Bulletin P109b
June, 1999

HANSEN TECHNOLOGIES CORPORATION

VLT Transducer Probe with Optional Digital Readout (DR)

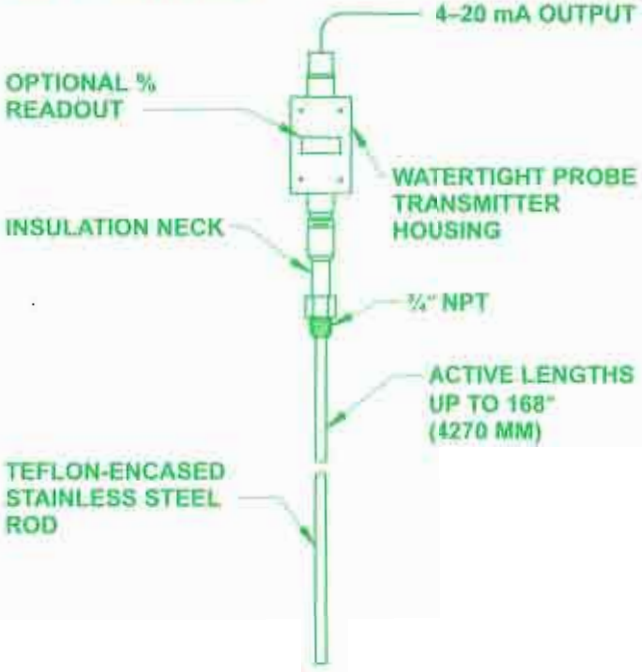
Specifications, Applications, Service Instructions & Parts

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



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.

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: ¾" 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)

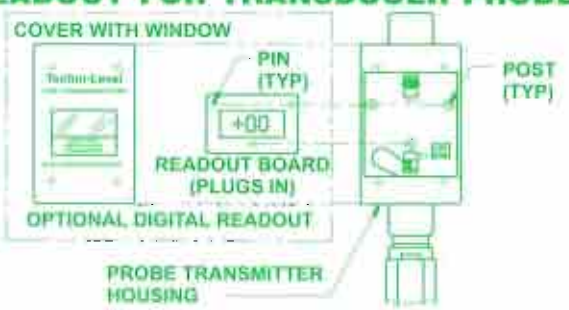
ADVANTAGES

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 VLTDR.02. 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 ¾" 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.

