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01 ELECTRIFICATION
ELECTRIFICATION

Powertrain electrification holds the key to sustainable future mobility. Vehicles with electrified powertrain architectures, such as battery electric (EV), hybrid (HEV), and fuel cell electric (FCEV), will shape the propulsion landscape over the next decade.

As an electrification pioneer, Vitesco Technologies offers propulsion solutions for all types of electrified vehicles based on our long-standing expertise in powertrain systems, ranging from stand-alone components, to intelligent operating strategies and full turn-key systems. The future of mobility is electric.
ELECTRIFICATION

ELECTRONIC CONTROL

Intelligent, networked powertrain electronics are the brain of efficient and clean propulsion systems. While this was already true on internal combustion engine (ICE) powertrains, smart electronics are even more prominent in electrified vehicles.

While continuing to deliver ever higher performance, powertrain electronics are also undergoing a transformation within the vehicle electrical and electronic (E/E) architecture. As the typical vehicle migrates from distributed electronics, towards domain-based, cross-domain and even server-based architectures, Vitesco Technologies, with its strong DNA in both electronics and software, remains at the forefront in enabling car makers to manage the ever-increasing complexity of electronics across their vehicle fleets.

ELECTRIC DRIVE CONTROL UNIT

Compact powertrain controller for small to medium sized electric vehicles.

Facts & Benefits

- Uses Vitesco Technologies electronics and mechanical designs
- Complete powertrain functionality
- CAN interface
- ISO26262 compliant
- Smart energy management

Technical Information

- Protection class: IP67
- Aircooled
- Rated voltage 48 V
- CAN interface
- Scalable power: 3 - 5 kW

PROPULSION TYPES

BEV  PHEV  MHEV

VEHICLE TYPES

Gasoline  Diesel  Passenger Car  Commercial Vehicle & Off-Highway  2-Wheeler & Powersports
MASTER CONTROLLER

Calculates and distributes torque request to various powertrain control units (engine, e-motor, battery, transmission).

Facts & Benefits
> Centralizing of generic software, functions and features
> Enables CO₂ savings via predictive driving algorithms
> System solution to manage engine, transmission, retarder, brakes, chassis
> Central home for connected functions leads to reduced number of ECU variants

Technical Information
> Micro Core: TC275 up to TC397 31 bit, Flash 4 MB...16 MB
> Interfaces: Ethernet, Flexray, CAN/FD, LIN and Sent
> Drivers: 8...16 output power lines (HS/LS), H-Bridges
> Housing: IP40 up to IP6K9
> Connector: 32 + 32 + 4 pins (example)

UNIVERSAL ACTUATOR CONTROL UNIT

Controller for e-clutch or e-axis actuators, gateway for e-clutch (manual transmission) or electronic central shifter for hybrid modules.

Facts & Benefits
> Flexible use for control of a BLDC motor
> Stand alone module
> Compact and lightweight design

Technical Information
> Substrate: PCB-FR4 technology
> Operating temperature: -40° to 125°C
> Microprocessor: 32 bit
> Sensors: 2 x 3 hall sensors (external)
> Actuators: 1 x B6 driver for EC-motor (external)
> Communication: 2x CAN
HIGH-VOLTAGE

Vitesco Technologies was among the first suppliers to launch an electric high-voltage (HV) axle drive with integrated power electronics and reducer, into volume series production at the end of 2019. This launch was the result of twelve years of high-voltage technology development. As early as 2007, Vitesco Technologies began development of the powertrain for the first generation of the Renault Zoe and has been advancing HV propulsion technology ever since.

HV drive solutions used in EVs as well as in FCEVs, facilitate locally emission-free driving. We are already on the path towards zero emission mobility and Vitesco Technologies is among the pioneers.

In Hybrid powertrains, HV systems operate in tandem with an ICE, to significantly lower vehicle CO₂ emissions. Hybrid powertrains provide a substantial positive impact on car maker fleet fuel consumption globally.

Outlook: To reduce Plug-in Hybrid Electric Vehicle (PHEV) cost and to thus increase its market penetration, Vitesco Technologies has developed the innovative "Cost-efficient PHEV" concept, which integrates the transmission and electric motor, while also facilitating an intelligent compact all-wheel-drive solution.

To increase the efficiency and range of electric powertrains, Vitesco Technologies is developing inverters utilizing state-of-the-art silicon carbide technology (SiC).
HIGH VOLTAGE AXLE DRIVE (EMR3)

Highly integrated high voltage axle drive consisting of a permanent-magnet synchronous e-motor, inverter and reducer.

Facts & Benefits
> Integration of motor, inverter and reducer
> High power density for a compact packaging
> No connectors, no cables between motor and inverter
> Reduced efforts for integration, sourcing and validation

Technical Information
> E-motor: permanent-magnet synchronous machine
> Max. torque: 310 Nm
> Max. power: 150 kW
> Continuous power: 50 kW
> Weight: 76 kg
> Size (LxHxW): 400 x 350 x 550 mm
> Electric parking lock included

HIGH VOLTAGE BATTERY JUNCTION BOX

Junction box for (dis-)connection of up to two battery cell stacks to the vehicle’s high voltage powertrain and auxiliary/charging devices.

Facts & Benefits
> Localized HV interfaces and ease of serviceability
> Aluminum and copper bus bar design possible
> Different contactor and switch off components
> Easily customizable to various battery designs
> Interfaces: DC charging, auxiliaries
> Integration of electronics (BMS / DC/DC) possible

Technical Information
> Voltage: 450 V or 800 V
> Max. current capability of ± 750 A
> Charging power: up to 350 kW
> Overcurrent switch-off capability of up to 2000 A with contactors or up to 25 kA with conventional or pyrotechnical fuses
HIGH VOLTAGE BATTERY MANAGEMENT SYSTEM

Battery Management System (BMS) for batteries of hybrid and battery electric vehicles.

Facts & Benefits
> Modular functions support individual customer needs
> Scalable control module for hybrid-, plug-in- and battery electric vehicles
> Calculation State of Function (SOF), State of Charge (SOC) and State of Health (SOH) of battery cells
> Controls internal and external actuators (e.g. contactors, cooling pumps, etc.)

Technical Information
> Scalable for 400 V and 800 V Li-Ion batteries
> Battery current measurement up to 1500 A
> Integrated passive cell balancing for high battery performance
> Cell voltage accuracy: ± 5 mV (@ -40°C - 65°C ambient temperature, -2 V up to 5 V)
> AutoSAR 4.2.2 compliant software
> Functional safety: up to ASIL D

HIGH VOLTAGE BOX

Re-charge high voltage battery from power grid; AC and DC charging. Useable for plug-in hybrids and electric vehicles.

Facts & Benefits
> Developed for worldwide charging requirements
> Galvanic isolated power transfer
> Optional Junction Box integration to connect to infrastructure
> Reduced packaging volume due to electrical synergies

Technical Information
> Charging power: 7.2 kW up to 22 kW
> LV DC/DC power: 3.7 kW (400 V - 12 V bi-directional)
> Optional DC Charging up to 150 kW (400 V)
> Grid Supply: AC in 100 - 240 V
> HV Battery: DC out 220 - 475 V
> Software: AUTOSAR
HIGH VOLTAGE DC/DC CONVERTER – 4TH GENERATION

High voltage DC/DC converter for hybrid or electric vehicle applications.

Facts & Benefits
> Increased output power (peak/cont.) / High power density
> Customizable for input voltages of 400 - 800 V and output voltages of 12 - 48 V
> Stand alone or integrated

Technical Information
> DC/DC power scalable up to 3.5 kW
> Output current two phase: 240 A at 14.5 V cont.
> Output peak current two phase: 280 A for 10 sec. at 14.5 V cont.
> Nominal operating voltage range HV: 220 V - 450 V
> Nominal operating voltage range LV: 8 V - 16 V
> Functional safety: ASIL B(D)
> Size (LxWxH): 250 x 200 x 50 mm
> Weight: 2.6 kg

HIGH VOLTAGE DC/DC CONVERTER FOR ELECTRICAL HEATED CATALYST

DC/DC converter for electrical heated catalyst for PHEV applications.

Facts & Benefits
> Optimized for heated catalyst applications
> Stand alone unit
> Mode: buck mode
> EMC legal requirements / AUTOSAR compliant software architecture
> Fully OBD compliant

Technical Information
> DC/DC power 1 x 5 kW or 2 x 5 kW
> Nominal operating voltage range HV: 220 V - 450 V
> Nominal operating voltage range LV: 32 V - 48 V
> Temperature range with derating: -40°C up to 85°C
> Functional safety: ASIL B(D)
> Chassis mounted / IP6k IPX7
HIGH VOLTAGE POWER ELECTRONICS
INVERTER + DC/DC CONVERTER

High voltage inverter and DC/DC converter for hybrid and electric vehicles.

Facts & Benefits
> Integrated inverter & DC/DC converter
> Sintered power stage for highest reliability
> Very high power density
> Modular design for standalone / integrated solutions

Technical Information
> Inverter performance: Up to 450 V / 450 A peak
> DC/DC: 3.6 kW peak / 3.04 kW cont.
> AUTOSAR 4.0.3 compliant software architecture
> Functional safety: Inverter ASIL C / DC/DC ASIL C optional
> Weight: 11.5 kg

HIGH VOLTAGE POWER ELECTRONICS
(EPF 2.8+ OPEN INVERTER)

High voltage open inverter for axle-drive integration for plug-in hybrid and battery electric vehicles.

Facts & Benefits
> Sintered power stage for maximum reliability
> Increased peak apparent power by 25%
> Enhanced control software enables high class smooth and quiet acceleration
> For plug-in hybrid and battery EV applications
> Motor mode / generator mode
> Direct integrated into the vehicles drive unit

Technical Information
> Inverter performance: Up to 460 V / 650 A peak
> AUTOSAR 4.0.3 compliant software architecture
> Functional safety: ASIL C / ASIL D certified multi core µC
> Communication Interface: CAN, CAN FD, Flexray
HIGH VOLTAGE POWER ELECTRONICS
(EPF4)

High voltage stand-alone inverter for hybrid and electric vehicles.

Facts & Benefits
> Improved power density
> Vitesco Technologies software platform
> Motor and generator mode
> Pos. sensor: resolver, sincos sensor

Technical Information
> Inverter performance: up to 470 V / 290 - 825 A peak
> AUTOSAR compliant software architecture
> Protection class for stand alone IP6k9k
> Size (LxHxW): 270 x 126 x 221 mm
> Functional safety: ASIL D
> Si power stage, SiC available optional

HIGH VOLTAGE POWER ELECTRONICS
SINGLE INVERTER (EPF 2.8+)

High voltage stand-alone inverter for hybrid and electric vehicles.

Facts & Benefits
> Sintered power stage for maximum reliability
> Enhanced control software enables high class smooth and quiet acceleration
> For plug-in hybrid and battery electric vehicle applications
> Motor mode / generator mode

Technical Information
> Inverter performance: Up to 460 V / 650 A peak
> AUTOSAR 4.0.3 compliant software architecture
> Protection class for stand alone IP6k9k
> Size (LxHxW): 270 x 126 x 221 mm
> Functional safety: ASIL C / ASIL D certified multi core µC
> Communication Interface: CAN, Flexray
> Packaging Volume: 7.8 liter
> Weight: 9.1 kg

PROPULSION TYPES
BEV  PHEV  MHEV  Gasoline  Diesel

VEHICLE TYPES
Passenger Car  Commercial Vehicle & Off-Highway  2-Wheeler & Powersports

PROPULSION TYPES
BEV  PHEV  MHEV  Gasoline  Diesel

VEHICLE TYPES
Passenger Car  Commercial Vehicle & Off-Highway  2-Wheeler & Powersports
INDUCTIVE ROTOR POSITION SENSOR (IRPS)

iRPS is a compact inductive sensor dedicated to high speed sensing. It provides accurate position in order to drive Brushless DC (BLDC) motors with the best efficiency. Also for Aeronautics & Industry.

**Facts & Benefits**
- Immune to low frequency magnetic fields
- Low cost aluminium target (no magnet)
- Light weight for sensor & target

**Technical Information**
- Temperature: -40°C up to 150°C (160°C in peak)
- Supply Voltage: 5 V (3.3 V possible)
- Supply Current: < 23 mA
- Output signal: Analog Sin / Cos
- Typical airgap: 2 mm ± 0.5
- Response time < 6 µs
- Speed: up to 120 krpm (for 4 pairs of pole)
LOW-VOLTAGE

Low-voltage electrification, in combination with continued improvements in the combustion engine, makes a valuable contribution to further reduction of vehicle carbon dioxide (CO₂) and pollutant emissions. Such mild-hybrid electrification, e.g. 48-volt electrification of ICE powertrains is a compelling low-cost hybridization option for many vehicles and its adoption is already underway on a large scale across car maker fleets.

Outlook: With innovations like the 48-volt HighPower electric motor, Vitesco Technologies enables low-speed purely electric urban driving at an attractive low cost. The 48-volt HighPower motor also increases energy recuperation in the hybrid vehicle and provides higher torque assistance to the ICE, resulting in even higher fuel and CO₂ savings.

12 V POWER NET SYSTEM

Supports the 12 V power net during peak demand, e.g. start-stop. Supplies additional electric energy for starting and re-cranking, and during engine idle.

Facts & Benefits
> Second power source (in serial connection)
> High number of load cycles

Technical Information
> Recuperation of electric energy
> Very low ohmic energy storage DLC
> Energy management and diagnosis, e.g. State of Charge (SoC)
> CAN or LIN communication
48 V BATTERY SYSTEM

48 V Li-Ion battery system for mild-hybrid vehicle applications.

Facts & Benefits
- Flexible platform design for customized OEM needs
- Low maintenance effort and cost
- Low noise
- Enhanced durability and resistance to impact forces

Technical Information
- Useable energy @EOL: 210 - 590 Wh
- Weight: ~7 - 18 kg
- Size (LxHxW): 375 x 185 x 167 mm
- Cooling Type: liquid, optional air/forced air
- Functional safety: ASIL C

48 V BELT-DRIVEN STARTER GENERATOR (AIR-COOLED)

Air-cooled 48 Volt Belt-driven Starter Generator (BSG) system including inverter. Generates high CO₂ benefits together with drivability improvements.

Facts & Benefits
- Air cooled BSG with integrated inverter
- Permanent magnet synchronous motor
- Generates CO₂ benefits and drivability improvements
- No service required
- IP2X / IP6K9K compliant
- Very high power density

Technical Information
- Start torque: 55 Nm
- Peak power: 12 kW in generator mode
- Weight: ~10 kg
- Ambient temperature: -40°C up to +105°C
- Dimensions (w/o pulley): length 165 mm / diameter: 155 mm
- Functional safety: ASIL-B
48 V BELT-DRIVEN STARTER GENERATOR (HYBRID-COOLED)

Hybrid-cooled 48 Volt Belt Starter Generator system including inverter. Generates high CO₂ benefits together with drivability improvements.

Facts & Benefits
> Hybrid-cooled (air-cooled e-motor/water-cooled inverter) BSG incl. Inverter
> Permanent magnet-assisted synchronous reluctance machine
> Generates CO₂ benefits and drivability improvements
> No service required
> IP2X / IP6K9K compliant

Technical Information
> Start torque: 60 Nm
> Peak power: 15 kW in generator mode
> Weight: ~10 kg
> Ambient temperature: -40°C up to +105°C
> Dimensions (w/o pulley): length: 165 mm / diameter: 155 mm
> Functional safety: ASIL-B

48 V BELT-DRIVEN STARTER GENERATOR (LIQUID-COOLED)

Liquid-cooled 48 Volt Belt-Starter Generator system including inverter. Generates high CO₂ benefits together with drivability improvements.

