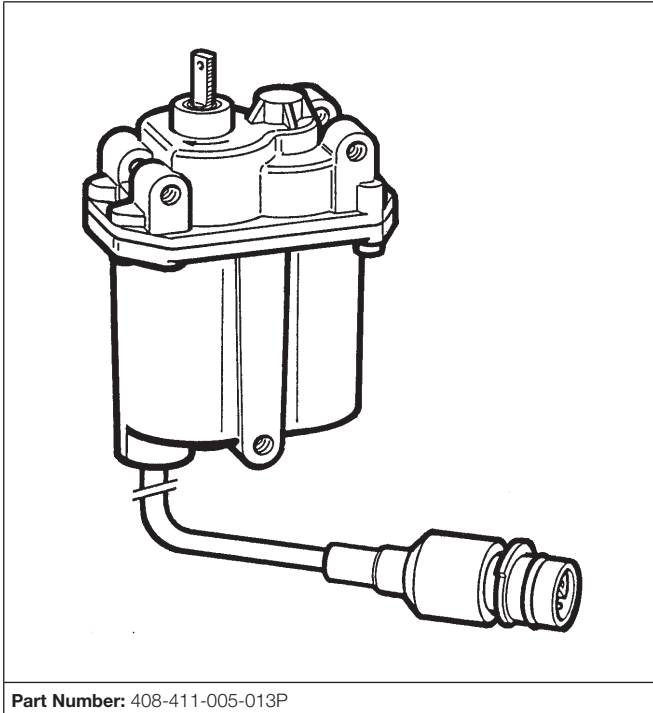
Technical data

Rated voltage	12 V / 24 V
Operating voltage	9.5 – 32 V
Operating temperature	-40 °C to +70 °C
Protection rating	IP53 DIN 40050
Installation location	Passenger compartment
Orientation	Electrical connection facing down (minimum 5°)
Connector	25-pole AMP

* Only for trained partners
** On request

Electrical actuator

System component for E-Gas® II, E-Gas® Compact



Part Number: 408-411-005-013P

Description

This electrical actuator was designed by VDO for the purpose of operating a diesel engine fuel-injection pump lever in conjunction with a VDO electronic controller.

Construction

Watertight cast aluminum housing with PTFE membrane for pressure equalization. Three-stage transmission permanently engaged with output shaft. A conductive plastic potentiometer provides feedback. Features a safety contact that opens when output shaft is at a pre-defined position. Connecting cable with con-

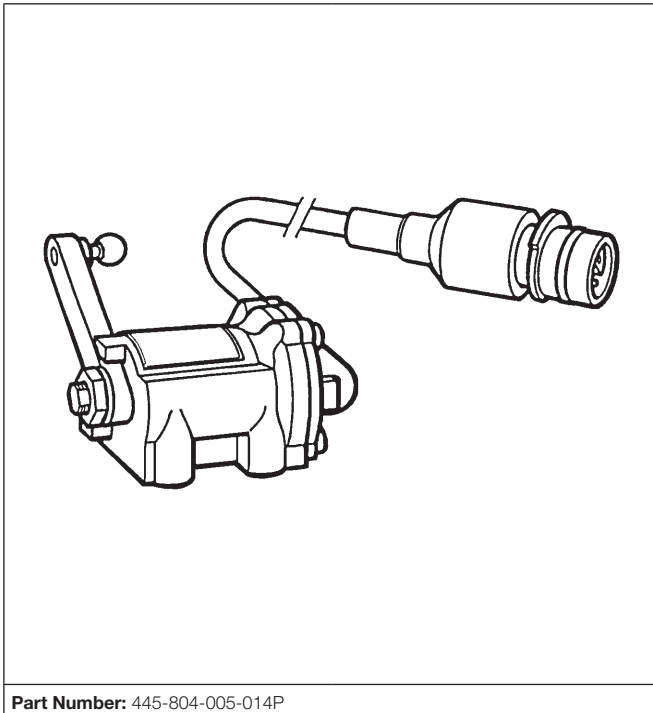
Technical data

Rated voltage	24 V
Rated torque	180 Ncm (used in conjunction with elec. controller)
Actuation time	< 250 ms at rated voltage 100 to 180 Ncm actuating torque
Safety contact switching point	21° to 12.5° (closed at no-load)
Operating temperature	-40 °C to +120 °C (+140 °C max. 1 x 1h)
Protection rating	IP56 DIN 40050
Mechanical angle	120°
Max. tightening torque for drive shaft	10 Nm
Max. tightening torque for fastening screws	8 Nm + 4 Nm (at 9 mm screw-in depth)
Connector	ITT Canon Sure Seal, 7-pin

* Only for trained partners
 ** On request

Set point sender

System component for E-Gas® II, E-Gas® Compact



Part Number: 445-804-005-014P

Description

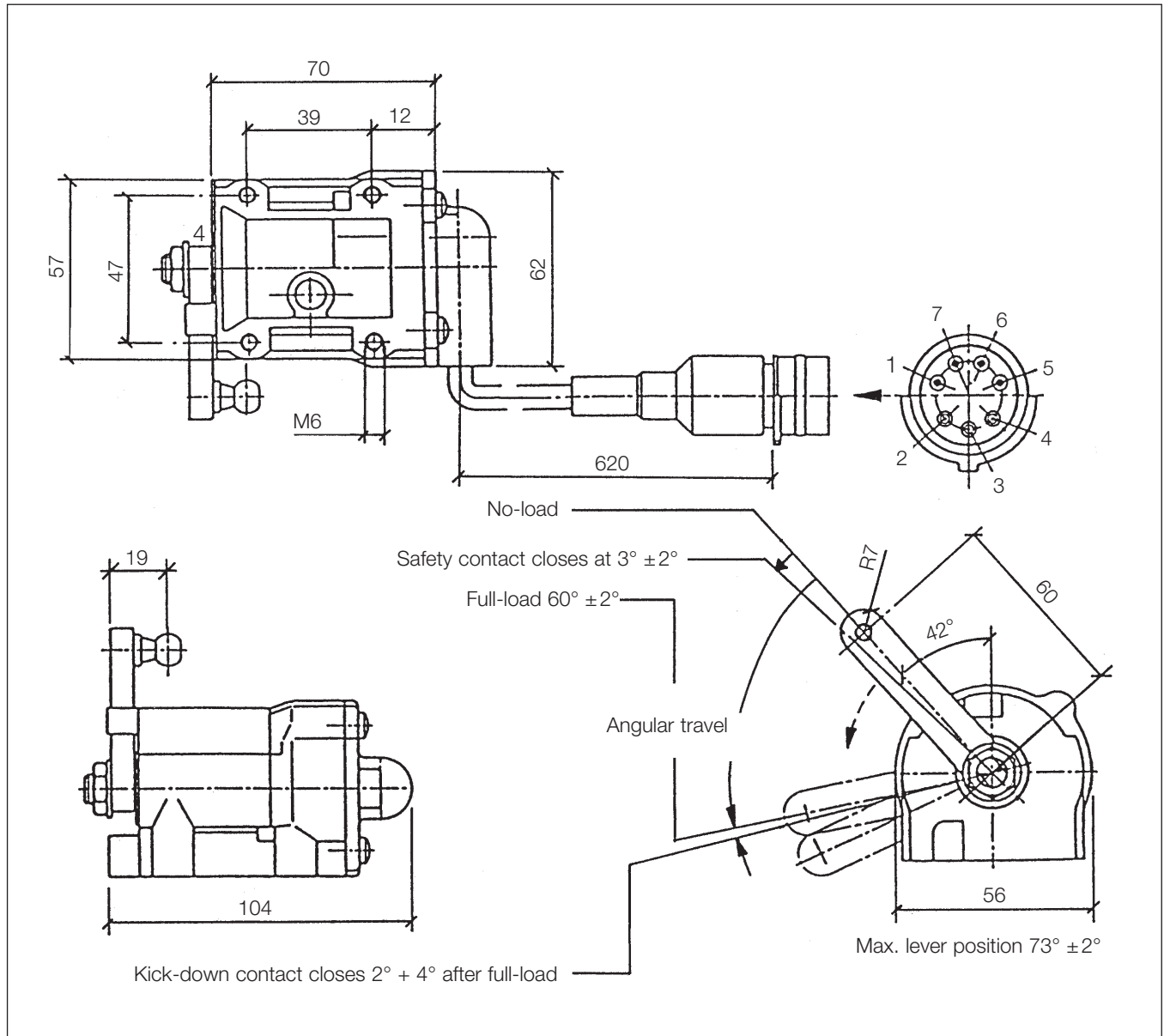
Set point senders use a potentiometer to convert a pedal position into an electrical signal. The potentiometer wiper is positively connected to the driving lever via the potentiometer and drive shaft. The potentiometer housing is positively connected with the aluminum housing. The set point signal is always available. A safety contact (SK) and kick-down contact (KD) are actuated within a predefined range. The safety contact corresponds to a specific potentiometer value. The actuating cam is positively connected with the drive shaft. When the driving lever moves from full-load to no-load, the safety contact is positively opened. Fatigue-resistant contact springs are used.

Technical data

Power supply via electronic controller	
Operating temperature	-40 °C to +80 °C
Initial torque	160 Ncm ^{+20 Ncm} _{-30 Ncm}
Final torque	280 Ncm ± 40 Ncm
Kick-down torque	550 Ncm ± 70 Ncm
Hysteresis	50 Ncm ± 20 Ncm at no-load 50 Ncm ± 20 Ncm at full-load
Protection rating	IP66 DIN 40050
Max. tightening torque for fastening screws 8 Nm + 4 Nm (at 9 mm screw-in depth)	
Connector	ITT Canon Sure Seal, 7-pin

* Only for trained partners
 ** On request

Dimensions [mm]



Terminal assignment	
1	• White, safety contact (SK), male
2	Red, potentiometer (SP+), female
3	Yellow, potentiometer (SPS), female
4	• Blue, kick-down contact (KD), female
5	Brown, potentiometer (SP-), male
6	• Green, kick-down contact (KD), male
7	• Black, safety contact (SK), male, wire 0.5 mm ²
	• Max. switching current 1 A (non-inductive)

Software

Part Number	
X12-397-051-001	E-Gas® Compact Testsoftware V.4002 WinXP



Electromechanical Components

5.2.1 Pedals

5.2.2 Hand-Operated Accelerators
and Pedal Sensors

5.2.3 Set Point Sender

5.2.4 Actuators

5.2.1 Pedals

5.2.1.a Floor-Mounted Pedal

5.2.1.b Suspended Pedal

5.2.1.c Customer-Specific Solutions

5.2.1.a Pedals | Floor-Mounted Pedal

The floor-mounted pedal is composed of a base-plate for mounting in the passenger compartment and a pre-fitted pedal plate (aluminum ADC12, injection molded, black finish, 66% nylon, 30% GFRP). Two return springs are used to replicate the pedal forces and direction-dependent hysteresis; twin return springs are used for added safety. Pedal position feedback is provided by a contactless sensor connected to either an analog or a PWM (pulse width modulated) signal circuit, depending on the variant. The no-load state can be detected either by an optocoupler or mechanically via a microswitch, according to the application.

Product	Engine type	Sensor
Pedal angle 39°		
X10-445-001-001	VM, MTU, John Deere, Detroit Diesel, Deutz, IVECO, Isotta Fraschini	1x analog, 2x switches
X10-445-001-002	Caterpillar (3000 Series), Perkins	1x analog, 1x switch
X10-445-001-004	Cummins Euro 3 Engine	1x analog, 2x switches
X10-445-001-007	Scania, DEC2	2x analog, 1x switch
X10-445-001-015	Iveco Engine	2x analog, 1x switch
X10-445-001-019	Bosch ECU Application	2x analog
X10-445-002-001	Daimler Chrysler	Dual Cross PWM, 200 Hz
X10-445-002-002	Perkins	PWM, 500 Hz
X10-445-050-014	Iveco	1x analog, 1x switch
A2C59511990	Perkins	2x analog, 1x switch

Pedal angle 45°

X10-445-100-002	Caterpillar (3000 Series), Perkins	1x analog, 1x switch
X10-445-100-004	Cummins Euro 3 Engine	1x analog, 2x switches
X10-445-100-006	MAN	2x analog, 1x switch
X10-445-100-010	UK Customer Application	2x analog
X10-445-200-001	Daimler Chrysler	Dual Cross PWM, 200 Hz
X10-445-200-003	CAT, Perkins Engine	PWM, 500 Hz
X10-445-300-003	Cummins (KD)	1x analog, 2x switches, KD
X10-445-300-004	Cummins	1x analog, 2x switches, KDF
KD = Kick Down KDF = Kick Down Feeling WOT = Wide Open Throttle PWM = Pulse Width Modulated signal		

Pedal angle 31°

X10-445-400-001	VM, MTU, John Deere, Detroit Diesel, Deutz, IVECO, Isotta Fraschini	1x analog, 2x switches	3
X10-445-400-002	Caterpillar (3000 Series), Perkins	1x analog, 2x switches	3
X10-445-400-004	Cummins Euro 3 Engine	1x analog, 2x switches	3
X10-445-400-013	Cummins	1x analog, 2x switches	3
A2C59511729	Customer-specific Interface	1x analog, 1x switch	99

New generation, 2010

Output signals from pedals in this range are generated by contactless sensors. Twin coil springs integrated into the pedal provide added reliability for the pedal return mechanism. A special hysteresis element ensures the best possible experience for the driver when the pedal is operated. Various Hall sensors operate in conjunction with the integrated electronics to generate either analog or pulse width modulated (PWM) signals. The range of sensors is designed to suit every common type of engine interface. Sensors can also be adapted in accordance with customer requirements for specialist applications.

An optional kick-down signal can be generated using a special integrated mechanism. Kick-down is triggered when a specified upper threshold value is exceeded in the analog voltage range or an upper PWM signal threshold is exceeded (no additional signal inputs for engine controller required).

Standard type**Compact type****Description**

Floor-mounted gas pedal for applications in commercial vehicles with electronically controlled engines.

The following variants are available:

- Standard type with 250 mm long foot plate and various pedal angles, available for series production: Q3, 2009
- Compact type with 164 mm short foot plate and 25° pedal angle, available for series production: Q4, 2009

Features

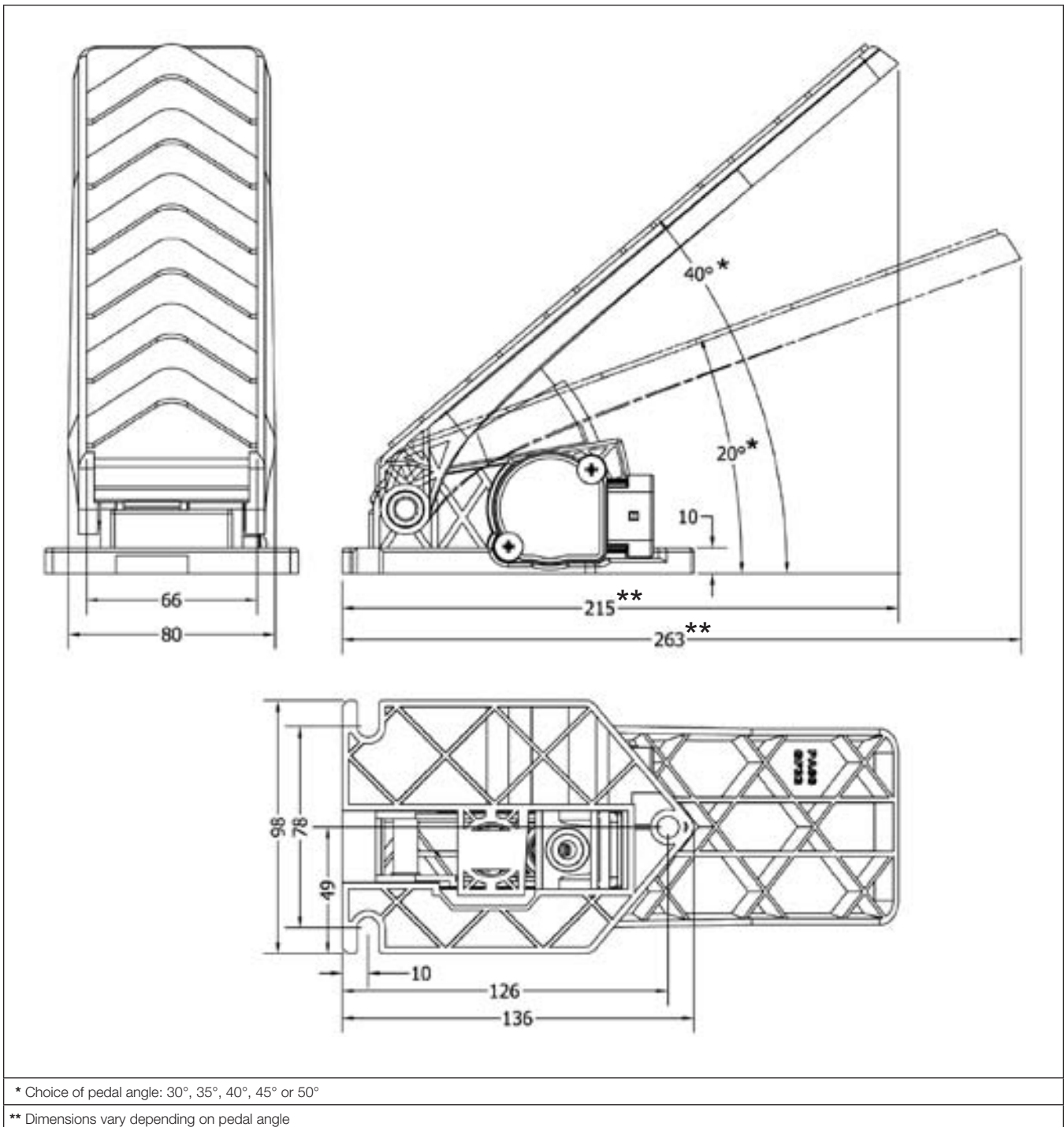
- Innovative, low-noise, compact design
- Rugged construction, suitable for many different applications
- Compatible with various engine interfaces
- Contactless, non-wearing sensors
- Integral twin return springs as per U.S. FMVSS-124
- Extremely reliable
- 6-pin connector (Delphi Packard, Type Metri Pack 150) built directly into sensor housing
- Customer-specific footplates can be accommodated on request
- Low noise pedal operation at no-load and full-load stops
- Quiet kick-down
- Glass fiber-reinforcement of plastic parts subject to mechanical load (PA66GF33)
- Choice of pedal angles (25°, 30°, 35°, 40°, or 45° for compact type, 30°, 35°, 40°, 45° or 50° for standard type)
- Angle of travel, 20°

Supported engine interfaces (both pedal types)

Single channel analog with or without idle switch	Bosch EDC, MAN, Iveco, Perkins, Scania DEC 2, VM, MTU, John Deere, Detroit Diesel, Deutz, CAT Series 3000
Single channel analog with idle switch (changeover contacts)	Cummins Euro 3 engines, SAE J1843
Dual channel analog	Cummins Euro 4/5, Bosch engine management system (EDC) < 80 mA (< 10 mA standby)
Single PWM	Perkins, CAT
Dual PWM	Mercedes, MAN

Standard type

Dimensions [mm]



Floor-Mounted Pedal 45°

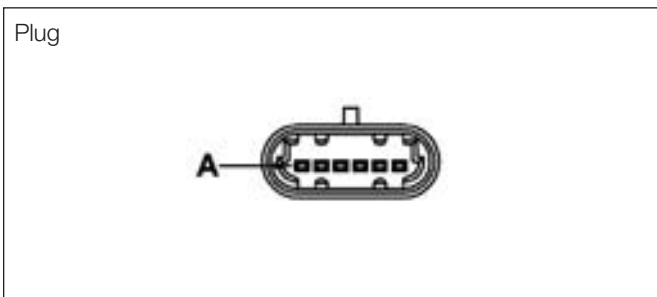
The floor mounted pedal consists of a base unit (nylon 66%, GFK 30%) with an already mounted pedal plate, that has to be fixed in the passenger compartment. For the simulation of the pedal forces, the path-dependent hysteresis and for the security two return springs are equipped. Depending on the design, the feedback of the pedal position takes place over a non-contact sender whereby the electronic coupling provides an analogue or a PWM signal. The idle position identification be made by an opto coupler or mechanically over a micro switch.