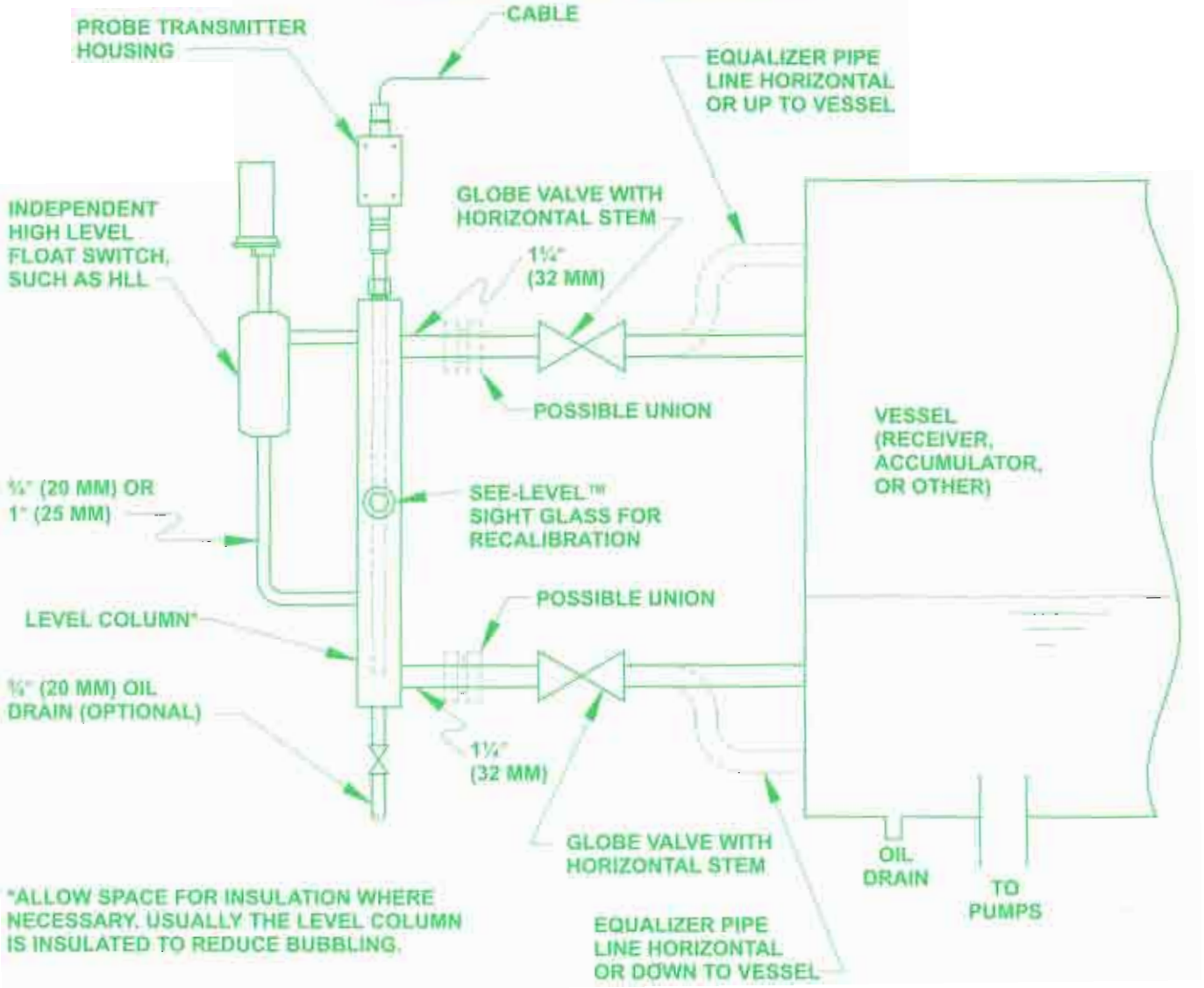
On halocarbon systems, over a period of time, the refrigerant in the level column will become oil rich. An extremely high concentration of oil may cause the original calibration to become offset, thus causing a false reading of refrigerant level. To prevent this, periodically remove oil from the level 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 ¾" 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.

