Sensata Technologies

CHILLVENTA eSPECIAL

Refrigeration | AC & Ventilation | Heat Pumps

13.–15.10.2020

CONNECTING EXPERTS.

Pressure and Safety Solutions for Heat Pumps Using Natural Refrigerants

Wednesday, October 14, 2020

NÜRNBERG MESSE

Who we are

European Head Office
Hengelo, The Netherlands

Monica Czarnecki
Market Segment Manager
Smart Buildings Division
Sensata Technologies Industrial Europe

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Senior Field Applications Engineer
Smart Buildings Division
Sensata Technologies Industrial Europe

About Sensata

CHILLVENTA eSPECIAL

We are a **global industrial tech company** and a leading provider of **sensor-rich solutions** creating valuable insights for customers.

Smart Building

Smart Factory

Clean Energy

Key market player
in **automotive**, appliance, aircraft, **industrial**, military, **heavy vehicle**, off-road, **HVAC**, data, telecom, RV, and marine markets

BY THE NUMBERS

$3.5B
2019 revenues

21,000+
employees

11 countries
with Sensata sites

Sensata's Broad Global Footprint

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- Manufacturing
- Business Site

Europe
Belgium, Bulgaria, France, Germany, The Netherlands, UK

Americas
Brazil, Mexico,
United States
(Arizona, California, Maryland, Massachusetts, Minnesota, Washington)

