

## HANSEN TECHNOLOGIES CORPORATION



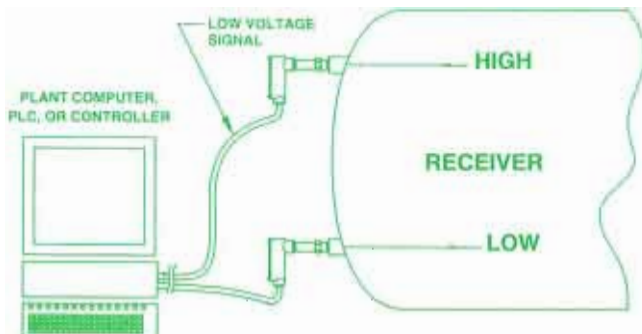
Single Point Level Sensor: SPL

### INTRODUCTION

These compact single point level sensors are an economical solution for reliable and accurate level detection. They are designed to detect the presence of ammonia liquid (but not oil) at a specific location in vessels containing ammonia refrigerant. The computer compatible, low voltage signal output can be used with plant computers, PLCs, solid-state relays or other controllers.

### APPLICATIONS

These level sensors are designed specifically for use in ammonia refrigeration systems. They provide single point ammonia liquid level detection for receiver/vessels, intercoolers, controlled pressure receivers, packaged chillers, compressor packages, pump packages, and flooded evaporators. Hansen single point level sensors can be used where float switches might otherwise be used, such as high and low level alarms in conjunction with plant computer, PLC or other controllers.



## Specifications, Applications, Service Instructions & Parts

### Single Point Level Sensors (for Ammonia)

for Refrigerant Vessels,  
Compressor Packages,  
Pump Packages, and  
Flooded Evaporators



### KEY FEATURES

- Computer compatible
- No moving parts; plug-in electronics
- Suitable for ammonia
- Unaffected by normal splashing or oil coating
- Non-optical
- Stainless steel sensor body
- Simple low voltage wiring

### ADVANTAGES

Less expensive than mechanical float devices, these solid-state electronic level sensors are very reliable, even in low temperature systems. Unlike optical devices, these sensors are not affected by film buildup or oil scum. Additionally, there is no lens which can be easily fooled by frost buildup. These sensors come factory pre-calibrated and tested; ready to use. There are no moving parts on the sensor probe to break, jam or fail. Electronics can be easily replaced without pumping out (opening) the system. Compact, raintight construction allows these sensors to be installed in almost any location. Overall performance is not affected by normal variations in refrigerant pressure, temperature, or contamination.

### ORDERING INFORMATION

Cat. No.	Description
SPL	Single Point Level Sensor for Ammonia, 1/2" NPT, Current Sinking NPN Output

**TO ORDER:** Specify catalog number SPL

## MATERIAL SPECIFICATIONS

### ELECTRICAL

Signal Output: NPN (Current Sinking),

Normally Closed

Supply Voltage: 10 to 30 volt D.C.

Power Consumption: 4 VA

Maximum Load: 300 ohms

Ambient Temperature: 32F to 125F (0°C to 52°C)

Sensing Principle: Capacitance

### MECHANICAL

Sensor Connection: 1/2" NPT

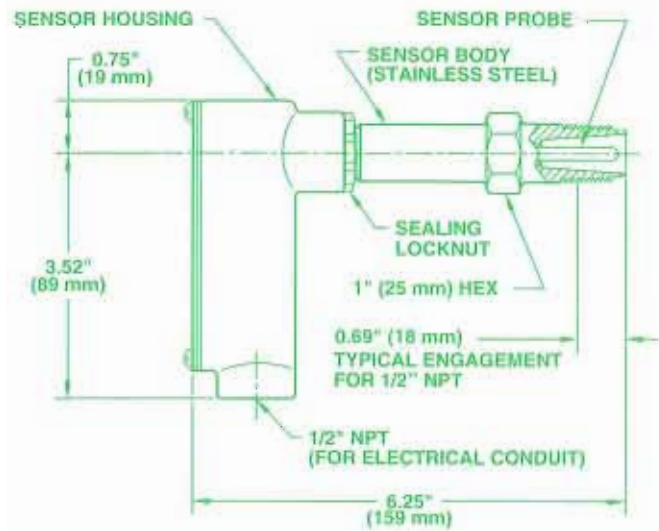
Sensor Housing: Raintight NEMA 3R, Aluminum