Analog 0.4–4.15 Volt




Technical Data	
Voltage supply 5 V ± 2% by electronic controller	
Operating temperature:	-40 °C to +85 °C
Protection:	IP 6k7k
Installation place:	Interior
Angle of actuation:	20° ± 2°
Signal output:	0.4–4.15 V

Electrical Connection: Front view



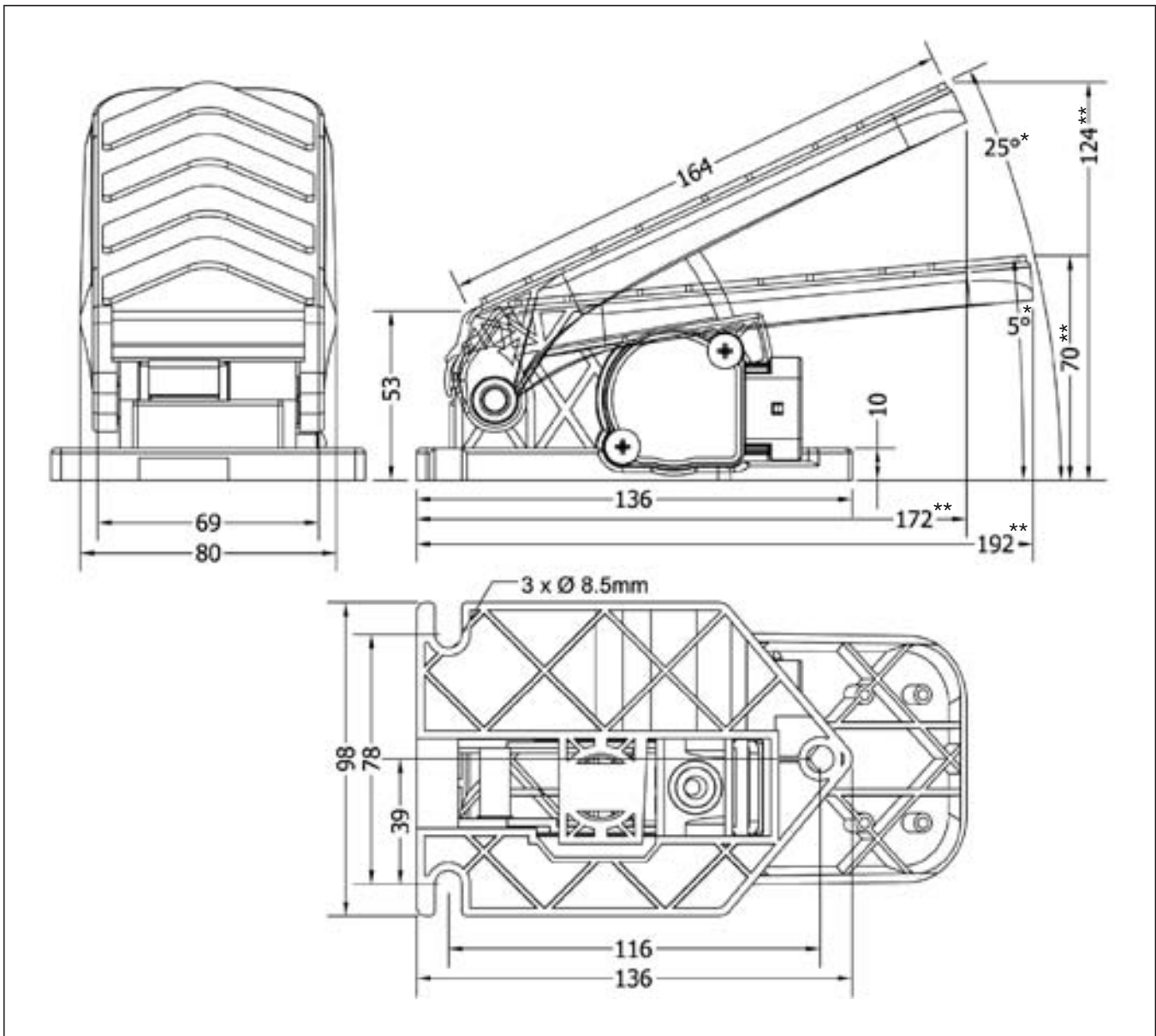
Terminal assignment		
Pin	Description	Color
A	IVS2 (NC)	–
B		–
C	Switch Common (Ground)	–
D	Signal ground	–
E	Signal output 1	–
F	Signal supply 1	–

Accessories: Counter connector for vehicle harness (not supplied as standard)

Part Number	Product	Description
		
A2C59512245	Kit D	Connector assembly: Delphi Metri Pack 150, 6-pole
	Female connector plug assembly	12066317 (1x)
	Female tin plated terminal	12103881 (6x)

Compact type

Dimensions [mm]



* Choice of pedal angle: 25° , 30° , 35° , 40° or 45°

** Dimensions vary depending on pedal angle

Floor-Mounted Pedal 25°

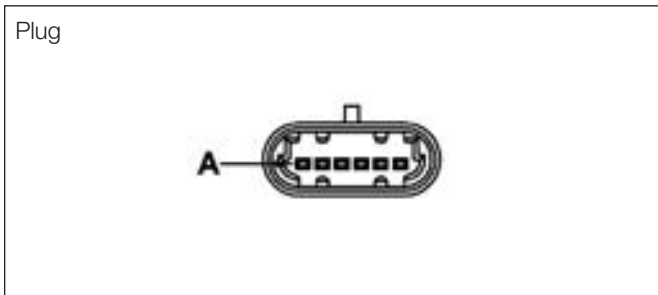
The floor mounted pedal consists of a base unit (nylon 66%, GFK 30%) with an already mounted pedal plate, that has to be fixed in the passenger compartment. For the simulation of the pedal forces, the path-dependent hysteresis and for the security two return springs are equipped. Depending on the design, the feedback of the pedal position takes place over a non-contact sender whereby the electronic coupling provides an analogue or a PWM signal. The idle position identification be made by an opto coupler or mechanically over a micro switch.

Analog 0.7–3.0 Volts / 3.0–0.7 Volts




Technical Data	
Voltage supply 5 V ± 2% by electronic controller	
Operating temperature:	-40 °C to +85 °C
Protection:	IP 6k7k
Installation place:	Interior
Angle of actuation:	20° ± 2°
Signal output 1:	0.7–3.0 V
Signal output 2:	3.0–0.7 V

Electrical Connection: Front view



Terminal assignment		
Pin	Description	Color
A	Ground 2	–
B	Signal output 2	–
C	Supply voltage 2	–
D	Ground 1	–
E	Signal output 1	–
F	Supply voltage 1	–

Accessories: Counter connector for vehicle harness (not supplied as standard)

Part Number	Product	Description
		
A2C59512245	Kit D	Connector assembly: Delphi Metri Pack 150, 6-pole
	Female connector plug assembly	12066317 (1x)
	Female tin plated terminal	12103881 (6x)

5.2.1.b Pedals | Suspended Pedal**Steel lever**

The suspended pedal consists of a base unit (nylon 66%, GFK 30%) and a pre-fitted pedal lever (stainless steel, SUS 304, polished). Twin return springs are used to replicate the pedal forces and direction-dependent hysteresis and to provide added safety. Pedal position feedback is provided by a contactless sensor connected to either an analog or PWM signal circuit, depending on the variant. The no-load state can be detected either by an optocoupler or mechanically via a microswitch.

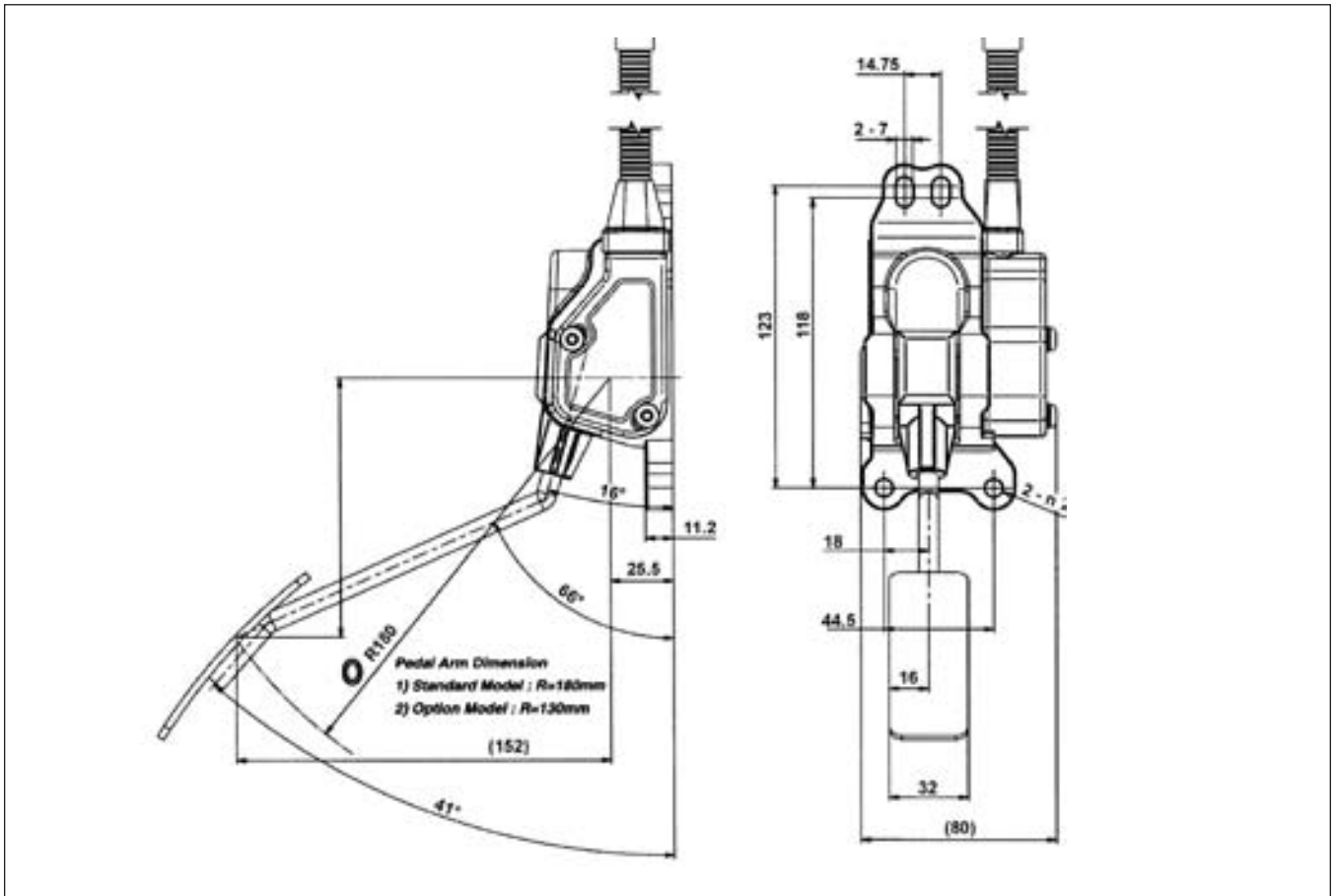
Analog 0.4 – 4.15 volts

Part Number: X10-445-110-002

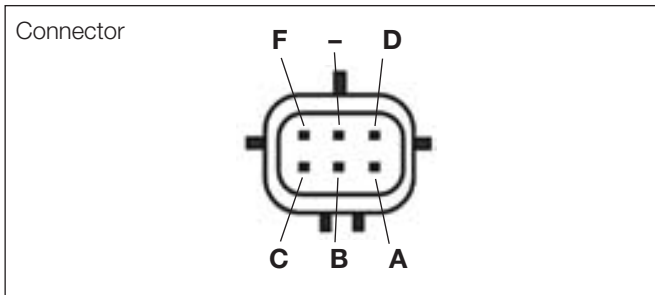
Interface to: Caterpillar (3000 Series), Perkins

Technical data		
Power supply via electronic controller		
Operating temperature		-40 °C to +85 °C
Protection: rating		Sensor IP 67
Installation location		Passenger compartment
Actuation angle		17°
Pedal force	Open-stroke	Close-stroke
No-load	16 ± 6N	15 ± 9 N
Limit stop	30 ± 9N	6 ± 5 N
Signal output		0.4–4.15 V
Idle validation switch (IVS)		0.6 V, NC

Dimensions [mm]




Electrical connection: Front view



Terminal assignment		
Pin	Description	Color
A	Supply voltage	Red
B	Signal output	Green
C	Ground	Black
D	Switch ground	Yellow
E	-	-
F	FS2 (IVS 2), NC	Pink

Accessories for vehicle wiring harness (not supplied as standard)

Part Number	Product	Description
	 PLUG	
X39-445-000-004	Kit C	Connector kit: AMP J Series, 6-pin
	Push-on connector	174262-2 (1x)
	Counter	174363-7 (1x)
	Contacts	
	Female	171662-5 (5x)
	Rubber plug	176886-2 (1x)
	Cable seal	172748-2 (5x)

Plastic lever

The suspended pedal consists of a base unit and a pre-fitted pedal lever (66% nylon, 30% GFRP). Twin return springs are used to replicate the pedal forces and direction-dependent hysteresis and to provide added safety. Pedal position feedback is provided by a contactless sensor connected to either an analog or PWM signal circuit, depending on the variant. The no-load state can be detected either by an optocoupler or mechanically via a microswitch, according to the application.

Short, analog 0.45–3.65 volts

Part Number: A2C59512134

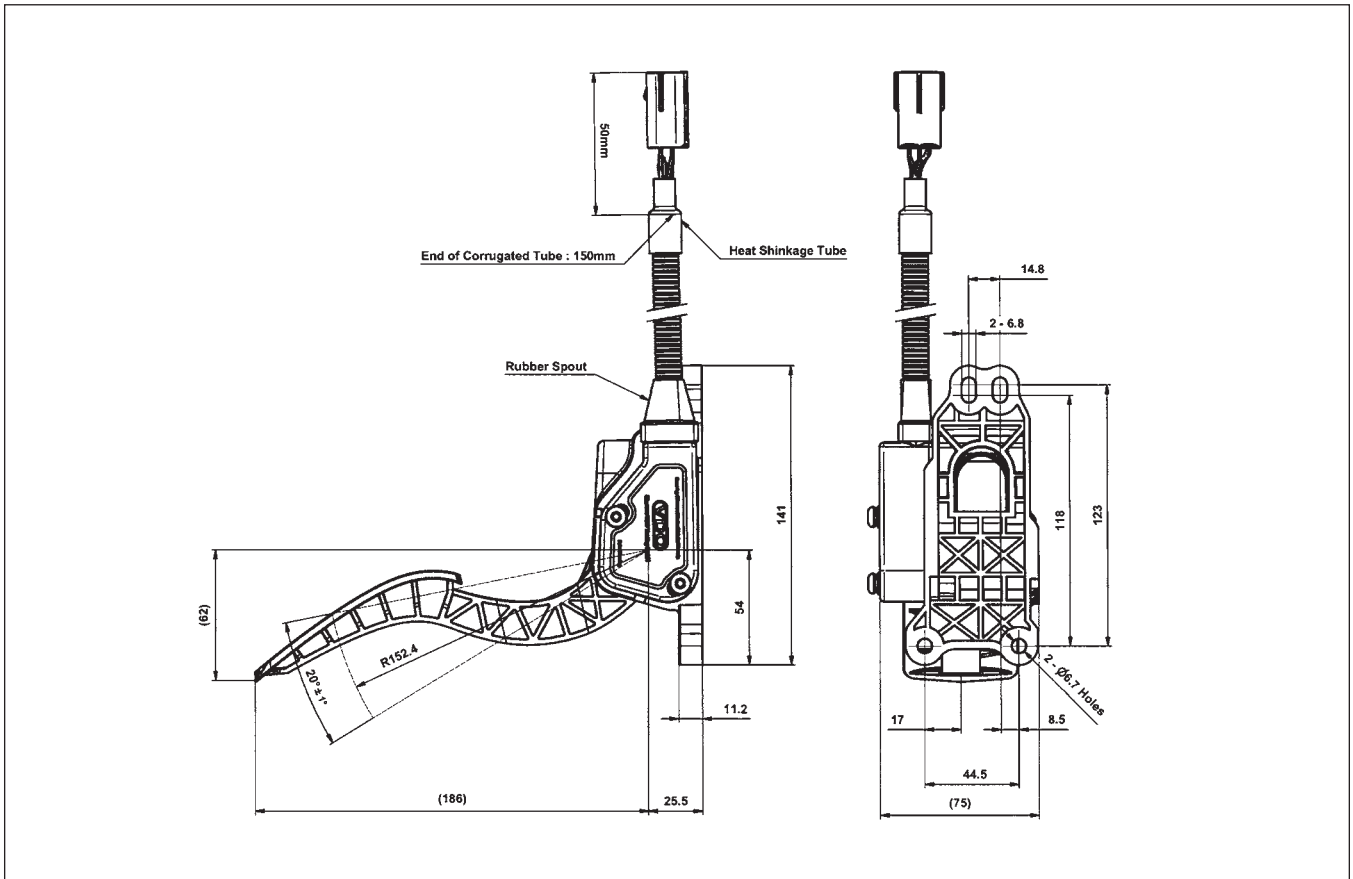
Interface to: Cumminis Euro 3

Technical data

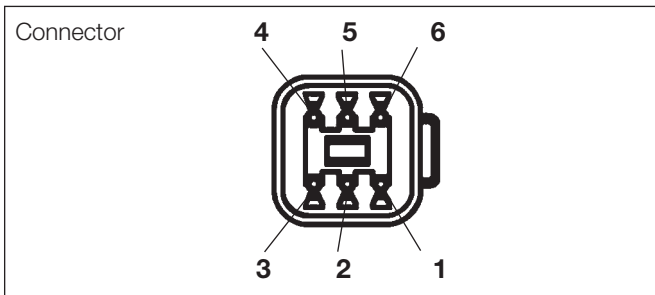
Power supply via electronic controller

Operating temperature		-40 °C to +85 °C
Protection: rating		Sensor IP 67
Installation location		Passenger compartment
Actuation angle		20° ± 1°
Pedal force	Open-stroke	Close-stroke
No-load	21.6 ± 6N	12.7 ± 7 N
Limit stop	35.6 ± 9N	19.6 ± 9 N
Signal output		0.45–3.65 V
Idle validation switch (IVS2)		0.6 V, NC
Idle validation switch (IVS3)		0.71 V, NO

Dimensions [mm]



Electrical connection: Front view



Terminal assignment		
Pin	Description	Color
1	Switch ground, common	Yellow
2	Idle validation switch (IVS3): NO	Blue
3	Signal output	Green
4	Ground	Black
5	Supply voltage	Red
6	Idle validation switch (IVS2): NC	Pink

Accessories for vehicle wiring harness (not supplied as standard)

Connector kit: Deutsch DT Series Connector; for 6 wires; DT04-6P

Long, analog 0.4–4.5 volts



Part Number: A2C59511187*

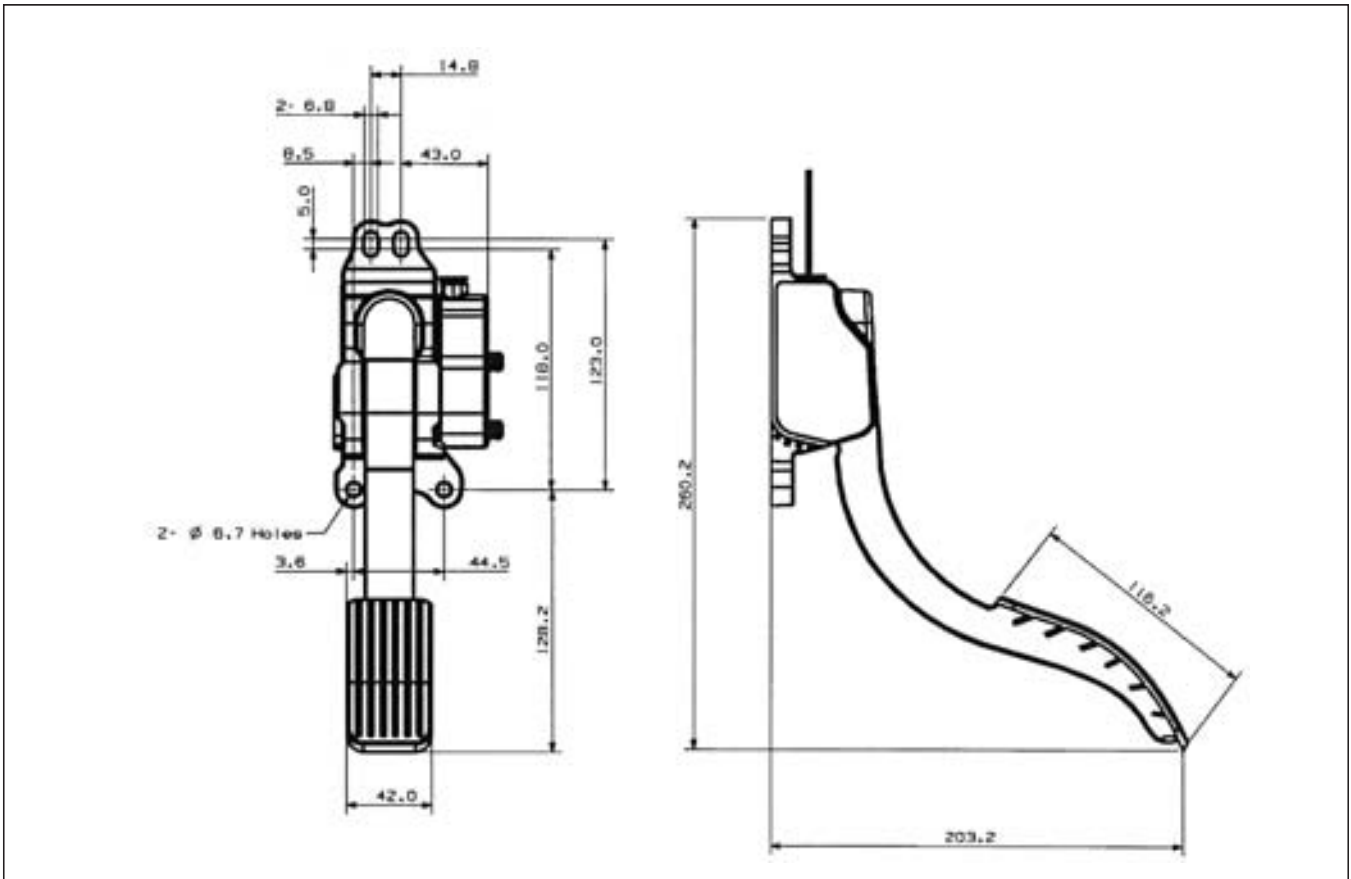
Interface to: Deutz Engine Application

*Supplied on request – limited availability

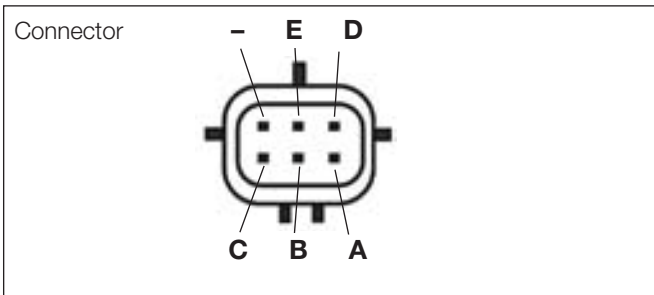
Technical data

Power supply via electronic controller		
Operating temperature		-40 °C to +85 °C
Protection: rating		Sensor IP 67
Installation location		Passenger compartment
Actuation angle		20° ± 1°
Pedal force	Open-stroke	Close-stroke
No-load	18 ± 6N	10 ± 7 N
Limit stop	32 ± 9N	17 ± 9 N
Signal output		0.4–4.5 V
Idle validation switch (IVS3)		0.6 V, NO

Dimensions [mm]




Electrical connection: Front view



Terminal assignment		
Pin	Description	Color
A	Supply voltage 1	Red
B	Signal output 1	Green
C	Ground	Black
D	Switch ground, common	Yellow
E	Idle validation switch (IVS3): NO	Blue
F	-	-

Accessories for vehicle wiring harness (not supplied as standard)

Part Number	Product	Description
		
X39-445-000-004	Kit C	Connector kit: AMP J Series, 6-pin
	Push-on connector	174262-2 (1x)
	Counter	174363-7 (1x)
	Contacts	
	Female	171662-5 (5x)
	Rubber plug	176886-2 (1x)
	Cable seal	172748-2 (5x)

New Generation, 2009

Suspended accelerator pedal for use in commercial vehicles with electronically controlled engines for robust and save operation. Two different designs with different pedal arm lengths are available. The electrical signals of the pedal position are provided by a contactless sensor. Two build-in return springs are used for safety and resetting the pedal position. A special designed hysteresis element provides an excellent driving comfort. Different contactless hall sensor electronics provide analogue- or pulse width modulated (PWM) signals. The sensor is designed to manage all common used engine interfaces. For special applications the sensor can be designed to meet the customer requirements. An optional kickdown feeling is realized by using a special mechanism. In this case the upper analogue voltage or PWM value of the signal span is used for kickdown indication (no need of an additional signal input in the engine control unit).

