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## Auto Pressure Transducer Sensor and Switch Application

### Engine System
- **MAP Sensor**
  - Manifold Air Pressure Sensor
- **MAP Sensor**
  - DI Pressure Sensor
- **High Pressure Sensor**
  - Dynamic Pressure Sensor (Diesel Pump)
- **Differential Pressure Sensor**
  - Common Rail Pressure Sensor
- **Boost Sensor**
- **Pressure Switch Manifold**
- **Range Sensor**
- **Pressure Sensor**
- **Pressure/Temperature Sensor**
- **Temperature Controlled Valves**
- **Variable Orifice Valve**

### Air Conditioning System
- **Auto Pressure Transducer**
  - Pressure Sensors
- **Air Classification Module**
  - Variable Orifice Valve
  - Pressure/Temperature Sensor
  - Temperature Sensor

### Transmissions System
- **Transmission Range Sensors**
  - Pressure Switch Manifold
  - Range Sensor
  - Pressure Sensor
  - Pressure/Temperature Sensor
  - Temperature Controlled Valves

### Chassis Control
- **Lon-g Sensor**
  - Power Steering
- **Cylinder Pressure Sensor**
  - Low-G Acceleration
- **Brake Sensor**
  - Combo Angular Rate/Capacitive Acceleration Sensor
Pressure Sensor Application

**Pressure Sensors**
- **60CP Series**
  5V Supply, Metric Ratio Output.
- **70CP Series**
  6-30V Supply, 4-20mA or Voltage Output.
- **83HP/84HP Series**
  Hermetic, Voltage Output Pressure Sensor.
- **85HP/86HP Series**
  Hermetic, 4-20 mA, Output Pressure Sensor.

**Application**
- Home air-conditioning/commercial air-conditioning/Industrial air-conditioning and refrigeration system.
- Remote control.
- Construction vehicle and general/refrigeration transportation vehicle.
- Aerospace system/military system.
- Gas/fluid pressure control.

<table>
<thead>
<tr>
<th>Pressure Range</th>
<th>Application</th>
<th>Measurement</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Bar 0.1 MPa</td>
<td>Particulate Filter (Diesel Engine)</td>
<td>Differential Pressure Type</td>
<td>MEMS</td>
</tr>
<tr>
<td>1 Bar 0.1 MPa</td>
<td>EGR</td>
<td>Differential Pressure Type</td>
<td>Ceramic Capacitor</td>
</tr>
<tr>
<td>1 Bar 0.1 MPa</td>
<td>Manifold Pressure</td>
<td>Absolute Pressure</td>
<td>Ceramic Capacitor</td>
</tr>
<tr>
<td>3 Bar 0.3 MPa</td>
<td>Boost Pressure</td>
<td>Absolute Pressure</td>
<td>Ceramic Capacitor</td>
</tr>
<tr>
<td>5 Bar 0.5 MPa</td>
<td>Exhaust Back Pressure</td>
<td>Absolute Pressure</td>
<td>Ceramic Capacitor</td>
</tr>
<tr>
<td>6 Bar 0.6 MPa</td>
<td>Hydrogen Fuel Cell</td>
<td>Absolute Pressure</td>
<td>Ceramic Capacitor</td>
</tr>
<tr>
<td>7 Bar 0.7 MPa</td>
<td>Electric Fuel Pump Control (IDI System)</td>
<td>Absolute Pressure</td>
<td>Ceramic Capacitor</td>
</tr>
<tr>
<td>8 Bar 0.8 MPa</td>
<td>Engine Oil Pressure</td>
<td>Absolute Pressure</td>
<td>Ceramic Capacitor</td>
</tr>
<tr>
<td>10 Bar 1.0 MPa</td>
<td>CNG / LPG</td>
<td>Absolute Pressure</td>
<td>Ceramic Capacitor</td>
</tr>
<tr>
<td>12 Bar 1.2 MPa</td>
<td>Automatic Transmission Box</td>
<td>Absolute Pressure</td>
<td>Ceramic Capacitor</td>
</tr>
<tr>
<td>20 Bar 2.0 MPa</td>
<td>Transmission Box of Dual Clutch</td>
<td>Absolute Pressure</td>
<td>Ceramic Capacitor</td>
</tr>
<tr>
<td>70 Bar 7.0 MPa</td>
<td>CTV, AMT</td>
<td>Absolute Pressure</td>
<td>Ceramic Capacitor</td>
</tr>
<tr>
<td>100 Bar 10.0 MPa</td>
<td>Four-Wheel Drive</td>
<td>Absolute Pressure</td>
<td>Ceramic Capacitor</td>
</tr>
<tr>
<td>100~200 Bar</td>
<td>Fuel Stratified Injection</td>
<td>Absolute Pressure</td>
<td>Silicon Strain Gauge Technology</td>
</tr>
<tr>
<td>200 Bar 20.0 MPa</td>
<td>Cylinder Pressure Sensor</td>
<td>Absolute Pressure</td>
<td>Silicon Strain Gauge Technology</td>
</tr>
<tr>
<td>400 Bar 40.0 MPa</td>
<td>Hydride Storage Canister</td>
<td>Absolute Pressure</td>
<td>Silicon Strain Gauge Technology</td>
</tr>
<tr>
<td>1,800~2,600 Bar 260.0 MPa</td>
<td>Common Rail Pressure</td>
<td>Absolute Pressure</td>
<td>Silicon Strain Gauge Technology</td>
</tr>
<tr>
<td>N/A Bar 0.0 MPa</td>
<td>OWS Seat Load Bearing</td>
<td>Sensor Shaft Force</td>
<td>Silicon Strain Gauge Technology</td>
</tr>
</tbody>
</table>
### Efficiency From Pressure Sensor

- The loading condition of air conditioning is reflected dynamically by pressure sensor. The engine management system ECU can adjust the output of engine power according to the loading condition of air conditioning and control the air-fuel ratio of engine accurately to achieve the purposes of optimal emission and fuel saving.

