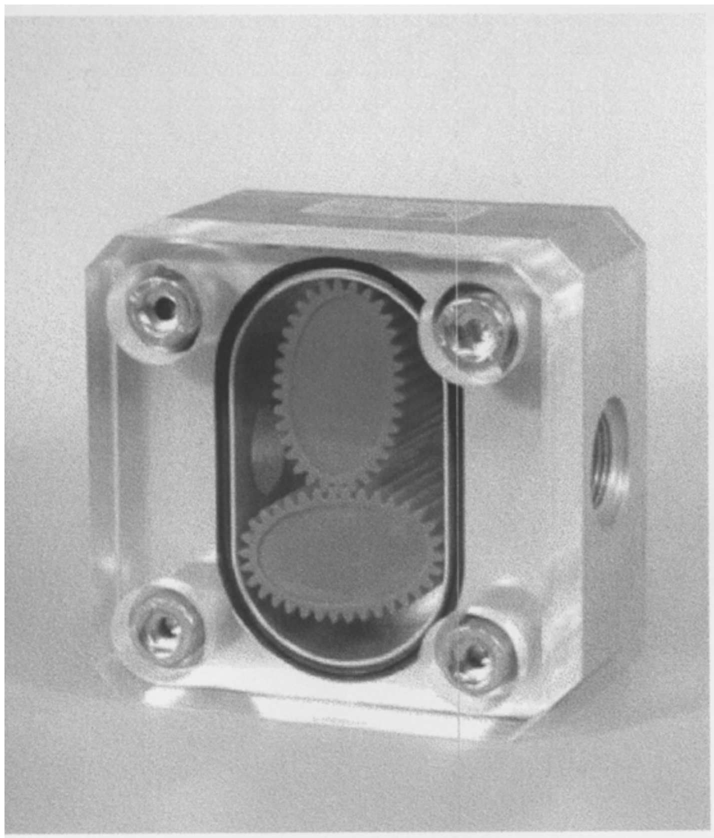
KOBOLD Series OVZ Oval Gear Flowmeter

User Instructions



KOBOLD Instruments Inc. 1801 Parkway View Drive Pittsburgh PA 15205

Phone (412) 788-2830 • Fax (412)-788-4890

OVZ_manual_10-17-03

Table Of Contents

List of Diagrams

List of Tables

CAUTION: For safety reasons, please read the cautionary information located at the end of the manual, before attempting installation.

1.0 General

The KOBOLD Series OVZ oval gear flow meters operate on the positive displacement principle. Liquid enters the meter inlet. Pockets formed by the oval gears and the meter cavity capture the liquid as it flows into the meter. The pockets of liquid force the oval gears to rotate as the liquid flows toward the meter outlet. Permanent magnets imbedded into the oval gears pass near a Hall Effect sensor as the oval gears rotate. As each magnet passes by the Hall Effect sensor, an output pulse is generated. This provides a meter output whose output frequency is directly proportional to flowrate. The OVZ operates over a wide viscosity range of 10 to 800 centistokes (cSt). The sensor output is available in either NPN open collector, PNP open collector or NAMUR.

2.0 Specifications

Accuracy:	2.5% of Full Scale
Turn Down:	10:1
Viscosity Range:	10 to 800 cSt
Filtration Requirements:	30 Micron filter recommended
Operating Temp. Range:	32 to 175°F
Maximum Pressure Limits:	
Differential Pressure:	14.5 PSI
Static Pressure:	
Material I:	145 PSIG
Material II:	145 PSIG
Material III:	230 PSIG
Material IV:	230 PSIG
Material V:	580 PSIG

Electrical Specifications:

Power Requirements:	
NPN Hall Effect:	5-20 VDC @ 15 mA Max.
PNP Inductive:	18-30 VDC @ 120 mA Max.
NAMUR:	8.2 VDC @ 3.5 mA Max.
Electrical Protection:	NEMA 4

Table 2.1 Material Combination Descriptions

Wetted Parts	Material I	Material II	Material III	Material IV	Material V
Housing	Delrin®	Delrin®	Aluminum	Aluminum	Aluminum
Housing Cover	Delrin®	Plexiglass	Plexiglass	Polysulfone	Aluminum
Gears	Delrin®	Delrin®	Delrin®	Delrin®	Delrin®
Axle	SS	SS	SS	SS	SS
O-Ring	Buna-N*	Buna-N*	Buna-N*	Buna-N*	Buna-N*
Max. Pressure	145 PSIG	145 PSIG	230 PSIG	230 PSIG	580 PSIG
Max. Temperature	175°F	175°F	175°F	175°F	230°F

* The standard O-ring on all models is Buna-N. Optionally viton is available.

Table 2.2 Part Number Decoding

OVZ = Oval Gear Flowmeter

Maximum Flowrate

- **-02** = 2.1 GPM (8 L/Min.)
- **-04** = 2.6 GPM (10 L/Min.)
- **-15** = 6.6 GPM (25 L/Min.)
- **-30** = 10.6 GPM (40 L/Min.)

Body Materials

- **1** = Delrin® body with Delrin® cover
- **2** = Delrin® body with plexiglass cover
- **3** = Aluminum body with plexiglass cover
- **4** = Aluminum body with polysulfone cover
- **5** = Aluminum body with aluminum cover