Standard type**Variant with extended pedal arm****Features**

- Innovative, low-noise, compact design
- Rugged construction, suitable for many different applications
- Compatible with various engine interfaces
- Contactless, non-wearing sensors
- Integral twin return springs as per U.S. FMVSS-124
- Extremely reliable
- 6-pin connector (Delphi Packard, Type Metri Pack 150) built directly into sensor housing
- Customer-specific footplates can be accommodated on request
- Low noise pedal operation at no-load and full-load stops
- Quiet kick-down
- Glass fiber-reinforcement of plastic parts subject to mechanical load (PA66GF33)
- Angle of travel, 18.5

Suspended Pedal

The suspended pedal consists of a base unit (nylon 66%, GFK 30%) with an already mounted pedal arm, that has to be fixed in the passenger compartment. For the simulation of the pedal forces, the path-dependent hysteresis and for the security two return springs are equipped. Depending on the design, the feedback of the pedal position takes place over a non-contact sender whereby the electronic coupling provides an analogue or a PWM signal. The idle position identification be made by an opto coupler or mechanically over a micro switch.

Analog 0.75–4.2 volts / 0.375–2.1 volts



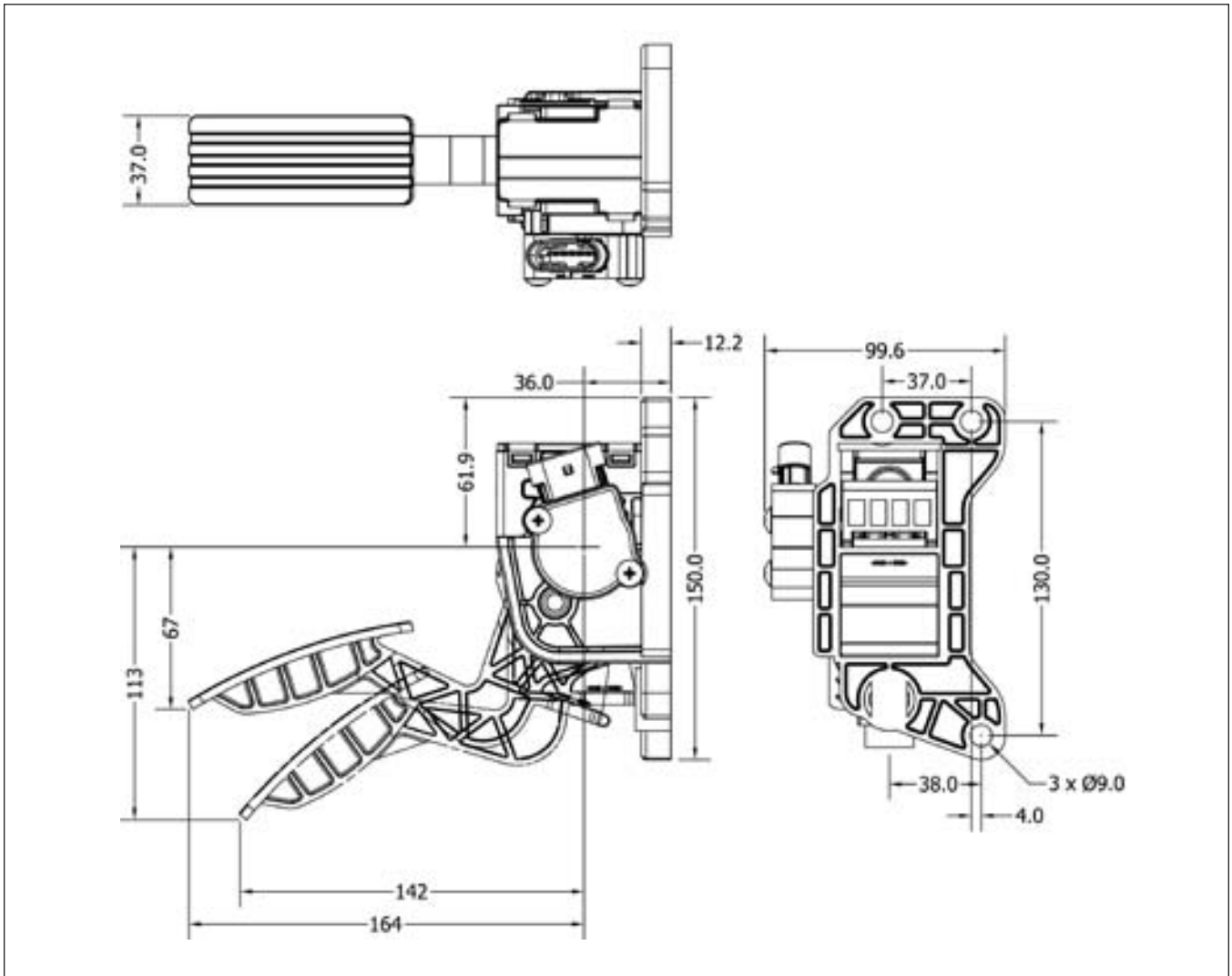
Part Number: A2C59512909

Interface customer specific

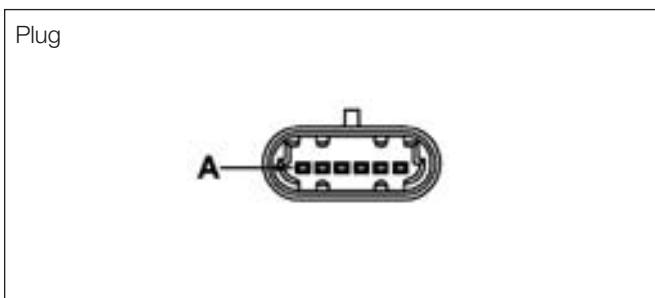
Technical Data

Voltage supply 5 V \pm 2% by electronic controller	
Operating temperature:	-40 °C to +85 °C
Protection:	IP 6k7k
Installation place:	Interior
Angle of actuation:	18.5° \pm 2°
Signal output 1:	0.75–4.2 V
Signal output 2:	0.375–2.1 V

Dimensions [mm]




Electrical Connection: Front view



Terminal assignment		
Pin	Description	Color
A	Ground 2	-
B	Pedal Signal output 2	-
C	Power input 2	-
D	Ground 1	-
E	Pedal Signal output 1	-
F	Power input 1	-

Counter connector for vehicle harness (not part of the delivery)

Part Number	Product	Description
		
A2C59512245	Kit D	Connector assembly: Delphi Metri Pack 150, 6-pole
	Female connector plug assembly	12066317 (1x)
	Female tin plated terminal	12103881 (6x)

Analog 1.1–4.2 volts / 0.55–2.1 volts**Part Number:** A2C59513366

Interface customer specific

Technical DataVoltage supply 5 V \pm 2% by electronic controller

Operating temperature: -40 °C to +85 °C

Protection: IP 6k7k

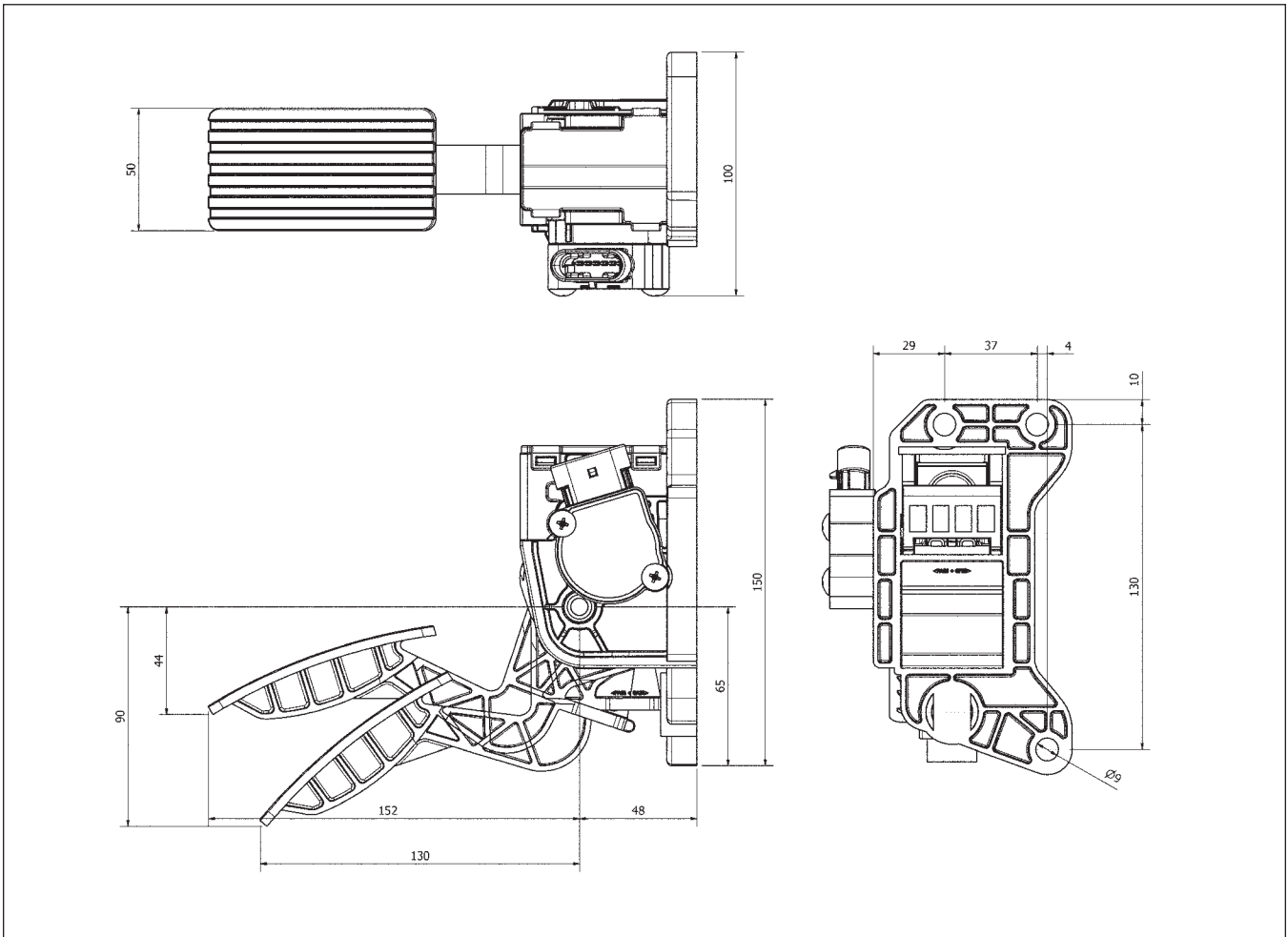
Installation place: Interior

Angel of actuation: 18.5° \pm 2°

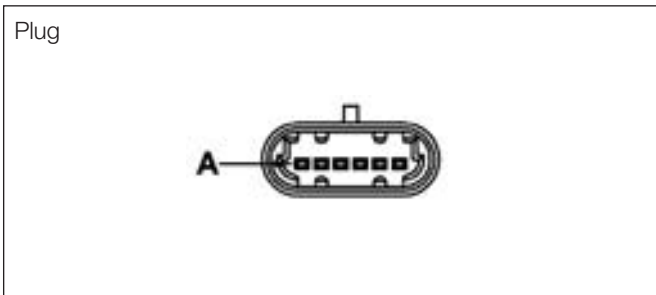
Signal output 1: 1.1–4.2 V

Signal output 2: 0.55–2.1 V

Dimensions [mm]



Electrical Connection: Front view



Terminal assignment		
Pin	Description	Color
A	Ground 2	–
B	Pedal Signal output 2	–
C	Power input 2	–
D	Ground 1	–
E	Pedal Signal output 1	–
F	Power input 1	–

Counter connector for vehicle harness (not part of the delivery)

Part Number	Product	Description
A2C59512245	Kit D	Connector assembly: Delphi Metri Pack 150, 6-pole
	Female connector plug assembly	12066317 (1x)
	Female tin plated terminal	12103881 (6x)

Analog 0.5–4.5 volts / 4.5–0.5 volts**Part Number:** A2C59514267

Interface customer specific

Technical DataVoltage supply 5 V \pm 2% by electronic controller

Operating temperature: -40 °C to +85 °C

Protection: IP 6k7k

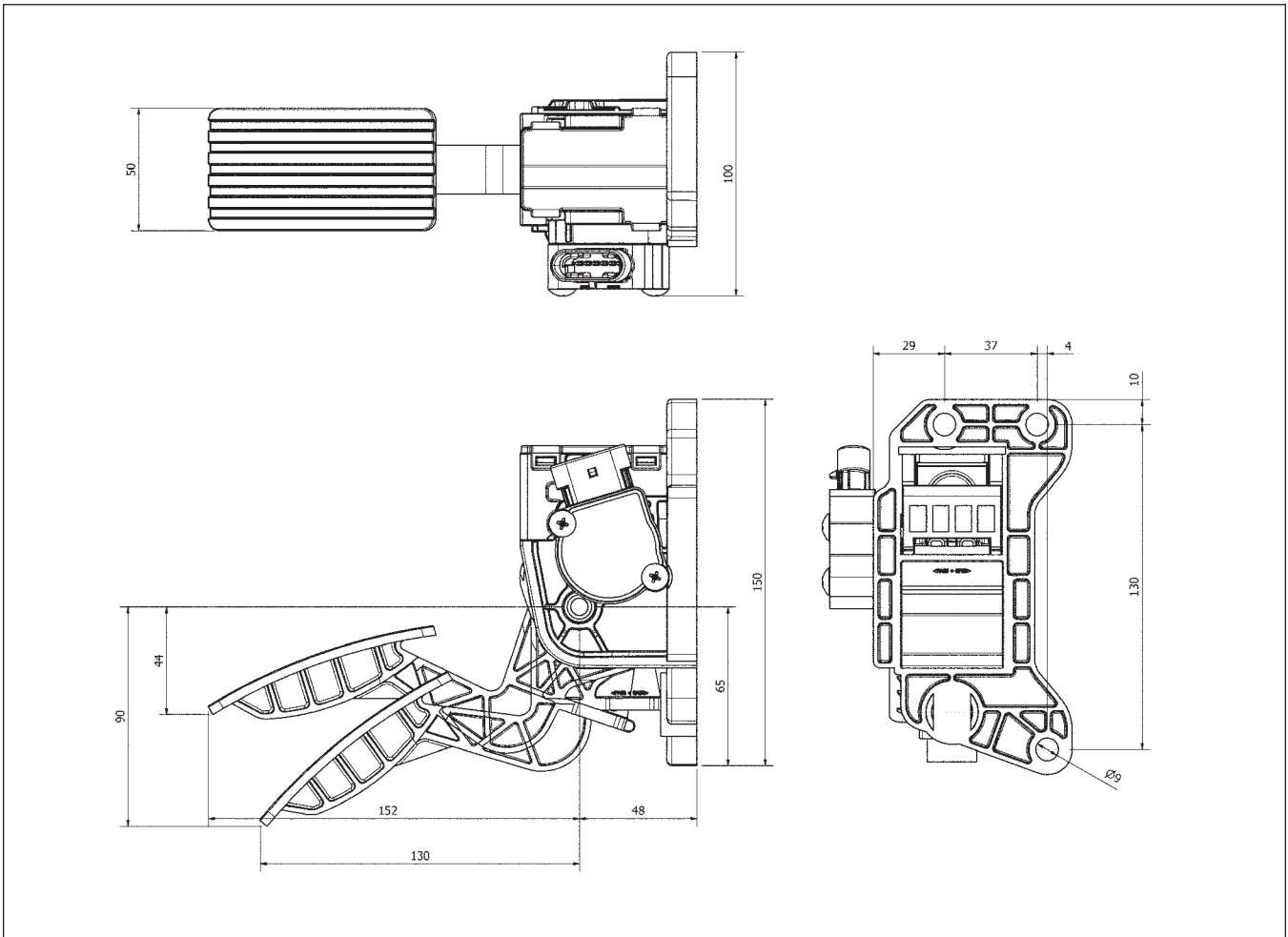
Installation place: Interior

Angle of actuation: 18.5° \pm 2°

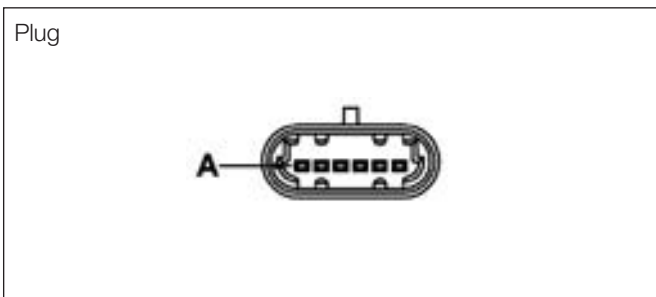
Signal output 1: 0.5–4.5 V

Signal output 2: 4.5–0.5 V

Dimensions [mm]



Electrical Connection: Front view



Terminal assignment		
Pin	Description	Color
A	Ground 2	–
B	Pedal Signal output 2	–
C	Power input 2	–
D	Ground 1	–
E	Pedal Signal output 1	–
F	Power input 1	–

Counter connector for vehicle harness (not part of the delivery)

Part Number	Product	Description
A2C59512245	Kit D	Connector assembly: Delphi Metri Pack 150, 6-pole
	Female connector plug assembly	12066317 (1x)
	Female tin plated terminal	12103881 (6x)

PWM 200 Hz, 82–41% / 18–59%, with kick-down**Part Number:** A2C59513863

Interface customer specific

Technical DataVoltage supply 5 V \pm 2% by electronic controller

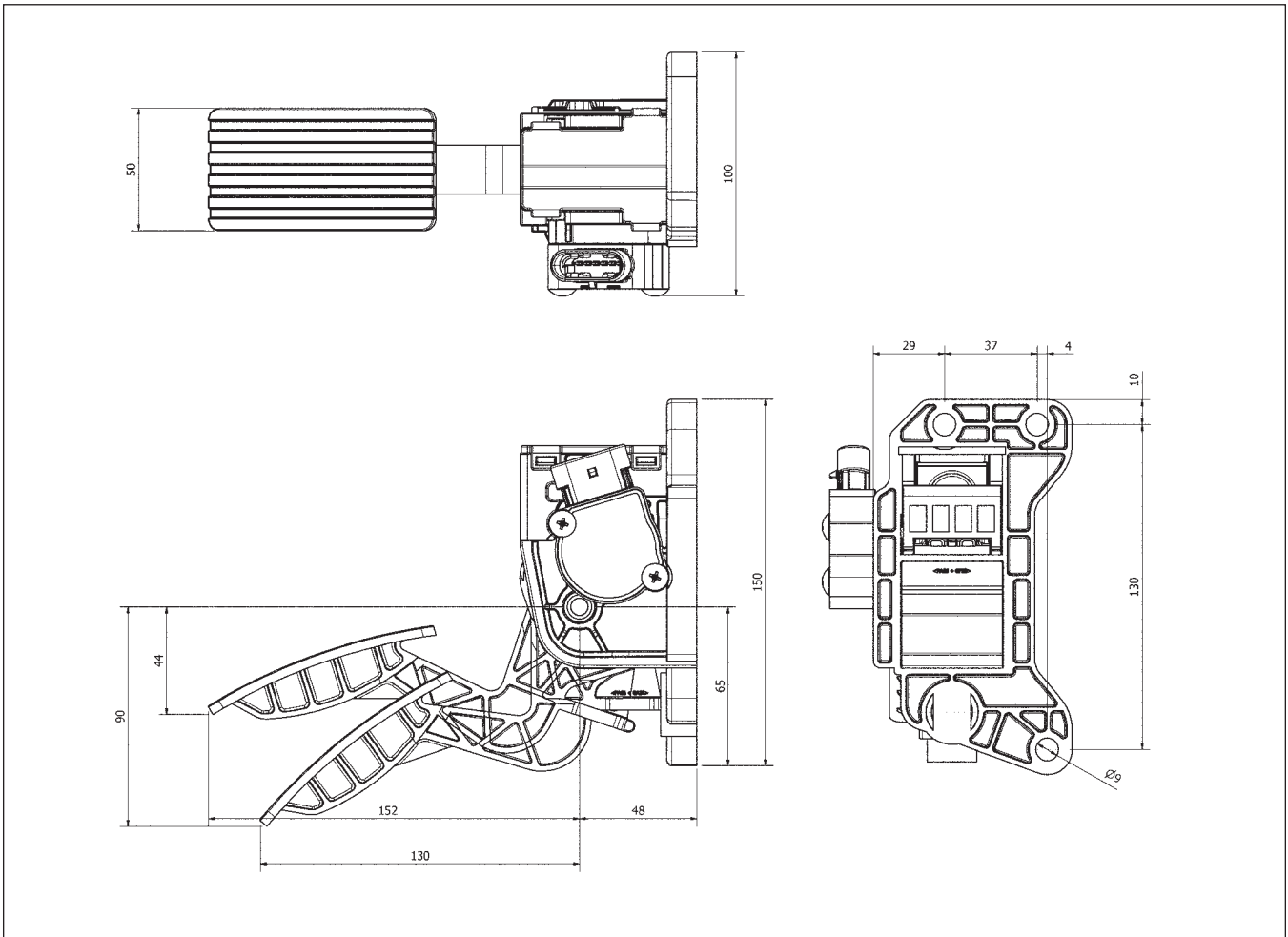
Operating temperature: -40 °C to +85 °C

Protection: IP 6k7k

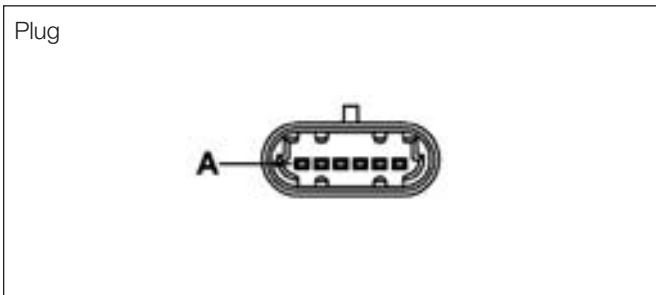
Installation place: Interior

Angel of actuation: 18.5° \pm 2°Signal output 1: PWM 200 Hz 82–41 %
Signal output 2: PWM 200 Hz 18–59 %