Asia
China
India
Japan
Korea
Malaysia

PLUS Sales & Engineering Support Offices Worldwide

Where are we active in HVAC

Two main market areas in the climate sector

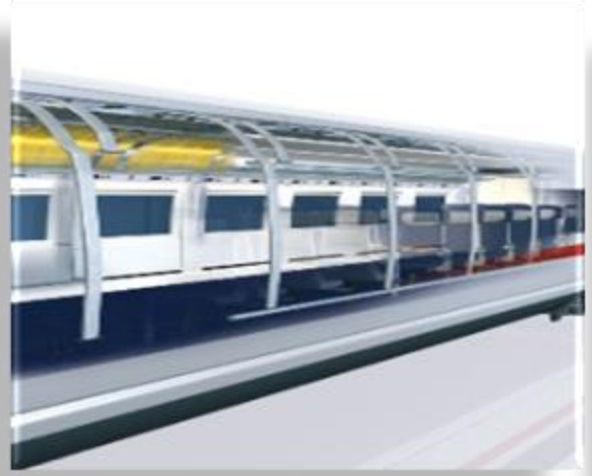
Climate control of goods

Commercial / Industrial Refrigeration

Transport Refrigeration

Climate control of people

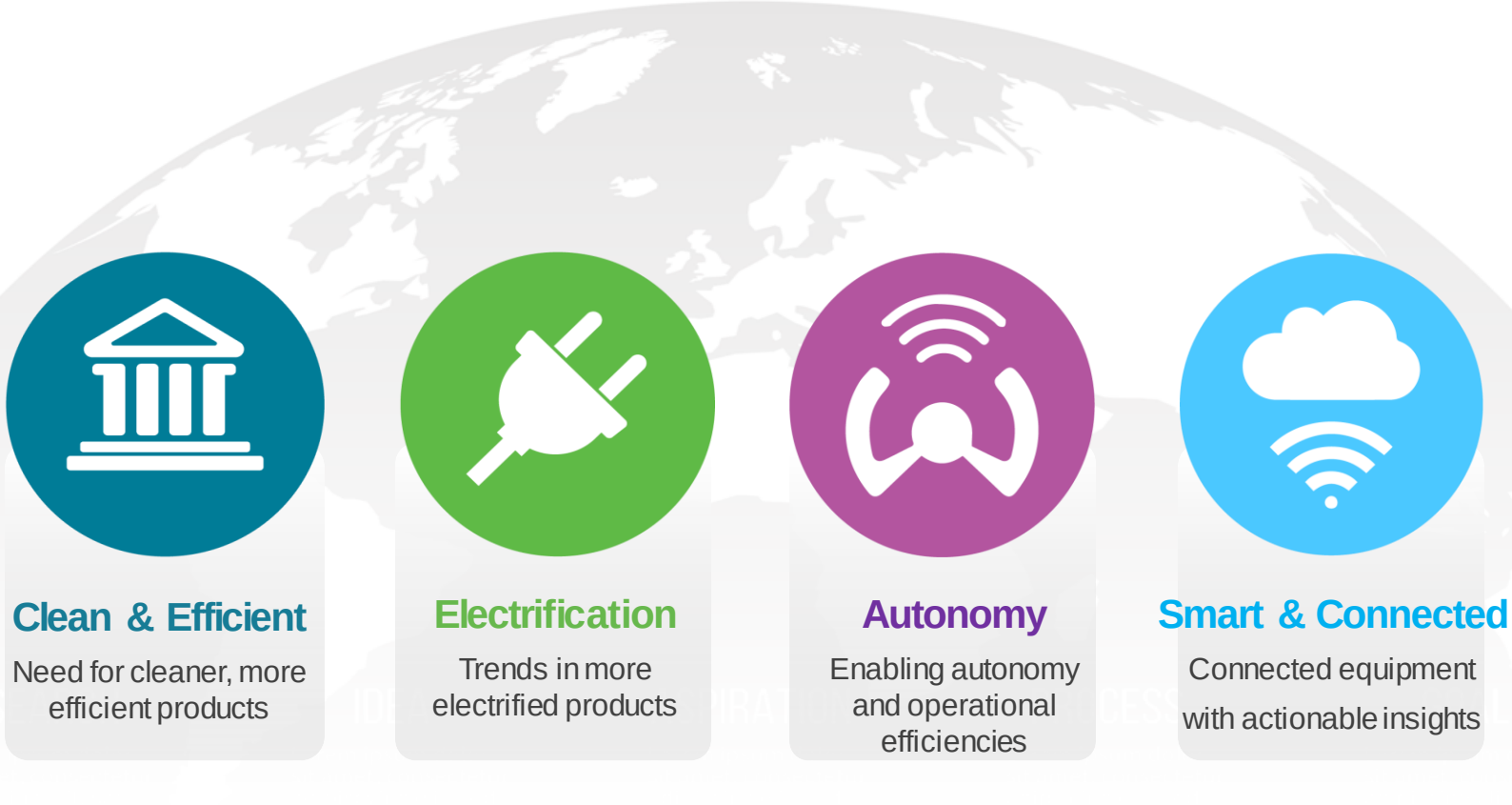
Rail & Bus Cooling



Chillers / Rooftops Split AC / Heat Pumps

Where we are going

Four key drivers are shaping our markets through the next decade



Clean & Efficient
Need for cleaner, more efficient products

Electrification
Trends in more electrified products

Autonomy
Enabling autonomy and operational efficiencies

Smart & Connected
Connected equipment with actionable insights

SAFE | CLEAN | EFFICIENT | COMFORTABLE

Tomorrow’s world

Megatrends and regulations to lower carbon footprint is changing technology requirements