Sensor Body: Stainless steel, ASTM A582

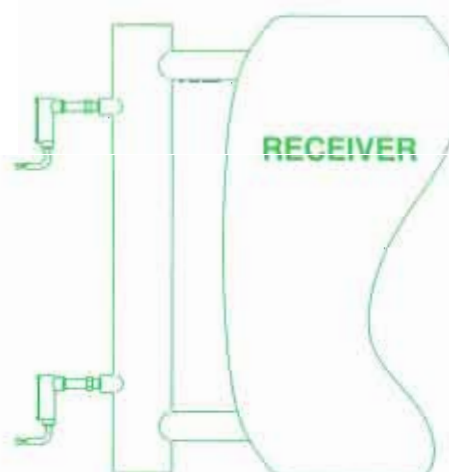
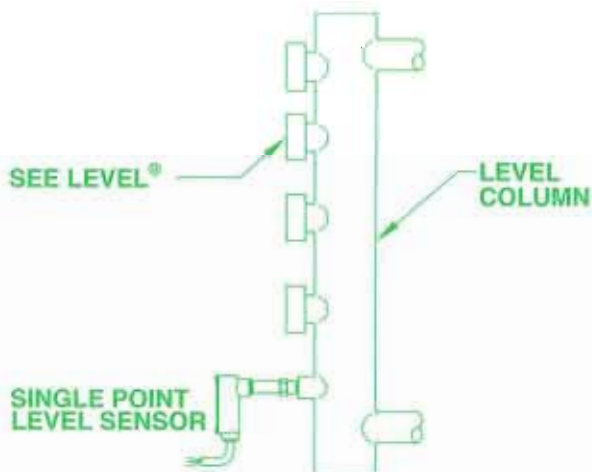
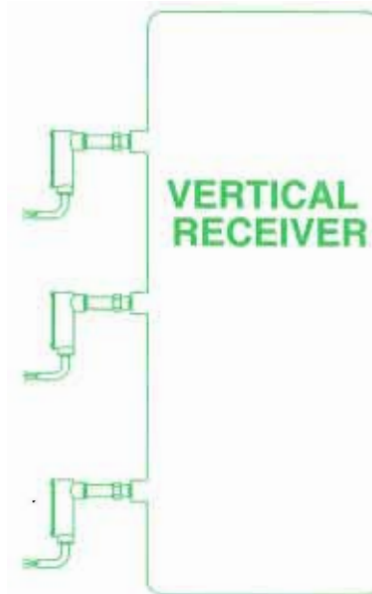
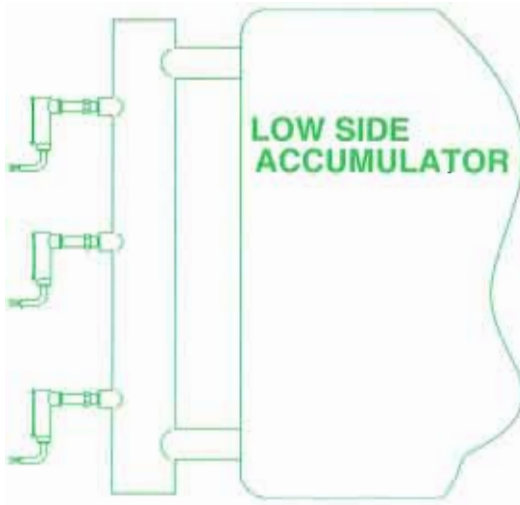
Safe Working Pressure: 400 psig (27 bar)

Refrigerant Temperature: -60F to +150F (-50°C to 65°C)

## INSTALLATION DIMENSIONS



## TYPICAL APPLICATIONS



Level columns should be at least 3" diameter for low temperature accumulators.