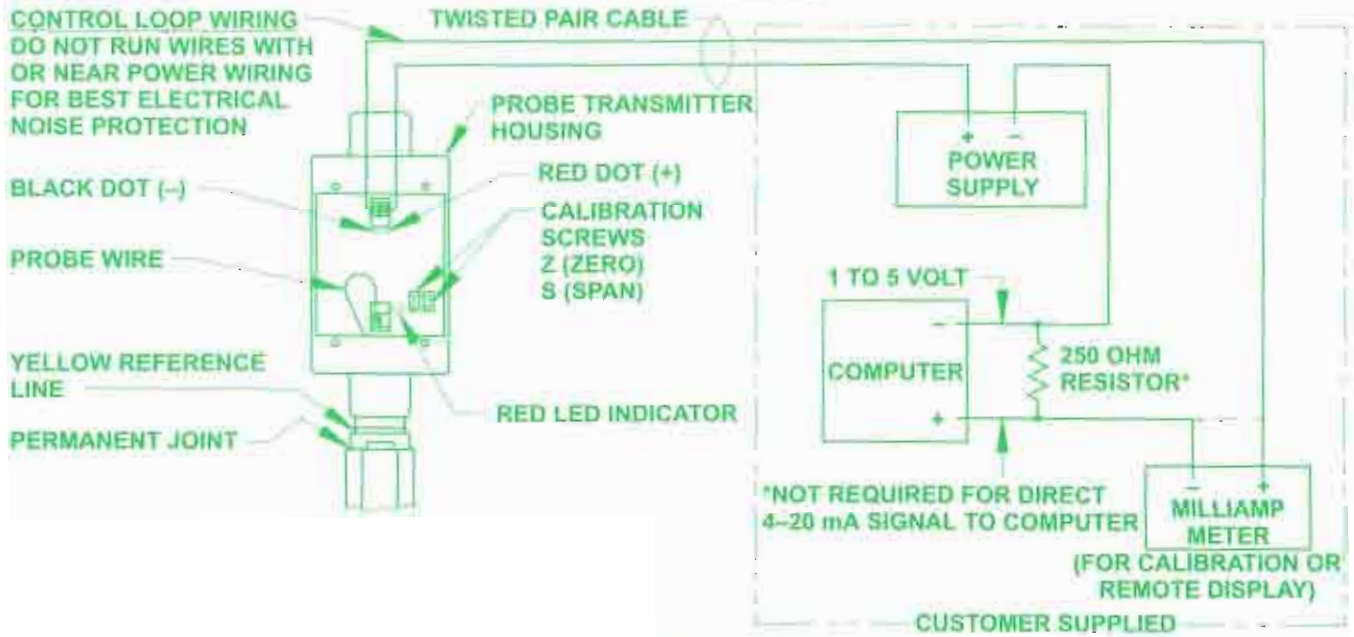
Fifty feet (15 meters) of 2-wire twisted pair cable is supplied with the probe. Longer lengths can be ordered or use ordinary 20 AWG wire. The total length of the cable from the probe to the computer is generally not a factor up to 500 feet (153 meters) with a typical 24VDC power supply. For longer lengths, 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.