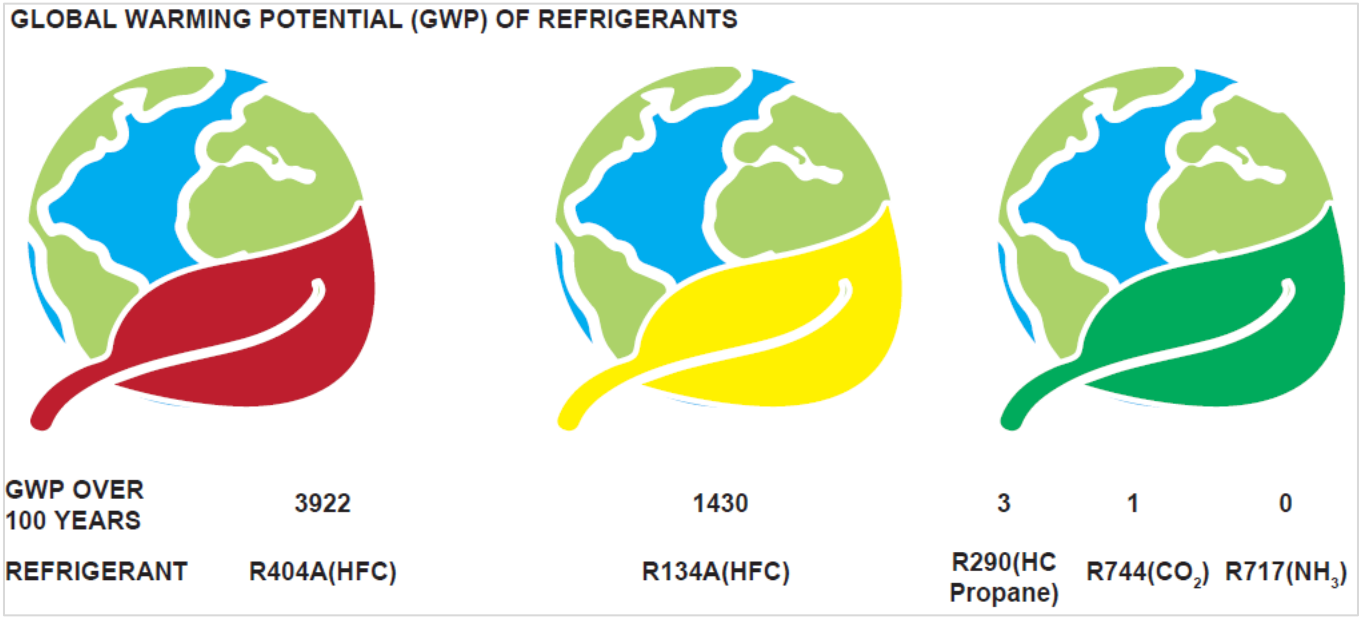
Clean & Efficient

Need for cleaner, more efficient products

- **Lower costs**
- **Environmentally friendly**
- **Legislation compliance**
- **Achieving EU 2030 climate targets**
- **Low GWP rates**
- **Natural refrigerant adoption**
- **Low leakage rates**

Today's Market

- EU air conditioning (AC) and heat pump (HP) market represented a 11.9M unit 2019 sales.
- Global decarbonization initiatives and legislation are driving the market to lower GWP and natural refrigerants (NR).
- EU is global leader in the adoption thereof.
- 80% of Heat pumps in EU market currently using R410A, remaining is R134A, R32, R290, among others.
- Growing number of suppliers shifting to offer natural refrigerant heat pump technologies.



(some info sourced: BSRIA, Jan 2020)

Design Challenges

- Applicability for retrofitting HP (heat pump) in existing, particularly older buildings
- High COP: making the heat pump more energy efficient despite the use of HC refrigerants
- System must not increase safety risks due to implementation of flammable or otherwise potentially harmful refrigerants
- Low to no leakage rates

Reliable, easy to implement components are key

Case Examples

Sensata has a wide range of pressure sensors specifically designed for heat pumps using traditional refrigerants as well as propane, CO2 and other natural refrigerant types.

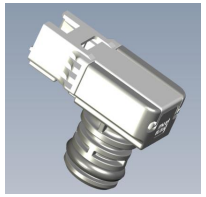
Case Example R290 refrigerant implementation

Application Requirements:

- Flammable gas certification of all the cooling loop components or certification of every single unit type.
- Prevent dangerous leakage and opt to make use of gas detection sensor.

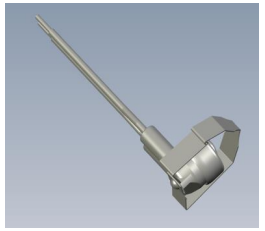
3 Pressure switch to ensure safety by high pressure cut-out control (HPCO)

4 Pressure sensor with thermal isolating tube for regulating the the cooling loop, ensuring less potential leakage and thermal isolation.



1 Pressure measurement in the hydronic heating loop, for optimal heating distribution

2 Regulating switch and thermal high cut-out protection

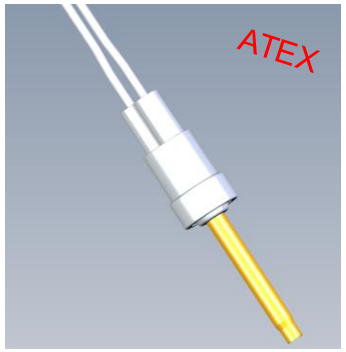


Case Example R290 refrigerant implementation

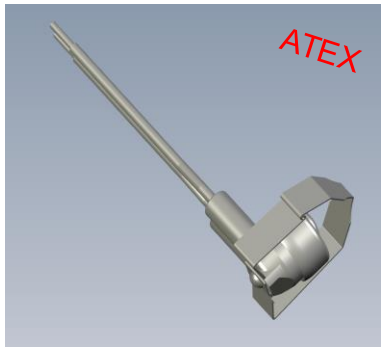
Sensata solutions:

Safety:

- Safety components: High pressure cut out switch (PS80), High temperature cut out switch (3NT)
- Atex certification for all regulating (high and low cooling loop sensors) and protection



PS80 pressure safetyswitch for protecting the system



3NT temperature safetyswitch for protecting the heat exchanger

With our broad portfolio of devices and collaborative design process, we help engineers and developers customize solutions to meet these demands