Sensor Style

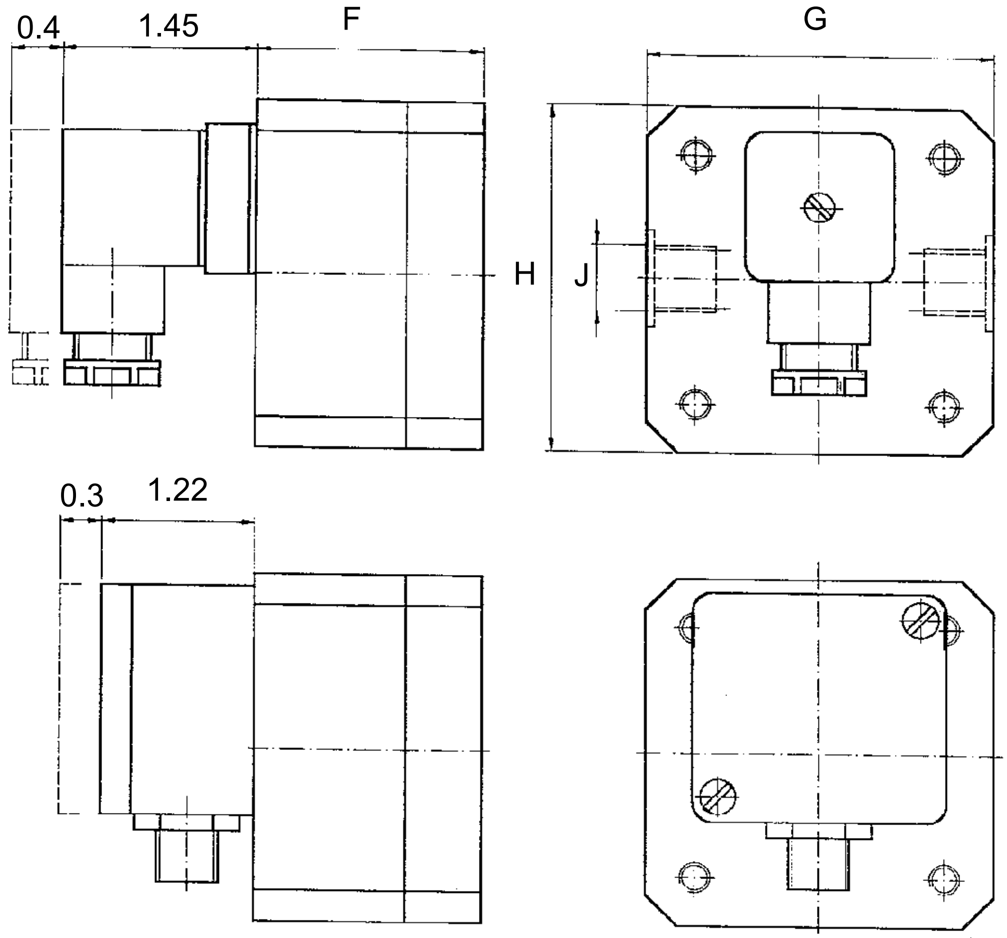
- **01** = NPN Hall Sensor with Hirschman connector
- **02** = NPN Hall Sensor with terminal box and cable gland
- **03** = NPN Hall Sensor with round plug and M12X1 socket
- **04** = PNP Inductive Sensor with 6 foot pigtail
- **05** = NAMUR Inductive Sensor with 6 foot pigtail

Process Connections

- **N** = NPT Threaded connections
- **R** = BSP Threaded Connections

OVZ -04 2 01 N **Sample OVZ Specification**

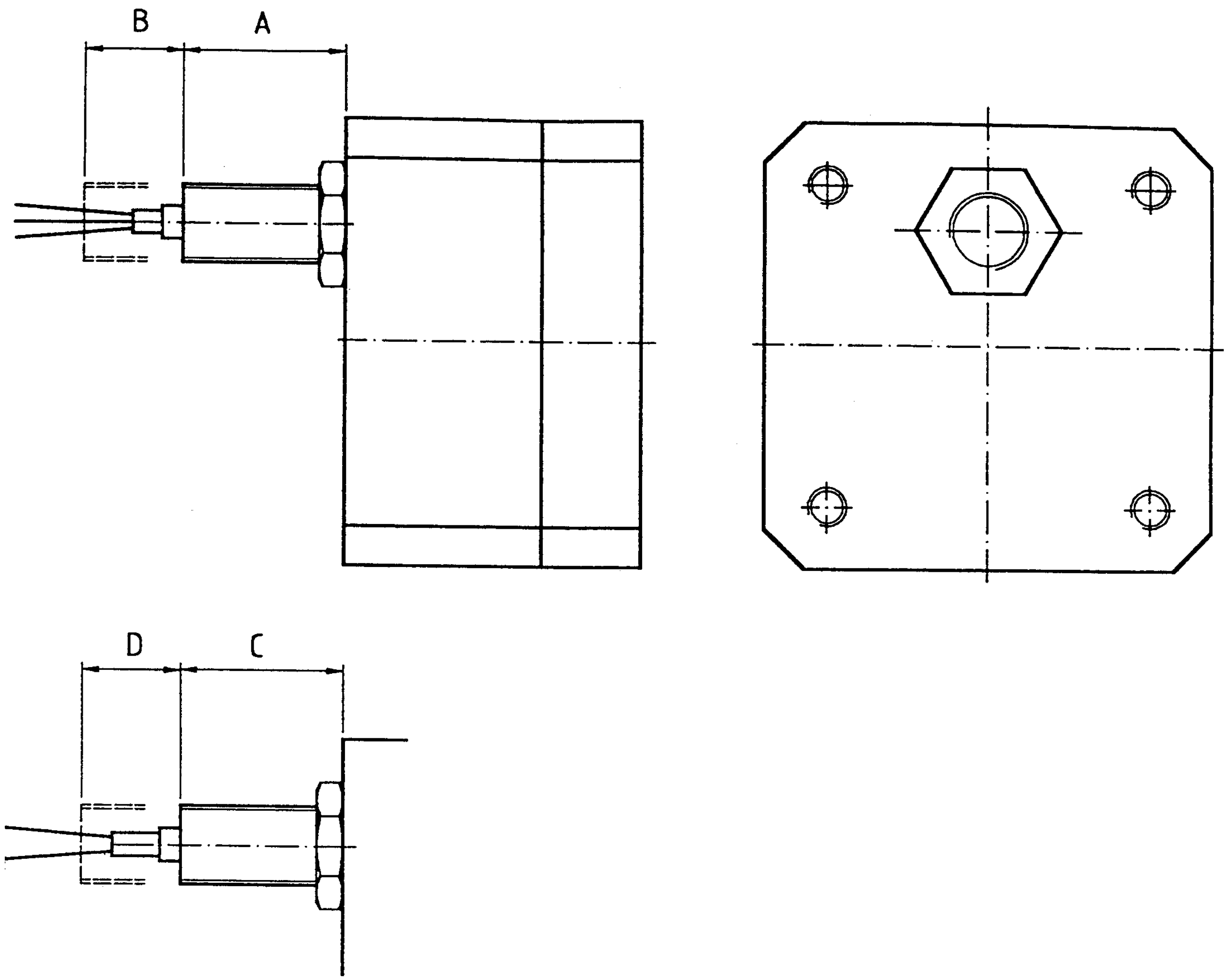
Diagram 2.1 Dimensions for Units with Junction Box or Hirschman Plugs