- Able to monitor the condition of air conditioning system at once and the system working condition can be reflected rapidly by pressure sensor. When ECU reduce the normal idling (usually from 500 to 550rpm), the system may not be shut off due to the instant start of air conditioning system. Meanwhile, while the air conditioning system is running, the idle speed and power output can be decided to boost according to the loading of air conditioning compressor. Even if not boosted, the idle speed can also be controlled.

- The rotational speed of air conditioning cooling fan can be controlled at once according to the loading condition of air conditioning (PWM way) to achieve the purposes of fuel saving and noise reducing.

- To monitor the refrigerant pressure at once can detect the refrigerant leakage instantly.

- The reliability, accuracy and service life are all much better than pressure switch, so it is more suitable for automobile.

- The universal design of pressure sensor is suitable for various auto air conditioners which can reduce the development and technology management cost significantly.

### Operation Principle

#### Application of Pressure Sensor in Automobile Air-Conditioning System

<table>
<thead>
<tr>
<th>Component</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaporator</td>
<td>Offer the temperature of evaporator and exterior temperature.</td>
</tr>
<tr>
<td>Expansion Valve</td>
<td></td>
</tr>
<tr>
<td>Pressure Sensor</td>
<td></td>
</tr>
<tr>
<td>Receiver</td>
<td></td>
</tr>
<tr>
<td>Coolant/Heater Control Unit</td>
<td>1. Blower speed control 2. Auto interior temperature control 3. Wind direction control of air conditioning</td>
</tr>
<tr>
<td>A/C Control Unit</td>
<td></td>
</tr>
<tr>
<td>Set Temp, by Driver</td>
<td></td>
</tr>
<tr>
<td>ECU Control Unit</td>
<td></td>
</tr>
<tr>
<td>Idle Air Control Valve</td>
<td></td>
</tr>
<tr>
<td>Multi-Speed Cooling Fan</td>
<td></td>
</tr>
<tr>
<td>Blower</td>
<td></td>
</tr>
<tr>
<td>Compressor</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- PWM: Pulse Width Modulation

**Auto Pressure Transducer (Ceramic) (APT)**

### Application

- High Pressure Side and/or Low Pressure Side of Air Conditioning
- Engine Control
  - Manifold Pressure
  - Fuel Pressure
  - Boost Pressure
  - Engine Oil Pressure
  - Transmission Box System
- Suspension Control
  - Load Measurement
  - Anti-Rolling System
  - Exhaust System
  - Power Steering

### APT Key Features

- The sensor design is based on ceramic capacitor structure.
- All signal processing circuits are gathered together as one application-specific integrated circuit.
- Allowable for a wider temperature range (-40°C to +135°C).
- Allowable pressure range is up to 3,000psi.
- Precise assembly process; no further adjustment is required after leaving factory.
- Absolute or relative pressure sensor.
- A reliable package type especially designed for engine and chassis installation.
- Accurate and stable output signal.
- Able to fit for all auto pressure liquids.
- Able to enhance the temperature output.

### APT Operation Principle

- Force/Pressure
- Mechanical Deflection
- Change in Capacitance
- Compare Electronics
- Voltage Output Proportional to Mech Input
Pressure Sensor of Power Steering System (PS)

PS Product Specifications
- Working Pressure Range: 0 ~ 3.138 MPa
- Maximum Pressure: 5.884 MPa
- Burst Pressure: 9.81 MPa
- Working Temperature: -35°C ~ +120°C
- Working Medium: Power Steering Fluid
- Power Supply: 5±0.5 VDC
- Output Voltage: 0.5 ~ 4.7 VDC
- Accuracy Range: ±3%、FS ±2%

PS Product Capability
- The pressure sensor of power steering system is to detect and control the pressure value of high pressure fluid flowing into the left chamber or right chamber of power cylinder by revolving the steering wheel and further deliver the data to ECU to control the steering of high pressure pump. It enables to control the high pressure fluid to push the cylinder to help with steering while steering a wheel. This may simplify the steering operation and decrease the controlling strength of steering of driver.

Engine Oil Pressure Sensor (OPS)

OPS Product Specifications
- Working Pressure Range: 0~0.8 MPa (adjustable)
- Working Temperature Range: -40°C~140°C
- Pressure Medium: Engine Oil
- Output Voltage: 0~4.795V DC
- Accuracy Range: ±3% @ -40°C~135°C
- Power Supply: 5±0.25V

OPS Product Capability
- To detect the engine oil pressure of engine system and then deliver the pressure data to ECU and then deliver it to the pressure gauge of engine oil.
- Under the condition of low engine oil pressure, ECU will report to the driver and adopt control measure automatically to protect the engine.

OPS Key Features
- High measurement accuracy enables ECU to detect and control the oil pressure of engine accurately.
- Good reliability and long service life; allowable to work under the bad environment of auto system.
- Ceramic capacitor structure; better compatibility with measurement medium and allowable to work within full temperature range.
Microfused Strain Gauge Pressure Sensors (MSG)

**MSG Product Specifications**
- Working Pressure Range: 0~180 MPa
- Safety Pressure: 220MPa
- Working Temperature Range: -40°C~140°C
- Power Supply: 5±0.25V
- Output Voltage: 0.475~4.935V DC
- Pressure Medium: Diesel

**MSG Product Capability**
- Measurement and control of common rail of diesel.
- Enhance the fuel efficiency and reduce the harmful emission.

