

# NBK BYPASS LEVEL GAUGES



Flow  
Pressure  
Level  
Temperature  
measurement  
monitoring  
control



- **KOBOLD Circular Magnet System Effective from All Sides**
- **1450 PSIG Maximum Pressure**
- **Temperature to 750°F**
- **Remote Transmission Capability**
- **Limit Switches Available**
- **Industrial Ruggedness**

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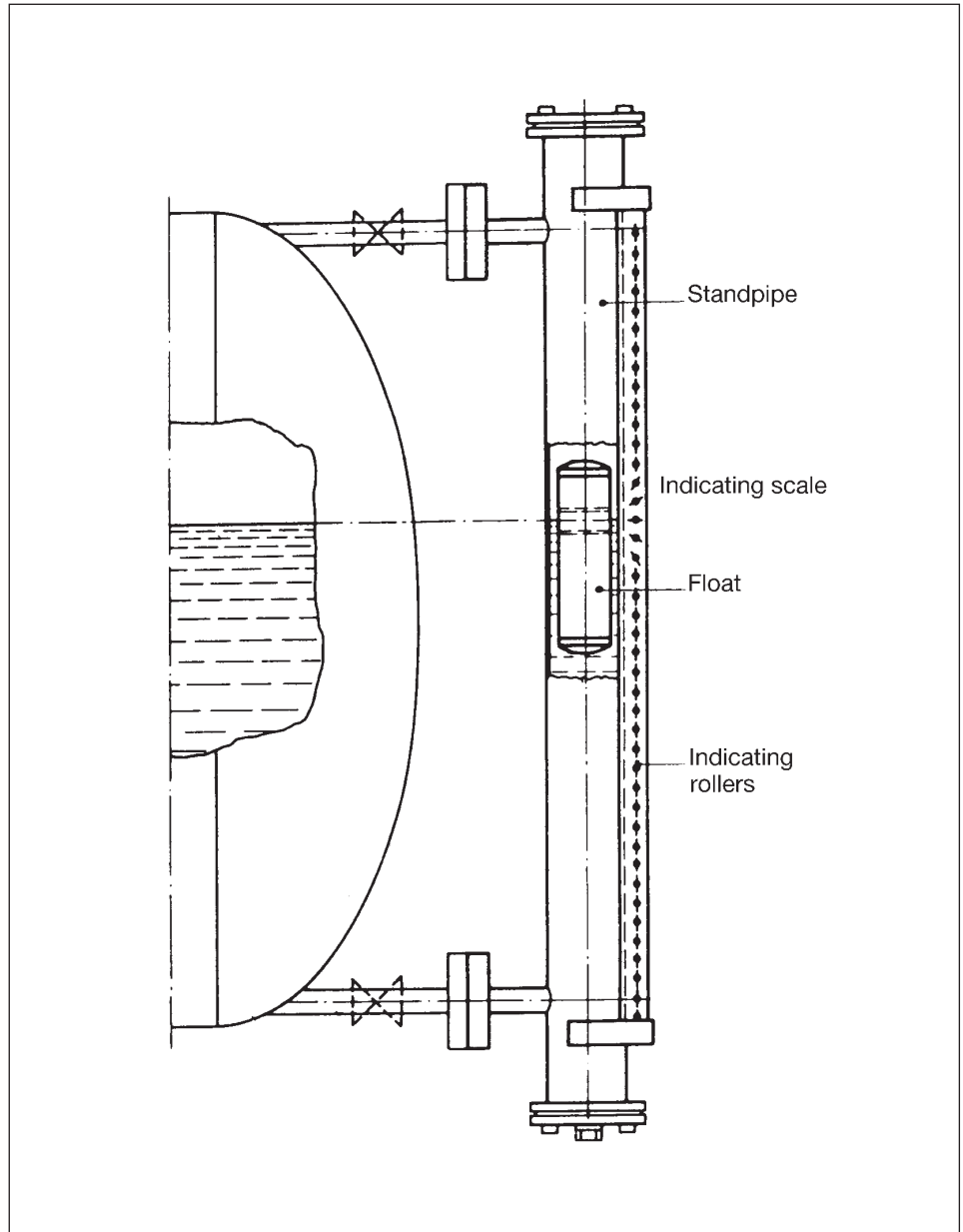
Model:  
NBK

KOBOLD bypass level gauges are used in applications requiring continuous measurement, indication and control of liquid levels. Any medium with viscosity less than 200 cPs is a candidate.

KOBOLD's bypass design relies on the hydrostatic pressure principle to display tank level in a side mounted measuring chamber. A float, containing a ring magnet, rises and falls with the liquid level in the bypass tube. This approach allows an all metal construction which eliminates the breakage and leakage problems frequently experienced with glass tube designs. Transmission, visual indication, or switching may be achieved by mounting magnetically sensitive devices on the exterior of the bypass tube. These devices track, or are activated by, the magnet inside the float.

The following devices are available with KOBOLD's bypass level gauges:

- **Magnetic Indicators:** An assembly of rollers may be mounted on the side of the gauge body. These rollers contain small bar magnets and are free to rotate about their axes. Passage of the level following float causes them to be rotated 180°. Since the indicators are white on one side, and red on the other, the location of the gauge's internal float, and liquid level, is clearly shown by the red to white transition area of the indicator assembly.
- **Level Transducer:** If data transmission is required, a signal can be generated with the aid of a resistive reed contact chain mounted on the outside of the bypass pipe. Using a separately mounted control element, a continuous 0-20 mA, 4-20 mA or 0-10 VDC signal is produced. Additionally, an integrally mounted 4-20 mA transmitter is available.
- **Switches:** Reed contacts may be mounted on the bypass pipe to monitor or control liquid levels. The magnet inside the float serves as the switch actuator.