	G (Inches)	**H** (Inches)	**F** (Inches)				**J**
			I	II	III/IV	V	
OVZ-02	2.68	2.68	1.77	1.77	1.70	1.61	1/4" NPT/BSP
OVZ-04	2.68	2.68	1.93	1.93	1.85	1.75	1/4" NPT/BSP
OVZ-15	3.90	3.90	2.80	2.87	2.80	2.60	1/2" NPT/BSP
OVZ-30	4.69	4.69	3.33	3.44	3.39	3.13	3/4" NPT/BSP

Diagram 2.2 Proximity Sensor Dimensions

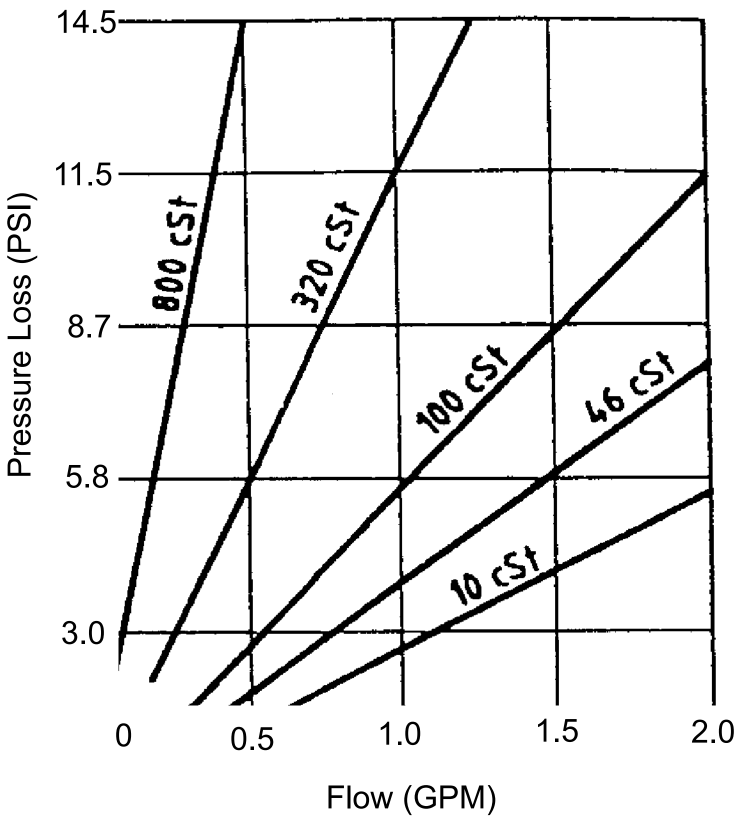
All sensor housing dimensions of Diagram 2.2 apply to units with proximity sensors



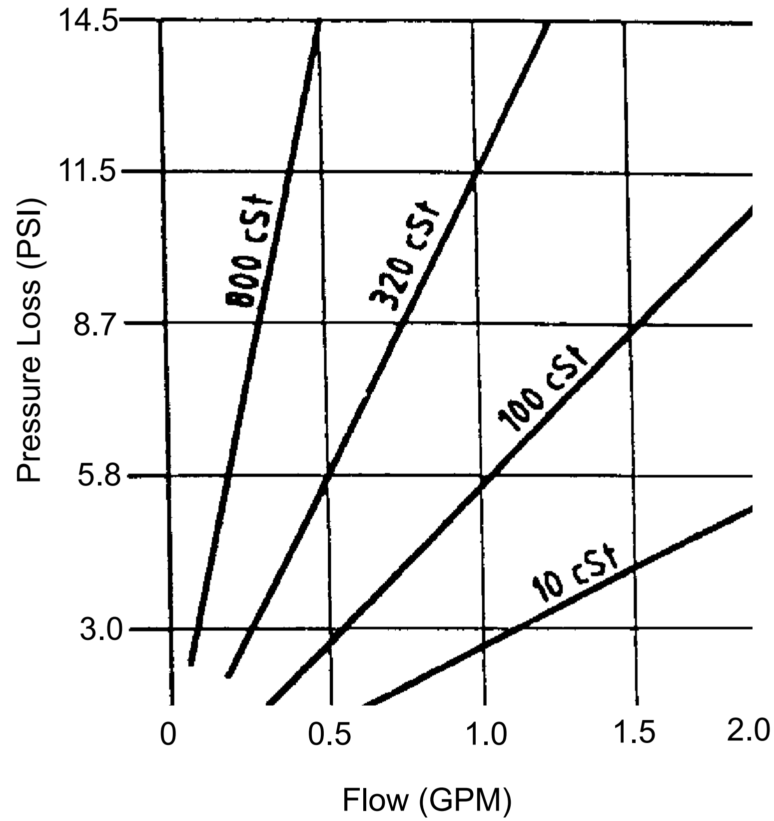
	PNP		NAMUR	
	A (inches)	B (inches)	C (inches)	D (inches)
OVZ-02	0.85	0.54	0.65	0.53
OVZ-04	0.83	0.55	0.63	0.55
OVZ-15	0.75	0.63	0.55	0.63
OVZ-40	0.67	0.71	0.47	0.71