**MSG Key Features**
- Silicone strain gauge is fixed on stainless steel diaphragm by glass welding method.
- Customized ASIC signal processing chip has perfect self-diagnosis function and provides EEPROM memory.
- Able to provide accurate and stable output signal within a wider working temperature range (-40°C to 140°C).
- Allowable pressure range is up to 3,000psi.
- Able to enhance the temperature output.
- Existing sealing structure.
- No further adjustment is required after leaving factory.
- Automatic temperature compensation function.
- Allowable to be used in various media.

**MSG Application**
- Brake Pressure
- Vehicle Stability Systems
- Diesel Common Rail
- GDI Fuel Pressure
- Transmission
- Occupant Weight Force Sensing

Exhaust Back Pressure Sensor (EBP)

**EBP Product Specifications**
- Working Pressure Range: 37.8~368.5kPaA
- Safety Pressure: 848kPa
- Burst Pressure: 1.117MPa
- Working Temperature Range: -40°C~135°C
- Power Supply: 5±0.5V
- Output Voltage: 0~4.795V DC
- Accuracy Range: ±3% @ -40°C~135°C
- Installation Position: Above the exhaust pipe or in front of turbocharger

**EBP Product Capability**
- To measure the exhaust back pressure of engine and output to ECU to figure out the engine loading to further adjust EGR rate.

**EBP Key Features**
- High measurement accuracy enables ECU to detect and control the exhaust pressure of engine accurately.
- Good reliability and long service life; allowable to work under the bad environment of auto system.
- Ceramic capacitor structure; better compatibility with measurement medium and is not sensitive to the sulfur of waste gas.
## Boost Sensor (BS)

### BS Product Specifications

- **Working Pressure Range**: 69.0~368.2 kPa
- **Safety Pressure**: 848 kPa
- **Burst Pressure**: 1.117 MPa
- **Working Temperature Range**: -40°C~135°C
- **Power Supply**: 5 ± 0.25 V
- **Output Voltage**: 0.145~4.84 V DC
- **Accuracy Range**: ±3% @ -40°C~125°C
- **Installation Position**: In front of turbocharger

### BS Product Capability

- To measure the inlet pressure of engine and output to ECU to figure out the inlet volume of engine.

### BS Key Features

- High measurement accuracy enables ECU to detect and control the inlet pressure of engine accurately.
- Good reliability and long service life; allowable to work under the bad environment of auto system.
- Ceramic capacitor structure; better compatibility with measurement medium.

### Boost Pressure Sensor

![Boost Pressure Sensor](image)

## Cylinder Pressure Sensor (CPS)

### CPS Product Specifications

- **Working Pressure Range**: 20 MPa
- **Accuracy Range**: 2% FS
- **Power Supply**: 5 ± 0.5 V
- **Working Temperature Range**: -40°C~135°C
- **To work with heat isolation plug, the air tightness shall be kept during the life cycle (hot condition).**

### CPS Product Capability

- A detection pressure signal (20 MPa) is provided by closed-loop control to meet the requirement of EURO 5 (2009) & EPA BIN 8 (2007).
- An axial ceramic heat isolation plug is taken as a transmission medium.
- Ceramic heat isolation plug can transmit cylinder pressure; MSG technology pressure sensor module.
- Fast reply of electronic module; the bandwidth can be 0-10 kHz.
- SFF & LFF two encapsulated modes (size & cost driven)

### Cylinder Pressure Sensor

![Cylinder Pressure Sensor](image)
Manifold Air pressure sensor (MAP/T-MAP Sensor)

MAP Specifications

- Accuracy: ±1.0% FS from -40°C to 125°C (+1% for Life)
- Pressure range: 12.5 to 105 KPa
- Overload pressure: 655 KPa (94 psia) for 5ms, functional recovery.
- Operating temperature: -40°C~125°C
- Storage and transport temperature: -40°C~150°C
- Electromagnetic compatibility: 100 V/m from 400 ~1,000MHz
- Response time: < 5 ms
- Start time: < 6.5 ms
- Output current: < 10 mA
- Overload voltage: < 16.5 VDC
- Anti-reverse voltage: > -14 VDC

MAP Key Features

- Precise measurement, mature and accurate temperature compensation
- Excellent Electromagnetic compatibility - anti vibration and media compatibility, reliable and long life, suitable to work under severe environment of automotive system
- Alumina septum is good for media compatibility measurement, reliable operation in the whole temperature
- Flexible packaging and customized interface available.

Braking Pressure Sensor (BPS)

BPS Specifications

- Operating pressure: 0~8MPa : 0~20MPa
- Safety pressure: 11MPa : 25MPa
- Burst pressure: 14MPa : 35MPa
- Operating temperature: -40°C~125°C
- Working media: Brake fluid
- Supply voltage: ±0.25VDC
- Output voltage: 0.428 ~ 4.725 VDC

BPS Product Capability

- Measure braking pressure of brake system; transmitting accurate pressure signal to the ESP system.
- Two packaging mode, the small package mode has a single output and redundant output.