Facts & Benefits
> Liquid cooled BSG
> IP6K9K, robustness against water and dirt
> No debris/dust, no service required
> Enables cost-efficient hybridization.

Technical Information
> Peak torque: 60 Nm
> Peak power: 12 kW in generator mode
> Weight: < 13.5 kg
> Ambient temperature: -40°C up to +140°C
> Stack length scalable (40 up to 80 mm)
> Functional safety: ASIL-B
48 V DC/DC CONVERTER (AIR-COOLED)

Air-cooled 48 V DC/DC converter for 12 V / 48 V power transformation. The converter stabilizes and connects the two voltage levels of the vehicles electrical system.

Facts & Benefits
> Bi-directional DC/DC converter 48 V - 12 V
> Stabilization of 12 V electrical system
> Pre-charging function for 48 V DC-link
> Self-protection
> Digital voltage and current control

Technical Information
> Power (buck mode): Up to 1.5 - 3 kW cont.; 215 A
> Power (boost mode): Up to 1.3 - 2.8 kW cont.; 58 A
> Input voltage: 24 V up to 54 V (VDA320 compl.)
> Output voltage: 6 V up to 16 V
> Protection class: IP6k9k
> Functional safety: ASIL B, up to ASIL C possible

48 V DC/DC CONVERTER (LIQUID-COOLED)

Liquid-cooled 48 V DC/DC converter for 12 V / 48 V power transformation. The converter stabilizes and connects the two voltage levels of the vehicles electrical system.

Facts & Benefits
> Bi-directional DC/DC converter 48 V - 12 V
> Stabilization of 12 V electrical system
> Pre-charging function for 48 V DC-link
> Self-protection
> Digital voltage and current control

Technical Information
> Power (buck mode): Up to 3.8 kW cont.; 271 A
> Power (boost mode): Up to 3.5 kW cont.; 73 A
> Input voltage: 24 V up to 54 V (VDA320 compl.)
> Output voltage: 6 V up to 16 V
> Protection class: IP6k9k
> Functional safety: ASIL B, up to ASIL C possible
48 V E-MOTOR

Compact electric machine for light and efficient electric vehicle applications.

**Facts & Benefits**
- Sealed motor
- Aircooled
- Smooth driving
- Efficient drive
- Compatible with different transmissions

**Technical Information**
- Protection class: IP67
- Rated voltage 48 V
- Max speed 7500 rpm
- Scalable power: 3 - 5 kW
- Size (LxHxW): 130 x 130 x 170 mm

48 V TRANSMISSION INTEGRATED MOTOR

48 V transmission-integrated oil-cooled motor including transmission-attached water-cooled power electronics.

**Facts & Benefits**
- Compact inverter design, high power density
- Allows advanced CO₂ benefits, significant traction assistance and pure electric driving
- No service required

**Technical Information**
- Peak torque: 55 Nm
- Peak power: 18 kW in generator mode
- Weight: ≤ 10 kg
- Ambient temperature: -40°C up to 120°C
- Dim (w/o inverter, w/o pulley): length 165 mm / diameter 150 mm
- Protection class: IP6k9k (inverter)
**ACTIVE PURGE PUMP**

Supports active regeneration of the active carbon canister by flowing evaporated hydro-carbon gases into the intake manifold.

**Facts & Benefits**
- System integration capability for OEM’s
- HC purging is independent from manifold vacuum
- OBD monitoring for HC evaporative leak detection
- "Hose Off" detection for emissions compliance
- Architecture enables smooth refueling event

**Technical Information**
- Radial pump with integrated electronics
- Purge flow: 60 slpm @ 8 kPa @ 9.8 V, RT, dry air
- Operating temp.: -40°C up to 120°C
- Pressure sensing option
- Brushless DC motor: ~30 W
- Motor speed: 60,000 rpm max

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**EMICAT® – ELECTRICALLY HEATED CATALYST**

Electrically heated catalyst (EMICAT®) with integrated highly effective support catalyst. Applicable for passenger cars and LCV.

**Facts & Benefits**
- Rapid catalyst light off temperature
- Reduced catalyst cooling during no-load phases
- Potential for precious metal reduction
- Additional energy added to the exhaust improves vaporization of liquids

**Technical Information**
- Application as three-way catalyst for gasoline engines as well as DOC, NOx-adsorber and SCR catalyst for diesel engines
- Operation voltage: 12 V - 24 V - 48 V
- Maximum current: 300 A
- Diameter: 115 - 342 mm
INTEGRATED STARTER GENERATOR CONTROL UNIT

For up to 150cc engine displacement in scooters and small motorcycles applications.

Facts & Benefits
> Replace conventional starter system and voltage regulator
> Faster & smoother start, less noise, reduced weight & size
> High reliable solution for start & stop function
> Built-in start & stop logic and Inputs/Outputs
> Configurable Inputs / Outputs for alternative functions

Technical Information
> Standalone Electronic Control Unit
> Drive up to 100A starting and 60 Amp generating current
> 32 bit microcontroller @ 32 MHz, 256 KB Flash
> IP66 and IP6K9K (high pressure cleaning)
> Operating temperature range: -10°C up to 85°C
COOLANT FLOW CONTROL VALVE

Rotary valve is used for shutting off the coolant flow, switching over coolant circuits and regulating the coolant flow.

Facts & Benefits
> Modular/flexible design (up to 5 ports with different flow directions)
> Full movement range, high speed
> Smart (integrated electronics)

Technical Information
> Temp. range environment: -40°C up to 125°C
> Temp. range fluid: -40°C up to 135°C
> Movement speed: < 2 s over 180° @ 13.5 V and RT
> Tube inner diameter: 16 mm
> Communication interface: LIN

THERMAL MANAGEMENT

Smart thermal management significantly extends the driving range of an EV or HEV by maximizing the use of battery energy for real driving. By careful re-use of heat energy in the car for air conditioning of the vehicle interior, thermal management conserves battery energy for extending vehicle driving range, and its benefits are especially significant at hot and cold temperature extremes.

Vitesco Technologies’ thermal management solutions cover a full-system scope, from control strategies to intelligent components such as electric coolant pumps, multi-port valves, and sensors. We manage both temperature extremes by flexible distribution of heat generated by powertrain components during operation. By allowing all components to operate at their optimal temperatures, our thermal management solutions reduce charging times and prolong battery life.
ELECTRIC WATER PUMP - 3

Modular and scalable coolant pumps for highly efficient thermal management in combustion and electrified vehicles.

**Facts & Benefits**
- Centrifugal Pump based on a modular and scalable design concept to ensure high total efficiency
- BLDC motor with sensorless field oriented commutation

**Technical Information**
- Volume flow: 500 l/h to 3,800 l/h
- Differential Pressure: 200 hPa up to 2,000 hPa
- Electrical Power: 40 W up to max. 150 W
- Coolant temp.: -40°C up to 125°C (depending on electrical power)
- Ambient temp.: -40°C up to 125°C (depending on electrical power)
- Dimensions: Ø -82 mm, Length -89 mm (without connector and coupling)

PRESSURE SENSOR - AIR CONDITIONING

Direct measurement of line pressure in air conditioning systems.

**Facts & Benefits**
- Robust sensing technology compatible with typical exhaust environment
- Flexible calibration of transfer functions
- Precision programmable clip levels
- Internal and output diagnostic capability
- High accuracy and temperature stability

**Technical Information**
- Flexible calibration of transfer functions
- Pressure range: Typical 35 bar high side & 10 bar low side
- Accuracy: 1% full scale
- Temp. range: -40°C up to 140°C
- Supply voltage: 5 V ± 0.5 V
- Supply current at 5 V: 10 mA max
- Output: Analog
SMART FLUID ACTUATOR (ELECTRICAL OIL PUMP)

The Smart Fluid Actuator can be used as electrical oil pump for thermal management and lubrication in IC, HEV and BEV systems. The pump is available as smart and non smart version.

Facts & Benefits
> Modular BLDC motor concept fitting broad range of power classes
> Modular pump sizing fitting different working points
> Optimized Design for Cold start
> Bolt on design / externally mounted

Technical Information
> Hydraulic: Gerotor, Dual Stroke Vane Pump, External Gear, Screw Pump
> Electrical power: 50 - 600 W
> Hydraulic power: 15 - 300 W
> Displacement: 1-4.5 cm³ / rev insert space: 1 - 4.5 cm³ / rev

PRESSURE SENSOR - BATTERY SAFETY MONITORING

Direct measurement of pressure in Battery case.

Facts & Benefits
> Detects pressure rise due to battery cell venting
> Designed for systems that comply with EVS-GTR (EV safety regulation)
> Suitable ASIL rating according ISO26262
> Fulfills toughest EMC requirements
> Flexible housing, connector and mounting design

Technical Information
> Pressure range: 10 kPa up to 150 or 400 kPa (adjustable)
> Accuracy: 1% full scale
> Temp. range: -40°C up to 140°C
> Supply voltage: 5 V ± 0.5 V
> Supply current at 5 V: 10 mA max
> Output: analog or SENT
SMART POSITION SENSOR COVER

Smart Position Sensor used for controlling Electrical Actuators (Thermal Management, Parklock, ...).

Facts & Benefits
- Inductive position sensor with ASIC
- Immune to low frequency magnetic fields (metal target, no magnet)
- H-bridge driver for DC motor (ASIC)
- Micro controller for position control

Technical Information
- Sensor measuring range: up to 360°
- Sensor accuracy: ± 1%, no hysteresis
- End of shaft or off axis sensor configuration
- H-bridge driver with 4 Amp current capability
- 16 bit MCU with embedded PID control
- Operating temp.: up to 140°C

TEMPERATURE SENSOR - COOLANT

Temperature measurement used in oil and coolant circuits.

Facts & Benefits
- Clip or screw-in design
- Wide range of applications
- High accuracy
- Short response time
- Long-term stability

Technical Information
- Engine coolant: -40°C up to 140°C
- Accuracy: ± 0.45°C @ 50°C (Plug in design)
- Response time: ~3.5 s (Plug in design)
Further ICE efficiency and emission improvements are still necessary to meet ever more stringent legislative requirements. Vitesco Technologies’ engine management solutions increase engine thermal efficiency, while our electrically heated catalyst and accompanying catalyst controller greatly reduce pollutant emissions through smart exhaust after treatment.

Between improvements of the ICE, innovative exhaust after treatment solutions, and various degrees of electrification, Vitesco Technologies offers a wide range of solutions for car makers in their journey to sustainable mobility.
ELECTRONIC CONTROL

A special expertise in system development, software and electronics has made Vitesco Technologies a global leader in engine and transmission control units. Our modular portfolio of micro controllers, application-specific integrated circuits (ASICs), circuit blocks, and software library enable a short time-to-market and to harvest scale effects while ensuring the highest quality level.

Working closely with car makers, we have leveraged our electronics and software DNA to create a family of Master Controllers for domain and cross-domain E/E architectures. Our PowerSAR (an efficiency-optimized software technology based on AUTOSAR) platform software provides a flexible software integration framework for high performance Master Controllers which host the higher-level control algorithms for hybrid powertrain management.

Facts & Benefits
- 12 V / 24 V supply
- Supports CAN based sensors (e.g. NOx, urea quality)
- Chassis mounted (under hood)

Technical Information
- Core: Andorra
- Flash size: 4 MB
- Interfaces: 3 CAN
- Injector drivers: 3 urea or HC dosing
- Driver outputs: 4 high-side + 19 low-side
- Tightness: IP5K6K
- Connector pins: 62

Controller for exhaust aftertreatment systems (selective catalytic reduction, diesel particulate filter).
CONTROL UNIT FOR DOUBLE CLUTCH TRANSMISSION

Mechatronic actuator module for dry 6-speed Double Clutch Transmission.

Facts & Benefits
> Directly attached to the gearbox
> Includes 2 BLDC motors
> Higher reliability and accuracy of control
> Flexible transmission design in regards to package
> High dynamics of integrated gear shift actuators

Technical Information
> Operating temperature: -40°C up to 115°C
> Sensors: 2x temperature, 2x shift motor position
> Actuators: 2x BLDC motors for gear changing
> Integrated control for 2 external BLDC motors for clutch control
> Functional safety level: ASIL C

CONTROL UNIT FOR AUTOMATIC TRANSMISSION

External Transmission Control Unit (TCU) for 6 speed automatic transmission.

Facts & Benefits
> Compact module with small size and low weight
> Flexible mounting positions in engine or passenger compartment
> Robust design with aluminium housing

Technical Information
> Substrate; PCB
> Operating temperature: -40° up to 105° C
> Microcontroller: 32 bit microcontroller
> Communication: CAN
> Safety level: ASIL B
**CV CONTROL UNIT FOR AUTOMATED MANUAL TRANSMISSION**

External transmission control unit for automated manual transmissions for light and medium duty commercial vehicles.

**Facts & Benefits**
- External control unit, transmission mounted
- Robust design, high reliability

**Technical Information**
- Substrate: Flex FR4 PCB substrate
- Operating temperature: -40°C up to 105°C
- Microprocessor: 32 bit microcontroller
- Sensors: 3x position, 3x speed
- Actuators: 4x electric motor
- Communication: CAN

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**CONTROL UNIT FOR TRANSMISSIONS**

Universal Transmission Control Unit (TCU) for transmissions.

**Facts & Benefits**
- Stand-alone TCU, chassis mounted
- Flexible module with various inputs and actuator outputs
- Universal use for different types of transmissions (AT, CVT, PMT, etc.)

**Technical Information**
- Technology: PCB substrate
- Temperature: -40º up to 105ºC
- 32 bit microcontroller
- Sensors: No Sensor Attached to TCU
- Actuators: 10 PWM proportional controlled solenoids
CV CONTROL UNIT FOR DOUBLE CLUTCH TRANSMISSION

Transmission Control Unit for wet 7-speed Double Clutch Transmission (DCT) for medium duty commercial vehicles.

Facts & Benefits
- External control unit for medium-duty commercial vehicles
- Reduced complexity and length of the wiring harness
- Supports creep mode and hill-start assist
- Supports efficient gear shifting strategies

Technical Information
- Substrate technology: PCB
- Operating temperature: -40°C up to 125°C
- Microprocessor: 32 bit with 4 MB of RAM
- Control of:
  - 4 gearshifts
  - 2 safety valves
  - Main oil pressure
  - Cooling oil pressure

ECU DIESEL MEDIUM & HEAVY DUTY ENGINES

Scalable, modular, validated electronic platform for diesel solenoid medium and heavy duty engines.

Facts & Benefits
- Diesel engine management for amplified common rail and pump-line-nozzle and other solenoid injection systems
- On-engine mounted with damping elements
- Fulfills current emission requirements (EPA 2010+, Euro VI+, combined with SCR)

Technical Information
- Core: TC1797
- Flash size: 4 MB
- Interfaces: CAN
- Injector drivers: 12
- Driver outputs: 21 + 1 H-bridge
- Tightness: IP69K, IP67
- Connector pins: 141
ECU DIESEL PLATFORM FOR COMMERCIAL VEHICLES

Scalable, modular electronic platform for diesel solenoid medium and heavy duty engines with integrated aftertreatment functions.

Facts & Benefits
> Standardized, scalable and modular electronics
> On-engine mounted with dampers
> 12 / 24 V universal voltage

Technical Information
> Core: Multicore TC297
> Flash size: 8 MB
> Interfaces: CAN, CAN FD, LIN
> Injector drivers: up to 6 cylinders, 3 banks
> Driver outputs: 59 + 3 H-bridges
> Tightness: IP6K9K
> Connector pins: 248

ECU GASOLINE PORT FUEL INJECTION

Scalable, modular, validated electronic and SW platform with standardized chipset for various PFI engines.