LEVEL COLUMN PIPING INSTALLATION

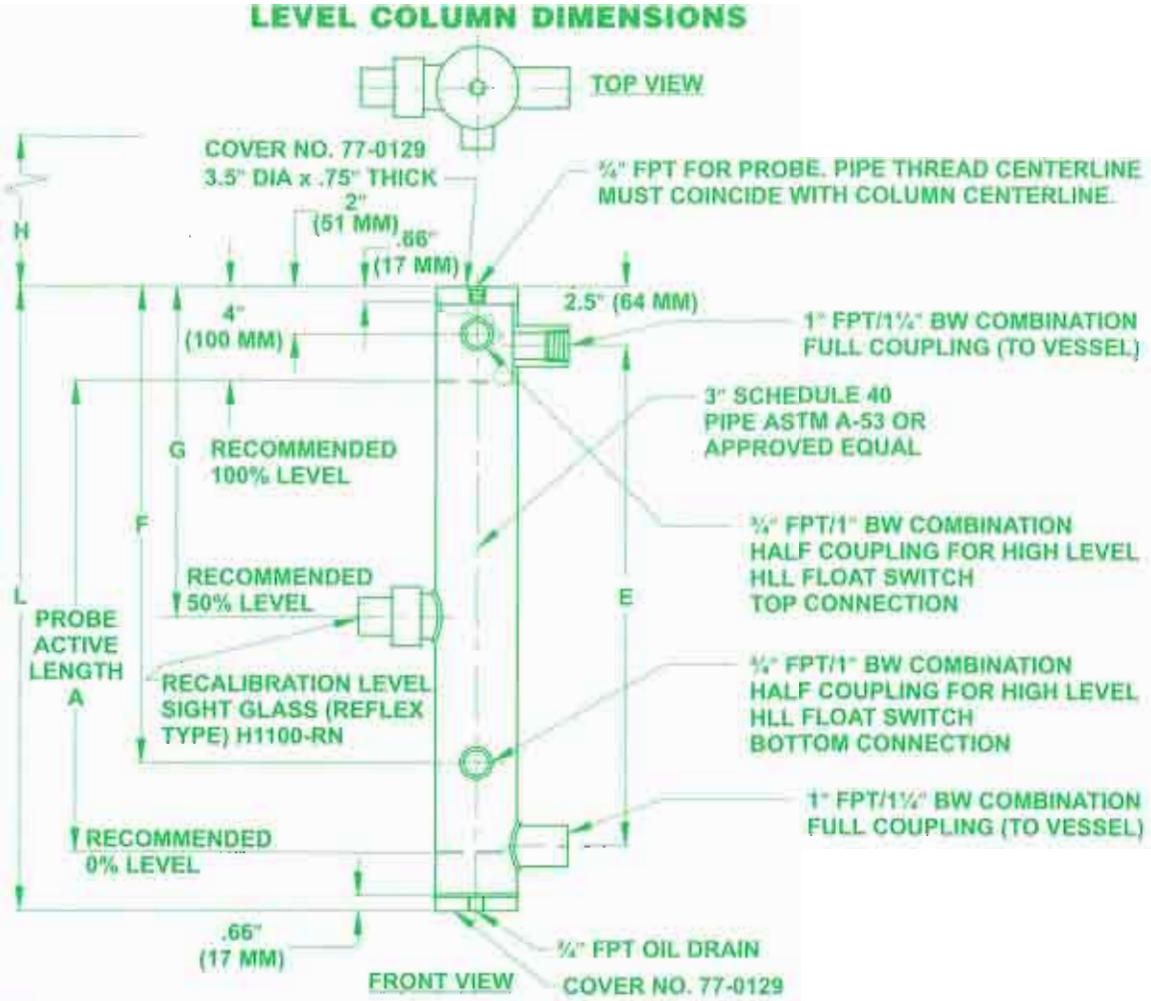
(Schematic only, not for construction)