BPS Key Features

- High accuracy, allows the ESP to control brake system accurately.
- It’s reliable and long life suitable to work under severe environment of automotive system.
### Differential Pressure Sensor (DPS)

**DPS specifications**

- Maximum operating pressure: 1.8 Bar G 1,000 normal when looping
- Output voltage: 0.5~4.5 VDC
- Burst pressure: 2.2 Bar G
- Pressure difference range: EGR system 0.2 Bar \ DPF system 1 Bar
- Signal sensing component and processing circuit separation

**DPS Capability**

- In order to comply with the requirements of the Euro 3 or Euro 4 vehicle emissions standards, usually place filter in the emissions area of vehicle exhaust emissions to block tiny particles of the exhaust gas.
- By detecting exhaust gas pressure difference in front and back channel of filter, DPS sensor transmits pressure difference signal to ECU, based on the pressure difference ECU is able to determine accumulated degree of particles in filter and to decide regeneration trigger time and additional fuel injection quantity, meanwhile EUC can also adjust temperature of exhaust gas by controlling the EGR valve.
- Allows the ECU to efficiently select the "regeneration" time and conduct exhaust emissions management. Well-functioning exhaust gas treatment system is able to reduce 70% 90% particles in exhaust gas, CO and HC reach 90%, and Nox can reach 40 60%.

### Mass Air Flow sensor (MAF)

**MAF Specifications**

- Measuring range: 1 : 50 (3 kg/h~1,000 kg/h)
- Measurement accuracy:
  - 2% at end of line: 4% after 160,000 km
- Temperature drift: 2% (-10 ~ +50°C)
- Temperature range: -40 ~ +130°C
- Response time: (t63): 5ms
- Star time: < 100 ms
- Pressure loss: 7~15 mBar
- Operating pressure: 8~16.5V
- Output type: analog: 0.2~4.8V (w / w/o possible ratio metric correction)
- Digital: 100~12,000 Hz

**MAF Capability**

- Air flow sensor is locating on air intake pipe, between air intake manifold and air filter. The air flow (including a flange and connecting potentiometer) is used for sensing flow and air temperature, turning intake air into electric signal and transmit to electronic control unit to determine fuel injection quantity of the engine room.
- As air (Oxygen content) is very important to Automobile engine electronic control; the sensor on electronic controlled fuel injection device to detect air volume sucked into engine is the air flow sensor, it is also an important component to decide accuracy of system control.
Capacitive Acceleration Sensing (CAS)

### Capacitive Acceleration Sensing

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Unit</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>+/- g</td>
<td>0.5</td>
<td>10</td>
</tr>
<tr>
<td>Sensitivity range</td>
<td>V/g</td>
<td>0.200</td>
<td>3.000</td>
</tr>
<tr>
<td><strong>ELECTRICAL</strong></td>
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<tr>
<td>Input voltage</td>
<td>V</td>
<td>4.5</td>
<td>5.5</td>
</tr>
<tr>
<td>Input current</td>
<td>mA</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Output current</td>
<td>mA</td>
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</tr>
<tr>
<td>Maximum input voltage</td>
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<td>Noise</td>
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<tr>
<td><strong>Performance</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Initial offset of zero</td>
<td>V</td>
<td>-0.050</td>
<td>0.050</td>
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<tr>
<td>Non-linear error</td>
<td>% FS</td>
<td>-1.0</td>
<td>1.0</td>
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<tr>
<td>Transverse sensitivity error</td>
<td>% Nom Sens</td>
<td>-3</td>
<td>3</td>
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<tr>
<td>Frequency response (-3dB)</td>
<td>Hz</td>
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<td>100</td>
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<tr>
<td>Sensitivity temperature</td>
<td>% Vcc</td>
<td>-4</td>
<td>4</td>
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<tr>
<td>Zero-bit temperature error</td>
<td>V</td>
<td>-0.100</td>
<td>0.100</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>deg C</td>
<td>-40</td>
<td>125</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>deg C</td>
<td>-40</td>
<td>150</td>
</tr>
<tr>
<td>Ground collision test</td>
<td>m</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

### Application

- Anti-roll chassis control
- Vehicle stability control
- Anti-lock brake systems
- Traction control systems
- OBDII rough road detection
- Inclination sensing
- Semi-active suspension systems

### CAS Product Capability

- E-OBD requires to diagnose engine Miss Fire Rate. The Miss Fire rate determines the engine performance and ensures life of vehicle operation process is fully complied with the Euro 3 / Euro 4 regulations.
- There are different ways to detect miss fire. One is to monitor crankshaft rotation rate by ECU and catch changes of crankshaft speed when every burst of flammable mixture gas. If it doesn’t detect the incident, the ECU will takes it as one fire.
- When vehicle if moving on bumping road, the inertia of crankshaft mechanism will create similar crankshaft speed mutation and unstable speed changes and cause ECU to mistake increase of miss fire.
- The engine must be able to identify normal miss fire and the miss fire on bumping road to avoid false alarm by engine ECU. Therefore it needs appropriate product to detect whether vehicle is moving on bumping road.

### CAS Key Features

- Vehicle Dynamics adjust system
- Vehicle suspension system
- 4WD ABS Anti-lock braking system
- E-OBD Rugged road recognition
- IMU integrated system
- Motorcycle collapse fuel cut off system
- Vehicle balance system
  - Comfort (body balance)
  - Security - prevention control
  - Security - immediate control
- Anti-collision monitoring
- Vehicle tilt angle
- Ramp control
- Electronically controlled braking device

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Humidity is referred to the content of water vapor in the air. It is generally called Absolute Humidity. When the humidity is considered to be the influence of heat storage of human body, the air temperature should be taken as an influence because the air temperature directly influences the volume of steam.

For example, in the automotive, if the Absolute Humidity in the air is higher than the one in the skin of human body, the human body will be heated. The heat would not easily discharge by evaporation of sweat. In the contrary, when the humidity is lower, the sweat of human body will continue to evaporate and human body would lose water and the electrolyte. If water and electrolyte are not supplied appropriately, heat related illness happens.