Dimensions [mm]



Electrical Connection: Front view



Terminal assignment		
Pin	Description	Color
A	Ground 2	–
B	Pedal Signal output 2	–
C	Power input 2	–
D	Ground 1	–
E	Pedal Signal output 1	–
F	Power input 1	–

Counter connector for vehicle harness (not part of the delivery)

Part Number	Product	Description
A2C59512245	Kit D	Connector assembly: Delphi Metri Pack 150, 6-pole
	Female connector plug assembly	12066317 (1x)
	Female tin plated terminal	12103881 (6x)

PWM 200 Hz, 82–41% / 18–59%**Part Number:** A2C59512986

Interface customer specific

Technical DataVoltage supply 5 V \pm 2% by electronic controller

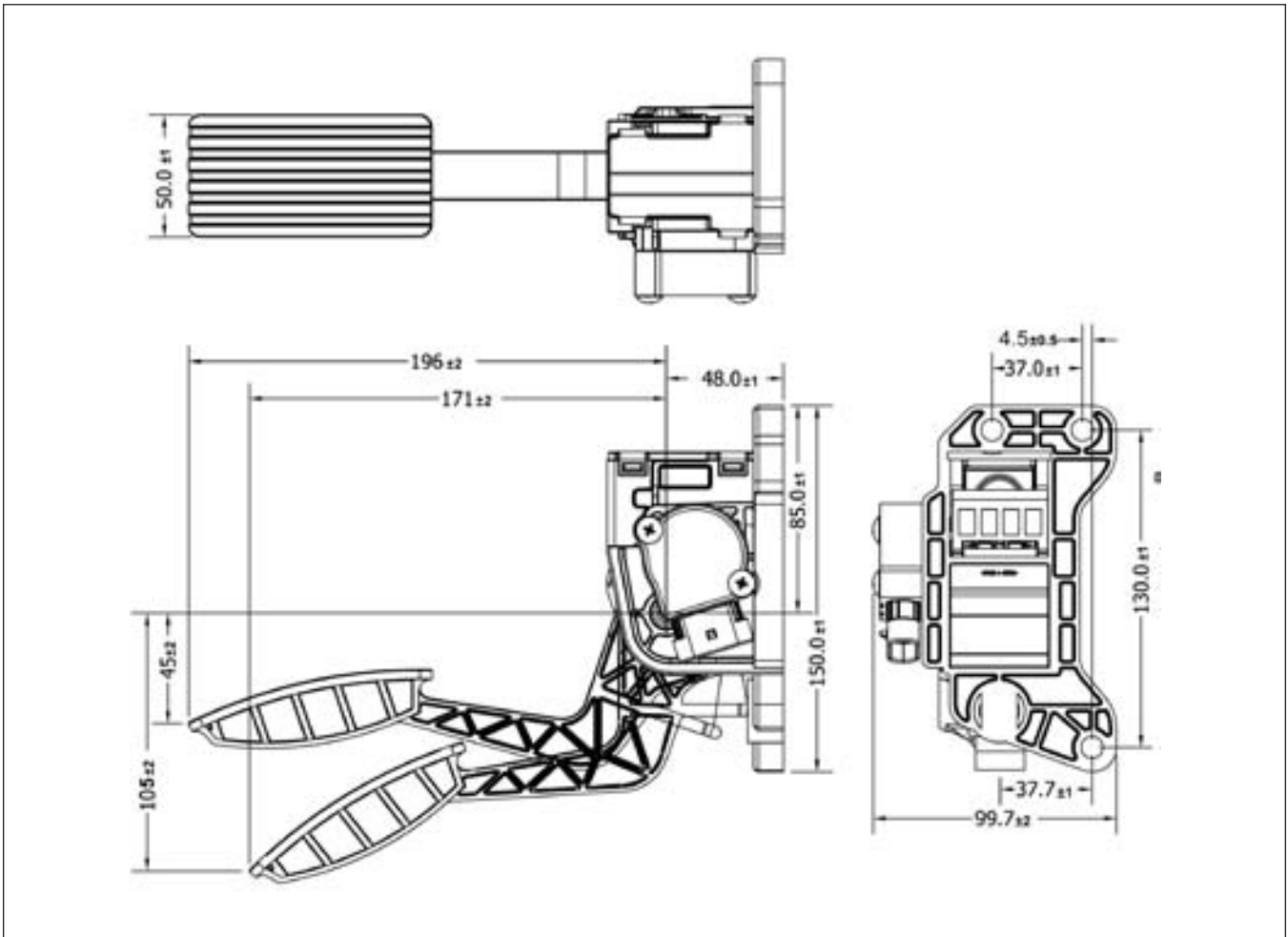
Operating temperature: -40 °C to +85 °C

Protection: IP 6k7k

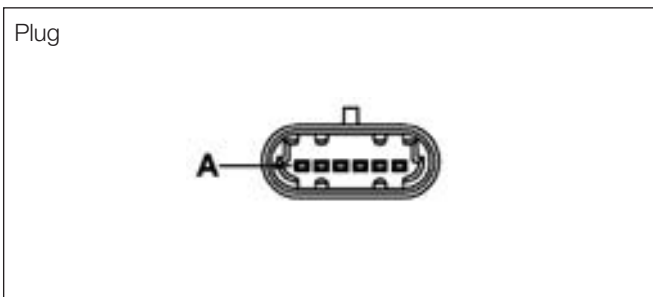
Installation place: Interior

Angle of actuation: 18.5° \pm 2°Signal output 1: PWM 200 Hz 82–41 %
Signal output 2: PWM 200 Hz 18–59 %

Dimensions [mm]




Electrical Connection: Front view



Terminal assignment		
Pin	Description	Color
A	Ground 2	-
B	Pedal Signal output 2	-
C	Power input 2	-
D	Ground 1	-
E	Pedal Signal output 1	-
F	Power input 1	-

Counter connector for vehicle harness (not part of the delivery)

Part Number	Product	Description
		
A2C59512245	Kit D	Connector assembly: Delphi Metri Pack 150, 6-pole
	Female connector plug assembly	12066317 (1x)
	Female tin plated terminal	12103881 (6x)

Analog 0.5–4.5 volts / 4.5–0.5 volts**Part Number:** A2C59513641

Interface customer specific

Technical DataVoltage supply 5 V \pm 2% by electronic controller

Operating temperature: -40 °C to +85 °C

Protection: IP 6k7k

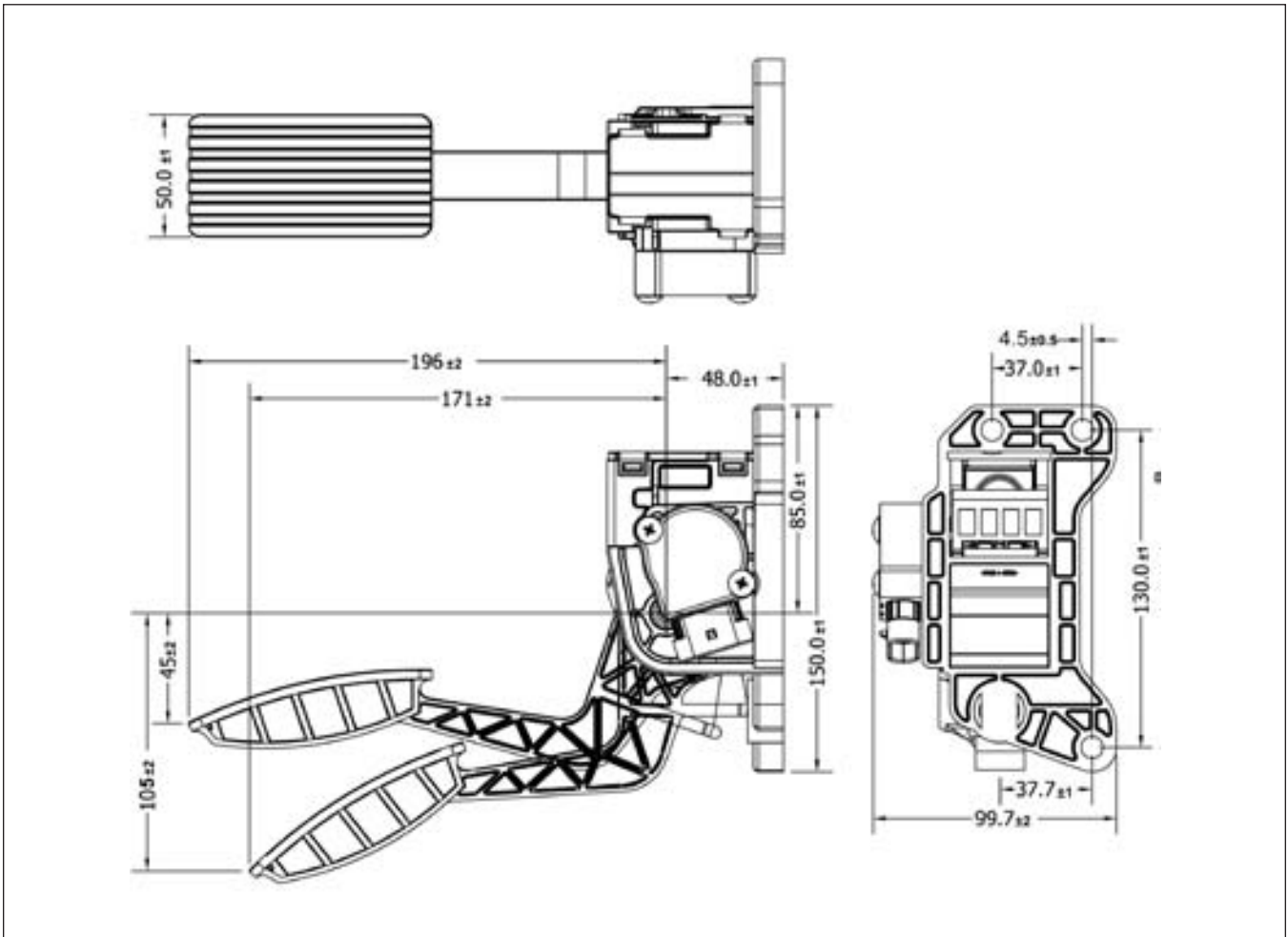
Installation place: Interior

Angle of actuation: 18.5° \pm 2°

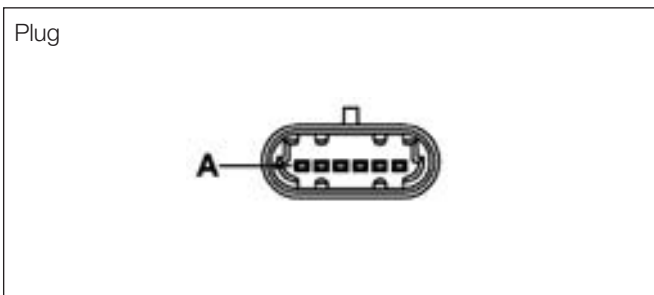
Signal output 1: 0.5–4.5 V

Signal output 2: 4.5–0.5 V

Dimensions [mm]




Electrical Connection: Front view



Terminal assignment		
Pin	Description	Color
A	Ground 2	-
B	Pedal Signal output 2	-
C	Power input 2	-
D	Ground 1	-
E	Pedal Signal output 1	-
F	Power input 1	-

Counter connector for vehicle harness (not part of the delivery)

Part Number	Product	Description
		
A2C59512245	Kit D	Connector assembly: Delphi Metri Pack 150, 6-pole
	Female connector plug assembly	12066317 (1x)
	Female tin plated terminal	12103881 (6x)



Customer-Specific Solutions

Tractor pedal

Description

This system is designed for applications that demand a rugged and reliable pedal. The pedal features internal, dual-redundant return springs to enable a safe, reliable return action. Information about the position of the pedal is transmitted via a contactless Hall sensor. A range of sensor outputs is available, providing single or dual channel, analog or PWM signals.

Features

- Robust and versatile
- Range of interface options
- Contactless, non-wearing sensor
- Extremely reliable



Tractor pedal

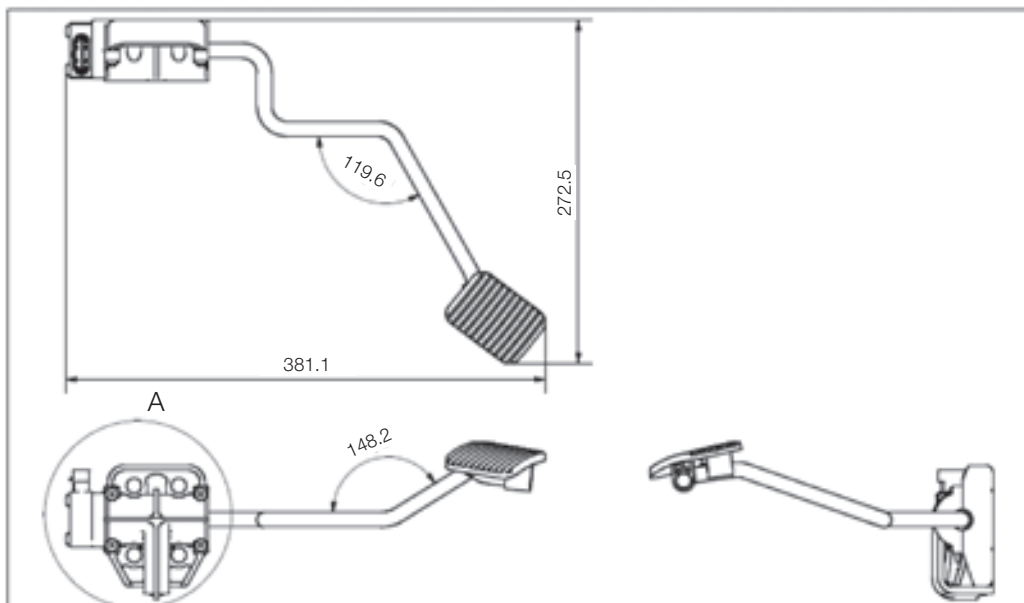
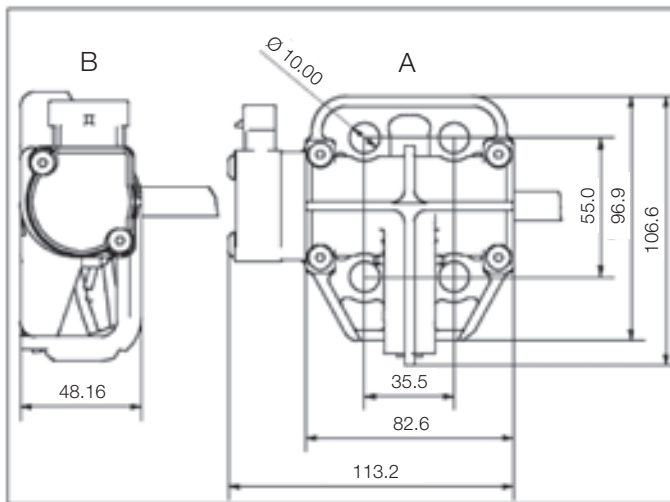
Concept

Rugged mechanical parts allow customers to enjoy years of trouble-free service. The bearing for the pedal lever is based on non-wearing, synthetic materials. Angular movement is safely restricted to the desired range, even in tough applications, thanks to sturdy, firmly attached limit stops. Along with the electronic position signal determined by the Hall sensor signals, this makes that the correct idle and full-load positions are always maintained. Carefully specified friction elements provide continuous adjustment across the full adjustment range, which is essential for both safety and drivability.

The sensor is connected directly to the vehicle wiring harness via a 6-pin connector (Delphi Packard Metri Pack 150, IP 67).



Dimensions [mm]



* The illustration shows one possible design option. The pedal arm geometry can be adapted to meet specific customer requirements.

5.2.2 Electromechanical Component | Hand-Operated Accelerators and Pedal Sensors

Hand-operated Accelerators

Hand-operated accelerators for mounting in cab. Rugged housing (aluminum) for safe operation of the accelerators. No self-actuating return mechanism. Lever position feedback is provided by a contactless sensor connected to either an analog or PWM signal circuit, depending on the variant. The no-load state is detected either by an optocoupler or mechanically via a microswitch, according to the version.

Analog 0.4–4.15 volts

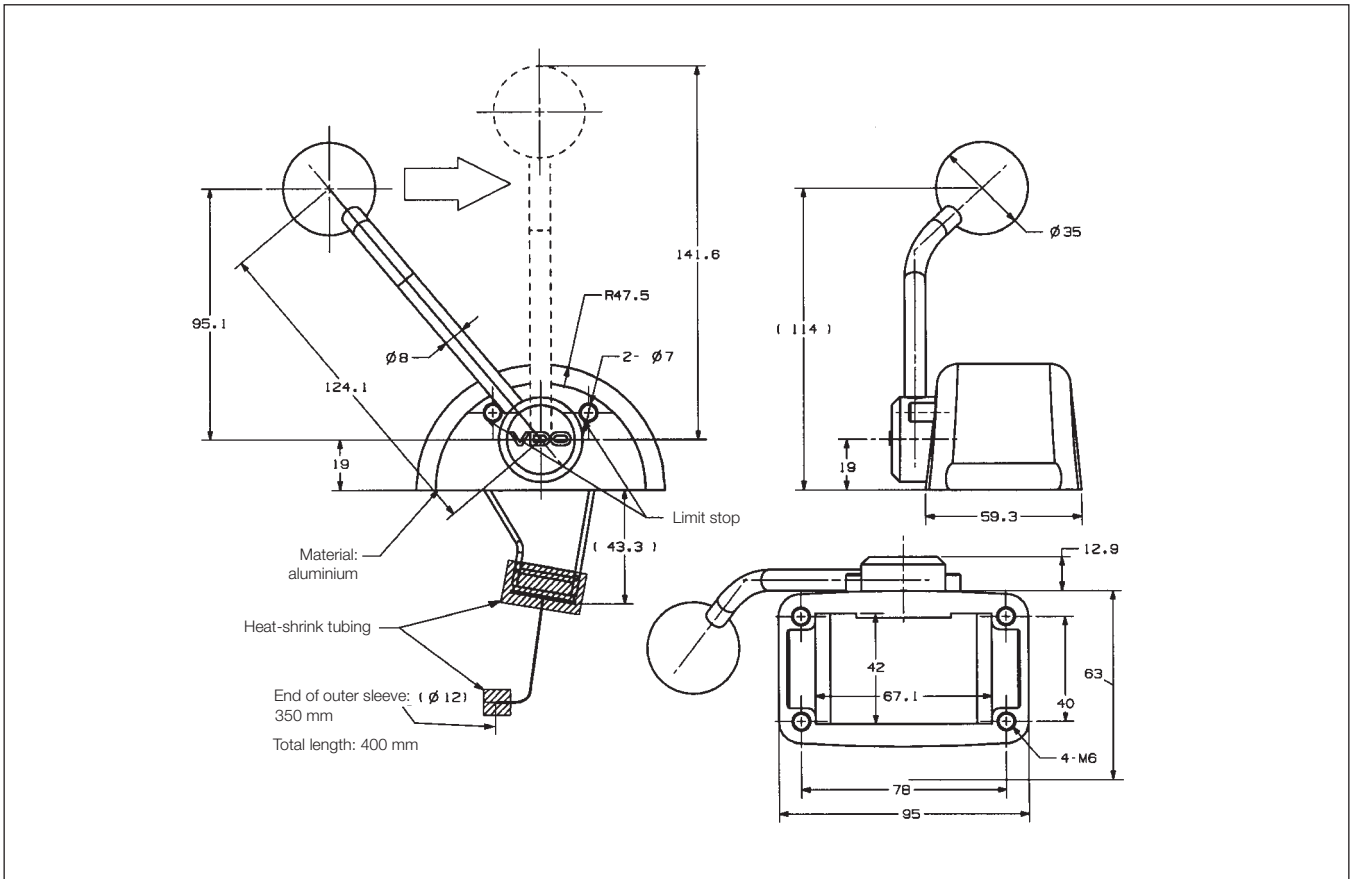


Part Number: X10-445-650-002

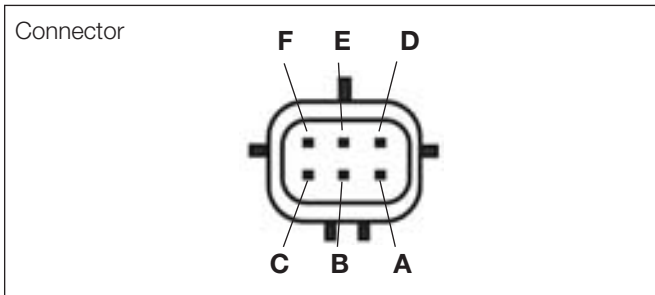
Interface to: Caterpillar (3000 Series), Perkins