TYPICAL WIRING



LEVEL COLUMN DIMENSIONS



COMPLETE LEVEL COLUMN UP TO 120" (3050 MM) OR PARTS ARE AVAILABLE FROM HANSEN TECHNOLOGIES. PLUGS ARE SUPPLIED IN THE OIL DRAIN AND FLOAT SWITCH CONNECTIONS.

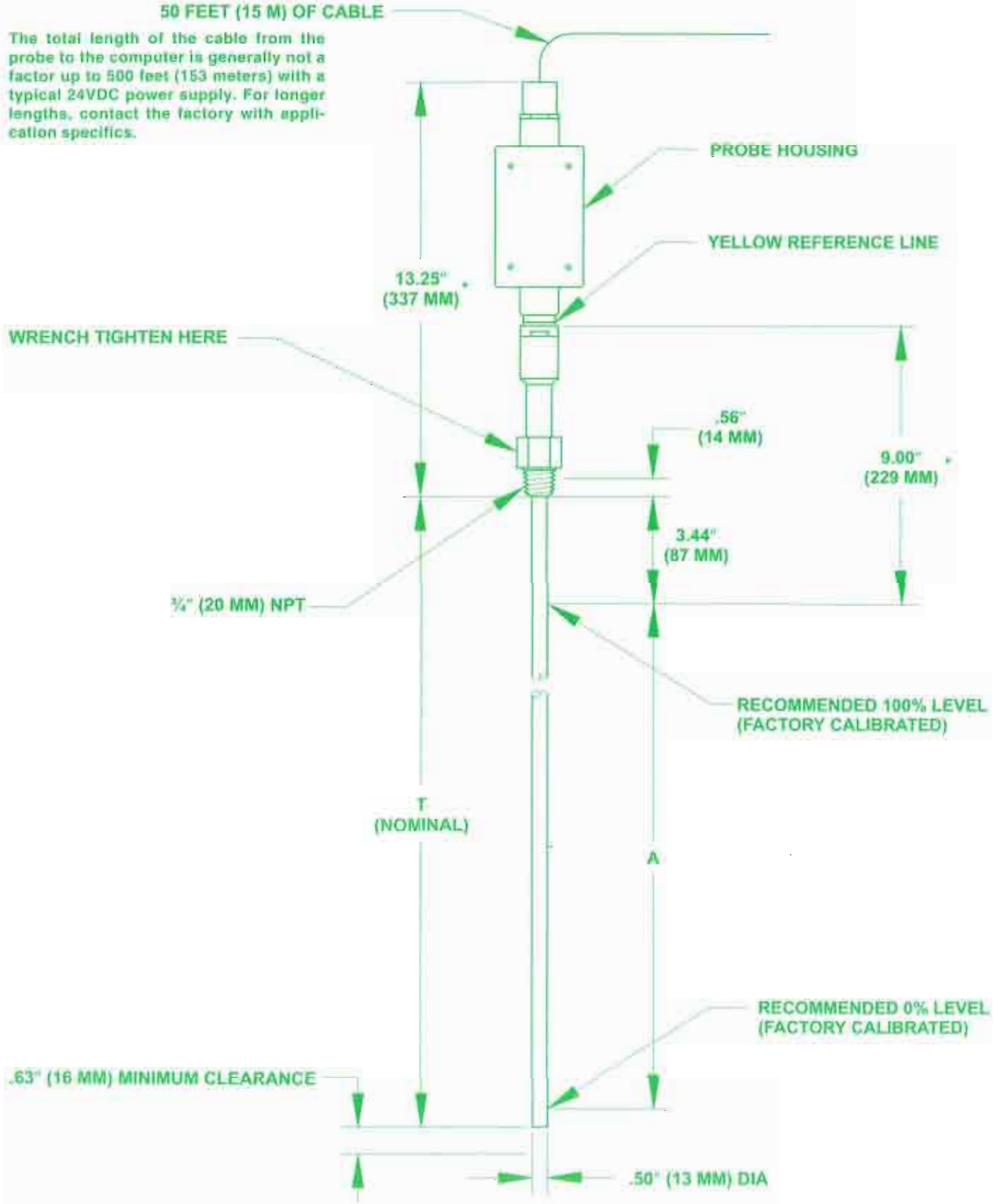
CATALOG NUMBER	PROBE ACTIVE LENGTH A	EQUALIZER LEGS E	FLOAT SWITCH LEG F	SIGHT GLASS LOCATION G	PROBE REMOVAL HEIGHT* H	COLUMN OVERALL HEIGHT L
LC.02	20" 510 mm	21.25" 540 mm	18.50" 470 mm	14.00" 356 mm	40.00" 1015 mm	26.50" 673 mm
LC.03	30" 760 mm	31.25" 794 mm	31.13" 791 mm	19.00" 483 mm	50.00" 1270 mm	36.50" 927 mm
LC.04	40" 1015 mm	41.25" 1048 mm	36.13" 918 mm	24.00" 610 mm	60.00" 1525 mm	46.50" 1181 mm
LC.06	60" 1525 mm	61.25" 1556 mm	46.13" 1172 mm	34.00" 864 mm	80.00" 2030 mm	67.25" 1708 mm
LC.08	80" 2030 mm	81.25" 2064 mm	56.13" 1426 mm	44.00" 1118 mm	100.00" 2540 mm	87.25" 2216 mm
LC.10	100" 2540 mm	101.25" 2572 mm	66.13" 1680 mm	54.00" 1372 mm	120.00" 3050 mm	107.25" 2724 mm
LC.12	120" 3050 mm	121.25" 3080 mm	76.13" 1934 mm	64.00" 1626 mm	140.00" 3556 mm	127.25" 3232 mm
(For Field Construction)	144" 3660 mm	145.25" 3689 mm	88.13" 2239 mm	76.00" 1930 mm	164.00" 4166 mm	151.25" 3842 mm
(For Field Construction)	168" 4270 mm	169.25" 4299 mm	100.13" 2543 mm	88.00" 2235 mm	188.00" 4775 mm	175.25" 4451 mm

*Add 3" (75 mm) for stainless steel extended neck version

PROBE DIMENSIONS

50 FEET (15 M) OF CABLE

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.



*Add 3" (75 mm) for stainless steel extended neck version

A (ACTIVE LENGTH)	20"	30"	40"	60"	80"	100"	120"	144"	168"
	510 mm	760 mm	1015 mm	1525 mm	2030 mm	2540 mm	3050 mm	3660 mm	4270 mm
T (INSERTION LENGTH)	25"	35"	45"	65"	85"	105"	125"	149"	173"
	635 mm	890 mm	1140 mm	1650 mm	2160 mm	2670 mm	3175 mm	3785 mm	4395 mm