Facts & Benefits
> One flexible design for all Euro6 PFI engines
> 3/4 cyl engine feed with gasoline, flex-fuel (ethanol), GPL
> Chassis mounted, engine bay

Technical Information
> Core: TC275, 200 MHz
> Flash size: 4 MB
> Interfaces: CAN, CAN-WakeUP, LIN, SENT
> Injector drivers: 4 PFI, CNG, E100
> Driver outputs: 38, 3 H-bridges
> Tightness: IP6K9K
> Connector pins: 160
ECU GASOLINE PORT FUEL INJECTION
READY-TO-USE EASY-U

Scalable, modular electronics and SW for various engines. Configurable off-the-shelf engine control unit.

Facts & Benefits
> Mature validated HW and SW platform for various vehicle configurations: EOBD, VVT, EGR, turbo, VIM, PORT and start/stop
> Supports Euro 6 and China 6

Technical Information
> Core: Andorra
> Flash size: 2 MB / 4 MB
> Interfaces: CAN, CAN-WakeUp, LIN, SENT
> Ignition driver: internal IGBT or external
> Injection drivers: 4 PFI
> Binary and linear O2 sensor
> Tightness: IP6K9K, IP67
> Connector pins: 128

ECU GASOLINE SDI READY-TO-USE EASY-U

Scalable, modular electronics and SW for various engines. Configurable off-the-shelf engine control unit.

Facts & Benefits
> Mature validated HW, SW and calibration platform; Supports Euro 6 / 6c
> Standardized electronic chipset
> HW, SW basic configuration ready for production

Technical Information
> Core: TC277, 200 MHz
> Flash size: 4 MB
> Interfaces: CAN, CAN FD, CAN WakeUp
> Injector drivers: 4 SDI + 4 PFI
> Driver outputs: 34 + 4 H-bridges
> Connector pins: 196
> Housing temp. range: -40°C up to 105°C
**ECU GASOLINE SOLENOID DIRECT INJECTION**

Scalable, modular and validated electronic and SW platform with standardized chipset for various SDI engines.

**Facts & Benefits**
- For customized gasoline solenoid direct injection systems;
- Supports Euro 7
- ECU with multiple options: variable valve lift control, lambda control LIN/BIN, turbocharger

**Technical Information**
- Core: Tricore and Power PC multicore architecture
- Flash size: 2.5 MB up to 16 MB
- Interfaces: CAN FD, LIN, FlexRay, SENT, PSI
- Injector drivers: 3 up to 6 SDI / PFI
- Driver outputs: high-/low-side, up to 6 H-bridges
- Connector pins: scalable up to 336
- Housing: aluminium-die-cast / aluminium-sheet-metal
- ISO 26262, AUTOSAR 4.3.1

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**ELECTRICAL HEATED CATALYST CONTROL UNIT**

Electronics for controlling catalyst heater, achieving Eu7 requirements. Configurable platform solution.

**Facts & Benefits**
- Heater power up to 6 kW / 48V
- Low frequency PWM operation
- OBD1 capabilities
- Output voltage and current measurements
- CAN interface configurable

**Technical Information**
- Micro Core: TC233 32 bit, Flash 1.5 MB, 100 pins
- Interfaces: CAN
- Drivers: Discrete high side driver for PWM operation and redundancy switch
- Housing: Diecast, sheet-metal IP6k9k, IPX7
- Connector: 18 pins / 4xM8 bolts
**EMS3 ENGINE MANAGEMENT SYSTEM PLATFORM**

Electronic and SW EMS platform for powertrain: gasoline, diesel and commercial vehicle.

**Facts & Benefits**
- For Euro 6+ gasoline / diesel drivetrain and electrical drive: PFI, SDI, PCR, Flex fuel, CNG
- Supports various engine sensors and actuators
- Improved power consumption and higher function integration

**Technical Information**
- Scalable microcontroller up to 6 cores and 16 MB flash size
- Interfaces: CAN-FD, LIN, FlexRay, SENT, PSI5, Ethernet
- Generic Timer Module V3.1 (GTM)
- Injector drivers: 2 up to 8 piezo, solenoid
- Driver outputs: 16 up to 60, flexible high- / low-side
- Low power dissipation and higher efficiency in electronics
- ISO 26262, PowerSAR®: Autosar 4.2 based software, multicore-distributed, legacy support

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**ELECTRONIC CONTROL UNIT FOR LIMITED SLIP COUPLING**

Control Unit for limited slip coupling and AWD applications

**Facts & Benefits**
- Unit directly attached to 4WD transfer case
- Control of valve and feeder pump to change torque distribution between front and rear axle

**Technical Information**
- Substrate: PCB
- Microprocessor
- Operating temperature: -40°C up to 120°C
- Sensors: 1 pressure sensor, 1x oil temperature sensor
- Actuators (Control): PWM control of 2x proportional valves, 1x feeder pump motor
**FUEL DELIVERY CONTROLLER**

Fuel Delivery Controllers to control electric fuel pumps either electronically commuted or with direct current motors.

**Facts & Benefits**
- Reduced consumption of electric energy
- Enhanced lifetime
- Reduced vibration and noise level

**Technical Information**
- Stand-alone device or integrated in fuel module
- Operating voltage: 6 up to 16 V
- Electrical power: 100 up to 200 W
- Operating temperature: -40°C up to 85°C
- Control input / output signal: PWM
- Degree of protection: IP6K7 and IP44

**INTEGRATED CONTROL UNIT FOR DRY DOUBLE CLUTCH TRANSMISSION**

Integrated transmission control unit for dry 7-speed double clutch transmission.

**Facts & Benefits**
- Mechatronic module integrated in the gearbox
- Direct connection of actuators to the control unit
- Higher reliability of the electronics due to the reduced number of internal connections
- Considerable weight reduction due to integration
- Supports improved driving comfort and reduced fuel consumption

**Technical Information**
- Substrate: Bare Die HDI technology
- Operating temperature: -40°C up to 140°C
- Control of BLDC motor of oil pump
- Sensors: 4 gearshift position, 2 clutch position, 2 speed, 1 pressure, 1 temperature
- Actuators (Control): 8 x PWM proportional solenoids
**INTEGRATED CONTROL UNIT FOR HYBRID DOUBLE CLUTCH TRANSMISSION**

Control unit for hybrid transmissions. In addition to the clutches for double clutch transmission, the unit can control a clutch for the motor of the hybrid system.

**Facts & Benefits**
- Transmission Control Unit for electrified powertrains
- Control module including sensorics
- Control of clutch and gearshift actuators
- Additional control of disconnection clutch to the E-Motor
- Control of electrical oil pump

**Technical Information**
- Substrate: BD-HDI
- Operating temperature: -40°C up to 140°C
- Sensors: 2x temperature (integrated), 1x rotary position 2x speed, 3x pressure, 4x gear shift position
- Actuators: connectors to 11 valves
- Functional safety level: ASIL D

**INTEGRATED CONTROL UNIT FOR HYBRID STEPPED AUTOMATIC TRANSMISSION**

Control Unit 7-speed automatic transmissions and electric transmission oil pump

**Facts & Benefits**
- Integrated in transmission
- Mechatronic module assembled on valve body
- Control of additional transmission oil pump for full electric drive

**Technical Information**
- Operating temperature: -40°C up to 140°C
- Microprocessor: 32 bit microcontroller
- Sensors: 3x speed, 1x pressure, 2x temperature, 1x position selector lever, 2x pressure switch
- Actuators: 10 power outputs for solenoids
- Substrate: LTCC
INTEGRATED CONTROL UNIT FOR WET DOUBLE CLUTCH TRANSMISSION

Integrated Transmission Control Unit (TCU) for wet 7-speed Double Clutch Transmissions (DCT). The TCU features Bare-Die High-Density Interconnect (BD-HDI) substrate technology.

Facts & Benefits
- Efficient design and packaging, reduced wiring and weight
- Short links to sensor systems and actuating elements
- Full integration of TCU, Sensors and Solenoids
- For use in front, rear, all-wheel-drive and hybrid applications

Technical Information
- Substrate: BD-HDI substrate technology
- Operating temperature: -40°C up to 148°C
- 2 x 32 bit microcontroller
- Sensors: 2x temperature, 1x motor speed, 2x various external sensors
- Actuators: control of 9 solenoids (+ 1 optional)
- Functional safety level ASIL-D

INTEGRATED CONTROL UNIT STEPPED AUTOMATIC TRANSMISSION

Overmolding of electronics, a highly sophisticated technology for TCUs on PCB substrate covered with mold compound.

Facts & Benefits
- Significant weight and size reduction
- High mechanical robustness
- Robust against aggressive substances (e.g. ATF)
- No oil corrosion of electronics or lead frames
- Molded sensor towers
- Increase of solder joint reliability
- Reduced amount of manufacturing processes

Technical Information
- PCB substrate as a basis
- Overmolding with epoxy material
- Operating temperature: -40 up to 140°C possible
INTEGRATED ELECTRO-HYDRAULIC CONTROL UNIT FOR STEPPED AUTOMATIC TRANSMISSION

Integrated transmission electro-hydraulic control module for 6-speed stepped Automatic Transmission (AT).

**Facts & Benefits**
- Integrated TCU including manifold and solenoids
- Compact module with small size and low weight
- Higher reliability and reduced number of connectors
- Smooth shifting of gears

**Technical Information**
- Substrate technology: LTCC and FR4
- Operating temperature: -40°C up to 140°C
- 32 bit microcontroller with external flash memory
- Actuators: 7 integrated solenoids
- Integrated hydraulic filter elements and manifold
- Plastic mechatronic with integrated lead frames

INTEGRATED GASOLINE SDI ECU AND TCU

Scalable, modular, validated electronic and SW platform with standardized chipset for various engines.

**Facts & Benefits**
- Combined control unit for gasoline solenoid direct injection and transmission control
- FF 8AT automatic transmission control with 6AT and CVT functional capability
- Supports Euro 6 / 6c

**Technical Information**
- Core: EMS TC277, 200 MHz; TMS TC275, 200 MHz
- Flash size: EMS 4 MB; TMS 4 MB
- Interfaces: CAN, CAN FD, LIN
- Injector drivers: 4 SDI
- Driver outputs: 48 + 6 H-bridges + 8 linear solenoids
- Tightness: IP69K
- Connector pins: 238
M4A AIR MODULE ENGINE CONTROL UNIT

For single cylinder, 4 stroke engines from 50cc up to 250cc in light motorcycles and scooters.

**Facts & Benefits**
- ECU with integrated throttle body, sensors and actuator
- Very compact size. Easy mounting
- Throttle body size from Ø 26 up to 32 mm
- Versatile configuration: engine mounting interface etc.
- Integrated 3-axis accelerometer (Tilt sensor)

**Technical Information**
- 26 pins connector (equivalent 35 pins standalone ECU)
- Integrated TPS, Temperature Manifold Air Pressure etc.
- 32 bit microcontroller, 32 MHz, 768 Kb Flash
- CAN interface
- EURO5 OBDII stage 2 compliant

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M4B AIR MODULE ENGINE CONTROL UNIT

For single cylinder, 4 stroke engines from 50cc up to 250cc in light motorcycles and scooters.

**Facts & Benefits**
- ECU with integrated throttle body, sensors and actuator
- Very compact size. Easy mounting
- Throttle body size from Ø 26 up to 32 mm
- Versatile configuration: engine mounting interface etc.
- Integrated 3-axis accelerometer (Tilt sensor)

**Technical Information**
- 34 pins connector (equivalent 43 pins standalone ECU)
- Integrated TPS, Temperature Manifold Air Pressure etc.
- 32 bit microcontroller, 32 MHz, 768 Kb Flash
- CAN interface
- EURO5 OBDII stage 2 compliant

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**PROTECTION TYPES**
- BEV
- PHEV
- MHEV
- Gasoline
- Diesel
- Passenger Car
- Commercial Vehicle & Off-Highway
- 2-Wheeler & Powersports

**VEHICLE TYPES**
- BEV
- PHEV
- MHEV
- Gasoline
- Diesel
- Passenger Car
- Commercial Vehicle & Off-Highway
- 2-Wheeler & Powersports
**M4C RIDE BY WIRE ENGINE CONTROL UNIT**

For 1 and 2 cylinder, 4 and 2 stroke engines up to 18,000 rpm in medium & high end motorcycles, scooters, ATV.

**Facts & Benefits**
- Simultaneously control 2 electric throttle body and mechanical throttle body
- Control up to 2 injectors per cylinder
- Euro 5 with OBD-II compliance
- Small and compact design
- ISO-26262 compliance

**Technical Information**
- 32 bit microcontroller, 80 MHz
- 1.5 MB Flash Memory
- Single pocket 64pins connector
- Separate safety monitoring unit for ETC system
- CAN (opt. LIN interface)

**PROPULSION TYPES**
- BEV
- PHEV
- MHEV

**VEHICLE TYPES**
- Gasoline
- Diesel
- Passenger Car
- Commercial Vehicle & Off-Highway
- 2-Wheeler & Powersports

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**M4D RIDE BY WIRE ENGINE CONTROL UNIT**

For 1 up to 4 cylinder, 2 and 4 stroke engines up to 16,000 rpm in all non-automotive applications.

**Facts & Benefits**
- Drives simultaneously up to 2 individual electrical throttle bodies and 2 DC-motor actuators
- Direct-drives up to 4 ignition coils (smart coils optional)
- Designed to meet Euro 5 with EOBD
- ISO-26262 compliant

**Technical Information**
- 32 bit microcontroller, 120 MHz
- 2 MB ROM (flash), 128 KB RAM
- IP67 and IP6K9K (high pressure cleaning)
- Separate safety monitoring unit for ETC system
- Operating temperature range: -40°C up to 85°C

**PROPULSION TYPES**
- BEV
- PHEV
- MHEV

**VEHICLE TYPES**
- Gasoline
- Diesel
- Passenger Car
- Commercial Vehicle & Off-Highway
- 2-Wheeler & Powersports
**M4L AIR MODULE ENGINE CONTROL UNIT**

For 1 cylinder, 4 stroke engines from 50cc up to 250cc in light motorcycles, scooters, lawn mowers, generator sets.

**Facts & Benefits**
- ECU with integrated throttle body, sensors and actuator
- Very compact size. Easy mounting
- Throttle body size from ø 26 up to 32 mm
- Versatile configuration: engine mounting interface, accelerator cable interface, canister purge etc.

**Technical Information**
- 18 pins connector (equivalent 27 pins standalone ECU)
- Integrated TPS, Temperature Manifold Air Pressure etc.
- 32 bit microcontroller, 32 MHz, 256 Kb Flash
- K-Line interface

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**M4L BLE AIR MODULE ENGINE CONTROL UNIT**

For single cylinder, 4 stroke engines from 50cc up to 250cc in light motorcycles, scooters, lawn mowers, generator sets.

**Facts & Benefits**
- ECU with integrated throttle body, sensors and actuator
- Very compact size. Easy mounting
- Throttle body size from ø 26 up to 32 mm
- Versatile configuration: engine mounting interface etc.
- Integrated Wireless connectivity

**Technical Information**
- 18 pins connector (equivalent 27 pins standalone ECU)
- Integrated TPS, Temperature Manifold Air Pressure and idle speed stepper
- 32 bit microcontroller, 32 MHz, 256 Kb Flash
- Bluetooth Low Energy 4.1 and K-Line interface
- MYKI smartphone APP
**M4LX-E AIR MODULE ENGINE CONTROL UNIT**

For 1-2 cylinder, 4 stroke engines, Power Equipment applications including lawn tractors and generators.