Diagram 2.3 Head Loss vs. Flowrate for OVZ-02

Material Combinations I and II



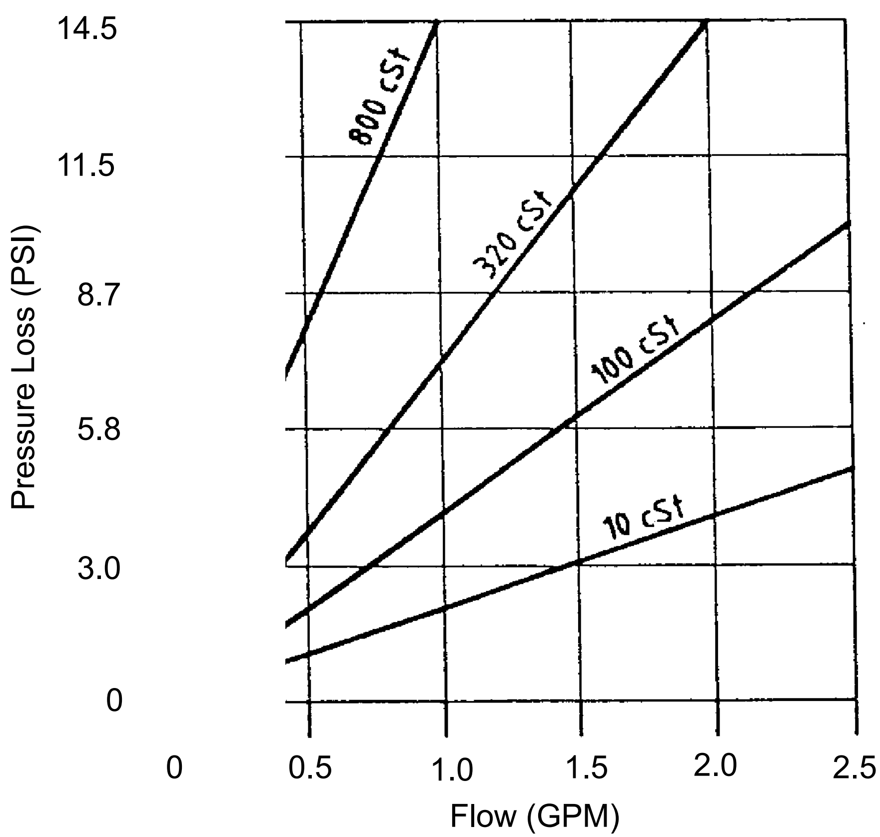
Material Combinations III, IV and V



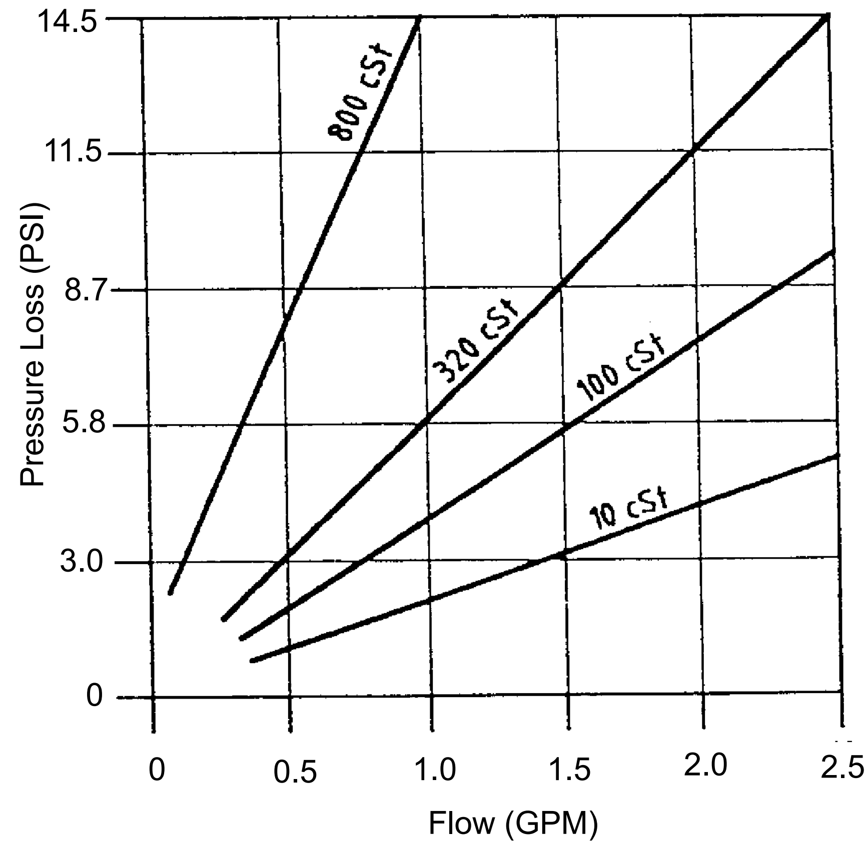
***Note: Meter pressure loss cannot exceed 14.5 PSIG**