TROUBLESHOOTING

PROBLEM	CAUSE	ACTION
Red LED indicator not lighted.	1. No power to probe housing or wrong voltage. 2. Moisture in probe housing.	1. Check voltage at terminals in the probe housing. 2. See Note 1 below.
Does not indicate level changes.	1. Fault in control loop wiring. 2. No continuity between probe and level column. To test, temporarily install wire from probe housing cover screw to level column and observe for changes. 3. Moisture in probe housing. 4. Equalizer valves closed. 5. Probe wire loose. 6. Equalizer lines clogged with oil or debris. 7. Poor pipe connection between level column and vessel.	1. See Note 2 below. 2. Check for Teflon tape or other nonconductive pipe sealant at probe-to-column connection; replace sealant. 3. See Note 1 below. 4. Open valves. 5. Open probe housing cover and check connection of probe wire (single wire lead) from probe center to terminal connection. 6. Remove oil and debris from equalizer lines and level column. 7. Check valve locations and orientation.
Indicates too low of a level compared to sight glass.	1. Fault in control loop wiring. 2a. (Ammonia only) Oil in level column. 2b. (Halocarbon only) Oil rich mixture in level column. 3. Moisture in probe housing. 4. Calibration not correct. 5. Calibrated for different refrigerant. 6. Column is not standard 3" dia. 7. Insulating resistance of Teflon-encased probe rod is too low.	1. See Note 2 below. 2a. Remove oil from level column. Also see page 3 for recommended level column piping. 2b. Remove oil from level column periodically or incorporate an "oil skimmer" or bleed connection. 3. See Note 1 below. 4. See recalibration instructions on page 7. 5. Contact factory. 6. Slight recalibration may be required. 7. See Note 3 below.
Indicates too high of a level compared to sight glass.	1. Fault in control loop wiring. 2. Moisture in probe transmitter housing. 3. Liquid boiling inside level column. 4. Calibration not correct. 5. Calibrated for different refrigerant. 6. Column is not standard 3" dia.	1. See Note 2 below. 2. See Note 1 below. 3. Insulate the level column. 4. See recalibration instructions on page 7. 5. Contact factory. 6. Slight recalibration may be required.
Intermittent high level.	1. Rapid suction pressure pull down results in bubbling and surging liquid. 2. High level alarm set point has been positioned too close to operating set point. 3. Moisture in probe housing.	1. Alter compressor loading sequence, defrost sequence, or liquid make up feed time to "reduce" pressure fluctuations in vessel. 2. Lower operating set point or raise high level set point. 3. See Note 1 below.
Occasional erratic level indicated without actual changes in level.	1. Moisture in probe transmitter housing. 2. Radio frequency interference (RFI). 3. High voltage power wires near control loop wiring. 4. Nonisolated devices (sensors or others) on the same power supply as the probe.	1. See Note 1 below. 2. Find source of interference, such as mobile radios or other transmitters, and disable. If unable, contact factory. 3. Relocate control loop wiring away from power wiring. 4. Place probe on separate power supply or replace nonisolated sensors with isolated ones. See Note 4 below.

Note 1: MOISTURE IN PROBE HOUSING. Dry the probe housing. If appearance is dry, look for 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 on the top of the probe, carefully seal the inside to prevent condensation migration into the housing.

Note 2: FAULT IN CONTROL LOOP WIRING. Check the wires in the housing for proper connections. See the probe wiring diagram on page 3. Wires should be securely fastened and not frayed. Also, check for continuity of each wire.

Note 3: INSULATION VALUE OF PROBE. The following procedure is only required if probe integrity is in question. With the probe wire removed from its socket, check the insulating resistance of the Teflon-encased probe rod using a megohmmeter. Connect positive side to probe wire, negative side to probe housing. The reading should be over 1000 MΩ for ammonia probes and over 50 MΩ for halocarbon probes. If the reading is less than this, contact the factory.

Note 4: ISOLATE 4–20 mA SIGNAL. Disconnect the computer. Also, disconnect any other sensors that use the same power supply. **The probe is temporarily disabled.** Use an ammeter (see page 3) to confirm actual milliamp readout. If it agrees with the actual level, then check the control circuit. If it agrees with the computer, recalibrate the probe.