In a running automotive, when air conditioning is turned on, sometimes diesel exhaust and the gas of Hydrocarbon emissions are released from the intake tunnel of air conditioning. When driving in the county side, the stink smell is also driving us to speed up away. The human body perhaps could adapt itself to the stinky smell, but the smell also brings hidden harm to us, which gives long term influence to human body.

ACM is key element to sense the hidden harm in air. ACM promptly detects CO, NOx, Hydrocarbon emissions outside of the automotive and the concentration of volatile organic compounds from the decoration, construction material and garbage in house. By the control mode to properly turn on and turn off the air valve, it maintains good air quality in vehicle.

Based on TI ACM patent of active sensitivity skill, the sensor could detect 2 to 5 ppm CO concentration, which is the average CO concentration in the cities of western countries. Normally it is no necessary to detect low concentration of gas in cities. However it is expected to do so in the country sides. ACM would remind ECU the source of smell nearby.

Based on TIACM patent of absolute concentration detect skill, 2 sensors separately exam the absolute concentration of NOx and CO. The advantage is to provide a report of air quality. It also applies to the condition when the gas exists longer time or increases its concentration, to even satisfy the demand of advanced loop circle control strategy.

TI ACM favors customers to develop more advanced loop circle control strategy.
### Product List of Pressure Switch

#### Specification Sheet of Pressure Switch

<table>
<thead>
<tr>
<th>Device</th>
<th>Switch Config</th>
<th>Reset Type</th>
<th>Switch Type</th>
<th>Cycle Life (K)</th>
<th>Operating Pressure Range (psig)</th>
<th>5-28 Mdc</th>
<th>Maximum Rated Current / Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Amps Inductive</td>
<td>Amps Res</td>
</tr>
<tr>
<td>PS80</td>
<td>SPST</td>
<td>Auto</td>
<td>NO/NC</td>
<td>100</td>
<td>0 to 750</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>20PS</td>
<td>SPST</td>
<td>Auto</td>
<td>NO/NC</td>
<td>100</td>
<td>Vac to 750</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>25PS</td>
<td>SPST</td>
<td>Auto</td>
<td>NO</td>
<td>100</td>
<td>Vac to 750</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>25PS</td>
<td>SPST</td>
<td>Auto</td>
<td>NC</td>
<td>100</td>
<td>Vac to 750</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>25PS</td>
<td>SPDT</td>
<td>Auto</td>
<td>NO</td>
<td>100</td>
<td>Vac to 750</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>25PS</td>
<td>SPDT</td>
<td>Auto</td>
<td>NC</td>
<td>100</td>
<td>Vac to 750</td>
<td>4</td>
<td>25</td>
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<tr>
<td>29PS</td>
<td>SPST</td>
<td>M.R.</td>
<td>NC</td>
<td>6</td>
<td>200 to 750</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>36PS</td>
<td>SPST</td>
<td>Auto</td>
<td>NO/NC</td>
<td>1,000</td>
<td>500 psi max</td>
<td>5mA-400 mA</td>
<td>--</td>
</tr>
<tr>
<td>39PS</td>
<td>SPST</td>
<td>Auto</td>
<td>NO/NC</td>
<td>250</td>
<td>Vac to 750</td>
<td>400mA - 2A</td>
<td>--</td>
</tr>
<tr>
<td>40PS</td>
<td>SPST</td>
<td>Auto</td>
<td>NO/NC</td>
<td>&gt;250</td>
<td>Vac to 750</td>
<td>5mA-400mA</td>
<td>--</td>
</tr>
<tr>
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<td>SPST</td>
<td>Auto</td>
<td>NO/NC</td>
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<td>Vac to 750</td>
<td>400mA-2A</td>
<td>--</td>
</tr>
<tr>
<td>42PS</td>
<td>SPST</td>
<td>Auto</td>
<td>NO</td>
<td>250</td>
<td>Vac to 750</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>42PS</td>
<td>SPST</td>
<td>Auto</td>
<td>NC</td>
<td>250</td>
<td>Vac to 750</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>42PS</td>
<td>SPDT</td>
<td>Auto</td>
<td>NO</td>
<td>250</td>
<td>Vac to 750</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>42PS</td>
<td>SPDT</td>
<td>Auto</td>
<td>NC</td>
<td>250</td>
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<td>4</td>
<td>5</td>
</tr>
<tr>
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<td>SPST</td>
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<td>NO/NC</td>
<td>250</td>
<td>Vac to 750</td>
<td>400mA - 6A</td>
<td>--</td>
</tr>
<tr>
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<td>SPST</td>
<td>Auto</td>
<td>NO</td>
<td>250</td>
<td>Vac to 750</td>
<td>4</td>
<td>3.2</td>
</tr>
<tr>
<td>44PS</td>
<td>SPST</td>
<td>Auto</td>
<td>NC</td>
<td>250</td>
<td>Vac to 750</td>
<td>4</td>
<td>3.2</td>
</tr>
<tr>
<td>44PS</td>
<td>SPDT</td>
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<td>NO</td>
<td>250</td>
<td>Vac to 750</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>44PS</td>
<td>SPDT</td>
<td>Auto</td>
<td>NC</td>
<td>250</td>
<td>Vac to 750</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>45PS</td>
<td>SPST</td>
<td>Auto</td>
<td>NO</td>
<td>100</td>
<td>Vac to 750</td>
<td>4</td>
<td>3.2</td>
</tr>
<tr>
<td>45PS</td>
<td>SPST</td>
<td>Auto</td>
<td>NC</td>
<td>100</td>
<td>Vac to 750</td>
<td>4</td>
<td>3.2</td>
</tr>
<tr>
<td>45PS</td>
<td>SPDT</td>
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<td>Vac to 750</td>
<td>2</td>
<td>5</td>
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<tr>
<td>45PS</td>
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<td>NC</td>
<td>100</td>
<td>Vac to 750</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>46PS</td>
<td>SPST</td>
<td>Auto</td>
<td>NO/NC</td>
<td>2,500</td>
<td>Vac to 750</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Application

- Home air conditioning/commercial air conditioning/industrial air conditioning and refrigeration system.
- Engine oil pressure control of construction machinery.
- Air compressor / Pump pressure control.
- Remote control system.
- Agricultural machinery.