Diagram 2.4 Head Loss vs. Flowrate for OVZ-04

Material Combinations I and II



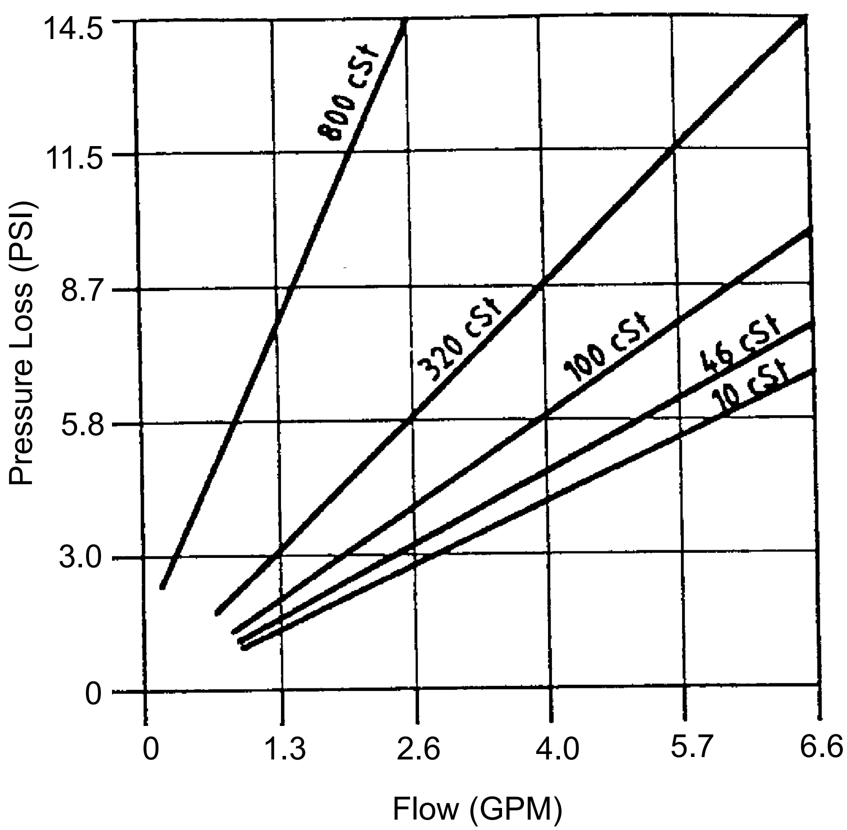
Material Combinations III, IV and V



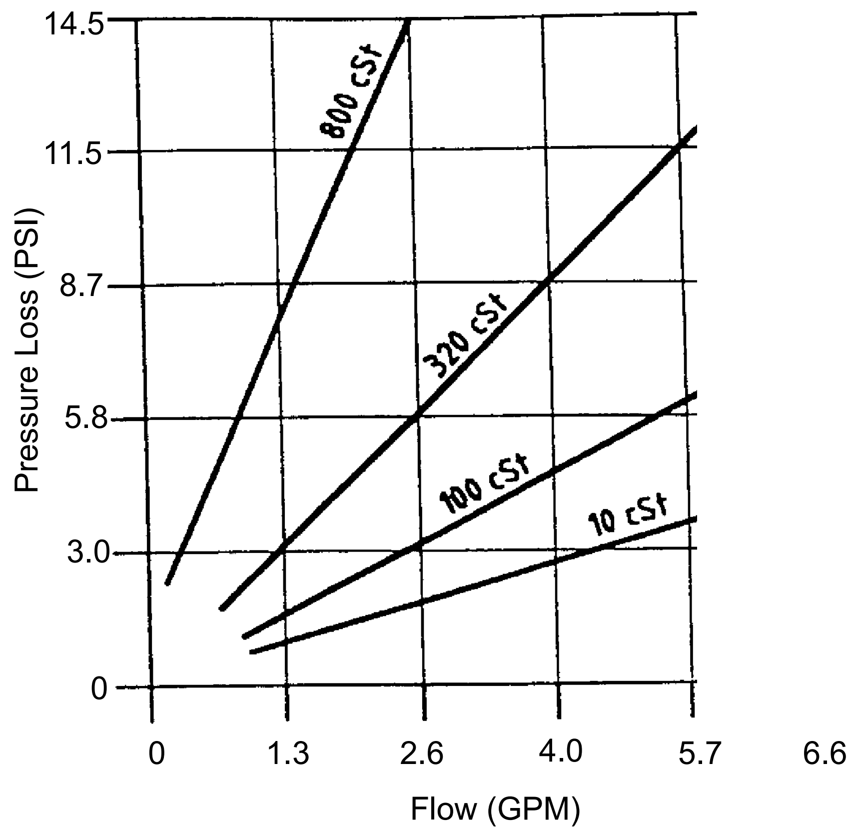
***Note: Meter pressure loss cannot exceed 14.5 PSIG**

Diagram 2.5 Head Loss vs. Flowrate for OVZ-15

Material Combinations I and II



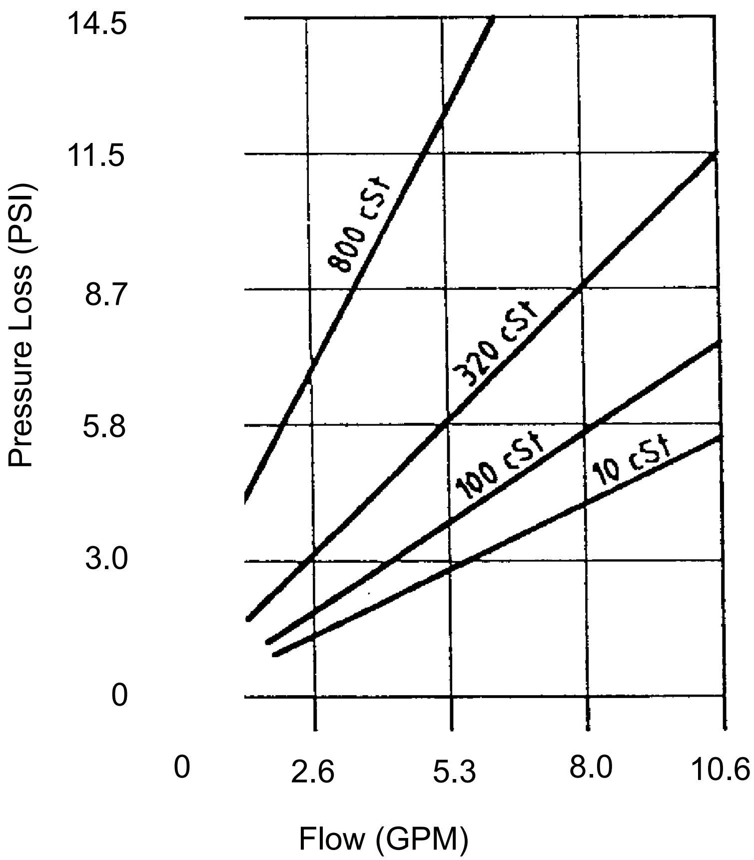
Material Combinations III, IV and V



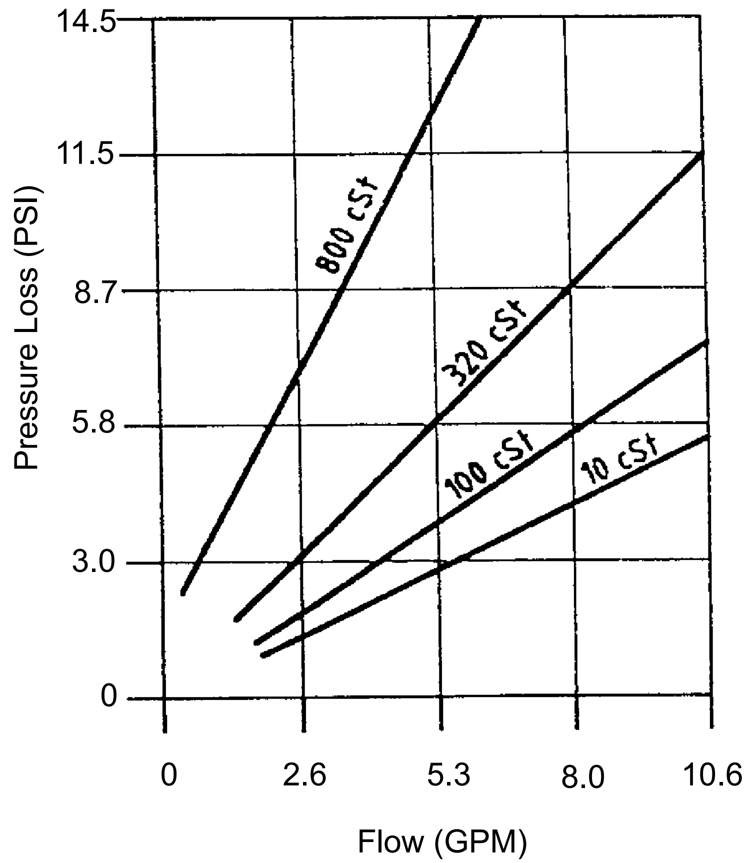
***Note: Meter pressure loss cannot exceed 14.5 PSIG**