RECALIBRATION

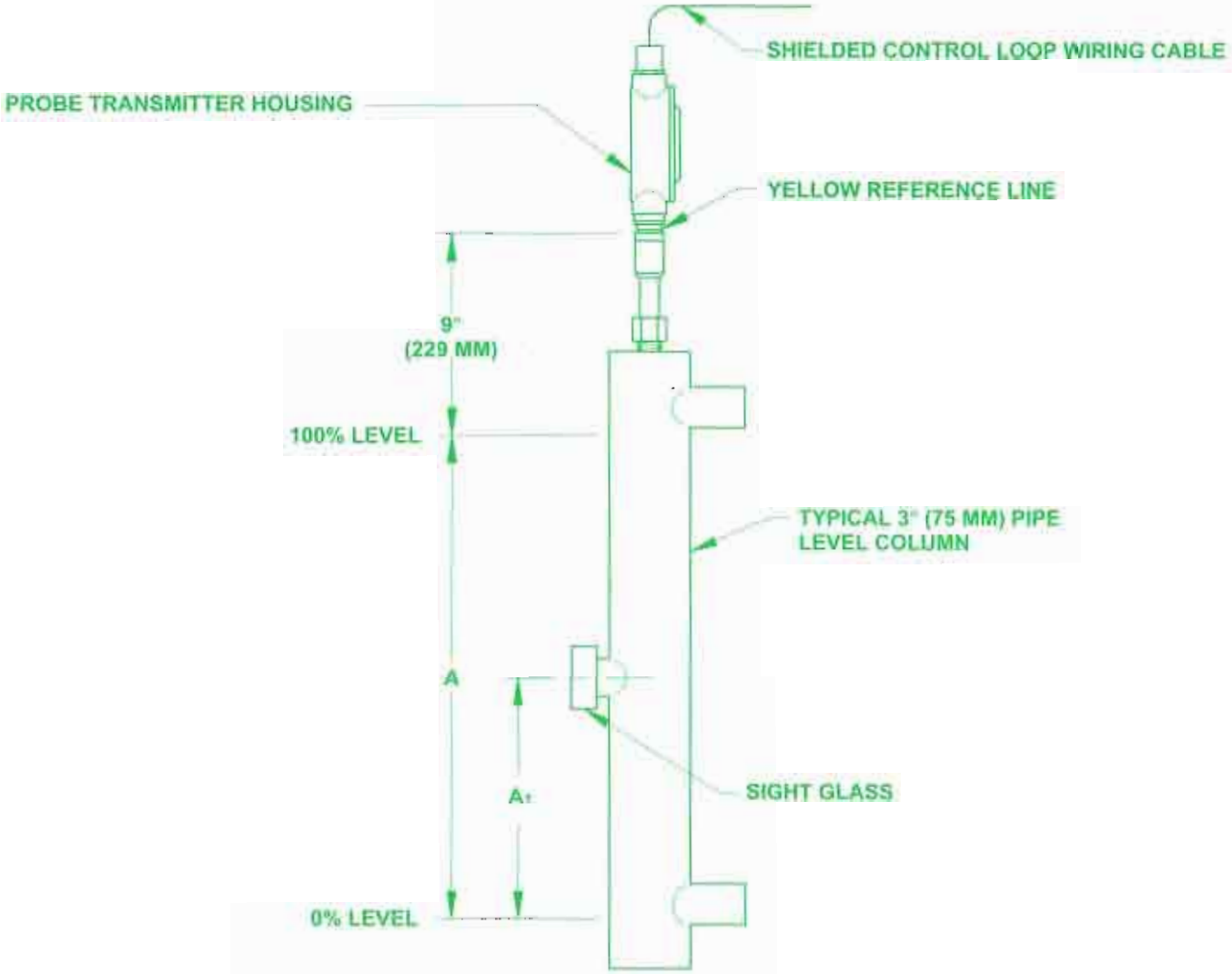
Techni-Level® level transducer probes are factory precalibrated for a 3" level column and the specified refrigerant. Probes installed in applications other than the specified may require slight adjustment in calibration settings. **Before** attempting to make any adjustment to calibration, review carefully the troubleshooting section on page 6, including the notes at the bottom of the page. Often, seemingly incorrect calibration is due to other factors.