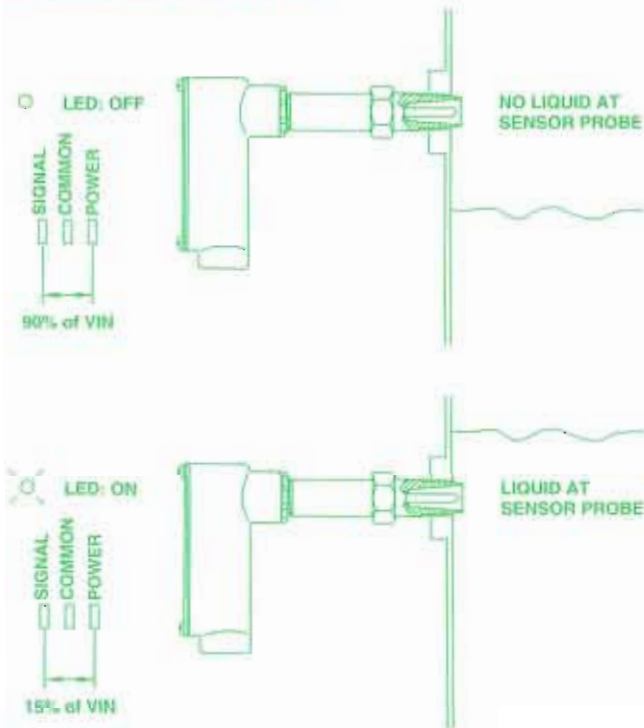
## INSTALLATION

Vessel should be free of refrigerant and system must be evacuated to zero pressure before installation begins. These sensors must be installed horizontally, with sensor body in horizontal position. Handle sensor with care; dropping can damage sensor probe. Use proper thread sealant and screw the threaded end of sensor body into half coupling located on vessel or column. Loosen sealing locknut to rotate sensor housing to suit application, and then retighten locknut. Make sure that locknut is tight to prevent moisture from entering sensor. Ideally, conduit opening in housing should face downward and be sealed to prevent moisture from collecting around the spade terminals inside sensor housing.

## ELECTRICAL

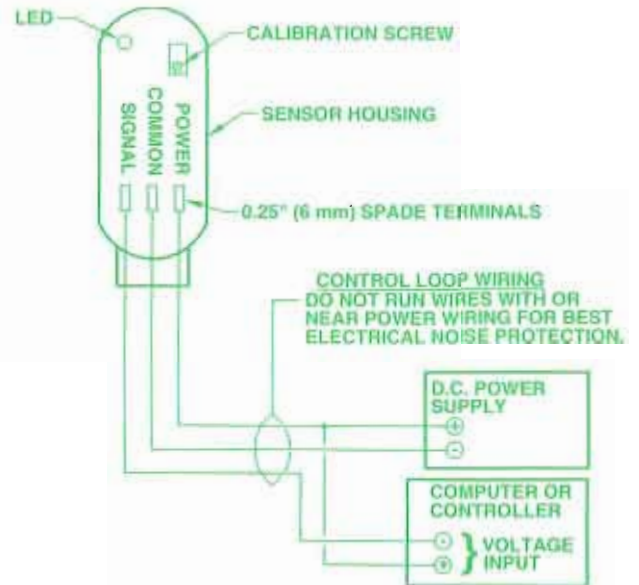
These level sensors are low voltage, three-wire devices having NPN (current sinking) output. See Typical Wiring on this page. Control loop wire size should be at least 20 AWG (0.5 mm<sup>2</sup>) and limited to 100 ft. (30 m). For best electrical noise protection, do not run control loop wiring with or near power wiring and use shielded cable.

A small, bright LED inside sensor housing illuminates to indicate the presence of liquid. With liquid at sensor probe, the output signal will be 15% of the voltage supply and the LED will illuminate (LED on). In the absence of liquid, the output signal will be 90% of the voltage supply (LED off). A built-in anti-splash time delay (three seconds) prevents unnecessary short cycling.



VIN = Supply Voltage Input

## TYPICAL WIRING



## RE-CALIBRATION INSTRUCTIONS

These level sensors are accurately factory pre-calibrated for vessels of any diameter containing ammonia refrigerant. Sensors are ready-to-use and should not require any field adjustment in calibration settings whatsoever. However, in the event that a level sensor should need re-calibration, follow the instructions below:

Before re-calibration begins, liquid in vessel or column must be clearly below level point of sensor. Remove sensor housing cover. Turn calibration screw clockwise until the small LED illuminates. Then, slowly turn calibration screw counterclockwise just until the LED turns off. Then continue to turn calibration screw 2 additional full turns counterclockwise (to compensate for tolerances). The sensor should now be re-calibrated. If one determines the sensor cannot be satisfactorily calibrated, contact factory.