**Facts & Benefits**
- ECU with integrated throttle body and sensors
- Electronic Governor applications
- Very compact size. Easy mounting
- Throttle body size: Ø 26 up to 36 mm
- Versatile configuration: engine mounting interface, canister purge

**Technical Information**
- Throttle Position Sensor (TPS), Temperature Manifold Air Pressure (TMAP) integrated
- 32 bit microcontroller, 32 MHz
- 768 KB Flash, 20 KB RAM
- IP66 and IP6K9K (high pressure cleaning)
- Operating temperature range: -30°C up to 85°C

**PROPULSION TYPES**
- Gasoline
- Diesel
- 48V
- MHEV

**VEHICLE TYPES**
- BEV
- PHEV
- 2-Wheeler & Powersports
- Commercial Vehicle & Off-Highway

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**M4REK AIR MODULE ENGINE CONTROL UNIT**

For 1 cylinder, 4 stroke engines from 250cc up to 500cc for middle range motorcycles, scooters, ATV.

**Facts & Benefits**
- ECU with integrated electronic throttle body and sensors
- Uses Vitesco Technologies automotive electronics and technologies
- Very compact size and easy mounting
- Several configurations: engine mounting interface, throttle diameters

**Technical Information**
- Single pocket 36 pins connector (equivalent to a 47 pins standalone ECU)
- IPX6 and IPX9K (high pressure cleaning)
- Operating temperature range: -30°C up to 85°C
- 32 bit microcontroller, 80 MHz, 1.5 Mb Flash Memory
- ECU) Separate safety monitoring unit for ETC system (ISO-26262 compliant)

**PROPULSION TYPES**
- Gasoline
- Diesel
- 48V
- MHEV

**VEHICLE TYPES**
- BEV
- PHEV
- 2-Wheeler & Powersports
- Commercial Vehicle & Off-Highway
**SELECTIVE CATALYTIC REDUCTION DOSSING CONTROL UNIT**

Standardized, validated electronic and SW platform for NOx aftertreatment control of passenger vehicles.

**Facts & Benefits**
- Proven mechanical and electronic concepts (driver, ASICs etc.)
- One or two chambers connector approach enables optimized wiring harness
- Direct connection to ECU and pump module
- 12 V application

**Technical Information**
- Core: TC233
- Flash size: 1.5 - 2 MB
- Interfaces: CAN, SENT, PWM
- Injector drivers: high- / low-side
- Heater driver: 2 + 1 optional
- Pump driver: BLDC pump + optional transfer pump

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**TANK DOMAIN CONTROLLER**

Central controller to sensors and actuators in tank domain. Tank domain controller controls the fuel delivery module and associated sensors (eg. fuel level sensor, pressure sensor, leakage detection).

**Facts & Benefits**
- Reduced consumption of electric energy
- Enhanced lifetime
- Reduced vibration and noise level
- Processing of other signals (e. g. fuel level sensor, pressure sensor, leakage detection)

**Technical Information**
- Operating Voltage: 6 up to 16 V
- Electrical power: 100 up to 200 W
- Operating temperature: -40°C up to 85°C
- Control input / output signal: CAN
- Degree of protection: IP6K7 and IP44
AIR MANAGEMENT

The air path provides an important lever to further increase the ICE efficiency and to reduce emissions. For air path management, Vitesco Technologies offers a highly efficient turbocharger to facilitate engine downsizing, and a portfolio of actuators and valves which control the intake of air and the dosage of recirculated exhaust gas (EGR).

In tandem with mass air flow and pressure sensors, these products ensure that the air path contributes to the optimal conditions required for a high thermodynamic efficiency and for reducing nitrogen oxide (NOₓ) and particle emissions.

AIR CONTROL VALVE 8.6 - PERFORMANCE LINE

Intake air pressure control on diesel combustion engines. Supports EGR & particle filter regeneration.

Facts & Benefits
- Modular capable for 12 V and 24 V systems
- Capable for big throttle plate diameters, high flow
- Capable for turbo- and supercharged applications
- High torque, fast response

Technical Information
- Temp. range: -40°C up to 150°C
- Response Time (typ.): 90 ms (13.5 V, RT)
- Pressure range: up to 4 bar peak
- TP Ø range: 57 mm to 100 mm
- Signal output: analog 5 V
- Weight: 1.1 kg (TP Ø 80 mm)
AIR CONTROL VALVE 11.1 - ECONOMY LINE

Intake air pressure control on diesel combustion engines. Supports EGR & particle filter regeneration on diesel engines. Full plastic design concept.

Facts & Benefits
> Low cost performance, full functional range
> Low weight, small package
> Capable for turbo applications

Technical Information
> Temp. range: -40°C up to 140°C
> Response Time (typ.): < 120 ms (13.5 V, RT)
> Pressure range: up to 4 bar peak
> Leakage (at stop): < 3 kg/h (TP Ø 48 mm, RT, dp = 600 hPa)
> TP Ø range: 40 mm to 57 mm
> Signal output: analog 5 V or digital SENT
> Weight: 570 g (TP Ø 55 mm)

AIR CONTROL VALVE 12 - MODULAR PERFORMANCE

Intake air flow and pressure control on combustion engines. Supports EGR & particle filter regeneration on diesel applications.

Facts & Benefits
> Modular design concept
> High torque, fast response
> Low weight, very small package
> Low leakage

Technical Information
> Temperature range: -40°C up to 140°C / 180°C for High Temperature
> Response Time (typ.): < 90 to 120 ms (13.5 V, RT)
> Pressure range: up to 4 bar peak
> Leakage (at stop): < 2.5 kg/h (TP Ø 52 mm, RT, dp 600 hPa), < 3.5 kg/h for High Temperature, dp 600 hPa
> TP Ø range: 40 up to 90 mm
AIR CONTROL VALVE 13 - ECONOMY LINE

Intake air flow and pressure control on combustion engines. Supports EGR and particle filter regeneration on diesel engine applications and secures smooth engine shut-off.

Facts & Benefits
> Modular design concept
> Lowest weight with hybrid housing, very small package
> Low cost performance, full functional range
> Leakage requirement as aluminum housing

Technical Information
> Temperature range: -40°C up to 140°C
> Response Time (typ.): < 90 to 120 ms (13.5 V, RT)
> Pressure range: up to 3 bar peak
> Leakage (at stop): < 2.5 kg/h (TP Ø 44 mm)
> TP Ø range: 40 up to 57 mm
> Weight (TP Ø 52 mm): 438 g

COMPRESSOR BYPASS VALVE

Continuously position controlled Compressor Bypass Valve on charged applications.

Facts & Benefits
> Modular design concept
> High torque, fast response
> Low weight, very small package
> Low leakage

Technical Information
> Temperature range: -40°C up to 140°C / 180°C for High Temperature
> Response Time (typ.): < 90 to 120 ms (13.5 V, RT)
> Pressure range: up to 4 bar peak
> Leakage (at stop): < 2.5 kg/h (TP Ø 52 mm, RT, dp 600 hPa), < 3.5 kg/h for High Temperature, dp 600 hPa
> TP Ø range: 40 up to 90 mm
**ELECTRICAL COMPRESSOR BYPASS VALVE**

Compressor surge prevention and turbocharger lag reduction by opening a bypass for the compressor.

**Facts & Benefits**
- Electromagnetic on-off solenoid
- Improved performance and size
- No vacuum lines, tank, or vacuum control valve needed
- Mounted directly on turbocharger or air duct

**Technical Information**
- Nominal operating voltage: 12 V
- Response time: < 50 ms at 20°C; 13.5 V
- Operation (gas) temperature: -40°C up to 180°C; short term (30min): 200°C
- Ambient temp.: -40°C up to 150°C
- Storage temp.: -40°C up to 200°C
- Travel: ≥ 5 mm; Poppet Ø: 26 mm

**ELECTRONIC OIL PUMP SINGLE OR MULTI PORT**

For 1 or multiple cylinder, 2 stroke engine applications. Widely used in marine applications.

**Facts & Benefits**
- Fully flexible mounting location
- In-tank or in-line
- Accurate oil delivery rate

**Technical Information**
- Customized oil flow rate and number of outputs
- Full control of flow from 0 up to 2 cc/sec
- Control of flow by Pulse-Width Modulation PWM / frequency input
- Full performance down to -40°C
**ELECTRONIC THROTTLE CONTROL - OVAL**

For single cylinder high end motorcycle, scooter, ATV, snowmobile.

**Facts & Benefits**
- Contactless redundant magneto resistive sensor
- Air channels designed to customer requirements
- Integration of Injector, TMAP & canister purge valve on throttle body is possible
- Throttle body diameter can be adapted to requirement
- Compatible with M3D or other drive by wire ECU

**Technical Information**
- Minimum idle flow at 40 kPa ΔP: 2 kg/h
- Response time of single throttle: < 100 ms (at 25°C)
- E-motor nominal supply voltage: 12 V
- Vibration level: 30 g
- Operating temperature range: -40°C up to 140°C

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**ELECTRONIC THROTTLE CONTROL - TWIN**

For high-end motorcycles, scooters, ATV and snowmobiles.

**Facts & Benefits**
- Twin bore monobloc concept
- Core components from automotive ETC
- Modular design concept
- Low weight, small package
- Contactless redundant magneto-resistive position sensor

**Technical Information**
- Airflow at fully closed position with 60 kPa ΔP: 2.3 kg/h for plate Ø 34 mm
- Airflow balancing between the 2 bores: max 0.2 kg/h
- Single Throttle Position Sensor (TPS) linearity: ± 1.5%
- E-motor nominal supply voltage: 12 V
- Operating temperature: -40°C up to 140°C
**ELECTRONIC THROTTLE CONTROL - TWIN PARALLEL**

For 2 cylinder high end motorcycle, scooter, ATV, snowmobiles.

**Facts & Benefits**
- Contactless redundant magneto resistive sensor
- Core components from automotive ETC
- Air channels designed to customer requirements (round or oval shapes)
- Integration of Injector, TMAP & canister purge valve on throttle body is possible
- Compatible with M3D or other drive by wire ECU

**Technical Information**
- Airflow balancing between the 2 bores: max 0.2 kg/h at 60 kPa ΔP
- Single TPS linearity: ± 1.5%
- TPS synchronous tolerance: ± 3%
- TPS hysteresis: < 0.1°
- Response time of single throttle: < 100 ms (at 25°C & supply voltage 13.5 V)

**ELECTRONIC THROTTLE CONTROL 11.2 - ECONOMY LINE**

Torque / load control on gasoline combustion engines. Supports idle speed, cruise and traction control.

**Facts & Benefits**
- Low weight, small package
- Low leakage
- Capable for turbo- and supercharged applications

**Technical Information**
- Temperature range: -40°C up to 140°C
- Pressure range: up to 4 bar peak
- Response Time (typ.): < 120 ms (13.5 V, RT)
- Leakage (at stop): < 2.5 kg/h (TP Ø 52 mm, RT, dp 600 hPa)
- TP Ø range: 40 up to 80 mm
- Signal output: analog 5 V or digital SENT
- Weight: 600 g (TP Ø 55 mm)
ELECTRONIC THROTTLE CONTROL 12

For single cylinder high end motorcycle, scooter, ATV, snowmobile.

Facts & Benefits
> Contactless redundant magneto resistive sensor
> Air channels designed to customer requirements
> Integration of Injector, TMAP & canister purge valve on throttle body is possible
> Throttle body diameter can be adapted to requirement
> Mechanical interface can be adapted to requirement

Technical Information
> Single TPS linearity: ± 1.5%
> TPS synchronous tolerance: ± 3%
> TPS hysteresis: < 0.1°
> E-motor nominal supply voltage: 12 V
> Operating temperature range: -40°C up to 140°C

ELECTRONIC THROTTLE CONTROL 12 - MODULAR PERFORMANCE

Torque / load control on gasoline combustion engines. Supports idle speed, cruise and traction control.

Facts & Benefits
> High performance throttle body actuator
> Modular design concept
> Low weight, very small package
> Low leakage, spherical bore optional

Technical Information
> Temp. range: -40°C up to 140°C / 180°C for High Temperature
> Response Time (typ.): < 90 to 120 ms (13.5 V, RT)
> Pressure range: up to 4 bar peak
> Leakage (at stop): < 2.5 kg/h (TP Ø 52 mm, RT, dp 600 hPa), < 3.5 kg/h for High Temperature, dp 600 hPa
> TP Ø range: 40 mm up to 90 mm
ELECTRONIC THROTTLE CONTROL 13 - ECONOMY LINE

Torque / load control on gasoline combustion engines. Supports idle speed, cruise and traction control.

Facts & Benefits
> Modular design concept
> Lowest weight with hybrid housing, very small package
> Low leakage, equal to standard aluminum housing
> Capable for turbo applications

Technical Information
> Temperature range: -40°C up to 140°C
> Response Time (typ.): < 90 to 120 ms (13.5 V, RT)
> Pressure range: up to 3 bar peak
> Leakage (at stop): < 2.5 kg/h (TP Ø 44 mm)
> TP Ø range: 40 up to 57 mm
> Weight (TP Ø 52 mm): 438 g

ELECTRICAL WASTEGATE ACTUATOR

Performing waste-gate adjustment to optimize functional application and reduce fuel consumption.

Facts & Benefits
> Continuous adjustment of external application using rotating output shaft
> Ideal for use in turbocharger applications
> Option: default position
> Permanent feedback signal (contactless)

Technical Information
> Max external load without return function: 92 Ncm
> Max continuous holding torque without return function at 140°C: 144 Ncm
> Holding torque capability at 140°C: 420 Ncm
> Response time less than: 100 ms/80°C 160°C
> Operation temp.: -40°C up to 160°C
MASS AIRFLOW SENSOR - FMT MAF+HPT SENT

Measurement of the intake airflow humidity, pressure and temperature for the engine management system.

Facts & Benefits
> High flow measurement accuracy
> Integral protection against water & contamination
> Excellent performance with intake airflow pulsation
> Customer specific output characteristic
> High dynamic range
> SENT V4 interface, 3 pin device
> Options for humidity and pressure sensors

Technical Information
> Sensing technology: Next generation MEMS
> Flow range: 4.5 kg/h up to 900 kg/h (62 mm tube)
> New-part tolerance: 1.5%

MASS AIRFLOW SENSOR - FMT MAF SENT

Measures intake airflow and temperature for the engine management system.

Facts & Benefits
> High flow measurement accuracy
> Integral protection against water & contamination
> Excellent performance with intake airflow pulsation
> Customer specific output characteristic
> High dynamic range
> 3 pin device with SENT V4 interface

Technical Information
> Sensing technology: Next generation MEMS
> Flow range: 4.5 kg/h up to 900 kg/h (62 mm tube)
> New-part tolerance: 1.5%
> Supply voltage: 5 V ± 0.5 V; Supply current: 5 mA
MASS AIRFLOW SENSOR - MT MAF

Measurement of the intake airflow and temperature for the engine management system.

Facts & Benefits
> High flow measurement accuracy & signal stability
> Integral protection against water & contamination
> Excellent performance with intake airflow pulsation
> Customer specific programmable output characteristic

Technical Information
> Sensing technology: hot-film bi-directional MEMS
> Flow range: 5 kg/h up to 800 kg/h (62 mm tube)
> New-part tolerance: 1.5%
> Supply voltage: 5 V ± 0.5 V
> Supply current: 8 mA max
> Output signal: frequency
> Intake air temperature sensor optional

PRESSURE SENSOR - AIR FILTER GAUGE

Relative pressure measurement used to monitor performance of intake air filter pressure measurement. For use in clean air environment.