ATEX certificates

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DEKRA

CERTIFICATE

(1) **Type Examination**

(2) **Component intended for use in potentially explosive atmospheres - Directive 2014/34/EU**

(3) Type Examination Certificate Number: **DEKRA 18ATEX0080U** Issue Number: **0**

(4) Product: **Pressure sensor 2CP, 81CP, 82CP, 87CP and 88CP Series**

(5) Manufacturer: **Sensata Technologies Changzhou Co., Ltd**

(6) Address: **18 Chuangxin Road, 213031 Changzhou, Jiangsu Province, China**

(7) This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) DEKRA Certification B.V., certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014.

The examination and test results are recorded in confidential test report no. NL/DEK/ExTR18.0047/00.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0 : 2012 + A11 : 2013 **EN 60079-15 : 2010**

except in respect of those requirements listed at item 18 of the Schedule.

(10) The sign "U" is placed after the certificate number. It indicates that this certificate must not be mistaken for a certificate intended for an equipment. This partial certification may be used as a basis for certification of an equipment.

(11) This Type Examination Certificate relates only to the design and construction of the specified product and not to the manufacturing process and its monitoring.

(12) The marking of the product shall include the following:

II 3 G Ex nA IIC Gc

Date of certification: 20 February 2019

DEKRA Certification B.V.

L.G. van Schie
Certification Manager

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DEKRA Certification B.V. Meander 1051, 6825 MJ Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands
T +31 88 96 83000 F +31 88 96 83100 www.dekra-certification.com Registered Arnhem 09085396

II 3 G Ex nA IIC Gc

II 3 G Ex nC IIC Gc
II 3 G Ex nC IIA Gc (With QC terminals)

DEKRA

CERTIFICATE

(1) **Type Examination**

(2) **Component intended for use in potentially explosive atmospheres - Directive 2014/34/EU**

(3) Type Examination Certificate Number: **DEKRA 18ATEX0081U** Issue Number: **0**

(4) Product: **Pressure Sensor PS80 and 25PS Series**

(5) Manufacturer: **Sensata Technologies Changzhou Co., Ltd**

(6) Address: **18 Chuangxin Road, 213031 Changzhou, Jiangsu Province, China**

(7) This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) DEKRA Certification B.V., certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014.

The examination and test results are recorded in confidential test report no. NL/DEK/ExTR18.0048/00.

Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0 : 2012 + A11 : 2013 **EN 60079-15 : 2010**

except in respect of those requirements listed at item 18 of the Schedule.

The sign "U" is placed after the certificate number. It indicates that this certificate must not be mistaken for a certificate intended for an equipment. This partial certification may be used as a basis for certification of an equipment.

(11) This Type Examination Certificate relates only to the design and construction of the specified product and not to the manufacturing process and its monitoring.

(12) The marking of the product shall include the following:

II 3 G Ex nC IIC Gc
II 3 G Ex nC IIA Gc (With QC terminals)

Date of certification: 4 February 2019

DEKRA Certification B.V.

L.G. van Schie
Certification Manager

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Refrigerating systems and heat pumps — Qualification of tightness of components and joints

SUMMARY SHEET

Test report of the examination of the:

Pressure sensors 81/82CP and pressure switch PS80

The component(s), pressure sensors and the pressure switches, made by the manufacturer Sensata Technologies Holland B.V., has/have been tested in regard to:

EN-ISO 14903:2017 Refrigerating systems and heat pumps - Qualification of tightness of components and joints.

See the identification sheet for all available product types.

The samples passed the performed test conform the requirements of the standard.

Signed in Acceptance:
Kiwa Nederland B.V.

Paul Dijkhof
Unit Manager Alternative Fuels and Pressure Products

Case Example R290 refrigerant implementation

Sensata solutions:

Safety:

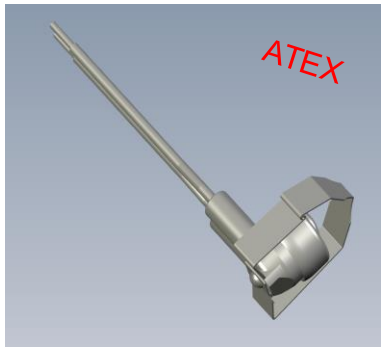
- Safety components: High pressure cut out switch (PS80), High temperature cut out switch (3NT)
- Atex certification for all regulating (high and low cooling loop sensors) and protection
- 100% component traceability possible with QR code