Diagram 2.6 Head Loss vs. Flowrate for OVZ-30

Material Combinations I and II



Material Combinations III, IV and V



***Note: Meter pressure loss cannot exceed 14.5 PSIG**

Table 2.3 K-factors

	K-factor (pulses/gal.)		Max. Frequency in Hz. (Note 1)	
	Material I, II	Material III, IV, V	Material I, II	Material III, IV, V
OVZ-02	1512	1512	53.3	54.8
OVZ-04	851	786	37.4	34.7
OVZ-15	198	198	21.8	20.8
OVZ-30	106	106	18.4	18.4

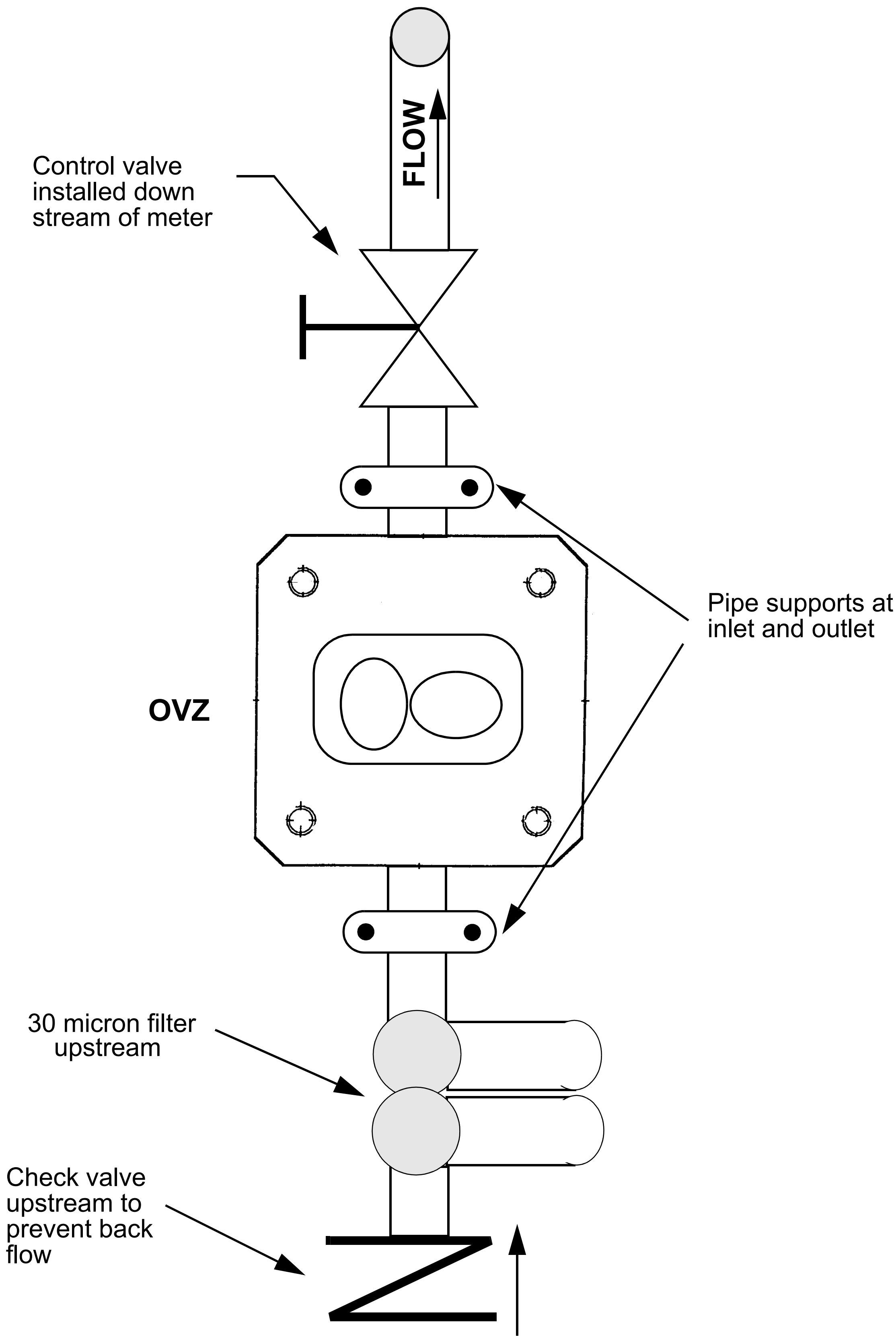
Note 1: The maximum output frequencies provided are based on the absolute maximum flow capability of the meter for a low viscosity fluid. The maximum flow capable with higher viscosity liquids will be limited to that which will keep the meter differential pressure below 14.5 PSI. See Section 5.1 on page 13.

3.0 Mechanical Installation

The following precautions must be adhered to when installing this flow sensor into the mechanical system. Failure to do so may result in meter damage:

1. The mounting position does not significantly affect the flowmeter. However, the normal mounting position is vertical with flow upward through the sensor. This ensures that the meter stays full thereby optimizing accuracy. The flow can be downward through a vertically oriented meter as long as the back-pressure is sufficient to keep the meter full of liquid. Installation in a horizontal piping run is also acceptable as long as the back-pressure is sufficient to keep the meter full.
2. The OVZ is bi-directional. It has no specific inlet or outlet port and flow can pass through the meter in either direction.
3. In order to prevent damage caused by the weight of the piping and process liquid, the piping must be rigidly supported at the meter inlet and outlet. Ensure that the piping is properly aligned to prevent torsional stress at the sensor fittings.
4. In order to prevent damage to the sensor caused by water hammer, the sensor should be kept filled with liquid at all times. To achieve this, locate shut off and control valves down stream of the sensor. If fluid can back-flow out of the sensor when the system is shut down, a check valve should be installed upstream of the sensor.
5. The maximum particle size that the OVZ can pass is 30 micron. If the liquid to be metered contains solids it is recommended that a filter capable of filtering down to 30 micron be installed upstream of the sensor.