**Other Liquids:** The SPL is also suitable for water up to 125F (52°C), Contact Factory. Further models of SPL are being developed by Hansen for other refrigerants (R22, R134a, etc.) as well as refrigeration oils.

## TROUBLESHOOTING

Does not indicate level changes	
CAUSE	ACTION
<ol style="list-style-type: none"> <li>1. Moisture in sensor housing or housing-to-sensor body joint.</li> <li>2. Fault in control loop wiring.</li> <li>3. No power to sensor housing or wrong voltage.</li> <li>4. Calibration not correct.</li> <li>5. Insulating resistance of sensor probe rod is too low.</li> <li>6. Oil level is above sensor probe.</li> </ol>	<ol style="list-style-type: none"> <li>1. See Note 1 below.</li> <li>2. See Note 2 below.</li> <li>3. Check voltage at terminals in the sensor housing.</li> <li>4. See re-calibration instructions on page 3.</li> <li>5. See Note 3 below.</li> <li>6. Remove excess oil or use "oil-sensor".</li> </ol>
Occasional erratic output	
CAUSE	ACTION
<ol style="list-style-type: none"> <li>1. Moisture in sensor housing or housing-to-sensor body joint.</li> <li>2. Rapid suction pressure pull down results in bubbling and surging liquid.</li> <li>3. High voltage power wires near control loop wiring.</li> <li>4. Non-isolated devices (sensors or others) on same power supply as sensor.</li> </ol>	<ol style="list-style-type: none"> <li>1. See note 1 below.</li> <li>2. Alter compressor loading sequence, defrost sequence, or liquid make up feed time to "reduce" pressure fluctuations in vessel.</li> <li>2. Relocate control loop wiring away from power wiring.</li> <li>4. Place sensor on separate power supply or replace non-isolated devices with isolated ones.</li> </ol>

### Note 1:

**MOISTURE IN SENSOR HOUSING.** Dry-out sensor housing. If appearance is dry, look for tattletale signs of moisture damage, such as white residue. Check cover gaskets, watertight cable connectors, and other water sealing joints; replace if worn. If a conduit connection is used carefully seal the inside to prevent moisture migration and condensation into sensor housing.

### Note 2:

**FAULT IN CONTROL LOOP WIRING.** Check wires in sensor housing for proper connection. See page 3 for sensor wiring diagram. Wires should be securely fastened and not frayed. Also check continuity of wiring.

### Note 3:

**INSULATION VALUE OF SENSOR PROBE.** The following procedure is only required if sensor probe integrity is questioned. With the sensor housing removed from sensor body, check the insulating resistance of the sensor probe using a 500V "Megger". Connect positive side to probe wire, negative side to sensor body. Result should be over 1000 Mega Ohms; if not contact factory.

## CAUTION

These level sensors have been designed for ammonia refrigeration systems. These instructions and related safety precautions must be completely read and understood before selecting, using, or servicing these sensors. Only knowledgeable, trained refrigeration mechanics should install, operate, or service these sensors. Stated temperature and pressure limits should not be exceeded. Do not remove sensors from vessels unless system has been evacuated to zero pressure. Escaping refrigerant might cause personal injury, particularly to eyes and lungs.

**WARNING:** As with all electronic and mechanical components, there is a limited life expectancy. An expected life of seven to ten years is typical. This should be understood as only a suggested replacement time period. Actual condition and performance of electronics due to ambient conditions, contaminants, quality of electrical current, voltage, etc. may necessitate a different replacement schedule. Regardless, level sensors should be inspected at least annually to ensure their safe and continuous service. Level sensors are not safety controls and must be backed up by safety devices as appropriate for the particular system. See also Safety Precautions in current List Price Bulletin and Safety Precautions Sheet supplied with product.

## WARRANTY

Hansen electronics are guaranteed against defective materials or workmanship for 90 days F.O.B. factory. All other components are guaranteed for one year F.O.B. factory. No consequential damages or field labor is included.