Facts & Benefits
> Flexible calibration of transfer functions
> Precision programmable clip levels
> Internal and output diagnostic capability
> High accuracy and temperature stability
> Fulfills toughest EMC requirements

Technical Information
> Adjustable characteristic via electronic calibration
> Pressure range: -10 kPa up to 10 kPa
> Operating temp.: -40°C up to 125°C
> Supply voltage: 5 V ± 0.25 V
> Output signal: Analog or SENT
> Transfer function: linear, ratiometric (analog version)
PRESSURE SENSOR - CRANKCASE GAUGE

Relative pressure measurement used to monitor performance of positive crankcase ventilation system thru pressure measurement in fresh air tube. Design can snap fit to plastic tube.

Facts & Benefits
- Flexible calibration of transfer functions
- Precision programmable clip levels
- Internal and output diagnostic capability
- High accuracy and temperature stability

Technical Information
- Adjustable characteristic via electronic calibration
- Pressure range: -10 kPa up to 10 kPa
- Operating temp.: -40°C up to 125°C
- Supply voltage: 5 V ± 0.25 V
- Output signal: Analog or SENT
- Transfer function: linear, ratiometric (analog version)
- Accuracy over full-scale: 3% full span (10°C up to 85°C)

PRESSURE SENSOR - MANIFOLD ABSOLUTE

Direct measurement of pressure in manifold.

Facts & Benefits
- Flexible calibration of transfer functions
- High accuracy and temperature stability
- Low cost design and high quality
- Fulfills toughest EMC requirements
- Flexible housing, connector and mounting design

Technical Information
- Pressure range: 40 kPa up to 120 kPa (for BAP)
- Pressure range: 7 kPa up to 500 kPa (for MAP and Turbo MAP)
- Accuracy: 1% full scale (10°C up to 85°C)
- Temp. range: -40°C up to 140°C
- Output signal: Analog or SENT
PRESSURE SENSOR - MANIFOLD ABSOLUTE WITH TEMPERATURE SENSOR

Small and robust Pressure Sensor with integrated temperature sensing for manifolds.

Facts & Benefits

> Flexible calibration of transfer functions
> High accuracy and temperature stability
> Low cost design and high quality
> Fulfills toughest EMC requirements
> Flexible housing, connector and mounting design

Technical Information

> Pressure range: 40 kPa up to 120 kPa (for TBAP)
> Pressure range: 7 kPa up to 500 kPa (for TMAP and Turbo TMAP)
> Accuracy: 1% full scale (10°C up to 85°C)
> Temp. range: -40°C up to 140°C
> Output signal: Analog or SENT

PRESSURE SENSOR - MANIFOLD GAUGE

Relative measurement of pressure or vacuum in the intake manifold.

Facts & Benefits

> Flexible calibration of transfer functions
> Precision programmable clip levels
> Internal and output diagnostic capability
> High accuracy and temperature stability
> Fulfills toughest EMC requirements

Technical Information

> Pressure range: -105 kPa up to 40 kPa (gauge)
> Accuracy: 1% full scale (10°C up to 85°C)
> Temp. range: -40°C up to 125°C
> Supply voltage: 5 V ± 0.5 V
> Supply current at 5 V: 10 mA max
> Load resistance: > 4.7 kΩ
VARIABLE TURBINE GEOMETRY ACTUATOR

Best performance for VTG adjustment to optimize functional application and reduce fuel consumption.

Facts & Benefits
> Continuous adjustment of external application using rotating output shaft
> Ideal for use in VTG applications
> Permanent feedback signal (contactless)
> Options: default position, integrated electronic

Technical Information
> Max external load without return function: 40 Ncm
> Max continuous holding torque without return function at 140°C: 65 Ncm
> Response time less than: 150 ms at 120°C
> Operation temp.: -40°C up to 160°C
CANISTER PURGE SOLENOID

The Canister Purge Solenoid controls hydrocarbon vapors from the canister to the intake manifold.

**Facts & Benefits**
- Higher flow than competitive valves
- Linear flow curve & fast response
- Sonic nozzle flow control
- Integrated particle trap to control contamination

**Technical Information**
- Flow at > 30 kPa – 110 SLPM (2.3 g/s, 7.9 kg/h)
- Operating voltage: 9 V - 16 V (13.5 V optimal)
- Coil resistance: 21Ω
- OBD leakage (6.7 kPa vacuum on port): < 3.0 SCCM
- Operating temp.: -25°C up to 125°C

**FLUID & EVAPORATION MANAGEMENT**

Considering the increasingly stringent emissions legislations worldwide, pollutant sources such as re-fueling and evaporation emissions are gaining importance. Vitesco Technologies has a true expert’s long-standing system knowledge in this field, with the modules, pumps, and valves, which effectively minimize this source of emissions.
**CUSTOMIZED FUEL DELIVERY MODULE**

Applicable for all types of engines and vehicles in non-automotive applications.

**Facts & Benefits**
- Cost optimized ESD control strategy
- On-board Fuel Level Sensor
- Adaptable for on-board Fine Filter
- Jet pump system maximizes fuel volume usage
- Designed and validated to specific non-automotive environment, employing automotive technologies

**Technical Information**
- Configurable Flow: 3 - 6 bar, 15 - 200 + LPH
- Configurable Inlet Screen
- 38 mm Brushed-type Fuel Pump
- Customized plastic flange
- Customized installation orientation and bottom referencing

**FLUID SENSOR - FLEX FUEL ETHANOL**

Detects ethanol concentration in gasoline / ethanol fuel mixture.

**Facts & Benefits**
- Highly accurate prediction of ethanol concentration
- Enables ethanol detection before inject./combustion
- Outputs ethanol concentration and fuel temperature within 250 ms after start-up
- Self diagnostic capability
- Calibrations available for worldwide market

**Technical Information**
- Measurement principle: capacitive (0-100% ethanol content)
- Accuracy: ± 5% ethanol concentration
- Pressure range: < 10 bar (145 psi)
- Fuel temp. range: -40°C up to 80°C
- Environmental temp.: -40°C up to 140°C
FLUID SENSOR - OIL LEVEL
ELECTROTHERMIC

Sensor monitors correct engine oil level to avoid overfill or underfill during driving or at key-on.

Facts & Benefits
> Overfill and low level indication
> Absolute measurement of oil level in static and dynamic conditions
> Replacement of oil dipstick
> Different mounting positions
> Temperature measurement optional

Technical Information
> Measuring principle: thermo resistive heated wire
> Measuring range: 100 mm between min & max
> Accuracy approx.: ± 3 mm
> First measurement: available 0.6s after key-on
> Measuring interval: > 10 s
> Operating temp.: -40°C up to 160°C

FLUID SENSOR - OIL LEVEL ULTRASONIC

Oil level measurement providing early warning of oil loss/fuel in oil or overfilling.

Facts & Benefits
> CO₂ reduction enabler via accurate oil level measurement allowing a reduction in the total amount of engine oil which in turn needs less engine heat up time from cold starts.
> Replacement of oil dipstick
> Detection of low level & overfill
> Absolute measurement of oil level in static and dynamic conditions

Technical Information
> Measuring principle: ultrasonic echo
> Measuring range: 18 mm up to 150 mm
> Level accuracy: ± 2 mm
> Power supply: 12 V / 10 mA typical
> Protection class: IP X9K
**FLUID SENSOR - UREA CONCENTRATION AND LEVEL**

Sensor supports to fulfill emission legislation and Onboard Diagnose (OBD) requirements for SCR systems.

**Facts & Benefits**
- Fast and accurate measurement of urea concentration (AdBlue®/DEF) in the SCR System
- Additional measurement of urea level and temperature
- Flexible mounting positions (In-tank, In-extraction unit, In-heater)

**Technical Information**
- Measuring principle: Ultrasonic
- Output signal: CAN, SENT
- Measuring range: concentration: 0% - 50% (urea mass) above freezing point
- Measuring range: level: 20 mm - 500 mm
- Measuring interval: 1s

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**FUEL PUMP WITH DIRECT CURRENT MOTOR**

In-tank fuel pump with brush-type direct current motor. The purpose of a car fuel pump is to convey the required quantity of fuel from the tank to the engine at the necessary pressure.

Picture: Gasoline Pump (on the left) and Diesel Pump (on the right).

**Facts & Benefits**
- Most cost-effective solution for systems without electronic control
- Stand-alone (electronics not required)

**Technical Information**
- Gerotor and side-channel turbine pump principles
- Pressure: up to 700 kPa
- Flow, typ.: 230 l/h at 500 kPa
- Efficiency, typ.: 30%
- Size (HxLxW): 28 x 38 x 43 mm
- Media: gasoline (up to E100), diesel (incl. RME)
In-tank fuel pump with brushless electronically commutated (EC) motor conveys the required quantity of fuel from the tank to the engine at the necessary pressure.

**Facts & Benefits**
- Improved quality, reliability and durability (fewer parts, no commutation wear)
- Precise rpm control possible
- High efficiency
- Electromagnetic compatibility improvement

**Technical Information**
- Side-channel turbine (gasoline), gerotor or screw pump (diesel) design
- Pressure: up to 700 kPa
- Flow, typ.: 330 l/h at 500 kPa
- Efficiency, typ.: 35%

In-tank Fuel Delivery Module for diesel and gasoline with the opportunity to integrate various functions. It delivers pressurized fuel to the engine.

**Facts & Benefits**
- CO₂ reduction through improved electrical efficiency
- Weight and volume reduction up to -20% (200 g)
- Increased pressure range (up to 800 kPa)
- Less interfaces

**Technical Information**
- 200 l/h @ 500 kPa
- > 40% system efficiency
- > 30% @ 100 l/h
- Optimized acoustics
- Controllable to 0 l/h flow
- Integrated Electronics Controller
FUEL DELIVERY MODULE FOR ENTRY LEVEL VEHICLES

Flange referenced gasoline module. Delivers pressurized fuel to the engine.

Facts & Benefits

- Very cost effective solution due to high flange integration
- Suitable for compact tanks with low flow requirements
- Also applicable for two-wheelers and recreational vehicles

Technical Information

- Low module weight
- Integrated vent valve
- Serviceable elements

FUEL DELIVERY MODULE FOR HIGH-END APPLICATIONS

Bottom referenced high performance module for diesel and gasoline. Delivers pressurized fuel to the engine.

Facts & Benefits

- Developed for high performance vehicles
- Applicable for complex tank geometries
- Multiple jet-pump and fuel level sensor solutions
- Dual pump configurations

Technical Information

- Brushless EC pumps or brushed-type DC pumps
- Hydraulic performance: > 280 l/h at 6.5 bar
FUEL DELIVERY MODULE FOR STANDARD APPLICATIONS

In-tank Fuel Delivery Module for gasoline and diesel systems with the opportunity to integrate various functions. It delivers pressurized fuel to the engine.

Facts & Benefits
> Cost effective modular design to cover various customer requirements
> Constant flow or demand regulated

Technical Information
> Brushless EC pumps or brushed-type DC pumps
> Optional integrated: fuel level sensor, filter, pressure regulator, electronics, vent valves and tank leakage detection sensor

FUEL LEVEL SENSOR WITH A SEALED CONTACT SYSTEM

Fuel Level Sensor with a fully capsulated sensor element and an open contact system. Picture: MAPPS sensor element (left) Modular Tank Sensor (right).

Facts & Benefits
> Hermetically sealed contacts assure robust protection against corrosion
> Longer life time (>10 million cycles) because of a wear free measurement system
> Electromagnetic compatibility

Technical Information
> Measuring range: up to 90°
> Operating current: up to 20 mA
> Resolution: 1.7 Degree / Pad
> Max. resistor tolerance: ± 1%
> Operating temperature: -40°C up to 80°C

PROPULSION TYPES | VEHICLE TYPES
---|---
BEV | Gasoline
PHEV | Diesel
MHEV | Passenger Car
48V | Commercial Vehicle & Off-Highway
2-Wheeler & Powersports

PROPULSION TYPES | VEHICLE TYPES
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BEV | Gasoline
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**FUEL LEVEL SENSOR WITH AN OPEN CONTACT SYSTEM**

Fuel Level Sensor with an open contact system. Picture: Detail of the ‘three finger contact’ (left) Modular Tank Sensor (right).

**Facts & Benefits**
> Redundant contacts
> Various contact materials for different technical requirements and market specific fuel compositions

**Technical Information**
> Measuring range: angle up to 100°
> Operating current: 1 up to 20 mA
> Resolution: 1.25 Degree/Pad
> Max. resistor tolerance: ± 1%
> Operating temperature: -40°C up to 80°C

**LATCHING VALVE**

Latching refueling valve is a bi-stable valve used to a seal pressurized tank or isolated HC vapors in a normal tank.

**Facts & Benefits**
> Significantly less energy consumption
> Maintains valve position using zero current draw
> Very low flow restriction
> Able to determine valve position (open/closed)
> Passive relief function for fuel tank over pressure
> Flexible packaging configurations

**Technical Information**
> 14 V DC pulse for 100 ms to change valve state
> Flow > 115 SLPM at 1.5 kPa
> Overpressure relief at 43.5 kPa
> Leak < 1 sccm at 5 kPa and 20 kPa tank pressure
> Leak < 3.5 sccm at 35 kPa tank pressure
> Leak < 10 sccm at -9 kPa tank pressure
LINEAR PURGE VALVE

The Linear Purge Valve controls the flow of hydrocarbon vapors from the canister to the intake manifold.

**Facts & Benefits**
- Very low operating noise
- Fast response for incremental flow control at all operating conditions
- Excellent low end flow control preventing unwanted surges of fuel vapor

**Technical Information**
- Typical flow: 70 SLPM at 57 kPa
- Operating voltage: 14 V
- Coil resistance: 14.0 Ω
- Max current: 500 mA
- Control circuit constant current at 150 up to 200 Hz
- Weight: 200 g

NATURAL VACUUM LEAK DETECTION (NVLD III)

Engine off OBD monitoring for Hydrocarbon evaporative leak detection. Legislation compliance.

**Facts & Benefits**
- With integrated electronics
- OBD HC leak diagnostic performed after key off
- Integrated solenoid for improved purge flow capacity
- Effective flow area independent of system vacuum
- Passive over pressure venting (including refueling)
- Temperature sensing, switch sensing

**Technical Information**
- Detection capable to 0.5 mm diameter leak
- Bit serial communication with ECU
- High In Use Monitor Performance
- Nominal coil resistance of 21 Ω
- Operating voltage: 9 - 16 V
- Operating Temp.: -40°C up to 85°C
FUEL PRESSURE REGULATOR

Calibrated pressure regulator for Diesel and Gasoline applications. It is responsible for regulating the pressure of the fuel flowing through the system.

Facts & Benefits
> Media compatibility up to E100
> High particle robustness
> Plastic cover flexible for all kind of applications

Technical Information
> Flow Range: up to 250 l/h
> Pressure Range: < 800 kPA
> Leakage in air @ 80% of p nominal: < 10 cm³/min
> Burst pressure: > 55 bar

PRESSURE SENSOR - FUEL VAPOR GAUGE

Relative pressure measurement used to detect any leak condition in evaporative fuel systems. Design can snap fit to plastic tube if any inline mounting is required.

Facts & Benefits
> Flexible calibration of transfer functions
> Precision programmable clip levels
> High accuracy and temperature stability

Technical Information
> Adjustable characteristic via electronic calibration
> Pressure range: -5 kPa up to 5 kPa (Low range)
> Pressure range: -15 kPa up to 45 kPa (High range)
> Operating temp.: -40°C up to 125°C
> Supply voltage: 5 V ± 0.25 V
> Output signal: Analog or SENT
> Transfer function: linear, ratiometric (analog version)
PRESSURE SENSOR - FUEL RAIL DIESEL

Direct measurement of pressure in diesel fuel rail.