---

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Application of Pressure Switch in Automobile Air-Conditioning System

**Application**

- The traditional automotive air conditioning system normally equips single stage, two stage or three stage pressure switches to protect system and to control fan. The control methods are high pressure protection, low pressure protection and fan operation control.
- The pressure switch membrane disk reacts when pressure changed. As membrane disk reverses and turns the connecting bar, it results in on or off of electronic switch.
- This applies to high or low pressure control of side air conditioning, circuit breaker of fan control from air conditioning, automotive power steering system, transmission stall control and engine lubricants supply control.
- Applicable pressure range up to 3,000psi
- Application model: 20PS, 25PS, 36PS, 46PS, 87PSL, 89PSF, 162PSD, 165PSD.

**Operation Principle**

- Compressor control
  - **Evaporator frosting prevention**
    - **Method 1:** To control on/off of compressor by install a temperature sensor at the exit of evaporator.
    - **Method 2:** Use an inspiratory cut-off valve to control refrigerant pressure in evaporator.
    - **Method 3:** Use variable compressor, methods 2&3 only apply to advanced vehicle.
  - **Fail-safe**
    - Disconnect the compressor, use high and low pressure protection switch to disconnect compressor.
- **Engine management**
  - Disconnecting compressor-accelerate at low speed
  - Disconnecting compressor-unstable idling
  - Disconnecting compressor-unstable idling

**Vehicle fuel loss factor**

- Start of the air conditioner compressor 60%
- Vehicle stationary idling increasing 20%
- Other electronic equipment consumption 50%

---

Diagram showing the components and control units in an air conditioning system, including:
- Compressor
- Blower
- Evaporator
- Condenser
- Receiver
- Coolant temperature
- Section valve location
- Speed
- Engine speed
- Idle Air Control Valve
- Pressure switch
- Pressure Sensor and Pressure Switch
- ECU Control Unit
- A/C Control Unit
- Temperature Sensor
- Air conditioning panel
- Set Temp by Driver
- Multi Speed
- Fluid Coupling
- Coolant temperature
- Section valve location
- Engine speed
- Idle Air Control Valve

20PS pressure switch
FRW Flexible Fluorocarbon Resin Insulated Wire

**Insulation material**
- Fluorocarbon Resin

**Features**
- Excellent in the oil and chemical resistance.
- Excellent in flexibility and strength
- Rating temperature range from -45℃ to 200℃
- Flame retardant property, which passes VW - 1 vertical flame test
- It does not include specific bromine-based flame retardant compound
- Insulating layer thickness is 0.4mm which meet requirement of IEC60950 and safe (above all meet UL standard)

**Application**
- Fits for internal wiring in the office equipment, Electrical and electronic, such as lamp wire of copy machine, printer wire, microwave heater wire, Temperature sensor wires for heat-resistant appliances, thermal resistance lead in LED lights.

<table>
<thead>
<tr>
<th>Conductor</th>
<th>Insulation</th>
<th>Overall Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWG No.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>7/0.125</td>
<td>0.375</td>
</tr>
<tr>
<td></td>
<td>Over 16</td>
<td>Over 17</td>
</tr>
<tr>
<td></td>
<td>Min.16(0.407mm)</td>
<td>Min.17(0.432mm)</td>
</tr>
<tr>
<td></td>
<td>Average(mil)</td>
<td>Average(mil)</td>
</tr>
<tr>
<td></td>
<td>1.36</td>
<td></td>
</tr>
</tbody>
</table>
FRW-ST Fuel Pump Tank Control Cable

**Insulation material**
- Flexible fluorocarbon resin

**Features**
- Excellent in flexibility and mechanical strength
- Excellent flexibility, which makes handling extremely easier
- Rating temperature range from -40℃ to 200℃
- Excellent resistance to oil and gasoline
- Flame retardant property, which passes VW-1 vertical flame test
- Clear color can be obtained

**Application**
- Lead wire for fuel pump in gasoline tank
- Wiring for transmission immersed in oil
- Lead wire for oil temperature sensor
- Wiring in the vicinity of engine radiator
- Wiring in air conditioner for automobile
- Wiring in distributor

**Insulation:** Flexible Fluorocarbon Resin

**Conductor:**
- Tin Coated Annealed Copper Wire

<table>
<thead>
<tr>
<th>Diameter or Nominal Cross-Sectional Area (mm$^2$)</th>
<th>Composition NO./Diameter of Component Wire(NO./mm)</th>
<th>Outside Diameter (mm)</th>
<th>Thickness of Insulation (mm)</th>
<th>Standard Overall Diameter (mm)</th>
<th>Maximum Conductor Resistance 20℃ (Ohm/Km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50</td>
<td>20/0.18</td>
<td>1.00</td>
<td>0.35</td>
<td>1.7 (+0.15, -0.08)</td>
<td>Below 38.60 Max. 38.60</td>
</tr>
<tr>
<td>0.75</td>
<td>30/0.18</td>
<td>1.20</td>
<td>0.35</td>
<td>1.9 (+0.15, -0.08)</td>
<td>Below 25.81 Max. 25.81</td>
</tr>
<tr>
<td>1.25</td>
<td>50/0.18</td>
<td>1.50</td>
<td>0.40</td>
<td>2.3 (+0.15, -0.08)</td>
<td>Below 15.50 Max. 15.50</td>
</tr>
</tbody>
</table>
AIRN Ignition System Control Cable