Technical data	
Power supply via electronic controller	
Operating temperature	-40 °C to +85 °C
Protection rating	Sensor IP 67
Installation location	Passenger compartment
Actuation angle	92°
Lever	4.3 N ±0.5 N
Signal output	0.4–4.15 V
Idle validation switch (IVS 1):	0.6 V, NC

Dimensions [mm]




Electrical connection: Front view



Terminal assignment		
Pin	Description	Color
A	Supply voltage, Vcc	Red
B	Signal output, Vs	Green
C	Ground	Black
D	Switch ground	Yellow
E	-	-
F	Idle validation switch (IVS 1): NC	Pink

Accessories for vehicle wiring harness (not supplied as standard)

Part Number	Product	Description
	 PLUG	
X39-445-000-004	Kit C	Connector kit: AMP J Series, 6-pin
	Push-on connector	174262-2 (1x)
	Counter	174363-7 (1x)
	Contacts	
	Female	171662-5 (5x)
	Rubber plug	176886-2 (1x)
	Cable seal	172748-2 (5x)

Analog 0.4–4 volts

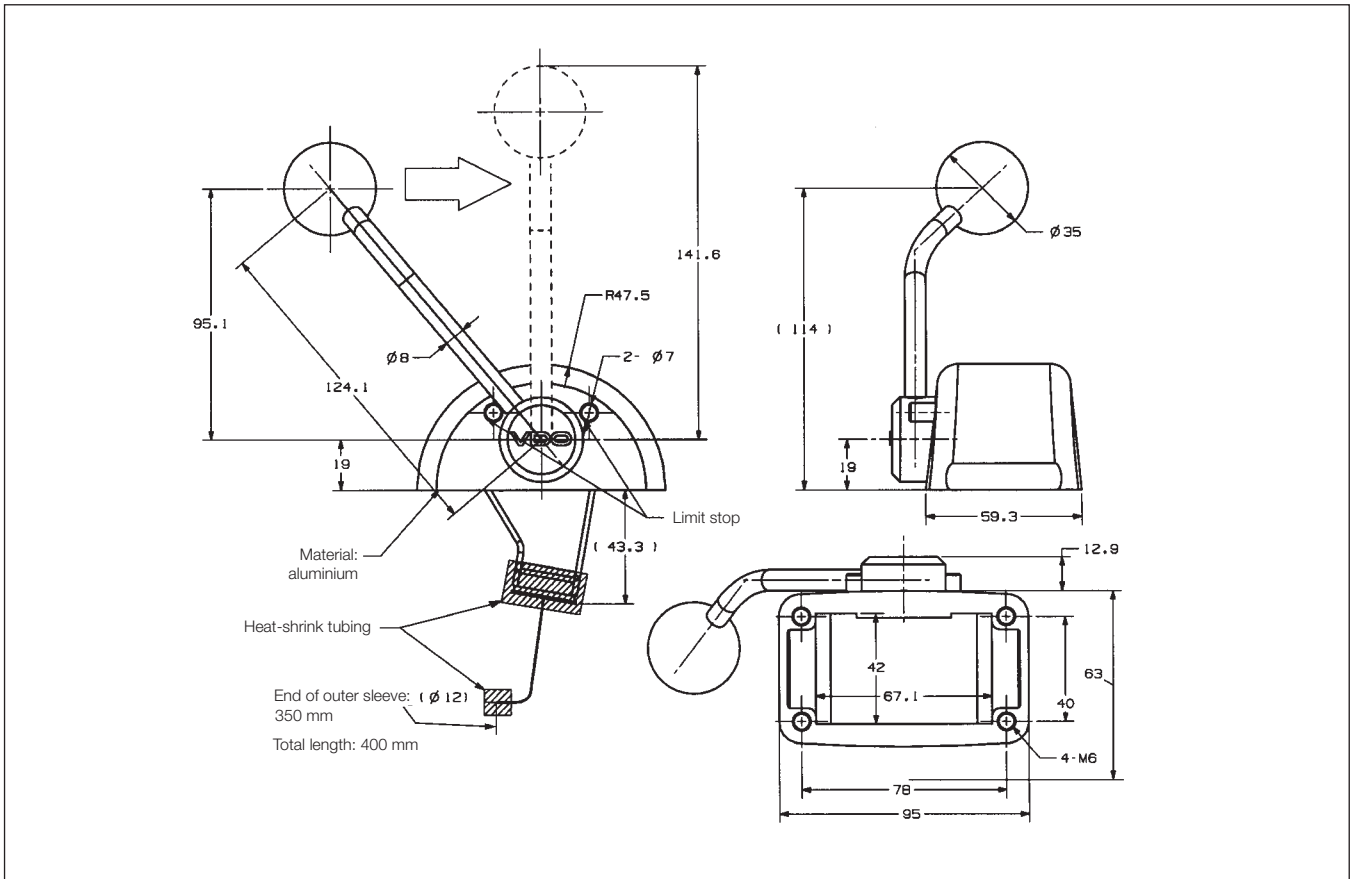


Part Number: X10-445-650-004

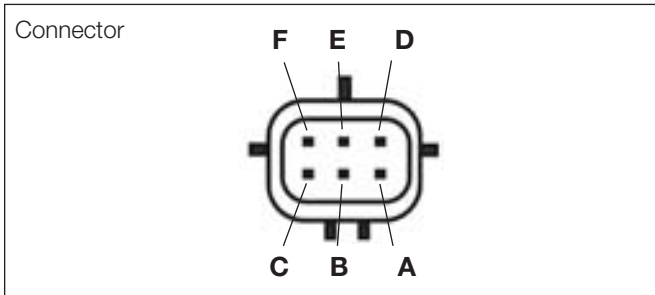
Interface to: VW, MTU, John Deere, DDEC, Deutz, Iveco, Isotta Fraschini
Engine Application

Technical data	
Power supply via electronic controller	
Operating temperature	-40 °C to +85 °C
Protection rating	Sensor IP 67
Installation location	Passenger compartment
Actuation angle	92°
Lever	4.3 N ± 0.5 N
Signal output	0.4–4 V
Idle validation switch (IVS 2):	0.6 ± 50 mV, NC
Idle validation switch (IVS 3):	0.71 ± 50 mV, NO

Dimensions [mm]




Electrical connection: Front view



Terminal assignment		
Pin	Description	Color
A	Supply voltage, Vcc	Red
B	Signal output, Vs	Green
C	Ground	Black
D	Switch ground	Yellow
E	Idle validation switch (IVS 3); NO	Blue
F	Idle validation switch (IVS 2); NC	Pink

Accessories for vehicle wiring harness (not supplied as standard)

Part Number	Product	Description
	 PLUG	
X39-445-000-004	Kit C	Connector kit: AMP J Series, 6-pin
	Push-on connector	174262-2 (1x)
	Counter	174363-7 (1x)
	Contacts	
	Female	171662-5 (5x)
	Rubber plug	176886-2 (1x)
	Cable seal	172748-2 (5x)

Analog 0.75–3.93 volts / 0.375–1.965 volts



Product may vary from illustration

Part Number: A2C59513193

Interface to: KTM X-Bow Engine

Technical dataPower supply via electronic controller (+5 VDC \pm 2 %)

Operating temperature -40 °C to +85 °C

Protection rating Sensor IP 67

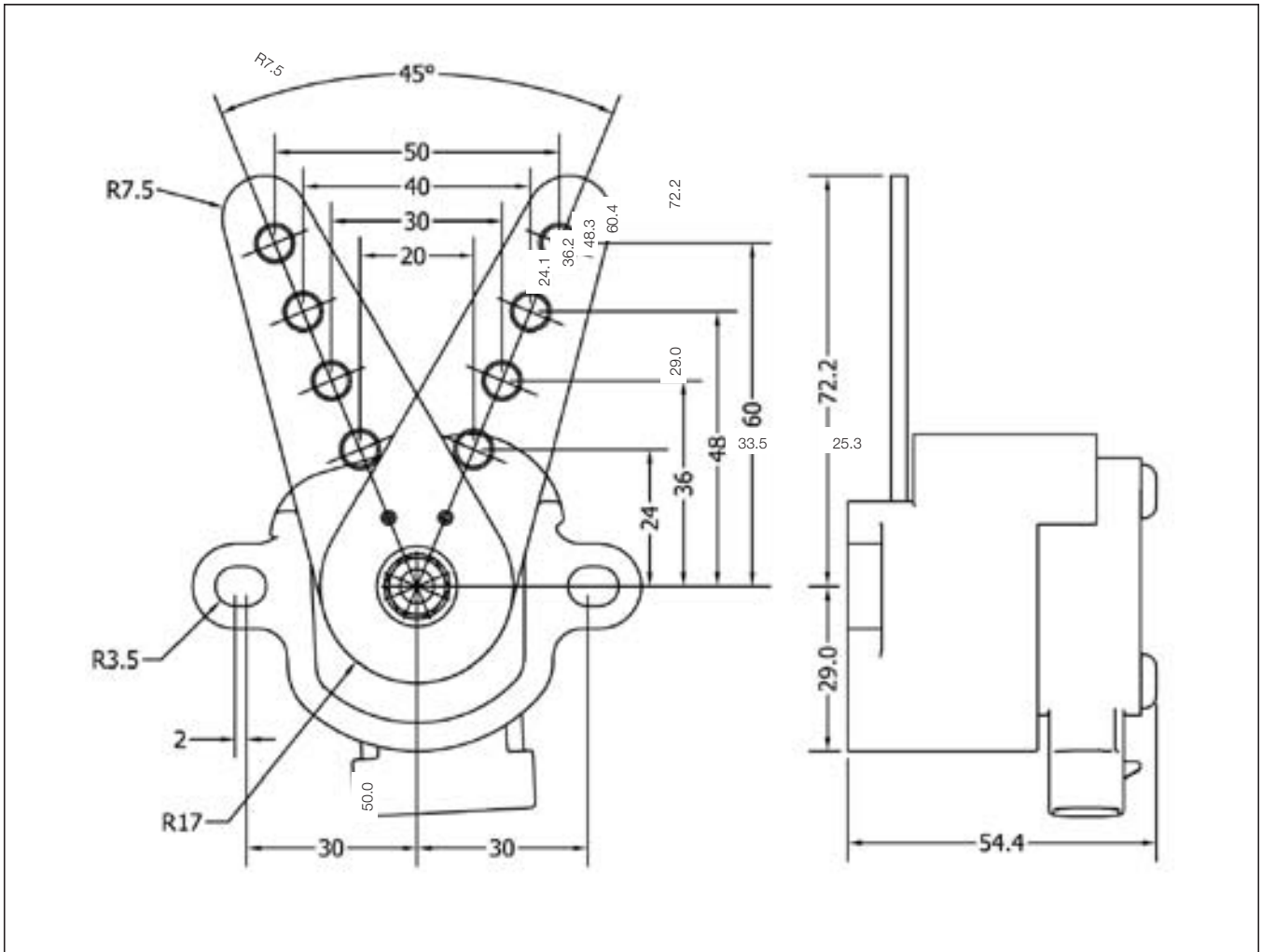
Installation location Passenger compartment

Actuation angle 45° \pm 1°

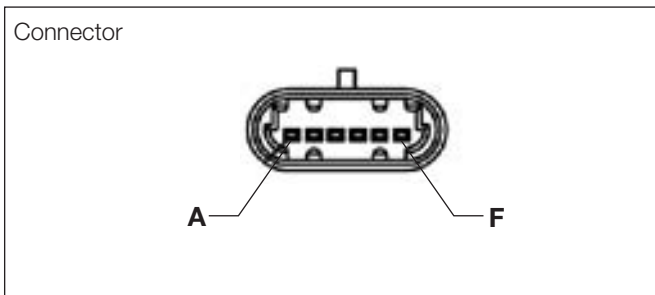
Signal output 1 0.75–3.93 VDC

Signal output 2 0.375–1.965 VDC

Dimensions [mm]



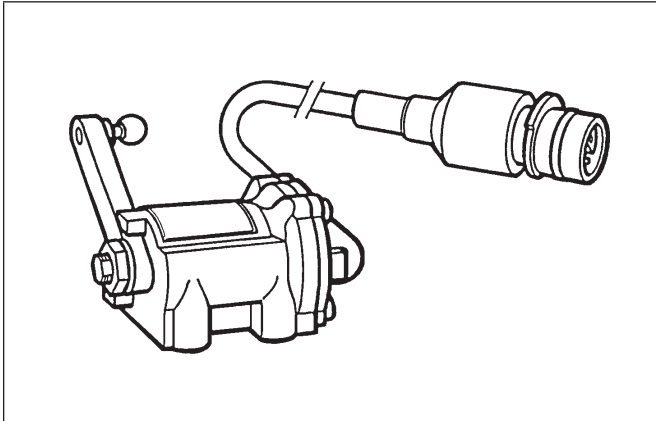
Electrical connection: Front view



Terminal assignment		
Pin	Description	Color
A	Ground 2	-
B	Signal output 2	-
C	Supply voltage 2	-
D	Ground 1	-
E	Signal output 1	-
F	Supply voltage 1	-

Accessories for vehicle wiring harness (not supplied as standard)

Part Number	Product	Description
A2C59512245	Kit D	Delphi Metri Pack 150
	Connector	12066317 (1x)
	Terminal	12103881 (6x)

5.2.3 Electromechanical Components | **Set Point Sender****System component for E-Gas® II, E-Gas® Compact**

Part Number: 445-804-005-014P

Please refer also to technical customer document 445-804-005-014P.

Description

Set point senders use a potentiometer to convert a pedal position into an electrical signal. The potentiometer wiper is positively connected to the driving lever via the potentiometer and drive shaft. The potentiometer housing is positively connected with the aluminum housing. The set point signal is always available.

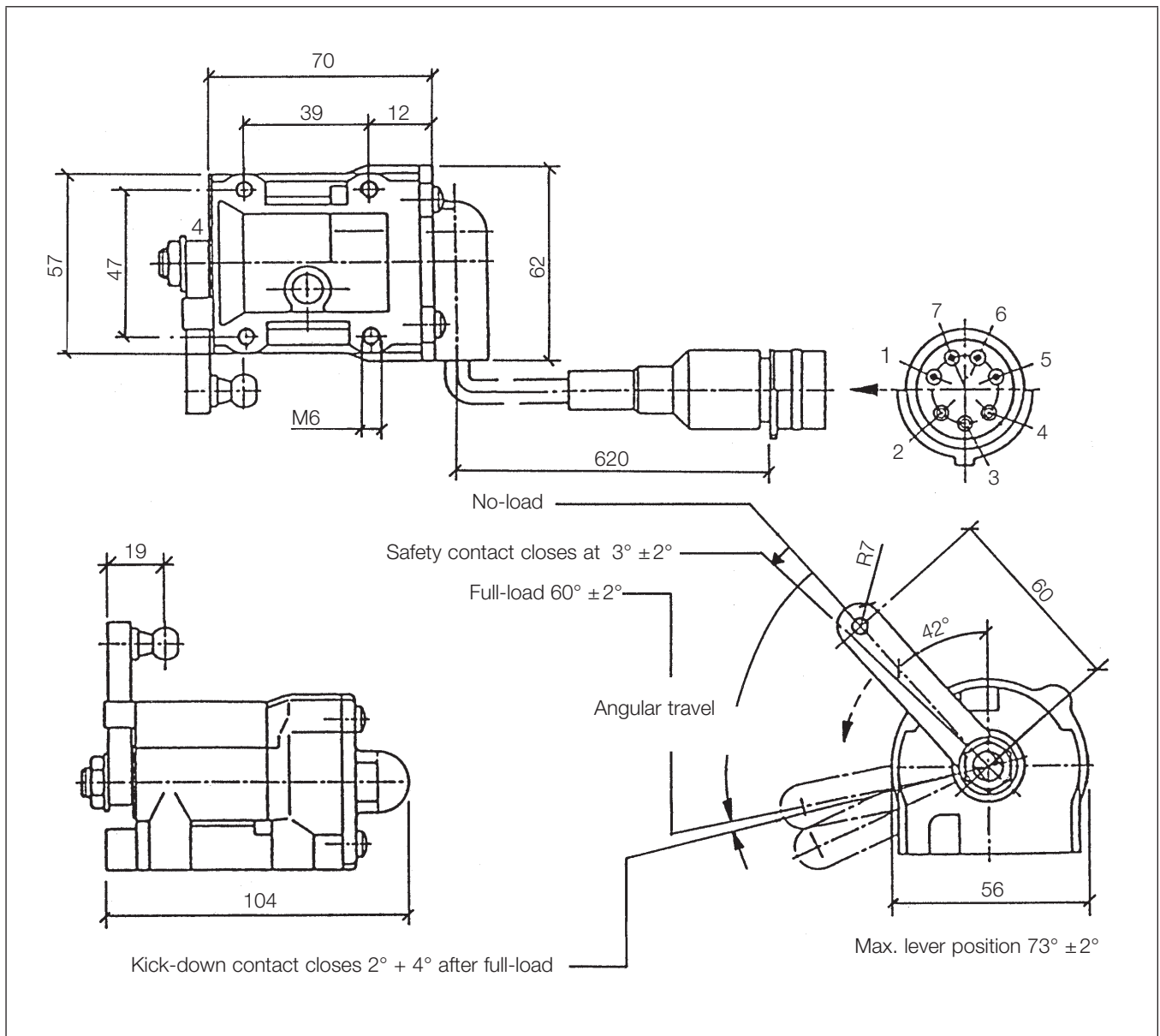
A safety contact (SK) and kick-down contact (KD) are actuated within a pre-defined range. The safety contact corresponds to a specific potentiometer value. The actuating cam is positively connected with the drive shaft. When the driving lever moves from full-load to no-load, the safety contact is positively opened. Fatigue-resistant contact springs are used.

Technical data

Power supply via electronic controller

Operating temperature	-40 °C to +80 °C
Initial torque	160 Ncm ^{+20 Ncm} _{-30 Ncm}
Final torque	280 Ncm ± 40 Ncm
Kick-down torque	550 Ncm ± 70 Ncm
Hysteresis	50 Ncm ± 20 Ncm at no-load 50 Ncm ± 20 Ncm at full-load
Protection rating	IP66 DIN 40050
Max. tightening torque for fastening screws 8 Nm + 4 Nm (at 9 mm screw-in depth)	
Connector	ITT Canon Sure Seal, 7-pin

Dimensions [mm]



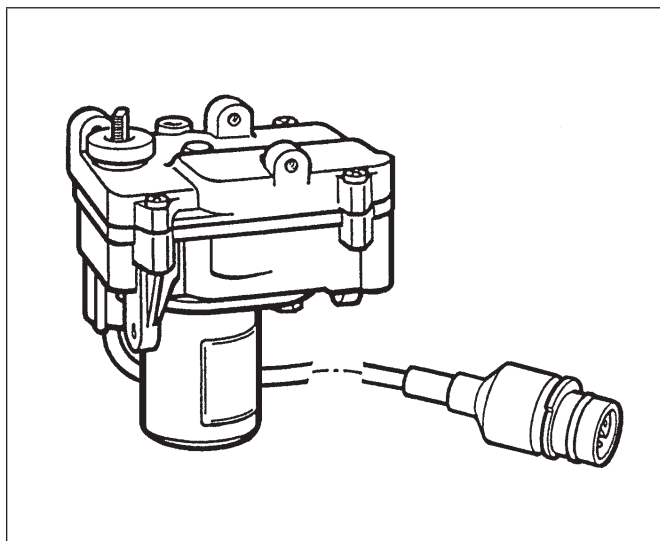
Terminal assignment

1	• White, safety contact (SK), male
2	Red, potentiometer (SP+), female
3	Yellow, potentiometer (SPS), female
4	• Blue, kick-down contact (KD), female
5	Brown, potentiometer (SP-), male
6	• Green, kick-down contact (KD), male
7	• Black, safety contact (SK), pin, wire, 0.5 mm ²
	• Max. switching current 1 A (non-inductive)

5.2.4 Electromechanical Components | Actuators

Electrical actuator

System component for E-Gas® Compact



Part Number: 408-422-006-001G

Please refer also to technical customer document 408-422-006-001G.

Description

This electrical actuator was designed by VDO for the purpose of operating a diesel engine fuel-injection pump lever in conjunction with a VDO electronic controller. A pulse-width modulated (PWM) signal is used to control the permanent magnet DC motor.