Efficiency:

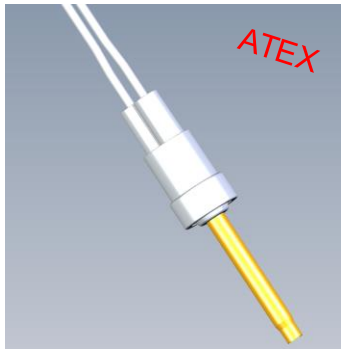
- High and low pressure sensor for regulating/optimizing the cooling loop 81CP (LP) or 82CP (HP)
- Pressure devices are designed with 5cm isolation tube to protect sensor/switch body for very high and very low temperatures.

Leakage prevention:

- Tube on pressure devices adds an additional feature in lowering chance of leakage due to solder (brazing) directly on refrigerant pipe.
- Sensors comply with ISO 14903:2017 regulation of tightness of components and joints.

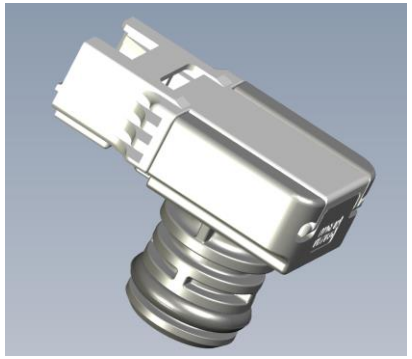


3NT temperature safety switch for protecting the heat exchanger



PS80 pressure safety switch for protecting the system

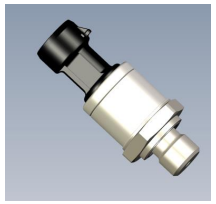
81CP or 82CP pressure sensor for regulating system



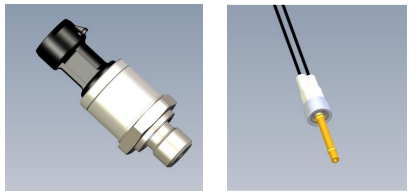
116CP pressure sensor for sensing pressure in hydronic loop

With our broad portfolio of devices and collaborative design process, we help engineers and developers customize solutions to meet these demands

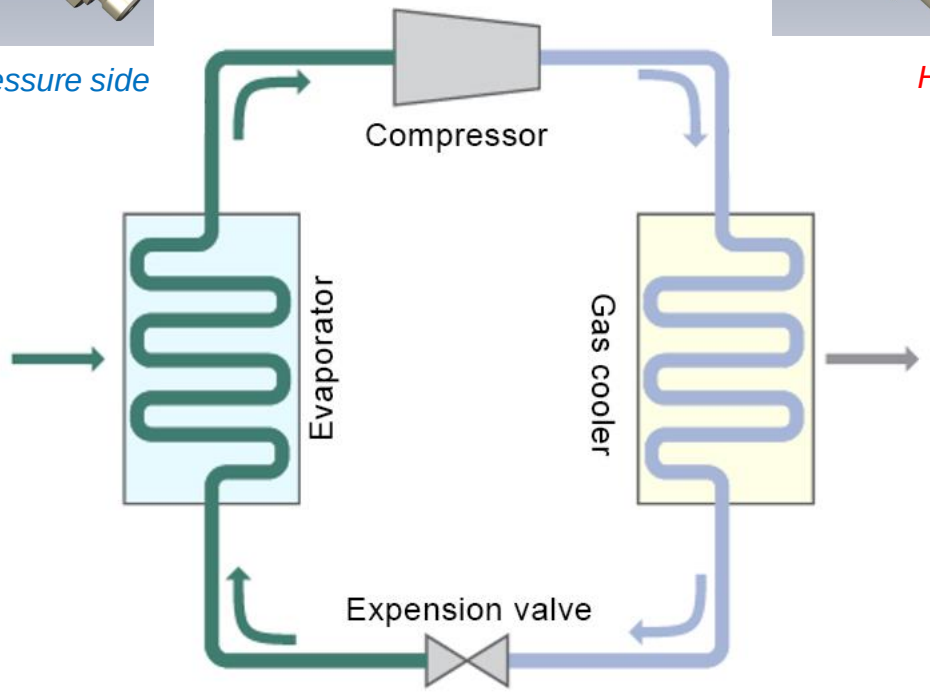
Case Example R744 (CO2) refrigerant implementation



Low pressure side



High pressure side



Application Requirements:

- High pressure refrigerant application to about max 180 bar.
- Prevent leakage of CO2 refrigerant (very small molecules).