To recalibrate probes without the optional digital readout (DR), a milliamp meter may need to be installed in series with the 4–20 mA control loop for the recalibration procedure. See the wiring diagram on page 3. **Disconnecting the control loop wire to install the meter temporarily disables the probe.** The computer or other controlling device will not be able to detect the refrigerant level while the control loop is disconnected. While disconnected, take the necessary steps to protect the compressor and all other equipment which relies on the probe signal.

Remove all liquid refrigerant from the level column or lower it to an actual level equal to 0%. Adjust the Z (zero) calibration screw slowly until the digital readout displays 0%. If using a milliamp meter, it should read 4 mA.

Next, raise the liquid level in the column to the 50% level. Hansen standard level columns have a sight glass at the 50% level. Adjust the S (span) calibration screw slowly until the digital readout displays 50% or the milliamp meter reads 12 mA. For other known levels, raise the liquid level in the column to the known level. See the diagram below to determine the % level of a sight glass. Then, adjust the S (span) calibration screw until the digital readout displays the known level % point or the milliamp meter displays the equivalent mA signal. Verify proper output.

NORMAL FACTORY-SET CALIBRATION LEVELS



Typical Normal 0% Level = 9" + Active Length (A) below yellow reference line

Sight Glass % Level = A_1 divided by Active Length (A)

CAUTION

Hansen **Techni-Level®** level transducer probes have been designed specifically for refrigeration systems. These instructions and related safety precautions must be completely read and understood before selecting, using, or servicing these probes. Only knowledgeable, trained refrigeration technicians should install, operate, or service these probes. Stated temperature and pressure limits should not be exceeded and all electronics should be protected from moisture. Do not remove probes from level columns or vessels unless the system has been evacuated to zero pressure. See also Safety Precautions in current the List Price Bulletin and the Safety Precaution Sheet supplied with the product. Escaping refrigerant can cause injury, especially to the 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. However, this should be understood as only a suggested replacement time period. Actual performance and physical condition of the electronics due to ambient conditions, quality of electrical current or voltage, etc., may necessitate a different replacement schedule. Regardless, probes should be inspected at least once a year to ensure safe and continuous service.

WARRANTY

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

ORDERING INFORMATION

Standard Active Probe Length*		Catalog Numbers	
		Transducer Probe	Standard Level Column
20"	(510 mm)	VLT.02	LC.02
30"	(760 mm)	VLT.03	LC.03
40"	(1015 mm)	VLT.04	LC.04
60"	(1525 mm)	VLT.06	LC.06
80"	(2030 mm)	VLT.08	LC.08
100"	(2540 mm)	VLT.10	LC.10
120"	(3050 mm)	VLT.12	LC.12
144"	(3660 mm)	VLT.14	**
168"	(4270 mm)	VLT.16	**

*Custom probe lengths up to 168" (4270 mm) maximum and custom column lengths up to 120" (3050 mm) maximum are available; contact the factory for details.
**Customer supplied, not available from Hansen.

To Order: Specify catalog number, refrigerant, probe active length, and whether the optional digital readout (DR) or a level column is desired. Where possible describe and sketch the application.

TYPICAL SPECIFICATIONS

"Refrigerant liquid level transducer probes shall have the ability to regulate a computer-compatible output signal proportional to the percentage of probe active length immersed in liquid refrigerant and shall not be affected by reasonable refrigerant temperature or pressure changes. Level transducers shall be **Techni-Level®** transducer probes as manufactured by Hansen Technologies or approved equal."

OTHER PRODUCTS

Pressure Regulators
Small Pressure Regulators and Reliefs
Gauge, Purge, and Needle Valves
Shut-Off Valves
Expansion Valves (HEV and TXV)
Refrigerant Solenoid Valves
Refrigerant Check Valves
Gas-Powered Valves
Refrigerant Float Switches
Float Drain Regulators
Refrigerant Liquid Pumps
AUTO-PURGER®s
Vari-Level® Adjustable Level Controls
Frost Master® Defrost Controllers
SEE-LEVEL™ Liquid Indicators (Sight Glass)
Pressure-Relief Valves
Rupture Disc Assemblies
Level Pulse Control Systems (LPS)

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