## OTHER HANSEN LEVEL PRODUCTS

Vari-Level® Adjustable Level Controls  
 Techni-Level® Level Transducer Probes (VLT)  
 Refrigerant Level Transducer Probes (SHP,SVP)  
 Level Cat® Refrigerant Level Transducer Probe with Control Unit  
 SEE LEVEL® Refrigerant Liquid Indicators  
 Refrigerant Float Switches (HLL, HLLS)

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**HANSEN TECHNOLOGIES  
CORPORATION**



**VLT Transducer Probe with  
Optional Digital Readout (DR)**

**INTRODUCTION**

Hansen **Techni-Level**® level transducer probes have fast become the industry standard for liquid refrigerant level control and monitoring. These reliable, well engineered electronic level transducer probes, when properly used, operate trouble-free and are not affected by reasonable changes in refrigerant temperature or pressure. They provide a computer compatible 4-20 mA (milliamp) output signal proportional to liquid level. Probes consist of a compact, electronic transmitter in a watertight housing assembled on top of a rugged, capacitance type level sensor. Probe active lengths up to 168" (4270 mm) are available. Normally, the probe must be inside a level column. Typical applications include: vertical and horizontal vessels, pump accumulators, pilot receivers, and refrigerant loss monitoring. These probes are operating control devices and should never be used as safety devices.

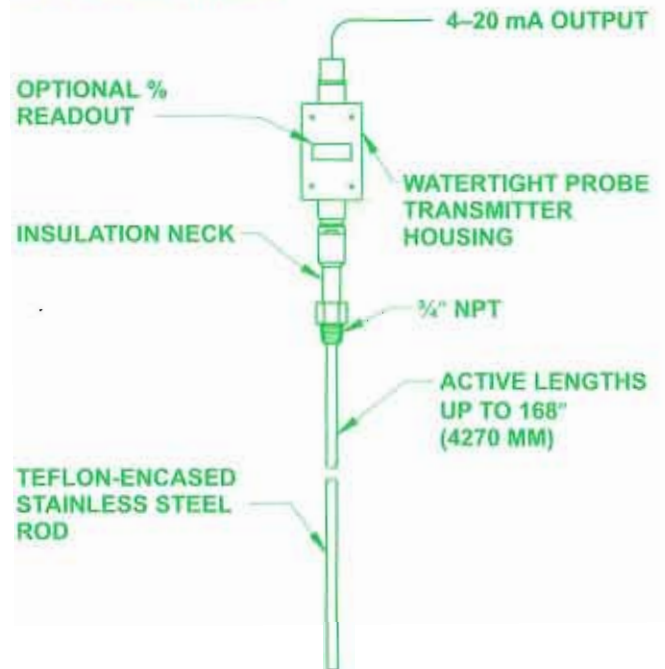
**Specifications, Applications,  
Service Instructions & Parts**

**VLT 4-20 mA  
Techni-Level® Level  
Transducer Probes**

**for use in 4-20 mA control loops  
for refrigerant level control  
and monitoring**

**ISO 9002**

**KEY FEATURES**



**ADDITIONAL FEATURES**

Specifically designed for refrigeration systems. Compact, solid-state transmitter and watertight housing are located on top of probe sensor. Computer compatible, 2-wire 4-20 mA signal. Designed for connection to a plant computer, PLC, or other device. Rugged probe sensor design. Electrically isolated output. Remote display of level possible. Suitable for ammonia, R22, R134a and other compatible refrigerants.

## SPECIFICATIONS

Signal Output: 2-wire 4–20 mA, DC, isolated  
Input Power: 12 to 36 volt DC, regulated,  
to be available at the probe  
Maximum Load Resistance: 1200 ohms  
Classification: Transmitter type/class 2U ANSI/  
ISA-S50.1

Enclosure: Watertight NEMA 4 (IP65)  
Fitting: 3/4" NPT male, connection to Level Column  
Standard Active Probe Lengths: 20" (510 mm),  
30" (760 mm), 40" (1015 mm), 60" (1525 mm),  
80" (2030 mm), 100" (2540 mm), 120" (3050  
mm), 144" (3660 mm), 168" (4270 mm); Custom  
lengths available up to 168" (4270 mm) max  
Safe Working Pressure (SWP): 400 psig (27 bar)  
Operating Temperature:  
Transmitter: -20°F to +140°F ambient  
(-30°C to +60°C) ambient  
Sensor: -60°F to +150°F (-50°C to +65°C)  
Below -60°F (-50°C) requires the stainless  
steel extended neck body; contact the factory.