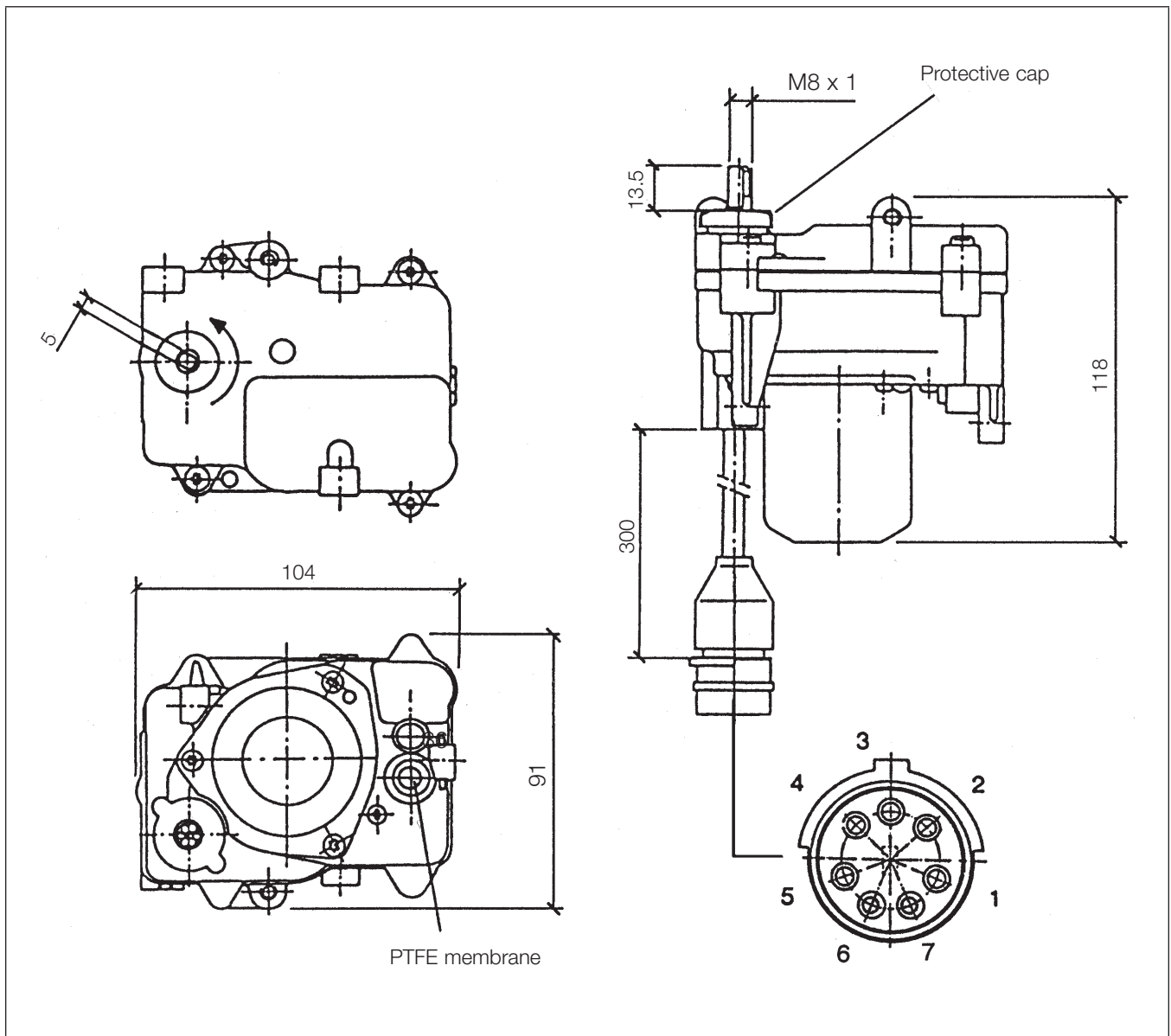
Construction

Watertight cast aluminum housing with PTFE membrane for pressure equalization. Three-stage transmission transfers force from the DC motor to the output shaft via an electromagnetic clutch. A conductive plastic potentiometer provides feedback. Connecting cable with connector.

Technical data

Rated voltage	24 V
Rated torque	250 Ncm
Closed-to-open stroke time	≤ 1 s
Closed-to-open stroke time (typical)	750 ms
Insulation resistance	≥ 500 kΩ
Dielectric strength	500 V
Operating temperature	-25 °C to +90 °C
Protection rating	IP56 DIN 40050 Part 9
Max. tightening torque for drive shaft	10 Nm
Max. tightening torque for fastening screws	12 Nm (at 9 mm screw-in depth)
Mechanical angle	103° ± 5°
Connector	ITT Canon Sure Seal, 7-pin

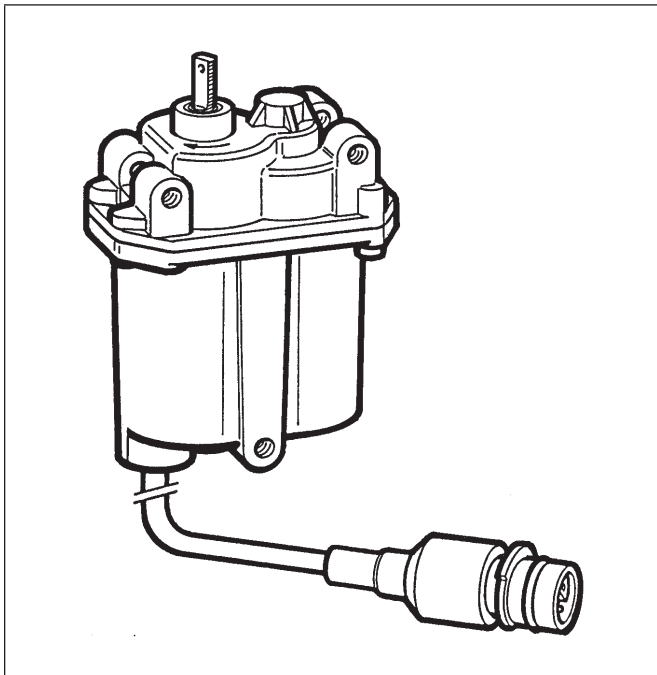
Dimensions [mm]



Terminal assignment	
1	Motor (-)
2	Potentiometer (IP-)
3	Potentiometer (IPS)
4	Potentiometer (IP+)
5	Clutch
6	Clutch
7	Motor (+)

Part Number	Product
X39-397-112-014	2 actuator bracket set (for engine mounting)

System component for E-Gas® II, E-Gas® Compact



Part Number: 408-411-005-013P

Please refer also to technical customer document 408-411-005-013P.

Description

This electrical actuator was designed by VDO for the purpose of operating a diesel engine fuel-injection pump lever in conjunction with a VDO electronic controller. A pulse-width modulated (PWM) signal is used to control the permanent magnet DC motor.

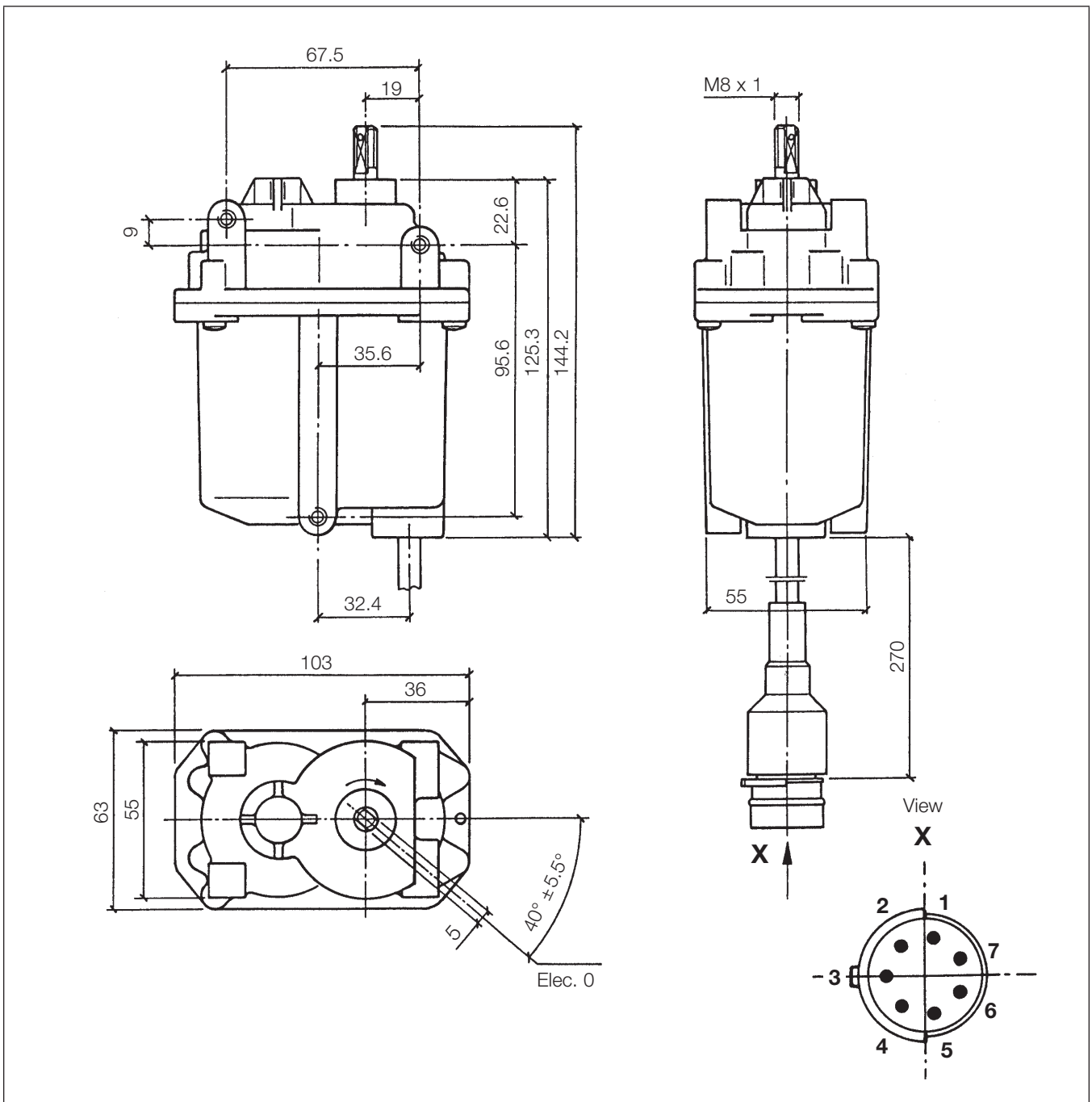
Construction

Watertight cast aluminum housing with PTFE membrane for pressure equalization. Three-stage transmission permanently engaged with output shaft. A conductive plastic potentiometer provides feedback. Features a safety contact that opens when output shaft is at a pre-defined position. Connecting cable with con-

Technical data

Rated voltage	24 V
Rated torque	180 Ncm (used in conjunction with elec. controller)
Actuation time	< 250 ms at rated voltage 100 to 180 Ncm actuating torque
Safety contact switching point	21° to 12.5° (closed at no-load)
Operating temperature	-40 °C to +120 °C (+140 °C to 1 x 1 h)
Protection rating	IP56 DIN 40050
Mechanical angle	120°
Max. tightening torque for drive shaft	10 Nm
Max. tightening torque for fastening screws	8 Nm + 4 Nm (at 9 mm screw-in depth)
Connector	ITT Canon Sure Seal, 7-pin

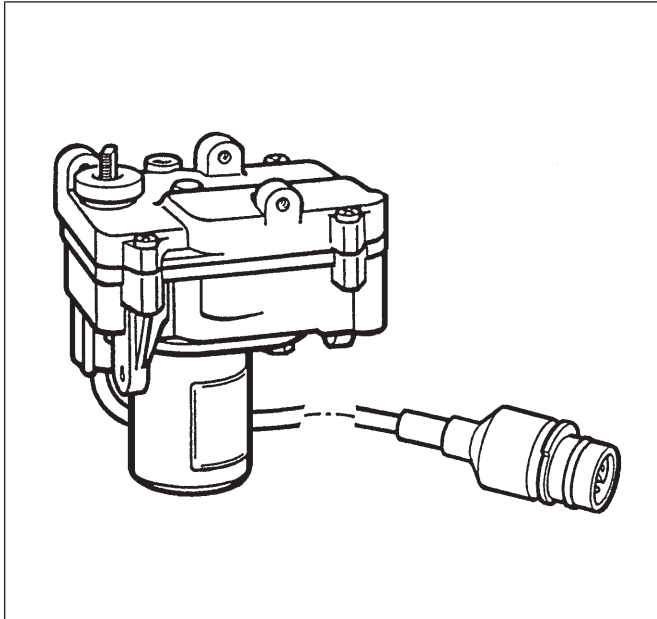
Dimensions [mm]



Terminal assignment	
1	Motor (-)
2	Motor (+)
3	Safety contact
4	Safety contact
5	Potentiometer (IP-)
6	Potentiometer (IPS)
7	Potentiometer (IP+)

Part Number	Product
240-110-001-001P	Damping elements (set)
993-620-079-1143	Lever (angled)
993-620-082-1143	Lever (straight)

System component for E-Gas® Compact, AGB Komfort



Part Number: 408-221-005-001G

Please refer also to technical customer document 408-221-005-001.

Description

This electrical actuator was designed by VDO for the purpose of operating a diesel engine fuel-injection pump lever in conjunction with a VDO electronic controller. A pulse-width modulated (PWM) signal is used to control the permanent magnet DC motor.

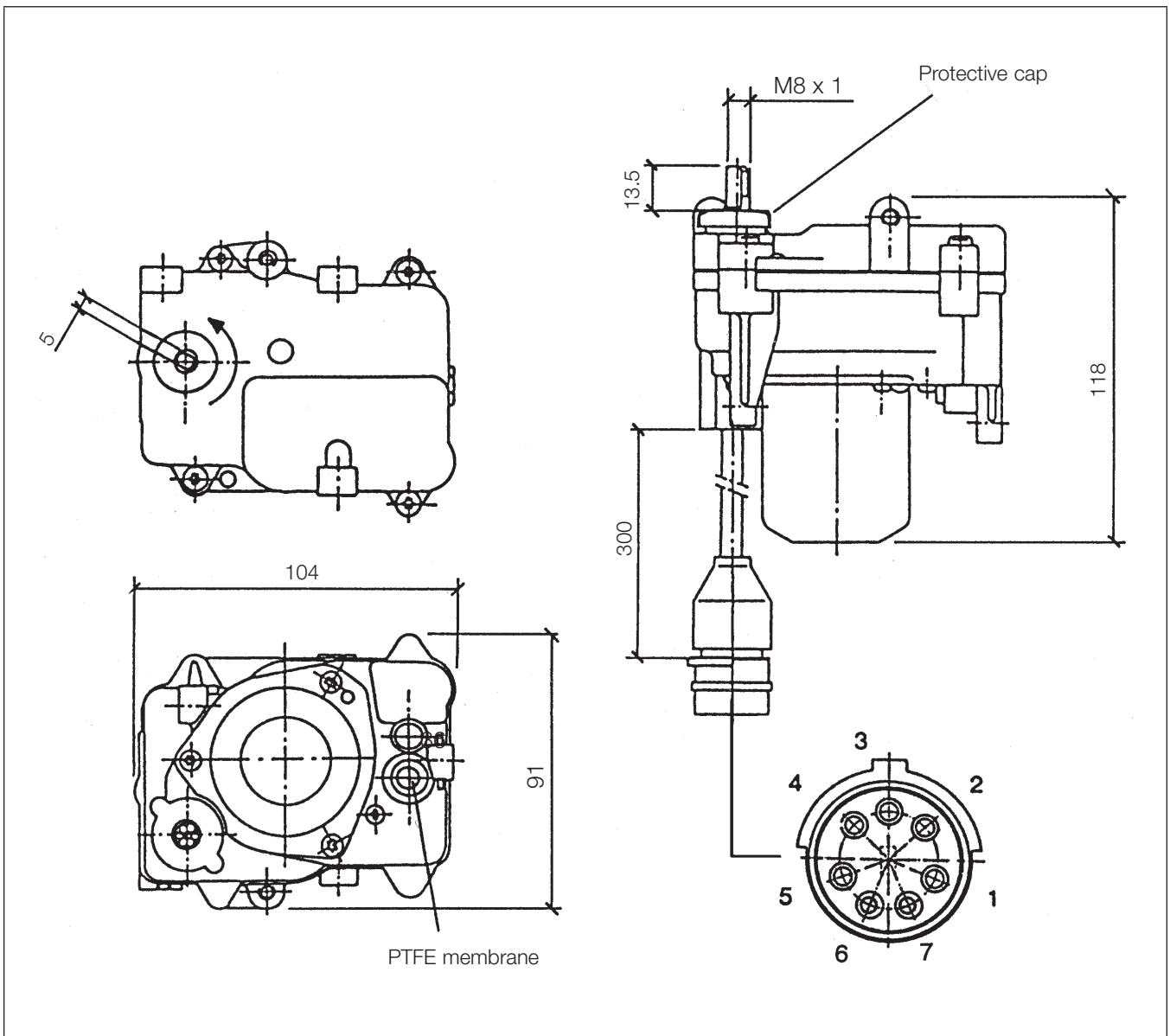
Construction

Watertight cast aluminum housing with PTFE membrane for pressure equalization. Three-stage transmission transfers force from the DC motor to the output shaft via an electromagnetic clutch. A conductive plastic potentiometer provides feedback. Connecting cable with connector.

Technical data

Rated voltage	12 V
Rated torque	400 Ncm counterclockwise (AGB) 300 Ncm clockwise (tempostat®)
Closed-to-open stroke time	≤ 2 s
Insulation resistance	≥ 500 kΩ
Dielectric strength	500 V
Operating temperature	-25 °C to +90 °C
Protection rating	IP56 DIN 40050 Part 9
Max. tightening torque for drive shaft	10 Nm
Max. tightening torque for fastening screws	12 Nm (at 9 mm screw-in depth)
Mechanical angle	103° ± 5°
Connector	ITT Canon Sure Seal, 7-pin

Dimensions [mm]

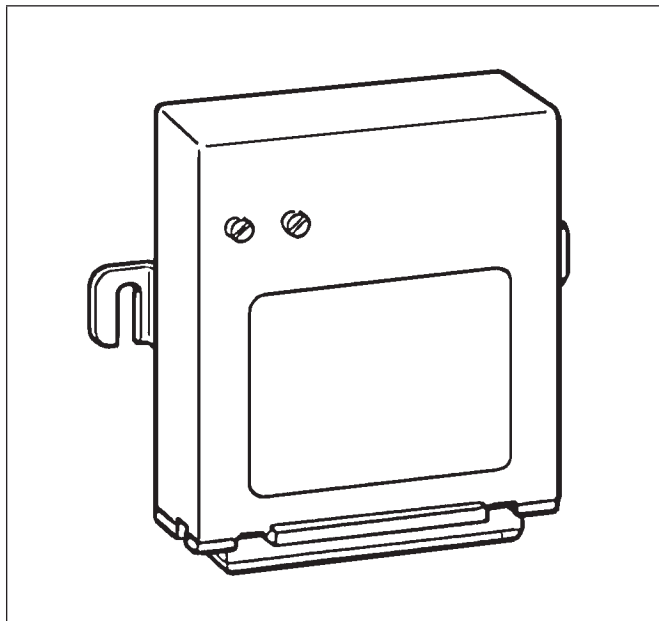


Terminal assignment	
1	Motor (-)
2	Potentiometer (IP-)
3	Potentiometer (IPS)
4	Potentiometer (IP+)
5	Clutch
6	Clutch
7	Motor (+)

Part Number	Product
240-110-001-001P	Damping elements (set)
X39-397-112-014	Actuator bracket set (for engine mounting)

Electronic controller

System component for E-Gas® Compact



Part Number: 412-413-011-002P

(Discontinued, available while stocks last)

Description

This electronic controller has been designed for use in specialist off-highway vehicles.

The system operates the fuel control lever of an internal combustion engine by means of an actuator, which moves according to a set of pre-defined set points. All input and output signals are processed by an integrated 16-bit processor. Thanks to the flexibility of its design, the controller can be programmed to meet a wide range of requirements, such as:

- Pedal-by-wire
- Engine speed control and limitation
- Vehicle speed control and limitation
- Position limitation
- Networking with other controllers

A custom PC-based software tool allows the controller to be accessed as necessary via the diagnostics interface in order to change the calibration or read out diagnostic trouble codes.

The controller complies with the following standards:

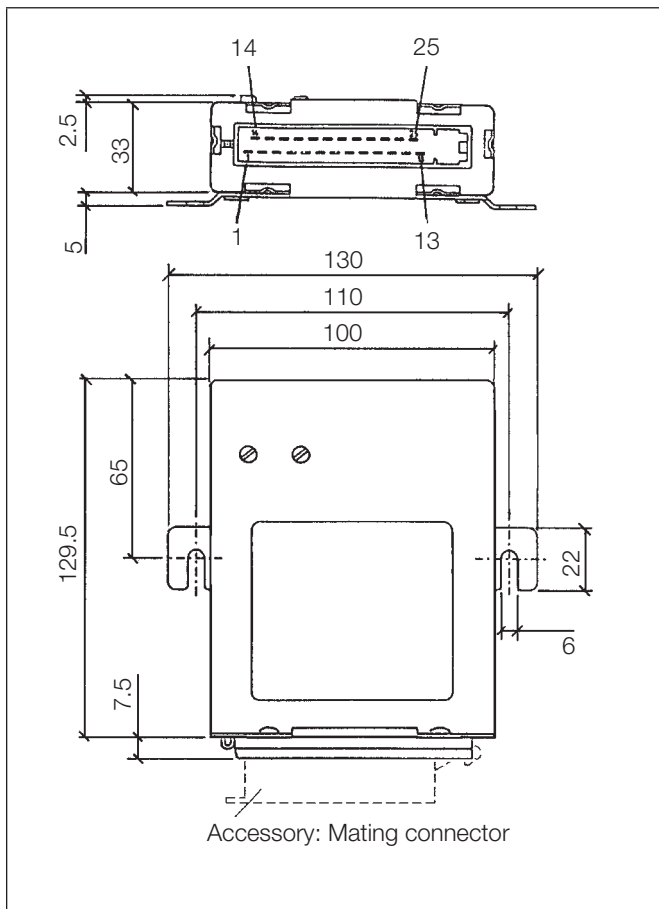
- 2006/96/EC Automotive EMC Directive
- Directive 92/24/EEC relating to speed limitation devices
- DIN 40839 Interferences conducted along supply lines

(In contrast to electronic controller 412-413-011-001P, the system has now been approved for use in all land-based vehicles and machinery.)