Facts & Benefits
> High accuracy and temperature stability
> High vibration robustness (low/high frequencies)
> Modular design for connector and mounting
> Flexible calibration of transfer functions
> Internal and output diagnostic capability

Technical Information
> Pressure range: 0 bar up to 3,400 bar
> Temp. range: -40°C up to 140°C
> Supply: 5 V, 10 mA
> Output signal: Analog or SENT
> Accuracy: 0.5% full scale output
> Response time: < 1 ms

PRESSURE SENSOR - FUEL RAIL GASOLINE

Direct measurement of pressure in fuel rail gasoline.

Facts & Benefits
> High accuracy and temperature stability
> High vibration robustness (low/high frequencies)
> Modular design for connector and mounting
> Flexible calibration of transfer functions
> Internal and output diagnostic capability

Technical Information
> Pressure range: 0 bar up to 500 bar
> Temp. range: -40°C up to 140°C
> Supply: 5 V, 10 mA
> Output signal: Analog or SENT
> Accuracy: 0.5% full scale output
> Response time: < 1 ms
PRESSURE SENSOR - OIL PRESSURE

Direct measurement of Oil pressure.

Facts & Benefits
> Robust sensing technology compatible with typical oil environment
> Flexible calibration of transfer functions
> Precision programmable clip levels
> Internal and output diagnostic capability
> High accuracy and temperature stability

Technical Information
> Adjustable characteristic via electronic calibration
> Pressure range: -5 bar up to 5 bar (Low range)
> Pressure range: -15 bar up to 45 bar (High range)
> Operating temp.: -40°C up to 140°C
> Supply voltage: 5 V ± 0.5 V
> Output signal: Analog or SENT
> Accuracy over full-scale: 1.5% full span (10°C up to 85°C)

PRESSURE SENSOR - IN LINE FUEL VAPOR GAUGE

Relative pressure measurement used to detect any leak condition in evaporative fuel systems.

Facts & Benefits
> Flexible calibration of transfer functions
> Precision programmable clip levels
> Internal and output diagnostic capability
> High accuracy and temperature stability

Technical Information
> Adjustable characteristic via electronic calibration
> Pressure range: -5 kPa up to 5 kPa (Low range)
> Pressure range: -15 kPa up to 45 kPa (High range)
> Operating temp.: -40°C up to 125°C
> Supply voltage: 5 V ± 0.25 V
> Output signal: Analog or SENT
> Accuracy over full-scale: 1.5% full span (10°C up to 85°C)
**SCR TANK EXTRACTION UNIT GEN 4**

Tank extraction unit "Gen 4" allows controlled pressure for stable spray pattern. Designed for passenger cars and light duty trucks.

**Facts & Benefits**
- Including filter, heating, level and quality sensor
- Silent orbital pump with purge functionality
- Maintenance-free lifetime filter
- Freeze proven
- Welded directly into the tank

**Technical Information**
- Pump capacity: max 4 kg/h
- Operating pressure: 5 - 6.5 bar (relative)
- Operating voltage: 12 V
- SAE interface for tank mounting

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**TEMPERATURE SENSOR - COOLANT / FUEL / OIL**

Temperature measurement in several liquid media (coolant, fuel, oil).

**Facts & Benefits**
- Clip or screw-in design
- Wide range of applications
- High accuracy
- Short response time
- Long-term stability

**Technical Information**
- Engine coolant: -40°C up to 140°C
- Engine oil: -40°C up to 150°C
- Fuel: -40°C up to 140°C
- Accuracy: ± 1.15°C (at 25°C)
- Response time: ~ 20s
The Turbo Purge Valve controls the flow of hydrocarbon vapors from the canister to the intake manifold on turbocharged applications.

**Facts & Benefits**
- EVAP turbo system cost savings for OEM
- Smooth start-to-open characteristics
- Robust design & easy to calibrate
- Multiple turbo purge system function in one assembly
- Flexible configuration using common actuator

**Technical Information**
- Incorporates check valves to protect purge system
- Operating voltage: 9 V - 16 V (13.5 V optimal)
- Operating temp.: -25°C up to 125°C
- Operating Pressure: up to 400 kPa
- Frequency: 5 Hz up to 30 Hz (10 Hz recommended)
- Purge flow: 110 SLPM
Vitesco Technologies’ electronics and electrification solutions contribute substantially to meeting the emission targets applicable to an ICE. For instance, our electronics and software provide the needed high precision control of urea dosing and spray formation, for robust Selective Catalytic Reduction (SCR) of NO\textsubscript{x} in the exhaust system.

Another Vitesco Technologies solution addresses challenges in exhaust catalyst temperature management. During prolonged engine-off periods - as is the case in hybrid powertrains - the catalytic converter cools down to a point below its minimum operating temperature of 250 °C. When the ICE is re-started, the catalyst requires a certain period to reach its “light-off” operating temperature. During the engine cold start phase, this time lapse until light-off also needs to be short to minimize the total emissions within a cycle. Vitesco Technologies’ electrically heated catalyst (EHC) EMICAT\textsuperscript{®} ensures that the catalyst begins to act quickly and that it permanently maintains its operating temperature in order to minimize the emissions after re-starting the engine, e.g. at the end of an engine-off period.

Meeting emission limits requires innovative sensors and actuators. One example is the NO\textsubscript{x} sensor which provides the basic input for a precise control of the emissions during real-world driving (Real Driving Emissions, RDE). This sensor along with many others deliver the data for a continuous control of exhaust gas after-treatment.

Compact ring-shaped metal substrate catalyst (CompactCat\textsuperscript{®}) as Diesel Oxidation Catalysts (DOC) for advanced compact SCR systems with integrated urea decomposition feature in the center.

**Facts & Benefits**
- Usage of outer mantel design for flow guidance (principle feature of CompactCat\textsuperscript{®} design)
- Inner hot tube with high droplet evaporation capability due to intense turbulent gas flow
- Compact robust system design
- Minimized thermal mass for low temperature urea decomposition

**Technical Information**
- Optimal performance with metal substrate (METALIT\textsuperscript{®}) in high efficient design structures
- Scalable substrate with inner tube for low guidance towards SDPF
- Easy integration with customized mantel tube design
**COMPACTCAT® FOR GASOLINE ENGINES**

Close-coupled compact metal substrate catalyst (CompactCat®) as Three-Way-Catalyst (TWC) directly mounted to the turbocharger.

**Facts & Benefits**
- Metal substrate (METALIT®) for optimized integration in close-coupled position
- "CompactCat" canning provides optimum exhaust gas temperature utilization
- Lowest emissions due to fast light-off

**Technical Information**
- Optimal performance with LS-Design® metal substrate
- Catalyst-integrated lambda-sensor (Lambdasondenkat™)
- Close-coupled position directly at turbocharger outlet
- "CompactCat" canning with hot gas circulating the catalyst surfaces

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**COMPACTCAT® FOR HEAVY - DUTY DIESEL ENGINES**

Close-coupled compact metal substrate catalyst (CompactCat®).

**Facts & Benefits**
- Metal substrate (METALIT®) for design freedom even in space limited engine compartments and chassis frames
- Heat loss reduction for improved cold-start and intra-urban use performance
- Improved thermal efficiency of DOC and the whole exhaust system

**Technical Information**
- METALIT® available in a wide range of sizes and geometrical shapes
- DOC-volume reduction up to 30% and volume reduction of the total system
- Optional with electrically heated catalyst EMICAT® for further low temperature decomposition enhancement
COMPACTCAT® FOR LIGHT - DUTY DIESEL ENGINES

Close-coupled compact metal substrate catalyst (CompactCat®) as Diesel Oxidation Catalysts (DOC) directly mounted to the turbocharger.

Facts & Benefits
> Metal substrate (METALIT®) for optimized integration in close-coupled position
> "CompactCat" canning provides optimum exhaust gas temperature utilization
> Lowest emissions due to fast light-off

Technical Information
> Optimal performance with LS-Design® metal substrate
> Close-coupled position directly at turbocharger outlet
> "CompactCat" canning with hot gas circulating the catalyst surfaces

ELECTRICAL EXHAUST GAS RECIRCULATION VALVE (EEGR)

Controls the amount of recirculated exhaust gas to reduce NOx emissions & fuel consumption.

Facts & Benefits
> Electric actuation has faster response and more control than conventional vacuum systems
> Eliminates vacuum regulator and connecting hoses
> Can be tailored to customer flow requirements

Technical Information
> Current consumption at max flow: 1.0 A at 20°C
> Nominal operating voltage: 12 V DC
> Max current consumption: 1.5 A
> Nominal coil resistance: 8.0 Ω at 20°C
> Nominal operating frequency: 90 Hz up to 175 Hz
> Position sensor supply voltage: 5 V DC
> Response time (total stroke): < 50 ms at 20°C, 13.5 V DC
EMICAT® INTEGRATED IN COMPACT SCR

Passive NOx-Adsorber (PNA) plus Diesel Oxidation functionality (DOC) in combination with electrical heated catalyst EMICAT® and reverse urea injection for advanced NOx reduction (SCR).

Facts & Benefits
> Bridging due to NOx storage until catalyst light-off
> Lowest emissions due to fast light-off in close-coupled position
> Ammonia formation at lowest temperatures with EHC support

Technical Information
> Optimal performance with LS-Design® metal substrate
> Reverse urea injection on hydrolysis coated heating disc
> "CompactCat" canning with hot gas circulating the catalyst surfaces in close-coupled position
> Electrical Heated Catalyst (EMICAT®) for 12 up to 48 V
> Maximum current: 300 A

EMICAT® INTEGRATED IN UNIVERSAL DECOMPOSITION PIPE

Universal Decomposition Pipe with an integrated electrically heated catalyst (EMICAT®) for urea decomposition and evaporation. Applicable for LCV and HD (On-Highway and NRMM).

Facts & Benefits
> SCR efficiency improvement in cold and transient operation
> Minimization of Urea deposits due to local efficient thermal management
> Optimization of urea decomposition and ammonia preparation for the SCR catalyst
> Compact flow optimized design

Technical Information
> Limited impact on electrical board net
> Operation voltage: 12 V - 24 V - 48 V
> Maximum current: 300 A
**EMICAT® - RING-SHAPED SCR CATALYST**

Ring-Shaped Electrically Heated Catalyst EMICAT® with integrated mixing and thermolysis pipe for highest NOx reduction (SCR) requirements in advanced compact system design.

**Facts & Benefits**
> Earlier dosing release by electrical heating
> Inner hot tube with high droplet evaporation
> Increased Ammonia uniformity for SCR catalyst
> Allows very compact system design

**Technical Information**
> Scalable compact system approach with variation of heating power according to requirements
> EMICAT® for 12, 24 and 48 V application
> EMICAT® in round and non-round ring-shape
> Ring-Shaped EMICAT® with control unit as a complete system

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**EXHAUST GAS RECIRCULATION VALVE - HIGH PRESSURE (HP - EGR)**

Helps to reduce emissions of NOx & fuel consumption in gasoline and diesel engines in HP EGR loop.

**Facts & Benefits**
> Balanced rotary throttle principle for EGR control
> Contactless MR Sensor, flexible output
> Provides accurate low flow precision
> High flow EGR with low gas pressure drop
> Fits high temperature & pressure pulsations

**Technical Information**
> Torque at flap: 230 Ncm
> Response time (85%): < 80 ms
> Nominal supply voltage: 12 V DC or 24 V DC
> Position sensor supply voltage: 5 V DC
> Max flow: up to 190 kg/h at 50 hPa
> Exhaust temp.: up to 700°C
EXHAUST GAS RECIRCULATION VALVE - LINEAR (L- EGR)

Helps to reduce emissions of NOx & fuel consumption in gasoline and diesel engines.

**Facts & Benefits**
- Linear sensor technology (direct position measurement)
- Reduced friction & short response time
- Low valve seat leakage
- Compact design
- Suitable for high temperature applications (optional water cooling)

**Technical Information**
- Nominal supply voltage: 12 V DC
- Position sensor supply voltage: 5.0 V DC
- Exhaust gas temp.: > 500°C with adequate cooling
- Typical flow: 120 kg/h max at dP 100 hPa (single poppet design)
- Response time (t85): < 100 ms

EXHAUST GAS RECIRCULATION VALVE - LOW PRESSURE DIESEL (LG - EGR)

Helps to reduce emissions of NOx & fuel consumption in diesel engines in LP EGR loop.

**Facts & Benefits**
- High flow LP EGR valve with small pressure drop
- Non-contacting sensor, flexible output, not sensitive against magnetic fields
- Improved flow accuracy due to Multi Point Calibration
- Adapted to corrosion requirement for LP EGR path
- Compact, light weighted size

**Technical Information**
- Response time (t90): < 90 ms
- Nominal supply voltage: 12 V DC
- Position sensor supply voltage: 5 V DC
- Exhaust gas temp.: > 500°C with adequate cooling
- Max flow: 245 kg/h at dP 20 hPa (38 mm dia. flap)
- Max differential pressure over flap: 300 kPa
- Internal leakage: < 3 kg/h at dP 600 hPa (38 mm dia. flap)
EXHAUST GAS RECIRCULATION VALVE - LOW PRESSURE GASOLINE (LG - EGR)

Helps to reduce emissions of NOx & fuel consumption in gasoline engines in low pressure exhaust gas recirculation (LP EGR) loop.

**Facts & Benefits**
- High flow LP EGR valve with small pressure drop
- Non-contacting sensor, flexible output, not sensitive against magnetic fields
- Improved flow accuracy due to Multi Point Calibration

**Technical Information**
- Response time (t90): < 90 ms
- Nominal supply voltage: 12 V DC
- Position sensor supply voltage: 5 V DC
- Max flow: 75 kg/h at dP 20 hPa (24 mm dia. flap)
- Max differential pressure over flap: 300 kPa
- Internal leakage: < 1.5 kg/h at dP 600 hPa (24 mm dia. flap)
- Exhaust gas temp.: up to 200°C

IGNITION COIL

For mopeds, scooters, light motorcycles, lawn mowers, electric power generators.

**Facts & Benefits**
- Small size inductive coil
- Standard primary connector
- Standard high voltage connector

**Technical Information**
- Nominal voltage supply: 14 V + 0.5 V
- Maximum primary current: 3.2 A
- Dwell time: < 6 ms
- Arc duration (1,000 V Zener): 0.5 + 0.2 ms
- Recommended cable size (mm²): 2.0 – 2.5
- Recommended cable overall diameter (mm²): 2.5 – 3.5
KNOCK SENSOR - M8 STANDARD DESIGN

Measures structural vibrations in the combustion engine to continuously adjust ignition parameters.

Facts & Benefits
> Optimized ignition timing for maximum efficiency
> High sensitivity
> Compact design, nested bolt possible
> Increase engine power
> Decrease fuel consumption

Technical Information
> Acceleration sensor based on piezo ceramic technology
> Frequency range: 3 kHz up to 25 kHz
> Possible integration of discharge resistor
> Integrated connector or cable version
> Various connector designs
> Nut and glue types assembly technology

Real-time combustion sensing, providing in-cylinder combustion pressure information.

Facts & Benefits
> CO₂ saving thanks to high accuracy knock detection
> CO₂ saving thanks to center of combustion control
> Enable alternative combustion control (HCCI, lean combustion, gasoline with high EGR rate ... etc.)

Technical Information
> Embedded electronic using direct analog path
> Independent of glow plug, improved robustness and signal
> Large bandwidth suitable for diesel & gasoline applications
> Output signal: 0 V - 5 V (ratiometric)
> Measurement range: 0 bar - 200 bar (adjustable)
> M10 thread
KNOCK SENSOR - MULTIPLE LEAD DESIGN

Knock sensor including small wire-harness.