**Insulation material**
- An EDPM Rubber Compound (Lead Free)

**Application**
- Car / Motorcycle Ignition System

---

**Item** | **Performance** | **Note**
--- | --- | ---
Dielectric Withstand Voltage | 25KV/AC 0.15sec | Spark Test
Oil Resistance | Do not swell unduly | 120°C * 24H
Cold Bend | No signs of cracking | -30°C * 1H
Life Cycle Test | No unfavorable result | –
Heat Aging | No signs of cracking | 120°C * 48H
Electrical Breakdown Voltage | Not less than 28.5KV/AC | 5-1

---

<table>
<thead>
<tr>
<th>Conductor</th>
<th>Insulation</th>
<th>Sheath</th>
<th>Standard Shipping length(M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-sectional area(mm²)</td>
<td>Constitution NO./Dia</td>
<td>Thickness Nominal (mm)</td>
<td>Overall Diameter (mm)</td>
</tr>
<tr>
<td>1.25</td>
<td>7/0.45</td>
<td>2.2</td>
<td>5.6</td>
</tr>
</tbody>
</table>
PEX-F Cross-Linked Polyethylene Cable

- **No.**
  - 3516M, 3516Q

- **Insulation material**
  - Cross-linked polyethylene

- **Features**
  - This wire doesn’t contain the specific bromine-based flame retardant compound, such as PBBs and PBDEs.
  - Offer two types of wires, low voltage type and high voltage type, with the same material and different thickness for insulation.
  - Excellent flexibility at low temperatures.
  - Rating temperature range from -40°C to 150°C.
  - Cross-linked insulation has excellent thermal stability, so it doesn’t melt even at abnormal high temperature.
  - Meet the requirements of the horizontal flame test. (Compliance with JASO D 608 92).

- **Application**
  - Suitable for HID lamp lead wire.

---

### Conductor (tinned copper) and Insulation

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Nominal cross-sectional area (mm²)</th>
<th>Constitution NO./Dia.</th>
<th>Overall Diameter (mm)</th>
<th>Nominal Thickness (mm)</th>
<th>Overall Diameter (mm)</th>
<th>Bobbin (mm)</th>
<th>Bundle (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3516M</td>
<td>High voltage</td>
<td>0.5</td>
<td>TA 20/0.18</td>
<td>1</td>
<td>1.4</td>
<td>3.8</td>
<td>500</td>
<td>200</td>
</tr>
<tr>
<td>3516Q</td>
<td>Low voltage</td>
<td>0.5</td>
<td>TA 20/0.18</td>
<td>1</td>
<td>0.8</td>
<td>2.6</td>
<td>1,000</td>
<td>500</td>
</tr>
</tbody>
</table>

---

Application: Suitable for HID lamp lead wire.

Conductor: Cross-linked Polyethylene

Insulation: Cross-linked Polyethylene

Tin Coated Annealed Stranded Copper
## Vehicle DC Motor Protector

6AP

### Product name: 6AP

<table>
<thead>
<tr>
<th>Product name</th>
<th>6AP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum Contact Ratings</strong></td>
<td></td>
</tr>
<tr>
<td>15VDC/30A/30000 cycles</td>
<td></td>
</tr>
<tr>
<td>30VDC/15A/30000 cycles</td>
<td></td>
</tr>
<tr>
<td><strong>Standard Operating Temperature Range</strong></td>
<td>100~170°C</td>
</tr>
<tr>
<td><strong>Tolerance On Open Temperature</strong></td>
<td>±5°C</td>
</tr>
<tr>
<td><strong>Certification</strong></td>
<td>UL / CSA / ENEC / SEMKO</td>
</tr>
<tr>
<td><strong>Application</strong></td>
<td>Electric window motor, wiper engine, sunroof motor, antenna motor, sliding doors engine, wedge and so on.</td>
</tr>
</tbody>
</table>
Auto Wire Harness/Seat Cushion Processing Module

Auto RF Antenna Assembly

Assembly of Automotive Wiring Lights

Vehicle / Mirrors Audio Line Set

Vehicle Power Wire Harness Set

Pressure Sensor Wire Set
Auto Wire Harness/Seat Processing Module

Wire Harness Assembly of Auto Display

Reversing Images Wire Harness Set

Electric Window Wire Set

Car Audio/Navigation Wire Harness Assembly

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Seat Cushion Heating Module

**Features**

- The heating wire uses high tension and high-strength fibers.
- The side-by-side strand that can maintain high buckling.
- High quality \ low cost hot press processing.
- High reliability of hot melt structure of materials technology.
- High-intensity heating + highly durable template design, with both high durability and high performance.
- Independent design, production, and LCC factory production, according to the materials used to achieve high quality and low price.
- According to the hot press structure, it achieves low price for durable complex template.
- Chose the most temperature based on development and production performance of heating wire.
- Design the most suitable temperature template by the supports of rich and colorful development and production performance of heating wire.
- Independent design ECU hotline, which provides the most suitable temperature control.