Technical data

Rated voltage	12 V or 24 V
Operating voltage	9.5–32 V
Operating temperature	-40 °C to +70 °C
Protection rating	IP53 DIN 40050
Installation location	Passenger compartment
Orientation	Electrical connection facing down (minimum 5°)
Push-on connector	25-pole AMP

Dimensions [mm]



Terminal assignment	
1	Terminal 15
2	Motor (-)
3	Clutch switch
4	Fixed engine speed control ON
5	Pedal unit PWM 1
6	Prog. limiter
7	tempostat® memo
8	Brake signal
9	Rotational speed
10	Actuator feedback
11	Pot. connector (+)
12	Pot. connector (-)
13	Fault light and button
14	Terminal 31 (ground)
15	Motor (+)
16	tempostat® off
17	Pedal unit PWM 2
18	Clutch
19	tempostat® S-B
20	tempostat® S+B
21	Speed signal
22	Not connected
23	Diagnostics K-line
24	Pot. wiper
25	Analog input

Part Number	Product
X11-397-109-003	Mating connector, edge connector, black
X11-397-109-004	Connector sleeve

6. Customer-Specific Solutions*

* Only available for series production applications on request

6.1 Control Units and Electronic Network Solutions (ENS)*

6.2 Custom Solutions*

- 6.2.1 Panel Design and Build
- 6.2.2 Cockpit Solutions
- 6.2.3 Centrobases 300 / 500
- 6.2.4 FlexCluster

6.3 Sensors for Engine Management Systems*

- 6.3.1 Intake Air Pressure Sensors (MAP, T-MAP)
- 6.3.2 Mass Airflow Sensor (MAF)
- 6.3.3 Knock Sensor
- 6.3.4 Crankshaft Position Sensor
- 6.3.5 Camshaft Position Sensor
- 6.3.6 High_temperature Sensor
- 6.3.7 Differential pressure Sensor



Control Units and Electronic Network Solutions (ENS)*

* Only available for series production applications on request



*Only available for series production applications on request

Control Units and Electronic Network Solutions (ENS)*

Modern vehicles and machines are expected to provide increasingly high levels of efficiency, comfort, and functionality. Our smart onboard electronics system and control unit solutions make it possible to master this challenge.

Control units

We have extensive expertise in the development of control units for specific applications and individual requirements.

Electronic network solutions

Our network solutions for onboard vehicle electronics replace conventional electrics and bulky fixed wiring harnesses. Featuring flexible multiplex architectures, our state-of-the-art networks offer high performance and reliable diagnostics using distributed intelligence techniques. Drivers can access all relevant information at any time via a direct interface. Standard data buses enable easy connection of a variety of components.

Significant system cost reductions

Our onboard electronics system radically reduces the number of cables, connections, plugs, relays, and fuses installed in a vehicle. This significantly increases vehicle reliability and helps lower the cost of wiring, while also reducing the overhead associated with quality checks, documentation, and servicing. Alongside these savings, the costs related to procurement, inventory, and administration can also be trimmed.



Control unit



Custom Solutions*

* Only available for series production applications on request

6.2.1 Panel Design and Build

6.2.2 Cockpit Solutions

6.2.3 Centrobase 300/500

6.2.4 FlexCluster





*Only available for series production applications on request

Panel Design and Build

From idea to finished panel

The panel forms the basis of each cockpit system and can be supplied in metal or plastic, as required. The complete system comprises the panel, instruments, switches, indicator lamps, and wiring harness and is delivered ready for installation. The instruments used come from our comprehensive VDO instrument range. Our versatile panel solutions can accommodate round or square instruments, digital displays, and audio systems with equal ease.

For us, designing instrument panels is all about meeting specific customer requirements. We work closely with our customers, developing their ideas to create the best possible panel for their needs.



Instrument panel for construction machinery developed to customer specifications



Instrument panels – complete solutions to meet specific needs

Our complete instrument panels combine proven VDO technology and classic design. Whether for sports cars, construction vehicles, agricultural machinery, special vehicles or leisure boats, our VDO panel building team is on hand to design, build, and supply ready-to-fit panels based on customer drawings.

Design, materials, instrumentation, and wiring are all subject to tough quality controls throughout each phase of the process.



VDO instrument panels in plastic



* Only available for series production applications on request

Cockpit Solutions

Our service, your cockpit: our cockpit solutions can be tailored to meet specific customer requirements. Whatever your needs, we are happy to assist – just ask.



* Only available for series production applications on request

Centrobases 300/500**

Versatile and adaptable

The VDO Centrobases 500 and Centrobases 300 instrument clusters allow all relevant engine data (analog and digital) to be presented clearly on a central display, thus enabling greater convenience and enhanced ergonomics in the driver's cab. Products in the Centrobases family are continuously adapted and updated to always meet customer requirements.

VDO Centrobases instrument clusters stand out for their efficiency, flexibility, quality, reliability, and ease of use. Dials can be adapted to meet individual customer requirements in terms of scaling, icons, and design.



Centrobases instruments with LCD and up to 12 warning lights



Intelligent instrument cluster with central connector and compact housing

**please see also Chapter 1.2



* Only available for series production applications on request

FlexCluster

Countless Tasks. One Solution

Our products always meet the highest standards with regard to quality, durability, and aesthetics, but the FlexCluster indicating instrument offers even more: maximum functionality in every respect.

Maximum flexibility: The tried and tested Gateway feature allows data to be processed from two different CAN busses running different protocols (e. g., SAE J1939 and/or CAN Open). This enables flexibility in use and ensures that all important data and information can be transmitted to other control units. Additional peripheral instruments, from oil pressure through fuel consumption to operating hours, can also be controlled via the FlexCluster. Accordingly, all data required for vehicle operation can be displayed.

Maximum safety: The FlexCluster indicating instrument provides a large number of customizable settings. DTC (Diagnostic Trouble Code) handling in accordance with the SAE J1939 protocol is thus made extremely simple. A back-up system ensures that the integral real-time clock is not affected if there is a loss of power.

Maximum compatibility: Maximum compatibility is guaranteed thanks to a wide array of analog and digital frequency inputs in conjunction with multiple CAN inputs.

Maximum individuality: The layout of the central dot-matrix display is fully customizable and can even be programmed to show personalized icons and corporate logos. All warning lights can be individually customized in terms of shape and color. There is also a range of options for the dials and bezels.

Maximum ergonomics: The best possible ergonomics are guaranteed with this space-saving design. It not only enables optimal readability of the instruments but also helps to increase comfort levels in the driver's cab.

Maximum spontaneity: Thanks to a specialized software, the FlexCluster indicating instrument can be programmed and configured to precisely meet any customer requirement. For added convenience, the self-explanatory software allows customers to implement changes themselves as and when required.

Maximum robustness: The extremely high protection rating (IP 67) of the housing means that the FlexCluster is suitable for continuous use under the most extreme conditions of heat/cold, moisture, vibration, etc.

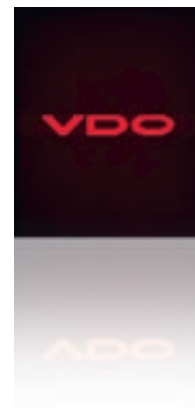
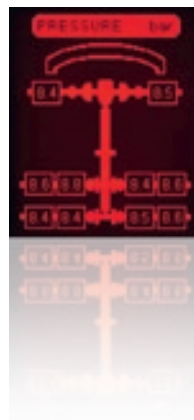
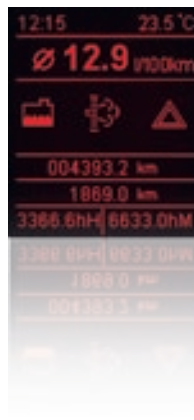
Specifications:	
Dimensions (mm):	290.6 x 143.5 x 72.5
Nominal voltage:	12 V or 24 V
Supply voltage:	9 V to 16 V or 18 V to 32 V
Operating temperature:	-40 °C to + 75 °C
Protection degree:	IP 67 front side and rear side
Features:	
Appearance:	Black dial with red pointers, multicolor printing Customization of dial, telltales, screening rings and HMI possible
Illumination:	white backlight and amber colored display illumination, dimming via PVM
Gauges:	4 gauges (2x large, 2x small) e.g. Speedometer, tachometer, fuel level, coolant temperature or air pressure
Display:	Dot matrix LCD, technology: FSTN Resolution: 115 x 145 Active area: 65.23 x 51.73 mm
Telltales:	24 + 2 (placed near small gauges)
Wake-Up:	CAN or term 15
EOL programming:	KWP2000 on CAN
Analog input (resistive/voltage):	6 (2 can be used as voltage input)
Digital input:	24
Frequency input:	4
Current input:	1
Output:	3 x 500 mA Output can be used as frequency or digital output (Low side switch)
External buzzer output:	1
D+ Generator load:	1 (150 Ω pull up @ 24 V or 53 Ω pull up @ 12 V)
Interfaces:	2 x CAN, 1 x LIN 1 x for additional gauge satellites
Connectors:	2 x Tyco Super Seal (35 pin and 23 pin) In-mold with back cover

This solution offers significant design flexibility in order to realize vehicle functionality and end-customer needs, including enhancing or changing features during the vehicle's lifetime. With a special application programming software, we offer our customers a powerful, established tool for simple programming.

The FlexCluster indicating instrument was specifically developed to withstand the harsh conditions associated with special-purpose vehicles.

With four instrument dials in an ergonomically optimized layout, 26 configurable warning lights, and a large dotmatrix display, the FlexCluster indicating instrument

is one of the most advanced system components available to the special vehicle manufactures today. The extensive customization options allow the system to meet even the toughest requirements, while also providing an optimal combination of individuality and value for money.





Sensors for Engine Management Systems*

* Only available for series production applications on request

6.3.1 Intake Air Pressure Sensors (MAP, T-MAP)

6.3.2 Mass Airflow Sensor (MAF)

6.3.3 Knock Sensor

6.3.4 Crankshaft Position Sensor

6.3.5 Camshaft Position Sensor

6.3.6 High temperatur Sensor

6.3.7 Differential pressure Sensor

* Only available for series production applications on request

Intake Air Pressure Sensors (MAP, T-MAP)

Temperature and absolute pressure sensors, 1 to 5 bar

Our innovative sensors help to meet increased global requirements with regard to enhanced performance, as well as current and future emissions regulations. Absolute pressure sensors are used to measure air pressure in different applications throughout the vehicle.

Operating principle

Our absolute pressure sensors are based on micro-machined silicon sensing elements, which deflect under load to generate a ratiometric voltage that corresponds to the incident pressure. This signal is in turn amplified and temperature-compensated according to a fully configurable digital calibration.

Applications

- MAP (**M**anifold **A**bsolute **P**ressure Sensor): Measurement of intake air pressure in order to measure air flow, which is an important variable in calculating the volume of fuel to be injected and, in turn, for optimization of the air-fuel mixture.
- T-MAP (**M**AP Sensor with integral Temperature Sensor): Measurement of intake air pressure and temperature in order to measure air flow, which is an important variable in calculating the volume of fuel to be injected and, in turn, for optimization of the air-fuel mixture.
- Turbo MAP (**M**anifold **A**bsolute **P**ressure Sensor for Turbocharged engines): Measures air pressure, for example, downstream of the turbocharger
- Turbo T-MAP (**Turbo MAP** Sensor with integral Temperature Sensor): Measures air pressure and temperature, for example, downstream of the turbocharger
- BAP (**B**arometric **A**bsolute **P**ressure Sensor): Measures barometric air pressure
- BPS (**B**rake **P**ressure **S**ensor): Measures air pressure in brake servo systems



MAP sensor



BAP sensor



T-MAP sensor



BPS sensor



* Only available for series production applications on request

Mass airflow sensor

A growing focus on reducing CO₂ emissions means that mass airflow sensors are becoming increasingly important in ensuring the optimum air fuel ratio. Mass airflow sensors are positioned directly after the air filter in the intake manifold and supply information on temperature, humidity, and intake air volume.

Despite their highly compact construction they feature precision technology to capture information which – , together with other engine data – enables optimum engine management.

This data includes:

- Intake air temperature
- Intake air humidity
- Intake air volume

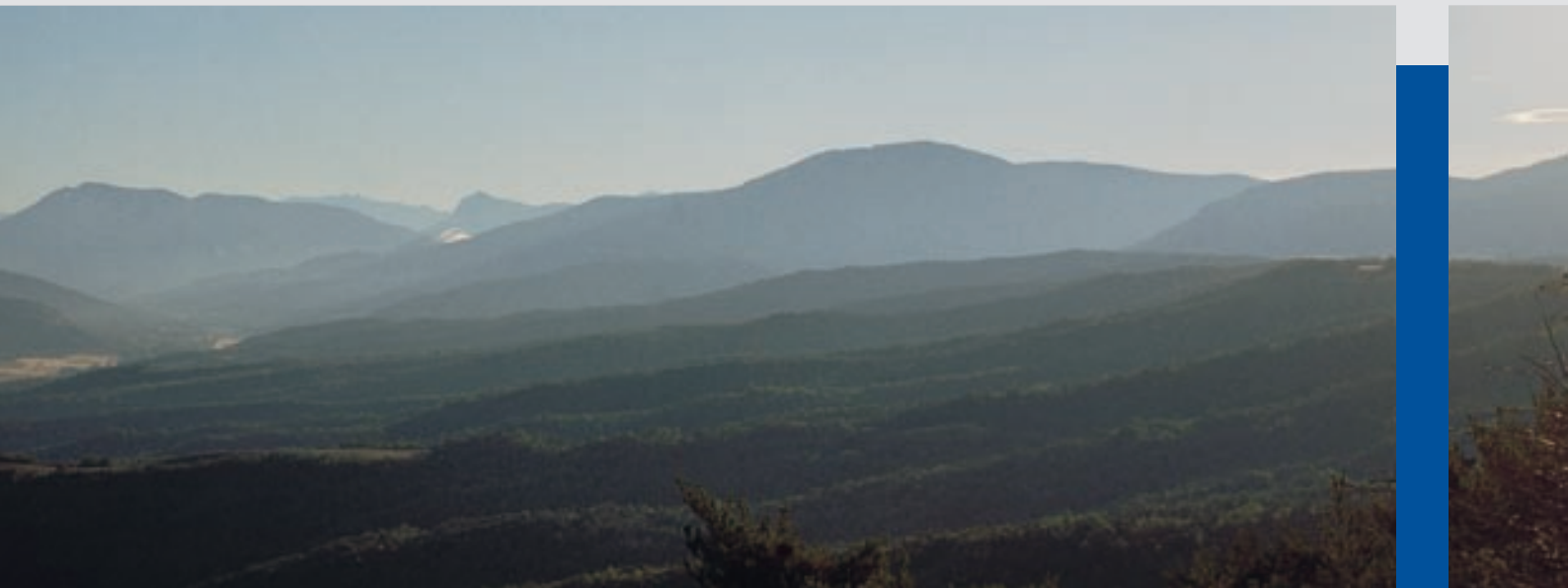
In gasoline engines, mass airflow measurement is used in conjunction with other sensor readings to regulate the supply of fuel to the engine.

In diesel engines, mass airflow sensors are used to regulate the exhaust gas recirculation rate and calculate the maximum injection quantity.

VDO mass airflow sensors are exceptionally reliable and highly capable of withstanding environmental factors. Their dynamic measurement ability makes an important contribution to reducing vehicle emissions.



Mass airflow sensor



* Only available for series production applications on request

Knock sensor

Modern engines which allow high compression ratios have a distinct disadvantage: their design leads to increased knocking, which can damage the engine. Knock sensors reliably measure the vibration of the engine block that is characteristic of engine knocking. This allows the firing angle and other parameters to be set such that the engine continues to function correctly close to the knock threshold. This not only protects the engine but also reduces fuel consumption.

To ensure maximum precision, VDO knock sensors deploy groundbreaking bandwidth technology.



Knock sensor



* Only available for series production applications on request

Crankshaft Position Sensor

The crankshaft position sensor supplies information on the crankshaft's current position, which the engine management system can then use to calculate rpm. These values make it possible to determine the most economical fuel injection and ignition timing for a vehicle.



Crankshaft Position Sensor



* Only available for series production applications on request

Camshaft Position Sensor

The camshaft position sensor is located in the cylinder head and reads the camshaft sprocket to determine the position of the camshaft. This information is required for functions such as initiating injection on sequential injection engines, the trigger signal for the magnet valve on pump valve injection systems and for cylinder-specific knock control.



Camshaft Position Sensor



* Only available for series production applications on request

High temperature sensor

The high temperature sensor from VDO also performs a key role in the exhaust gas after-treatment process. It delivers impressive long-term stability and provides high accuracy temperature measurements with good linearity. The heat-resistant temperature probe has many applications in innovative systems, including:

- Measurement of exhaust gas temperature for optimization of the combustion process
- Measurement of exhaust gas temperature for protection of various components
- Control and monitoring of diesel particulate filter systems

The measurement range extends up to 1200 °C. Thanks to its ability to generate a reliable measurement signal under such harsh conditions, this sensor makes it possible to deliver a perfectly controlled fuel supply for combustion in the diesel particulate filter.



High temperature sensor

Product benefits:

- High precision
- Minimal signal aging across the entire life cycle
- Compact construction allows optional fitment
- Low thermal inertia ensures rapid response characteristics

Technical data:	
Response time T63:	4–13 s (20 m/s gas flow)
Temperature range:	-40 °C ... + 1200 °C
Working temperature for the cable:	200 °C (250 °C short time)
Working temperature electronics:	-40 °C to 125 °C (140 °C optional)
Accuracy low temp. (< 500 °C):	± 2 °C + 0.75 % FSO
Accuracy high temp. (> 500 °C):	± 7.5 °C
Refreshing rate:	> 100 Hz to 12 bit
Supply voltage:	5 VDC (12 VDC, 24 VDC optional)
Resolution ADC:	14 bit
Connector:	3 pins
Thermocouple:	Type N
ASIC:	(16 bit C, instrumental amplifier, reference temperature)
Output:	PWM, 5 V, CAN



* Only available for series production applications on request

Differential pressure sensor

The 2-port pressure sensor for diesel particulate filters from VDO provides outstanding differential pressure measurement. This sensor is extremely precise and highly reliable under even the most demanding conditions, thanks to back-side sensing.

Using the differential pressure measured between the filter outlet (P1) and the filter intake (P2), the VDO pressure sensor is able to determine with a high degree of precision the actual exhaust gas flow through the diesel particulate filter and therefore the level of clogging in the filter. The sensor generates an analog output voltage proportional to the differential pressure, which is used as input by the electronic control unit (ECU).

If this voltage exceeds a predefined value stored in the ECU, the control unit initiates a regeneration process to burn off the residue in the particulate filter. This process restores gas flow to the original level, thereby allowing optimal performance to be achieved.



Differential pressure sensor

Product benefits:

- Direct pressure measurement
- Suitable for system-internal and emissions diagnostics
- Wide measurement range
- High accuracy, high thermal stability
- Excellent dynamic response
- Complies with the strictest EMC requirements
- Resistant to even highly aggressive media

Technical data:

Operating characteristics:

Response time:	< 2 ms
Temperature range:	-40 °C to +140 °C
Accuracy:	1 % FS (10 to 85 °C)
Supply voltage (Vs):	5.00 ± 0.5 VDC
Supply current at 5 V:	10 mA max.
Pressure range:	0 kPa to 125 kPa
Load resistance:	< 4.7 kΩ
Power on time:	< 10 ms
Weight:	< 45 g

Maximum ratings:

Overpressure:	500 kPa
Storage temperature:	-40 °C to +150 °C
Supply voltage:	16 VDC

7. Appendix

7.1 Product Solutions and Applications

7.2 Alphabetical Index

7.3 Numerical Index

7.4 Notes



Product Solutions and Applications

Product Solutions and Applications

	CANcockpit	Ocean Link	Centrobase 300/500	Modulcockpit II	Viewline	Instrument panels	Sensors	Fuel systems	Pedals	Actuators	AGB III	Pedal Interface II	Screen washer systems	Audio systems	Marine sensors	Control units and electronic network solutions (ENS)	
Applications	On-Highway																
	Cars	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Mobile cranes	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Buses	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Trucks	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Special-purpose vehicles	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Off-Highway																
	Construction vehicles	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Agricultural vehicles	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Industrial trucks				●	●	●	●	●				●	●	●		
	Forestry vehicles	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Special-purpose vehicles	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Leisure vehicles																
	Power sports vehicles								●			●	●				●
	Motorcycles							●	●			●	●				
	Leisure boats																
	Engine-powered and sailing boats	●			●	●	●	●	●						●	●	
	Boat engines	●			●	●	●	●	●								●
	Stationary machinery																
	Engines					●	●	●	●		●						
	Generators				●	●		●	●				●				
	Compressors				●	●		●	●				●				
	Engine-powered equipment				●	●		●	●								



Alphabetical Index

7.2. | Alphabetical Index

Looking for a specific product group or a particular product? This section lists all our products, product groups, and solutions in alphabetical order.