Facts & Benefits
- Global cost saving on component and assembly process
- Facilitates engine assembly
- Reduce number of parts
- Provide flexibility to design
- Better rooting

Technical Information
- Standard knock sensor characteristics with piezoelectric technology – frequency range 3 kHz - 25 kHz
- Nut and glue types assembly technology for KS
- Many type and number of connector designs available
- Design on customer demand and needs

METALIT® AS DIESEL OXIDATION CATALYST

Metal substrate (METALIT®) catalyst for hydrocarbon (HC), carbon monoxide (CO) and nitrogen monoxide (NO) oxidation. Applicable for cars, trucks and non-road mobile machinery (NRMM).

Facts & Benefits
- High-performance catalysts based on turbulence-generating substrate structure
- Optionally with integrated air gap insulation for minimum space requirements in the engine compartment
- Low backpressure for optimum fuel consumption

Technical Information
- Oxidizing catalyst coating with platinum and palladium
- Wide variety of round and non-round geometries available
- Serial production diameter up to 450 mm
- Cell density and foil structure applicable to customer requirements
- Can be combined with the electrically heated catalyst EMICAT®
### METALIT® AS RING CATALYST

Ring shaped metal substrate (METALIT®) consisting of an outer mantle, a ring shaped matrix and an inner mantle. Exists with or without mantle.

**Facts & Benefits**

- Improvement of single cylinder lambda distribution due to high turbulent mixing zone
- Less influence of wastegate on flow distribution
- Lower aging

**Technical Information**

- Application as three-way catalyst for gasoline engines as well as DOC, NOx-adsorber and SCR catalyst for diesel engines
- Substrate length: 50.8 mm – 174 mm
- Cell density: 100 cpsi – 800 cpsi
- Foil design: LS; LS-PE; PE; PM

### METALIT® AS SCR CATALYST

Metal substrate (METALIT®) catalyst for Selective Catalytic Reduction (SCR) of nitrogen oxides (NOx). Applicable for cars, trucks and Non-Road Mobile Machinery (NRMM).

**Facts & Benefits**

- High-performance reduction catalysts based on turbulence-generating substrate structure
- Reduced catalyst volume results in lower space requirement
- Low backpressure for optimum fuel consumption
- Enables ammonia slip catalyst as a very short disc in metal design, down to 20 mm

**Technical Information**

- Application as three-way catalyst for gasoline engines as well as DOC, NOx-adsorber and SCR catalyst for diesel engines
- SCR-coating: base metals (vanadium) or zeolites
- Wide variety of round and non-round geometries available
- Optimal performance with CS-Design metal substrate
- Can be combined with the electrically heated catalyst EMICAT®
**METALIT® AS SCR LIGHT-OFF CATALYST**

Small metal substrate (METALIT®) catalyst slice in front of the SCR-catalyzed Diesel Particulate Filter (SPDF). Applicable for passenger cars and LCV.

**Facts & Benefits**
- Efficiency improvement of the SCR system in cold and transient operation
- Short slice in front of the SDPF to achieve low thermal capacity
- Further reduction of thermal capacity by using PE-Design®
- Low backpressure for optimum fuel consumption

**Technical Information**
- SCR-coating: base metals (vanadium) or zeolites
- Wide variety of round and non-round geometries available
- Cell density and foil structure optimized to application

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**METALIT® AS SENSOR CATALYST**

Metal substrate (METALIT®) catalyst with integrated hole for sensors.

**Facts & Benefits**
- Optimisation of space compartment
- Protection of the sensors against water splash
- Direct and fast measuring in the catalyst to avoid breakthrough

**Technical Information**
- Application as three-way catalyst for gasoline engines
- Temperature, NOx and Lambda sensors can be integrated in the METALIT® catalyst
- Combination with LS or PE foil structure is possible for flow uniformity
Metal substrate (METALIT®) as Three-Way-Catalyst (TWC) for hydrocarbon (HC), carbon monoxide (CO) and nitrogen oxide (NOx) oxidation. Applicable for cars, trucks and non-road mobile machinery (NRMM). Exists with or without mantle.

Facts & Benefits
> High-performance catalyst based on turbulent flow structure
> Reduced catalyst volume results in lower space requirement
> Low backpressure for optimum fuel consumption and maximum power
> Robust design

Technical Information
> TWC coating with platinum and palladium for oxidation and rhodium for reduction
> Wide variety of round and non-round geometries available
> Serial production diameter up to 450 mm

Small metal substrate (METALIT®) catalyst for high efficient 2-Wheeler Exhaust Aftertreatment. Applicable for 2- and 3-wheelers. Exists with or without mantle.

Facts & Benefits
> High-performance catalysts based on turbulent flow structure
> Low backpressure for high power applications
> Robust design

Technical Information
> Depending on the λ-control, the catalysts can be used as 3- or 2-way catalyst
> Wide variety of round and non-round geometries available
> Very small diameters possible Ø ≥ 30 mm
> Cell density and foil structure applicable to customer requirements
**METALIT® WITH ASYMMETRICAL CONTOUR**

Asymmetrical metal substrate contours (METALIT®) for extreme close coupled position. Applicable for passenger cars and LCV.

**Facts & Benefits**
> DOC efficiency improvement in cold and transient operation
> Optimum space utilization in engine compartment
> Installation in ultra close-coupled position without affecting the entire vehicle/frame architecture
> Minimized backpressure due to maximum cross section

**Technical Information**
> Application as three-way catalyst for gasoline engines as well as DOC, NOx-adsorber and SCR catalyst for diesel engines
> Innovative folded foil design
> High degree of freedom in shape and contour design for maximum space utilization

---

**NOX SENSOR - CLASSIC MULTI-PURPOSE DESIGN**

Robust exhaust gas sensing for efficient exhaust gas aftertreatment systems.

**Facts & Benefits**
> Real time high accuracy measurement
> Key component for all future engine management or exhaust aftertreatment systems
> Continuously improved to comply with worldwide emission standards (EU, NA, JP, CN)

**Technical Information**
> Measuring principle: ZrO₂-based multilayer sensor with integrated heater
> Output signals: NOx, λbin, λlin or O₂-conc.
> Supply voltage: 12 V or 24 V
> Data link: CAN 2.0 or SAE-J-1939
> Operating gas temp.: 100°C up to 800°C
> NOx-accuracy: ± 10 ppm for NO < 100 ppm (± 10% above 100 ppm)
NOX SENSOR - COMPACT PASSENGER CAR DESIGN

Robust and compact exhaust gas sensing for efficient exhaust gas aftertreatment systems.

Facts & Benefits
- Real time high accuracy measurement
- Key component for all future engine management or exhaust aftertreatment systems
- Continuously improved to comply with worldwide emission standards (EU, NA, JP, CN)

Technical Information
- Measuring principle: ZrO2-based multilayer sensor with integrated heater
- Output signals: NOx, λbin, λlin or O2-conc.
- Supply voltage: 12 V
- Data link: CAN 2.0
- Operating gas temp.: 100°C up to 800°C
- NOx-accuracy: ± 10 ppm for NO < 100 ppm (± 10% above 100 ppm)

OXYGEN SENSOR

For 1 or multiple cylinder, 2 and 4 stroke engines in all types of non automotive applications.

Facts & Benefits
- Heated and planar type
- Fast light off: thin element
- Fuel economy: low heater power consumption
- Resistant to water droplets
- Vibration resistance

Technical Information
- Lead wire: 4 wire
- Cable length: 500 mm
- Body length: 35 mm
- Thread size: M12
- Reference air: breathing type (membrane) / compatible with pumping current
PRESSURE SENSOR - EXHAUST BACK PRESSURE

Direct measurement of Exhaust Back Pressure.

**Facts & Benefits**
- Robust sensing technology compatible with typical exhaust environment
- Flexible calibration of transfer functions
- Precision programmable clip levels
- Internal and output diagnostic capability

**Technical Information**
- Flexible calibration of transfer functions
- Pressure range for exhaust back pressure: Typical 6 bar or 4 bar
- Accuracy: 1% full scale
- Temp. range: -40°C up to 140°C
- Supply voltage: 5 V ± 0.5 V
- Supply current at 5 V: 10 mA max

PRESSURE SENSOR - PARTICLE FILTER / EGR DIFFERENTIAL

Differential measurement of exhaust treatment particle filter pressure drop. Differential measurement across orifice.

**Facts & Benefits**
- Flexible calibration of transfer functions
- Precision programmable clip levels
- Internal and output diagnostic capability
- High accuracy and temperature stability
- Flexible housing, connector and mounting design

**Technical Information**
- Pressure range: -50 kPa up to 100 kPa (differential)
- Accuracy: 1% full scale (10°C up to 85°C)
- Temp. range: -40°C up to 125°C
- Supply voltage: 5 V ± 0.5 V
- Supply current at 5 V: 10 mA max
- Load resistance: > 4.7 kΩ
- Output signal: analog or SENT
PRESSURE SENSOR - PARTICLE FILTER GAUGE (SINGLE PORT)

Relative measurement of exhaust pressure before or after the DPF.

Facts & Benefits
> Flexible calibration of transfer functions
> Precision programmable clip levels
> Internal and output diagnostic capability
> High accuracy and temperature stability
> Fulfills toughest EMC requirements

Technical Information
> Pressure range: 0 kPa up to 125 kPa
> Accuracy: 1% full scale (10°C up to 85°C)
> Temp. range: -40°C up to 125°C
> Supply voltage (Vs): 5 V ± 0.5 V
> Supply current at 5 V: 10 mA max
> Load resistance: > 4.7 kΩ
> Response time: < 2 ms

PRESSURE SENSOR - SECONDARY AIR ABSOLUTE

Direct measurement of pressure in secondary air flow.

Facts & Benefits
> Flexible calibration of transfer functions
> High accuracy and temperature stability
> Low cost design and high quality
> Fulfills toughest EMC requirements
> Flexible housing, connector and mounting design

Technical Information
> Pressure range: 50 kPa up to 150 kPa (for SAA)
> Accuracy: 1% full scale (10°C up to 85°C)
> Temp. range: -40°C up to 140°C
> Supply voltage: 5 V ± 0.5 V
> Supply current at 5 V: 10 mA max
> Load resistance: > 4.7 kΩ
> Response time: < 2 ms
PRE-THROTTLE VALVE

Intake air pressure control in combination with low pressure EGR.

Facts & Benefits
> Modular design concept
> Very low weight and small package
> Low cost performance, full functional range

Technical Information
> Housing material: Thermoplastic
> Temperature range: -40°C up to 140°C
> Response time (typ): < 90 to 120 ms (13.5 V, RT)
> TP Ø range: 40 mm to 57 mm
> Weight (TP Ø 52 mm): < 480 g
> Pressure range: up to 3 bar peak
> Signal output: analog 5 V or digital SENT

SCR INJECTOR AIR COOLED

Key technology in the area of NOx reduction to meet the future emissions legislations.

Facts & Benefits
> Single fluid airless system
> Simple and reliable delivery of urea with excellent spray performance
> Multiple spray configurations

Technical Information
> Spray patterns: cone, bent and elliptical
> Sauter Mean Diameter (SMD): 70 μm up to 155 μm dependent upon OD
> Fluid pressure range: 4 bar up to 9 bar
> Max. body/ambient temp.: 160°C continuous
> Max. tip fluid temp.: 120°C continuous with peaks to 130°C
> Max. inlet temp.: 110°C continuous
**TEMPERATURE SENSOR - HIGH MULTIPLE**

Temperature acquisition for closed loop after treatment control (DPF/ GPF, SCR, DeNOx/LNT).

**Facts & Benefits**
> Smart sensor with digital output, high accuracy
> Stable signal over lifetime (ageing compensation)
> High temperature robustness

**Technical Information**
> Thermocouple sensor technology, Type N
> Response time: 7s at 10 ms flow (5.5 s at 20 ms)
> Sensing temp.: -40°C up to 950°C
> Working temp. electronics: -40°C up to 140°C
> Accuracy: < 500°C ± 4°C over lifetime; > 500°C ± 0.8% over lifetime
> Supply voltage: 12 V or 24 V DC (30 mA) / CAN; 5 V DC (< 20 mA) / SENT

---

**SCR INJECTOR LIQUID COOLED 3.0**

Liquid-cooled SCR dosing unit for NOx reduction in close coupled applications.

**Facts & Benefits**
> Simple and reliable delivery of urea with excellent spray performance
> Multiple spray configurations
> Greater ease of assembly

**Technical Information**
> Spray patterns: cone and elliptical
> Sauter Mean Diameter (SMD): 60 - 130 µm (5 bar) (AUS32)
> Fluid pressure range: 4 to 9 bar
> Max. injector fluid tip temp.: 130°C peak
> Max. ambient temp.: 160°C continuous / 200°C peak
**TURBOCHARGER FOR COMMERCIAL VEHICLE APPLICATIONS**

Turbocharger product range for CV application needs – up to 750 kW.

**Facts & Benefits**
- 100% engine specific thermodynamic design
- Robust design – based on PC experience benchmark quality records

**Technical Information**
- Optional water-cooled bearing housing
- Milled compressor wheel
- Exhaust temperature depends on application needs – possibilities up to 1050°C
- Max. speed: up to 580 m/s
- Turbine wheel design: Radial or RAAX™
- Both rotational directions available
- Pneumatic or electric waste-gate actuation

**TURBOCHARGER WITH ALUMINIUM TURBINE HOUSING**

Weight and cost reduction with thermal advantages.

**Facts & Benefits**
- Cost reduction by lower material cost & elimination of heat shields
- Prevents oil coaking during heat soak
- Ensures faster heat-up of water and oil
- Application specific wheel design for cutting edge thermodynamics
- Benchmark quality records
- Faster heat-up of water and oil

**Technical Information**
- Water-cooled aluminum turbine housing
- Exhaust temperature up to 1050°C
- Rotational speed up to 580 m/s
- Turbine wheel design: Radial or RAAX™
**TURBOCHARGER WITH STEEL TURBINE HOUSING**

Benchmark thermodynamic performance.

**Facts & Benefits**
- Robust and reliable design
- RAAX™ turbine technology for best transient response
- Application specific wheel design for cutting edge thermodynamics, drivability and best fuel economy
- Superior quality supported by fully-automated assembly process
- Benchmark quality records
- High thermodynamic performance and low inertia wheel set – supports best transient performance and Real Driving Emissions (RDE) targets

**Technical Information**
- Exhaust temperature up to 1050°C
- Rotational speed up to 580 m/s
- Pneumatic or electric waste-gate actuation

---

**TURBOCHARGER WITH VARIABLE RAAX TURBINE TECHNOLOGY**

RAAX turbine technology with variable inlet guide vanes for improved time to torque.

**Facts & Benefits**
- Robust and reliable design with enhanced wear behavior
- Benchmark hysteresis for excellent controllability
- Low inertia for superior transient response
- Compensates adverse impacts of reduced scavenging
- Improved part load Real Driving Emissions (RDE) cycle efficiency
- Optimized Material set up based on maximum exhaust gas temperature

**Technical Information**
- Variable geometry turbine with 3D vane geometry
- Rotational speed up to 600 m/s
- Exhaust gas temperature up to 1050°C
- For Gasoline Engine with Miller/Atkinson Cycle

---

**PROPULSION TYPES**

<table>
<thead>
<tr>
<th>BEV</th>
<th>PHEV</th>
<th>MHEV</th>
<th>Gasoline</th>
<th>Diesel</th>
</tr>
</thead>
</table>

**VEHICLE TYPES**

- Passenger Car
- Commercial Vehicle & Off-Highway
- 2-Wheeler & Powersports

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**PROPULSION TYPES**

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**VEHICLE TYPES**

- Passenger Car
- Commercial Vehicle & Off-Highway
- 2-Wheeler & Powersports
Universal Decomposition Pipe (UDP) for in-pipe AdBlue® (DEF) injection and urea decomposition. Engineered in modular sizes for specific power ratings.