**Application**

- Car seat \ massage chair \ electric scooter \ etc


![Image of Seat Cushion Heating Module](image-url)
External Tire Pressure Monitoring System

- Wireless tire pressure monitoring system (Hereinafter referred as TPMS AVT-C1 can assure safety of driver). The system can automatically and immediately detect tire pressure and temperature of every tire. When detecting abnormal tire pressure or temperature, the system will immediately send a warning signal to the signal receiver (monitor), meanwhile display digitally (pressure and temperature values) and warning alarm to inform driver temperature status of the tire that require immediate repair. It provides safe driving and longer tire life, the most important is able to efficiently save fuel consumption and increase added-value of product and driving.

Features

- DIY outside tire pressure & temperature detector.
- LCD seven-color backlight, can set backlight according to preference.
- Able to set high and low tire pressure / temperature detecting value.
- 32-bit encrypted ID, FSK transmission.
- With high and low tire pressure as well as high and low temperature warning.
- Waterproof and dustproof sensor, the harsh conditions of use.
- Graphical LCD interface.
- It can be used and no need to replace the air-nozzle of the car.
- Power shortage warning.
- Driver-oriented and able to show tire pressure and temperature of four tires at same time.
- In accordance to user’s need, our system provides different unit options in different tire pressure (kg/cm²/psi/kpa/bar) and tire temperature (°C/°F).
- Easy installation and does not require professional technician.
External Tire Pressure Monitoring System

Sensor Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating environment temperature</td>
<td>-40°C ~ 125°C</td>
</tr>
<tr>
<td>Operating environment humidity</td>
<td>100%</td>
</tr>
<tr>
<td>Weight</td>
<td>8.8g(±0.5g)</td>
</tr>
<tr>
<td>Pressure monitoring range</td>
<td>0~450Kpa</td>
</tr>
<tr>
<td>Temperature monitoring range</td>
<td>-40°C ~ 125°C ±1°C</td>
</tr>
<tr>
<td>Radio frequency</td>
<td>429.925MHz(±0.5MHz)</td>
</tr>
<tr>
<td>RF modulation</td>
<td>FSK</td>
</tr>
<tr>
<td>Battery capacity</td>
<td>&gt;2.9V, CR 1632T418-5, 125mAH, for -40°C ~ 125°C</td>
</tr>
</tbody>
</table>

Monitor Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>5V</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-40°C ~ 100°C</td>
</tr>
<tr>
<td>Rating current</td>
<td>10 mA</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-40°C ~ 125°C</td>
</tr>
<tr>
<td>Measuring pressure</td>
<td>Max 450KPA</td>
</tr>
</tbody>
</table>
**SPEC Pak® Connector**

**Feature**
- SPEC Pak® is a highly configurable, rugged, environmentally sealed family of connectors. The IP68 shell conforms to industry standards for flammability and weather-ability. The core contact technology housed within the SPEC Pak® shell has been proven reliable for more than 50 years. These contacts accommodate wires from 24 — 3/0 awg (0.25 to 85.0 mm ) and are capable of handling from 15 to 310 amps per contact at 600 volts (UL). Combining the power, signal and ground contacts with the wide array of colored touch safe Powerpole housings provide engineers thousands of design options for the most demanding applications.

**Features**
- Environmentally sealed (IP68) rated shell
- Rugged, safe and versatile shells
- 15 to 310 amp per contact capability at 600 volts (UL)
- Power, signal & ground in a single interconnect
- Color-coding capabilities
- Highly configurable

**Benefits**
- Exceeds the industry standard for environment protection against dust and water
- UV and chemical resistant shells comply with many industry standards
- Proven reliable flat wiping and pin & socket contact technology
- Ease of assembly by color coding contact housings with circuits or wire colors
- Thousands of configurations available by combining power, signal and ground with a range of wire sizes
Battery & Charging Connector for Electric Vehicles

SBS® 75x

APP®'s SBS75x connector provides high power and auxiliary contacts in a robust housing. The touch-safe connector is ideal for battery charger and battery insertion / replacement applications.

Feature

- Two power contacts UL Rated to 105 amps
- Touch safe per UL1977 (Section 10.2)
- Four auxiliary contacts UL rated to 20 amps
- UL94 V-0 flammability rating
- Robust design provides up to 10,000 mating cycles
- UL hot plug rated
- Chemical resistant housing available
Battery Connections for Electric Vehicles

Powerpole® (PP15/45, PP75, PP120 & PP180)

- APP’s powerpoles are modular, cost effective connectors that offer engineers design flexibility, robust construction, and color coding for ease of harnessing. Accessories allow panel mounting, latching and cable strain relief. Contacts are available for wire, PCB, and busbar applications.

Feature

- Genderless modular housings
- 15 to 180 amps per contact at 600V (AC / DC)
- Up to 10,000 mating cycles
- Hot pluggable
- UL94 V-0 flammability rating
Battery / Battery Charger / Electric Bikes / Scooters / Lawn Equipment

Multipoles (SB@/SBE@/SBX@)

- APP’s Multipole connectors are available in two pole and three pole in the (SB) version and as two pole with up to four auxiliary contacts in the (SBE / SBX) version. All are mechanically keyed and color coded (colors determine voltage) to prevent accidental cross mating. SBE / SBX connectors are also finger safe per UL1950 / EN1175.

Feature

- SB and SBX are available from 50 to 350 amps 600V (AC / DC) per UL
- SBE is available from 80
- Hot pluggable
- UL94 V-0 flammability rating
- Chemical resistant housings
- Up to 4 auxiliary contacts
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