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CANcockpit, Slaves, 100 mm	1.3.1	1 1
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Centrobases 300, Warning Lamp Display	1.2.1	1 1
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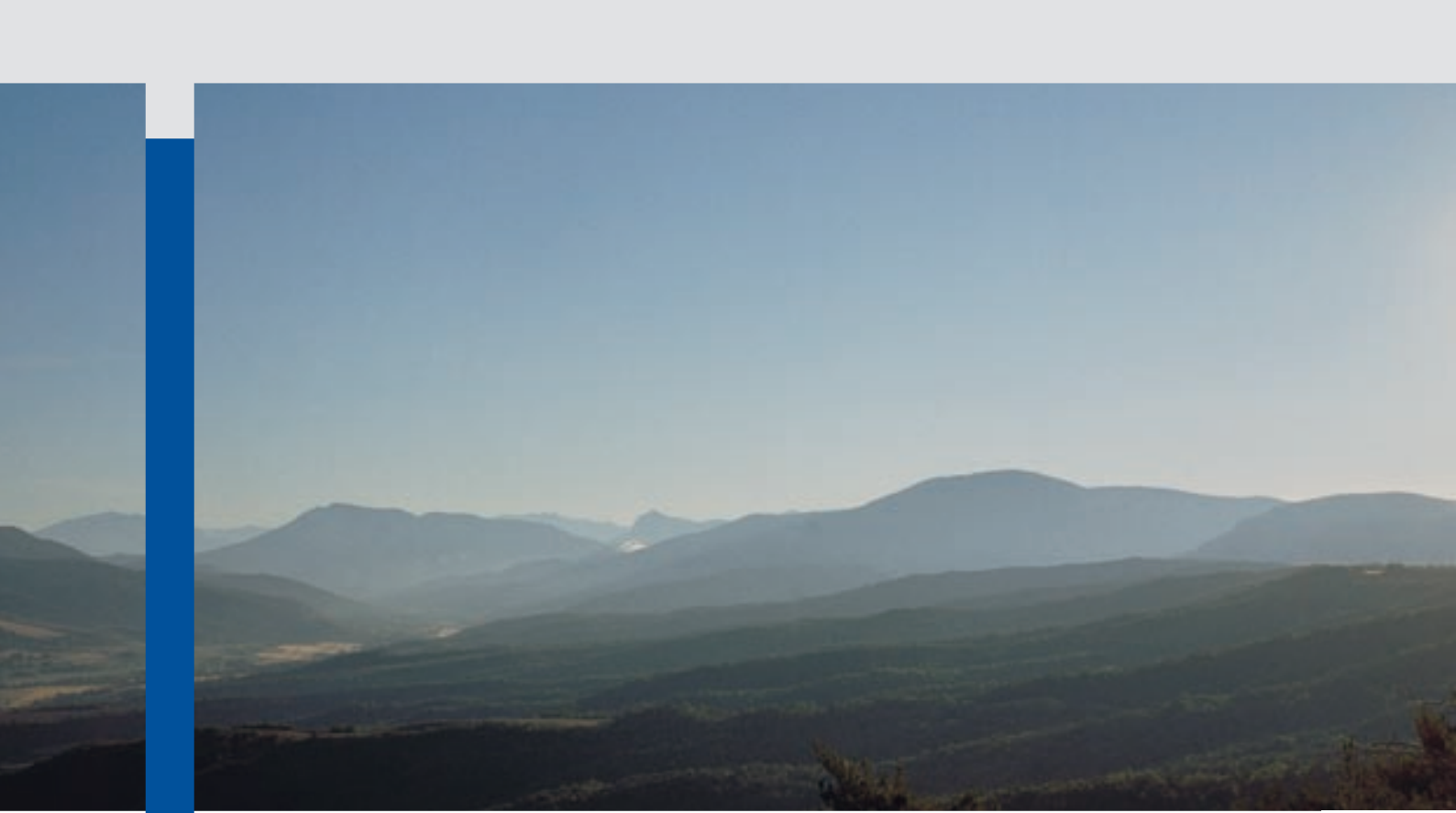
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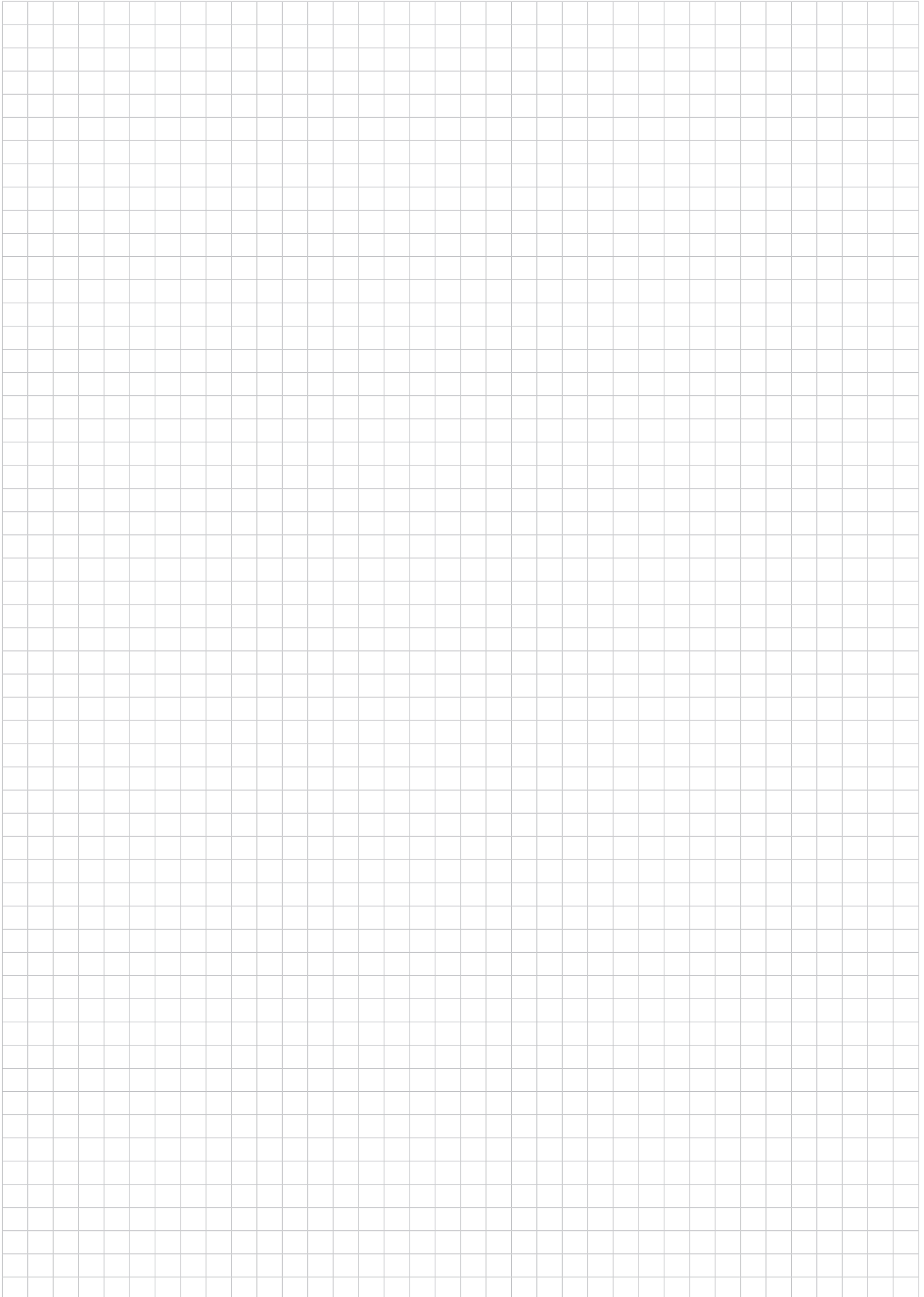
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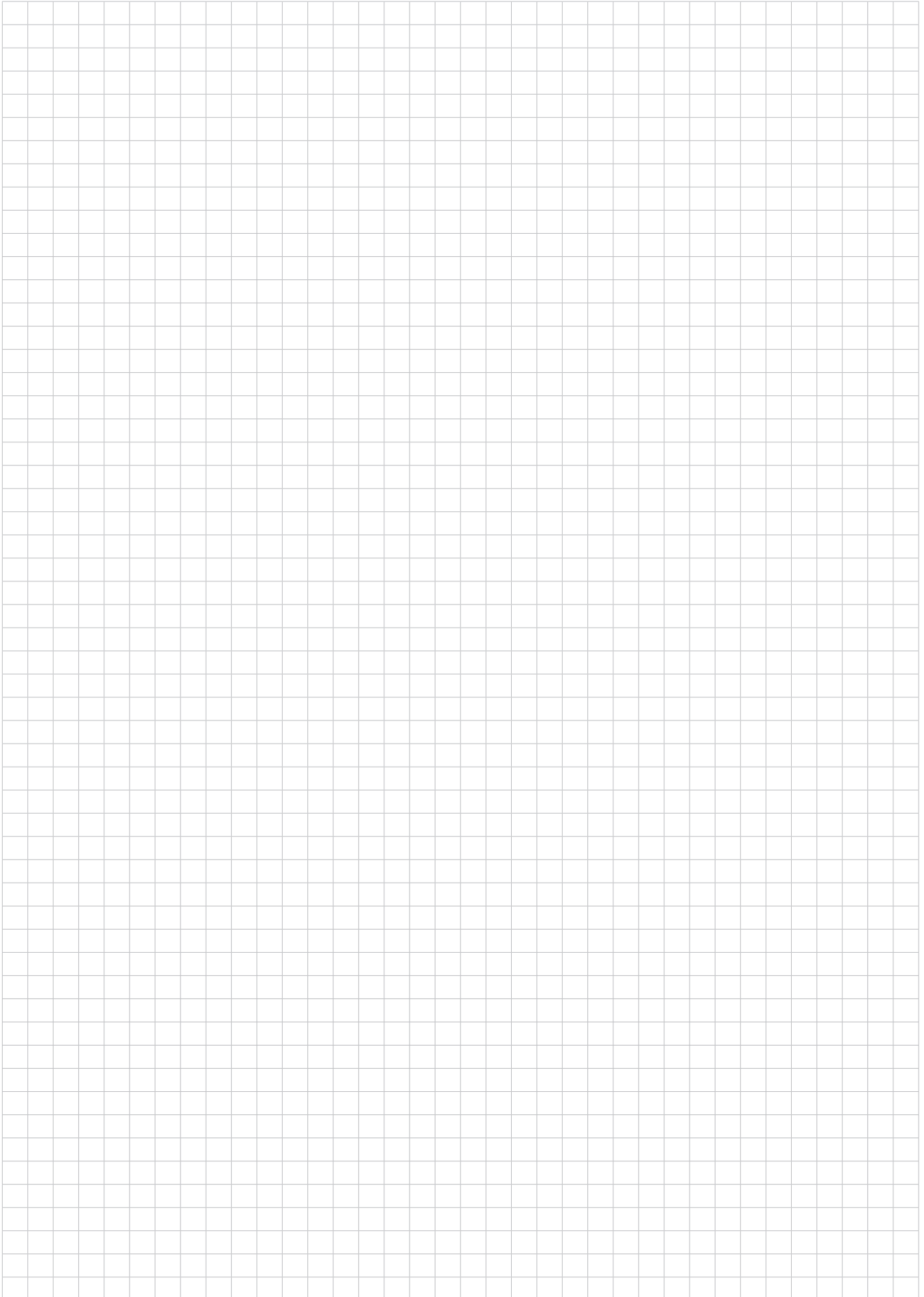
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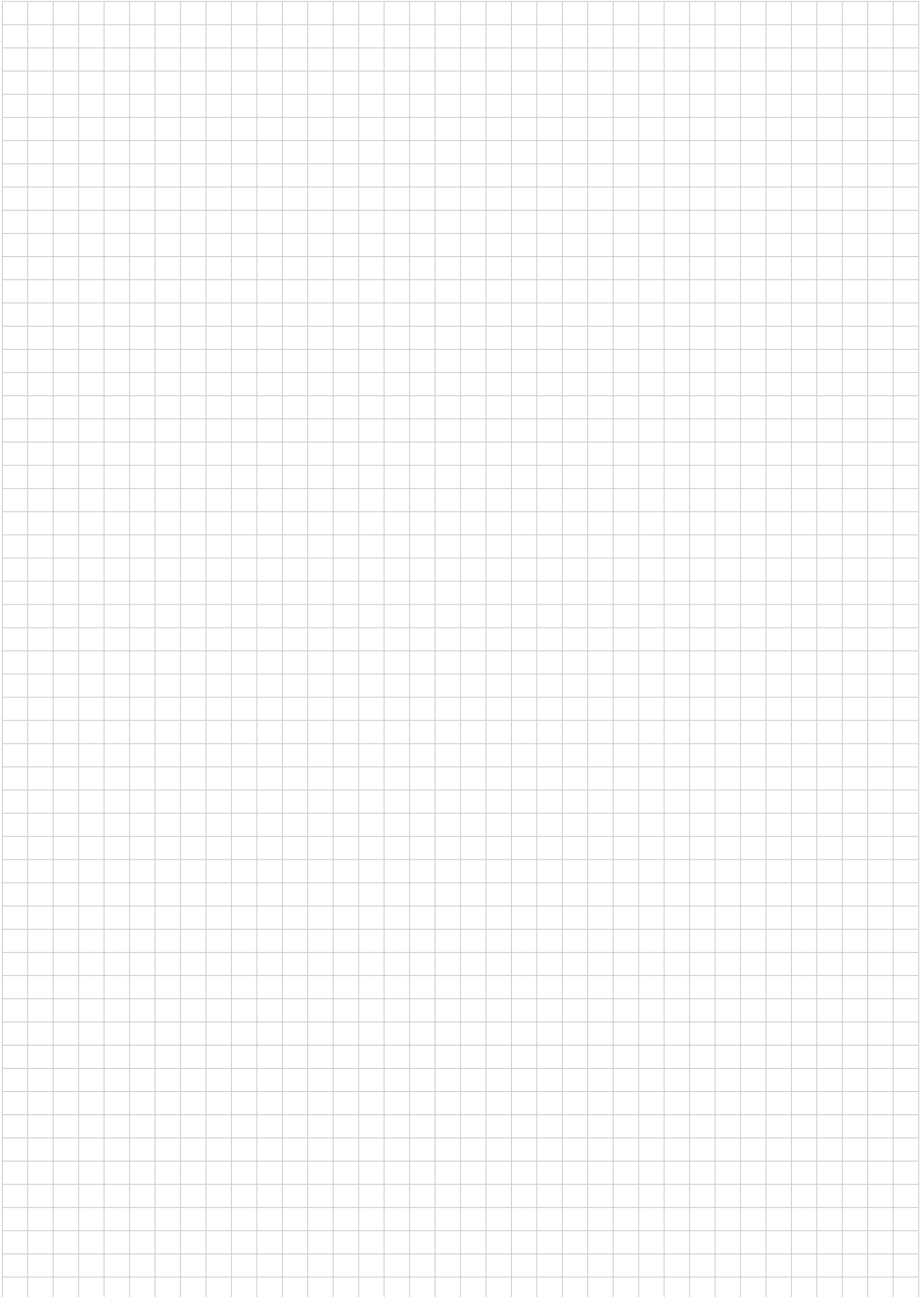
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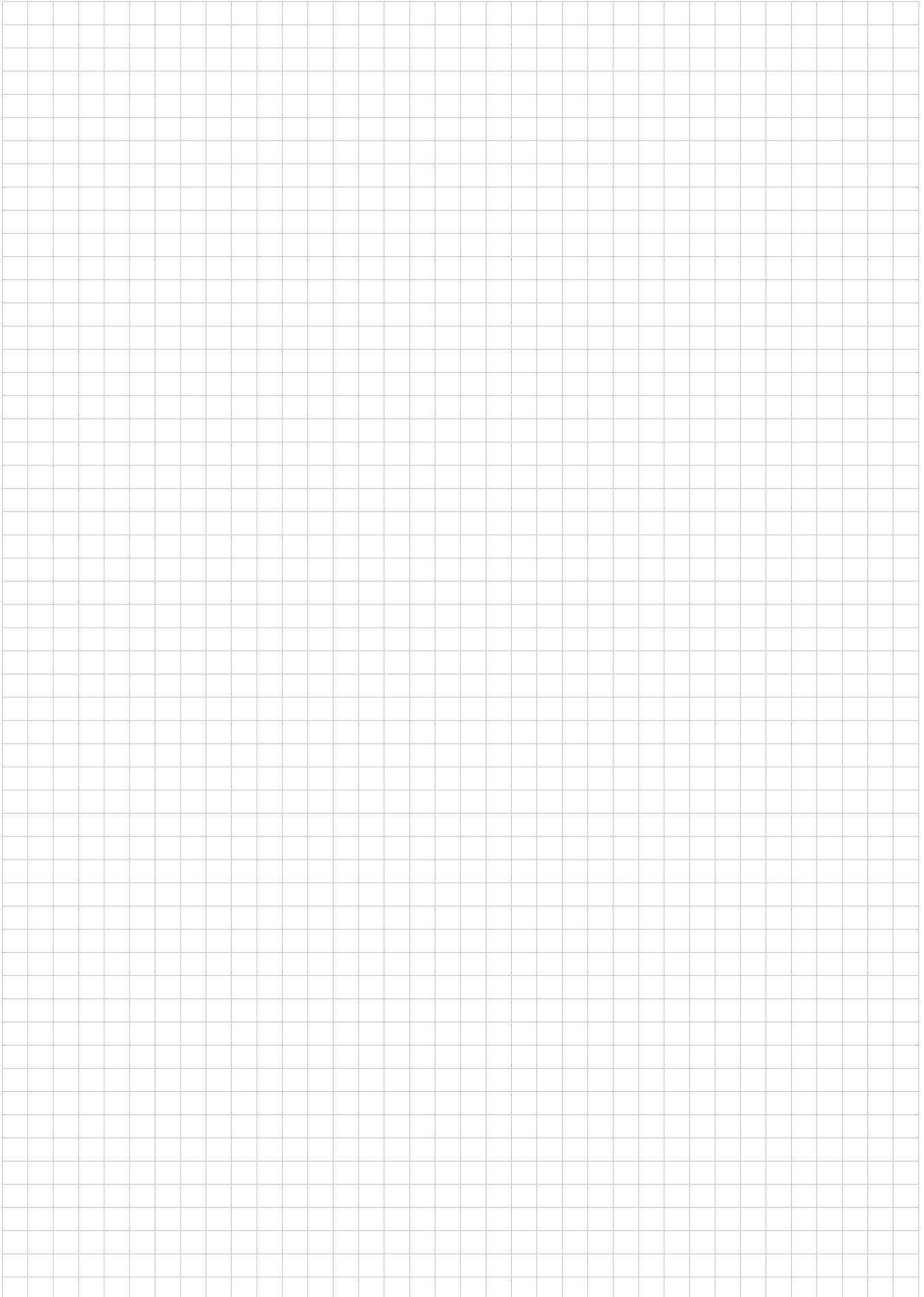


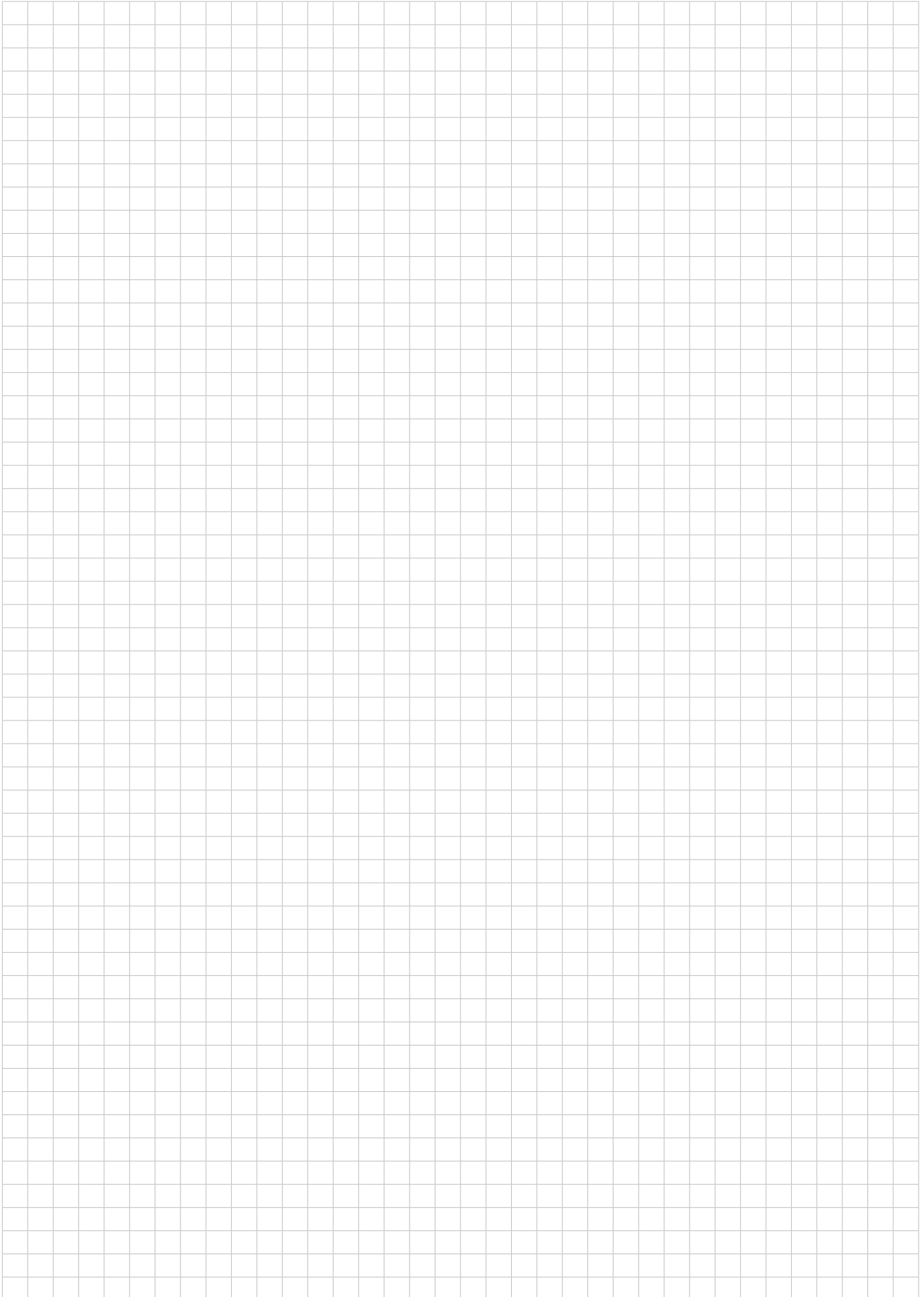
Notes













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