Diagram 3.1 Recommended OVZ Installation

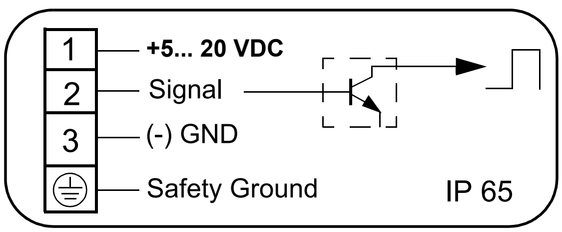


4.0 Electrical Connections

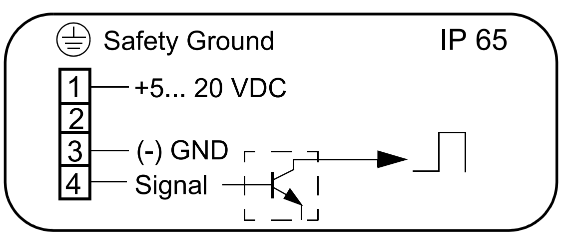
Diagram 4.1 Hall Effect Sensor Wiring

The Hall Effect sensor used with the OVZ employs an NPN open collector output. If this sensor is to be used to generate a pulse output, a user-supplied pullup resistor must be connected between the supply and signal output. This resistor should be sized such that the collector to emitter current is nominally 5 mA during the transistor “on” state. Under no circumstances should the collector to emitter current exceed 10 mA. The value of the pullup resistor is typically between 2 K and 10 K ohms, depending upon the supply voltage. See the wiring example below.

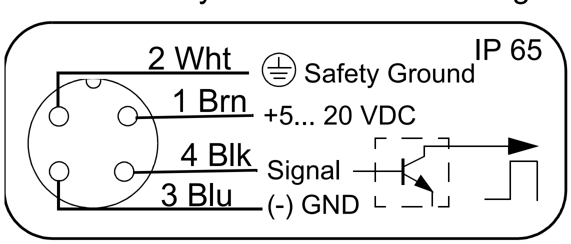
Hirschman Connector



Aluminum Junction Box



M-12 Style Connector and Plug



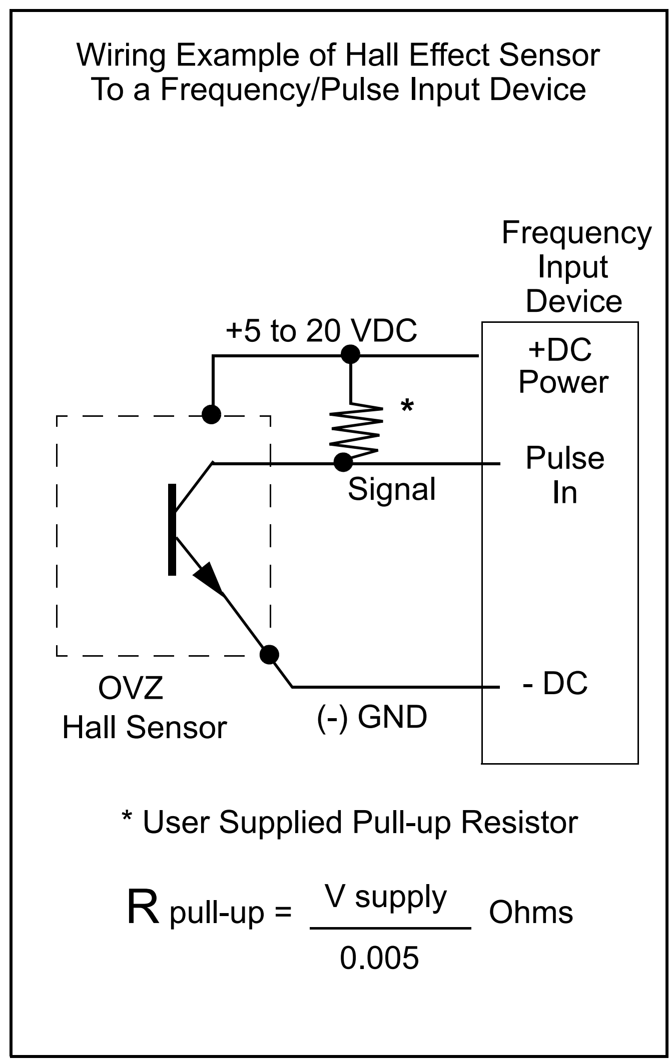


Diagram 4.2 Proximity Sensor Wiring (PNP Output)