## LEVEL COLUMN

Body: 3" Schedule 40 pipe, standard  
Sight Glass: Located at 50% level, standard  
Safe Working Pressure (SWP): 400 psig (27 bar)  
Operating Temperature: -60°F to +240°F  
(-50°C to +115°C)

## ADVANTAGES

These probes are shipped factory precalibrated and tested on a refrigeration system. The electronics can be changed without opening the refrigeration system. These probes have internal dampening to avert false alarms triggered by normal turbulence and splashing of refrigerant. The optional digital readout enables the plant operator to easily know the refrigerant level at a glance. The 4–20 mA signal is commonly used with computers, programmable logic controllers, and other accessories. This signal can also be easily converted to a 1–5 volt or 2–10 volt DC signal.

## OPTIONAL DIGITAL READOUT

Transducer probes can be factory or field fitted with an internal LCD digital readout. This readout is visible through a clear window in the cover of the watertight probe housing. It is internally powered and displays percentage of immersed probe active length. Ambient temperature range for the LCD readout is +32°F to +140°F (0° to +60°C). Specify the DR suffix when ordering probe. Example: To order a 20" (510 mm) active length probe with built-in digital readout, specify catalog number VLTD02. For field retrofitting, order kit number 77-1004.

## INSTALLATION OF OPTIONAL DIGITAL READOUT FOR TRANSDUCER PROBES



## REMOTE DISPLAY

A milliamp meter may be inserted in series with the 4–20 mA control loop to facilitate localized indication of the liquid level. See the wiring diagram on page 3. This can be an analog milliamp meter or other component, such as a digital process meter.

## INSTALLATION

Level columns are required in applications where refrigerant evaporation occurs within the vessel being monitored; such as flooded evaporators, low side vessels or accumulators. Using a level column (typically 3" diameter) separates the probe sensor from the boiling which occurs in the vessel. Therefore, true refrigerant liquid level is being measured, not surges of bubbling liquid. Level columns can be supplied by Hansen or fabricated in the field. See page 4 for level column details and dimensions. When refrigerant temperature is lower than ambient, the level column must be insulated.

Adequate vertical distance for probe insertion should be provided above the 3/4" FPT opening on the column. If overhead space is not available, a level column with flanged connections and shut-off valves may be used. Follow good piping practice and refrigeration system maintenance to avoid oil accumulation inside the level column. Equalizer lines and valves should be positioned as shown in the Level Column Piping Installation diagram on page 3. It is recommended that a high level float switch cutout be installed whenever practical. This provides a nonadjustable safety control in case of an incorrect high level setting or failure of a high level control device.

On halocarbon systems, over a period of time, the refrigerant in the level column will become oil rich. An extremely high concentration of oil may cause the original calibration to become offset, thus causing a false reading of refrigerant level. To prevent this, periodically remove oil from the level column.

Remove the probe from the packing crate, being careful not to bend the probe sensor. Insert the probe into the top opening of the level column. Use nonelectrically-isolating pipe thread sealant (do not use Teflon tape) on the 3/4" MPT fitting on the probe. Insert the probe in the top of the level column. Tighten the probe with a wrench on the hex; do not grip the probe housing. Pressure test for leaks.

Fifty feet (15 meters) of 2-wire twisted pair cable is supplied with the probe. Longer lengths can be ordered or use ordinary 20 AWG wire. The total length of the cable from the probe to the computer is generally not a factor up to 500 feet (153 meters) with a typical 24VDC power supply. For longer lengths, contact the factory with application specifics. Connect the probe transmitter to the control loop wiring as shown in the wiring diagram on page 3. Do not run control loop wiring with or near power wiring. For maximum physical and electrical protection, run the control cable inside a separate metal conduit. Conduit must be sealed at the connections to prevent moisture entering into the probe housing.