Case Example CO2 R744 refrigerant implementation

Sensata solutions:

Safety:

- High pressure cut out PS80-21-xxxx switch to prevent dangerous overpressure.
- 100% component traceability possible with QR code.

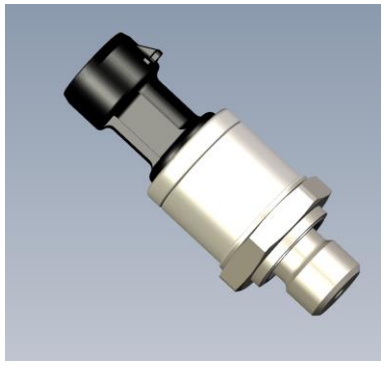
Efficiency:

- High and low pressure sensor (PTE7100) for regulating/optimizing the cooling with Sensata high pressure MSG (micro-fused strain gage) technology.
- Pressure devices are designed with male screw thread or 5cm isolation tube to protect sensor/switch body for very high and very low temperatures.

Leakage prevention:

- Tube on pressure devices adds an additional feature in lowering chance of leakage due to solder (brazing) directly on refrigerant pipe.
- Sensata hermetic sensors PTE7100 based on demanding high pressure automotive applications (brakes, fuel injection).
- Pressure hermetic switches PS80-21-xxxx based on high reliable and proven PS80 pressure safety family,

PS80-21 pressure safety switch for protecting the system



PTE7100 (MSG) technology for regulating high pressure application

With our broad portfolio of devices and collaborative design process, we help engineers and developers customize solutions to meet these demands

Sensor Solutions for Heat Pumps and Refrigeration

CHILLVENTA eSPECIAL

- ✓ wide range of pressure sensors specifically designed for heat pumps using traditional refrigerants, propane, CO2 and other natural refrigerant types
- ✓ pressure switches, thermostats offer a broad portfolio for heat pump and refrigeration applications.
- ✓ One stop shop for regulation and protection of cooling loop
- ✓ Long term reliability of the parts.
- ✓ ATEX IEC 60079- 0/-15 certification
- ✓ ISO14903 Qualification of tightness of components and joints in refrigerating systems and heat pumps

Sensata Technologies

	Solution	Features and Benefits	Function
	**116CP Pressure Sensor**	• Water pressure sensor, including certifications for potable water • Cost-efficient sensor due to the huge manufacturing scale and high-volume supplier base	Pressure measurement in the hydronic heating loop, for optimal heating distribution
	**3NT Thermostat**	• Small and easy to mount, high temperature resistant • Highly reliable safety switch with ATEX certification for R290 and other flammable refrigerants	Regulating switch and thermal high cut-out protection
	**PS80 Pressure Switch**	• Automatic reset; environmentally sealed or vented switch; SPST switch normally open or normally closed • Low cost pressure switch for stationary systems with ATEX certification	Pressure switch to ensure safety by high pressure cut-out control (HPCO) or cut-out at low side (LPCO)
	**81/82CP Pressure Sensor**	• ATEX and ISO14903 certifications for use with flammable refrigerants • The sensor can be brazed directly in copper tubes	Pressure sensor with thermal isolating tube for regulating the the cooling loop, ensuring less potential leakage and thermal isolation
	**112CP Pressure and Temperature Sensor**	• Pressure and temperature measurement in one package • Fast, in-stream temperature measurement	Precise superheat measurement
	**PTE7100 Pressure Sensor**	• High pressure hermetic measurement in one package • Fast, in-stream temperature measurement	Ensures the system regulation when the refrigerant is CO2
	**2HMP Pressure Sensor**	• Rugged seal ideal for outdoor environments, industry leading accuracy over broad temperature range • Media (hermetic) and electrical isolation protects against thermal and electrical shock; outstanding EMC/ESD performance	Pressure monitoring at suction or discharge side
	**A2L leak detector**	•A2L gas leakage detection sensor to control mitigation systems and/or shutdowns • In compliance with new North American and European standard (UL 60335-2-40 Ed.3 and IEC 60335-2-40 Ed.6).	Works for mildly flammable (A2L) refrigerants R32, R454B, R1234yf

Contacts

For more information about our products and capabilities, please visit our exhibitors profile @ Chillventa eSpecial.

Our team is available to chat,

video conference and call.

You can also reach out to us at:

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hj-klein-bluemink@sensata.com

Thank you for your attention.

CONNECTING EXPERTS.