18-30 VDC		
(+) V	—	Brown
(-) GND	—	Blue
Signal	—	Black

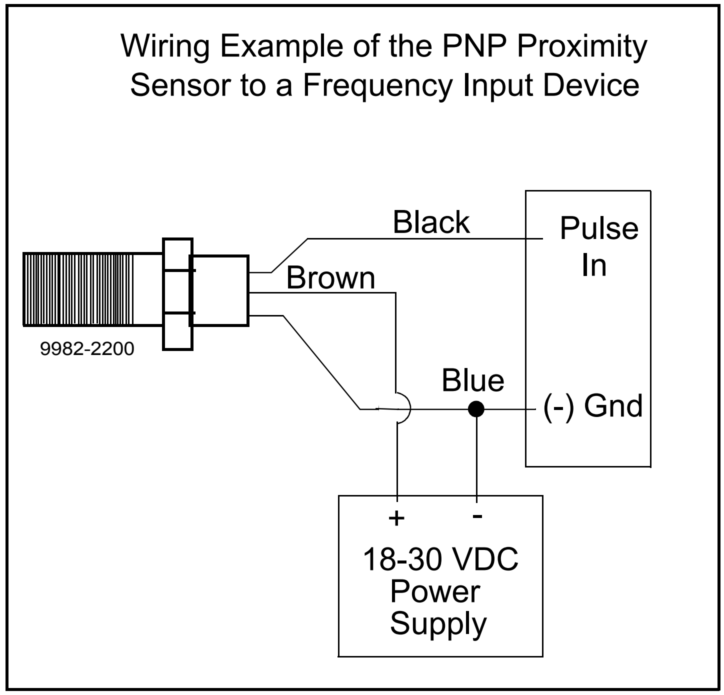
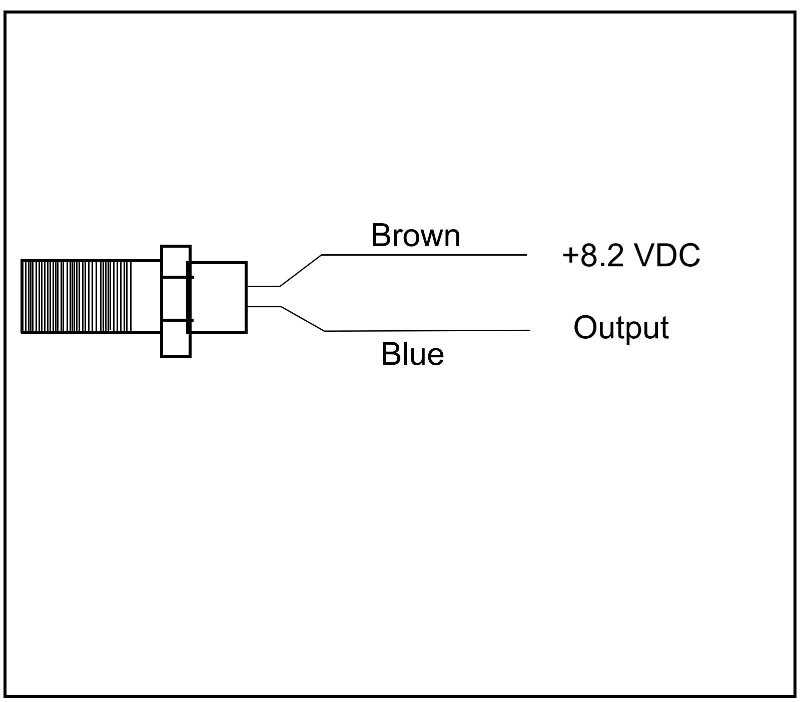


Diagram 4.3 NAMUR Sensor Wiring



5.0 Operation

5.1 Operating the OVZ within its Differential Pressure Limits

The Series OVZ has a maximum meter differential pressure limitation of 14.5 PSI. Operation with a meter differential pressure above 14.5 PSI will result in reduced axle and gear life. As flowrate through the meter increases, meter differential pressure increases as well. Also, for a constant flowrate, meter differential pressure will increase as viscosity increases. Both the desired operating flowrate and fluid viscosity must be considered when determining what the meter differential pressure will be. In some cases, for more viscous fluids, flowrate may have to be limited to ensure that the meter differential pressure limit is not exceeded. Diagrams 2.2 through 2.6 (pages 5 through 8) provide differential pressure versus flowrate for various fluid viscosities. These plots should be used to determine the maximum fluid flowrate the meter can pass while keeping the meter differential pressure below the 14.5 psi limit.

Example 5.1:

An OVZ-30 in material combination III is to be used to meter a fluid whose viscosity is 100 cSt. The desired flowrate is 8 GPM. Referring to Diagram 2.6 for material combination III the meter differential pressure will be approximately 5.8 PSI. This being below the 14.5 PSI limit, is acceptable.

Example 5.2:

The same OVZ-30 is to be used with a 700 cSt. fluid. Again referring to Diagram 2.6, The maximum flowrate that the meter can pass while keeping meter differential pressure below the 14.5 PSI limit is approximately 7 GPM. Therefore operating above 7 GPM risks damaging the meter.

6.0 Maintenance

If installed and operated properly, the OVZ requires no routine maintenance or recalibration. The only wear parts are the gears and axles. These parts are easily replaced by simply removing the front cover to access the meter internals. Easy access to the meter internals also makes cleaning the meter simple. The OVZ does not require recalibration after gear replacement.

7.0 Arrival of Damaged Equipment

Your instrument was inspected prior to shipment and found to be defect-free. If damage is visible on the unit, we advise that you carefully inspect the packing in which it was delivered. If damage is visible, notify your local carrier at once. The carrier is liable for a replacement under these circumstances. If your claim is refused, please contact KOBOLD Instruments.

CAUTION

PLEASE READ THE FOLLOWING WARNINGS BEFORE ATTEMPTING INSTALLATION OF YOUR NEW DEVICE. FAILURE TO HEED THE INFORMATION HEREIN MAY RESULT IN EQUIPMENT FAILURE AND POSSIBLE SUBSEQUENT PERSONAL INJURY.

- **User's Responsibility for Safety:** KOBOLD manufactures a wide range of process sensors and technologies. While each of these technologies are designed to operate in a wide variety of applications, it is the user's responsibility to select a technology that is appropriate for the application, to install it properly, to perform tests of the installed system, and to maintain all components. The failure to do so could result in property damage or serious injury.
- **Proper Installation and Handling:** Use a proper thread sealant with all installations. Take care not to overtighten the inlet and outlet fittings. Ensure that piping at the inlet and outlet is properly supported. Always check for leaks prior to system start-up.
- **Wiring and Electrical:** Section 2.0, Specifications and Section 4.0, Electrical Connections, provide the voltage and current limitations and the wiring for the various sensor types. The sensor electrical ratings should never be exceeded. Electrical wiring of the sensor should be performed in accordance with all applicable national, state and local codes.
- **Temperature and Pressure:** Table 2.1, Material Combination Descriptions, provides the temperature and pressure limits for each material combination. Operation outside these limitations will cause damage to the unit and can potentially cause personal injury. Fluid should never be allowed to freeze inside the meter.
- **Material Compatibility:** Table 2.1, Material Combination Descriptions, provides the materials of construction for all models. Make sure that the model which you have selected is chemically compatible with the application liquids. While the meter is liquid and spray resistant when installed properly, it is not designed to be immersed.
- **Flammable, Explosive and Hazardous Applications:** The NAMUR proximity sensor is the only sensor which is designed for installation in hazardous locations. Use of the NAMUR sensor in hazardous areas requires installation with an appropriate intrinsic safety barrier. These type of installations require special wiring procedures and should be left to properly trained and certified electricians.
- **Make a Fail-safe System:** Design a fail-safe system that accommodates the possibility of transmitter or power failure. In critical applications, KOBOLD recommends the use of redundant backup systems and alarms in addition to the primary system.