**Facts & Benefits**
- Flexible in pipe installation
- Fast evaporation of AdBlue® (DEF) droplets
- Integrated thermolysis of AdBlue® (DEF) droplets and hydrolysis to Ammonia
- AdBlue® (DEF) dosing at low temperature duty cycles
- Mixing of Ammonia with exhaust gas

**Technical Information**
- Stainless steel housing with cockpit for SCR-injector installation
- Defined inlet geometry with confuser for flow guidance
- Evaporator with coated METALIT®
- METALIT® in MX-Design® with integrated shovels for enhanced droplet evaporation
BRUSHLESS DC DRIVES HIGH EFFICIENCY

Best performance motors to reasonable prices for different use out of a scalable, modular concept.

Facts & Benefits
- High efficiency Brushless DC drives for use in double clutch, AWD-disconnect, Oil pumps...
- Small package, low weight, low inertia due to high copperwire filling rate which is caused by the special single tooth winding technology
- Low content of rare earth material
- High torque as well high speed capability

Technical Information
- Different performance classes: 50 W up to 900 W
- Variation of diameter, length and windings depending on customers’ needs
- Temp. range: -40°C up to 140°C

TRANSMISSION

Automatic transmission systems are gaining market share worldwide. According to market studies, in 2025 approximately two thirds of all new vehicles are expected to be fitted with some type of automatic transmission. This increase will happen not least because of the expected growing number of hybrid vehicles.

Vitesco Technologies offers intelligent electronic solutions for both automatic and hybrid transmissions, delivering fuel efficiency and comfort. Our portfolio of electrified transmission solutions also includes efficient brushless electric motors, electronic oil pump, electrically actuated clutches, electric gear-shift actuators, sensor clusters, and single position encoders or pressure sensors.
**CV ELECTRONIC CLUTCH ACTUATOR**

The ECA is a robust electronic clutch actuator for Off-Highway and Commercial Vehicle Applications.

**Facts & Benefits**
- Electronic clutch actuator for commercial vehicle applications
- Rugged design (mechanical shock: up to 50G)
- High thermal stability
- 17° angle within 250 ms
- Refined clutch actuation, enables creep mode

**Technical Information**
- **Electronics:**
  - PCB substrate
  - 12 / 24 V
  - 32 bit microcontroller
  - CAN communication
- **Motor:**
  - 250W 3-phase BLDC motor
  - 1200 RPM
  - 2.5 Nm@1000 RPM torque
- **General:**
  - Operating temperature: -40°C to 121°C
  - 100:1 planetary gear set
  - Integrated position sensor

---

**DRIVE LOCK ACTUATOR FOR PARK LOCKING SYSTEMS**

The Drive Lock is an external controlled actuator (E-motor control via higher-level control unit).

**Facts & Benefits**
- Compact and robust design
- Customization of interfaces
- Self-locking system

**Technical Information**
- Torque: 5 to 7 Nm
- Target twist angle: 25 to 30°
- Total twist angle: 40°
- Sensor accuracy: ± 1°
- Thermal requirements: -30°C up to 110°C
- Optional: Smart solution available; up to ASIL D possible; Communication CAN or LIN
- Optional: Back-drivable system w/o disconnect function
DUAL-DRIVE-PUMP

High overall efficiency in both electrical and mechanical operation modes thanks to significant reduction of oil recirculation.

**Facts & Benefits**
- Substitution of peripheral devices compared to MOP + EOP architecture
- High overall efficiency in both – electrical & mechanical operation modes
- Lower total cost of actuation function
- Significantly easier integration
- Lower installation space needs

**Technical Information**
- BLDC motor: 650 W, 12 V
- Max. Pressure: 60 bar
- Max. Flow: 30 l/min
- Temperature range: -40°C up to 140°C
- ASIL level: Up to ASIL C

ELECTRONIC TRANSMISSION ACTUATOR 270

The eTA270 is a multipurpose smart actuator for harsh environments with fully integrated enhanced control logic and position sensor.

**Facts & Benefits**
- Highly efficient and fast field oriented BLDC motor control
- Cost effective VT-owned ASIC for motor control
- Enhanced protection of electronics by overmolding technology
- ASIL C support possible

**Technical Information**
- Motor: 2 Nm maximum torque at 0 RPM, 270 W class BLDC motor
- Temperature: -40°C up to 125°C (Option: 140°C)
- Weight: approx. 1.1 kg
- Protection class: IP6k9k
- Mounting: submerged with pass-through connector or external
- ASIL level: QM (Option: up to ASIL C)
ELECTRONIC TRANSMISSION OIL PUMP 270

The eTop270 is an auxiliary or stand-alone smart oil pump for harsh environments to support start-stop, boost, engine-off sailing or oil cooling of traction motors.

Facts & Benefits
> Highly efficient and fast field oriented BLDC motor control
> Cost effective VT-owned ASIC for motor control
> Enhanced protection of electronics by overmolding technology
> Scaleable gerotor set
> High power density

Technical Information
> 375W cont. operation oil cooled at 90°C
> Temperature: -40°C up to 125°C (Option: 140°C)
> Weight: approx. 1.3 kg; Pump: 15 lpm / 8 bar
> IP6k9k, mounted externally or submerged
> Sensorless operation (Option: Sensor integrated)

ELECTRONIC TRANSMISSION ACTUATOR PLATFORM

Modular platform for peripheral devices for transmissions. It can be designed as a clutch actuator, a pump for transmission lubrication or transmission cooling.

Facts & Benefits
> Flexible actuation platform for transmissions
> Integrated BLDC motor and electronic control board
> Reduced time to market due to standardised components
> Reduced engineering efforts for OEM

Technical Information
> Voltage rating: 4.5 to 24 V
> Power: 80 to 400 W
> Operating temperature: -40°C up to 140°C
> Sensor or sensorless control
> functional safety level: up to ASIL C
**ELECTRONIC TRANSMISSION OIL PUMP 600**

The intelligent transmission oil pump for high performance applications (600 W, 12 V) fully replaces the mechanical pump (max. 38 bars) with a weight of only kg 1.9.

**Facts & Benefits**
- Vitesco Technologies B6-Driver ASIC
- Substitution of electrolytic capacitor
- Motor, pump and inverter are Vitesco Technologies components
- Low NVH
- Sensors integrated, no wire harness or cables

**Technical Information**
- BLDC motor 600 W, 12V
- Nom. Pressure – flow * 12 bar – 15 l/min - +80°C
- Max. operating pressure * 38 bar
- Temp. range -40°C up to 140°C
- Lifetime 8000 h

**POSITION SENSOR - LINEAR CONTACT-LESS - HALL EFFECT TECHNOLOGY**

Sensor mainly used for gear neutral & all gears, clutch master cylinder, pedal, fork position sensor.

**Facts & Benefits**
- Small sensor size
- Through aluminum wall measurement
- Compatible with Ferrite Magnets
- Compliant with ISO26262 (safety requirement)

**Technical Information**
- Overall accuracy: ± 2%
- Target: Magnet
- Measurement: linear up to 60 mm
- Air gap: up to 11 mm
- Operating temp.: -40 up to 150°C
- Operating voltage: 5 V ± 0.5 V
- Output signal: Analog, PWM, SPI or SENT
POSITION SENSOR - ROTARY CONTACTLESS - HALL EFFECT TECHNOLOGY

Sensor used for PRND, rotary valve position (EGR, ETC, ACV, Water valve...), general purpose rotary actuators.

Facts & Benefits
- Small sensor size
- Through aluminum wall measurement
- Compatible with Ferrite Magnets
- Compliant with ISO26262 (safety requirement)

Technical Information
- Overall accuracy: ± 2%
- Target: NdFeB, ferrite magnet
- Measuring range: up to 360°
- Air gap: up to 11 mm
- Operating temp.: -40 up to 150°C according to application
- Operating voltage: 5 V ± 0.5 V
- Output signal: Analog, PWM, SPI or SENT

POSITION SENSOR - ROTARY CONTACTLESS - INDUCTIVE TECHNOLOGY

Sensor used for PRND, rotary valve position (EGR, ETC, ACV, Water valve, Thermal Management).

Facts & Benefits
- Metallic target, no magnet
- Immune to low frequency magnetic field, no pollution by iron particles
- Single or redundant configuration
- ASIC available
- Compliant with ISO26262 (safety requirement)

Technical Information
- Measuring range: up to 360°
- Overall accuracy: ± 1%
- Air gap: up to 5 mm
- Linearity: < ± 1% full scale
- No hysteresis
**POSITION SENSOR - LINEAR CONTACT-LESS - INDUCTIVE TECHNOLOGY**

Sensor mainly used for Park/No Park, clutch master cylinder, linear actuators, PRND, fork position sensor.

**Facts & Benefits**
- Metallic target (Al, Fe, ...), no magnet needed
- Immune versus low frequency magnetic field (electric motor, starter current, ...), no pollution by iron particles
- Single or redundant output
- ASIC available
- Compliant with ISO26262 (safety requirement)

**Technical Information**
- Measuring range: 6 mm to 60 mm
- Overall accuracy: ± 2%
- Air gap: up to 5 mm
- Linearity: < ± 1% full scale
- Operating temp.: -40°C up to 160°C
- No hysteresis

**SMART GEAR ACTUATOR UNIT FOR DOUBLE CLUTCH TRANSMISSION**

Actuator Unit for dry Double Clutch Transmission (7-speed).

**Facts & Benefits**
- Simplified gearbox packaging due to modular approach towards actuation control
- Efficient control of integrated electric motors and solenoids
- Proprietary drivers for efficient electric motor control

**Technical Information**
- Technology: FR4 8 layers PCB
- Operating temperature: -40°C up to 125°C
- Microprocessor: 32 bit Microcontroller TC233
- Sensors: 2x motor angular sensor, 2x solenoid position, 4x hall switches
- Actuators: integrated 2x BLDC motors (Gear select), integrated 2x solenoid (Gear shift)
- ASICS: PSBC, BLDC1
SMART GEAR BOX ACTUATOR UNIT FOR DEDICATED HYBRID TRANSMISSION

Dog clutch actuator for HEV and EV.

**Facts & Benefits**
> Miniaturisation of filter circuitry
> Robustness increase by SMD components only
> Cost efficient
> Enhanced control
> Independent of Dog Clutch design

**Technical Information**
> Micro Core: 16 bit μC MC9S12, Flash 256 KByte, 64 pins
> Interfaces: LIN
> Drivers: 3 output power lines for 2 DC Motors
> Housing: AlSi12Cu1 (sealed)
> Connector: 4 pins / sealed
03
BEYOND POWERTRAIN
BEYOND POWERTRAIN

Vitesco Technologies is also utilizing its core competencies in applications beyond the powertrain. A comfortable vehicle access system that utilizes our sensor expertise, or the application of pressure sensors in the brake system environment are prominent examples.
**BRUSHLESS DC MOTOR HIGH EFFICENCY FOR BRAKE APPLICATIONS**

BLDC motor of an innovative braking system.

**Facts & Benefits**
- Small package, low weight, due to high copperwire filling rate which is caused by the special single tooth winding technology
- Low content of rare earth material
- Symmetrical Back EMF layout for easy electronic commutation
- Low inertia due to optimized rotorcore concept by usage of tube style shaft

**Technical Information**
- Motorsize: length 89 mm, diameter 80 mm
- Motortorqueconstant up to 4.5 Nm at 90 A
- Performanceclass up to 1.400 W in peak
- Temp. range: -40°C up to 120°C
- Vibration resistant up to 40 g

**DOOR HANDLE SENSOR**

Sealed module integrating various keyless access functions into a door handle or exterior module.

**Facts & Benefits**
- Easy integration of various sensors/functions for Keyless Entry System: capacitive lock and unlock, mechanical switch, Hall ICs, LF antenna, pocket/ground lighting and NFC reader, BLE transceiver, inductive switch

**Technical Information**
- Power consumption: 70 μA to 200 μA for double zone sensor depending on response time
- Response time: 5 ms up to 30 ms
- Detection distance (lock/unlock): ~ 2 mm to 10 mm, depending on door handle type
- Antenna inductance: 100 μH up to 500 μH
- Temp. range: -40°C up to 85°C
**DOOR HANDLE SENSOR - BLE**

Door Handle Sensor with BLE reader.

**Facts & Benefits**
- BLE function integrated into sealed stand alone module
- Vehicle sharing, fleet management
- Smartphone compatibility with most smartphones (Apple, Huawei, Samsung, Sony, LG, Nokia, HTC)
- Vehicle personalization and vehicle status

**Technical Information**
- BLE protocols: 4.2
- Single module for capacitive, lighting and BLE function
- LIN, CAN communication
- BLE range around 10 m (free field)
- Dark current: ~ 50 µA for BLE function
- BLE scanrate: ~ 100 ms
- Temp. range: -40°C up to 85°C

**DOOR HANDLE SENSOR WITH NFC READER**

Sealed module integrating lock/unlock functions (PASE) and vehicle access with smartphone or smart card.

**Facts & Benefits**
- NFC function integrated into sealed stand alone module
- Vehicle sharing, fleet management
- Back-up to BLE for smartphone as a smart key
- Compatibility with most smartphones
- No risk of relay attack due to short detection distance

**Technical Information**
- NFC protocols ISO/IEC 14443-A NFC IP1, upcoming NFC Forum
- Typical reading distance up to 25 mm
- Dark current adder for NFC function: 150 uA
- Single MCU for capacitive sensors and NFC function
- Temp. range: -40°C up to 85°C
- Reaction time: ~ 100 ms (NFC and capacitive function)
EASY TRUNK ACCESS SENSOR

Sealed capacitive sensor module integrated inside a bumper for keyless access to the trunk or sliding doors.

Facts & Benefits
- Easy hands-free opening or closing of the trunk or sliding doors
- Sensor activated with movement of the leg (no need to press a button or remote control)
- Integration of capacitive sensor inside a bumper
- Dual electrode set to prevent false activations

Technical Information
- Detection distance: up to 15 cm (tunable to application)
- Quiescent current: 2.5 mA (no low power mode), 250 µA (low power mode)
- Temp. range: -40°C up to 85°C
- LIN, ON/OFF voltage or current output

PRESSURE SENSOR - BRAKE BOOSTER ABSOLUTE

Pressure measurement for Start-Stop applications.

Facts & Benefits
- Flexible calibration of transfer functions
- Precision programmable clip levels
- Internal and output diagnostic capability
- High accuracy and temperature stability
- Fulfills toughest EMC requirements

Technical Information
- Pressure Range: 10 kPa up to 120 kPa
- Accuracy: 1% full scale (10°C up to 85°C)
- Temp. range: -40°C up to 140°C
- Supply voltage: 5 V ± 0.5 V
- Supply current at 5 V: 10 mA max
- Output signal: Analog or SENT
PRESSURE SENSOR - BRAKE BOOSTER GAUGE

Relative measurement of vacuum inside brake booster.

Facts & Benefits
> Flexible calibration of transfer functions
> Precision programmable clip levels
> Internal and output diagnostic capability
> High accuracy and temperature stability
> Flexible housing, connector and mounting design

Technical Information
> Pressure range: -105 kPa up to 40 kPa (gauge)
> Accuracy: 1% full scale (10°C up to 85°C)
> Temp. range: -40°C up to 125°C
> Supply voltage: 5 V ± 0.5 V
> Supply current at 5 V: 10 mA max
> Load resistance: > 4.7 kΩ
> Output signal: Analog or SENT
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031 48 V Battery System
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