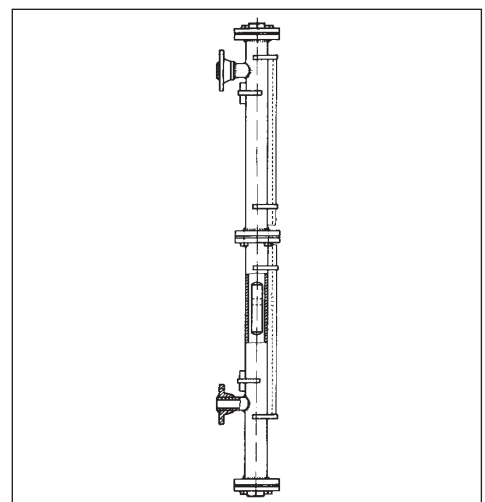


**Bypass Pipe**

The bypass pipe (sometimes called the standpipe) is constructed of 316-Ti stainless steel. Depending on local conditions, the bypass pipe will be connected to the side of the tank with either flanges or NPT fittings.

Individual bypass gauges are available in single unit lengths to 19.7 feet (6 meters.) Longer versions are possible by delivering the gauge in two or more sections.

**Max. Pressure:** 1450 PSIG  
**Temperature Range:** - 58 °F to + 750 °F  
 (- 50 °C to + 400 °C)



**Cylindrical Floats**

The unique float design developed for the KOBOLD NBK series is the key to this level indicating system's versatility. The float contains a permanent magnet which is specially designed to project a uniform magnetic field 360° around the float. This means that the magnetic roller indicators, switches and analog transducers can be placed anywhere on the periphery of the bypass pipe.

For the NBK-0300 series and NBK-0600 series, the standard floats are made of 316-Ti stainless steel. Optional floats are available in titanium for low specific gravity liquids. All floats for the high pressure NBK-0700 and NBK-1000 series are made of titanium.

**Stainless Steel Floats**

The standard floats for the NBK-0300 and NBK-0600 series are made of 316-Ti stainless steel and used with liquid specific gravities down to 0.8. They are hermetically sealed and completely liquid and gas tight.

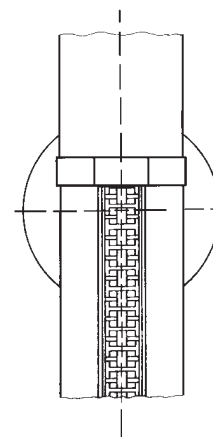
**Titanium Floats**

An optional titanium float is available for NBK-0300 and NBK-0600 series to be used with liquids which have a specific gravity lower than 0.8. The titanium float can be used with liquid specific gravities between 0.54 and 0.79. Titanium floats are standard for the high pressure NBK-0700 and NBK-1000 series and can be used with liquid specific gravities above 0.54.

**Magnetic Indicators**

For local level indications, a magnetic roller indicator can be mounted on the bypass pipe. As the float rises past the indicator assembly, its ring shaped magnetic field rotates the individual indicator elements from their white, to their red sides. The large contrast produced by use of these two colors allows easy reading of the level even from a distance.

The standard polypropylene rollers may be used with media temperatures to 212°F. For applications to 750°F, ceramic roller assemblies are used. The entire assembly is highly resistant to vibration due to the stabilizing effect of the individual magnets in each indicator element. This makes the KOBOLD bypass gauge a good choice for a wide variety of level indicating applications.



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Float Type	Maximum Pressure	Diameter (inches)	Length (inches)	Minimum Liquid Specific Gravity
Standard Stainless Steel for NBK-03 & NBK-06	580 PSIG	2.05	10.67	0.8
Low Specific Gravity Titanium Float for NBK-03, Option-T3	230 PSIG	2.05	11.81	0.54
Standard Titanium Float for NBK-07	930 PSIG	2.05	8.85	0.8
Low Specific Gravity Titanium Float for NBK-06 & NBK-07, Option-T7	930 PSIG	2.05	18.50	0.54
Standard Titanium Float for NBK-10	1450 PSIG	2.05	12.80	0.8
Low Specific Gravity Titanium Float for NBK-10, Option-T10	1450 PSIG	2.05	28.35	0.54

**Transducer**

Level transmission can be provided in addition to, or in place of, visual local indication. This is done by locating a reed chain transducer outside the bypass pipe (NBK Option W or WHT).

The transducer is located inside a stainless steel tube which is clamped to the bypass pipe. It is composed of a series of reed switches connected by resistors. As the float in the bypass tube moves, reed contacts near its location are closed, altering the resistance seen on the chain's terminals. This system allows continuous level measurement in 0.4" (10 mm) increments.

A separate electronics module converts the resistance to a current, voltage, or relay output. The three-wire bridge resistance design of the transducer allows separation of the electronics and the transducer by distances exceeding one mile. See the DFM, DST or DFA series for details.

Additionally, an integrally mounted, 2-wire 4-20 mA transmitter can be provided in lieu of the external controllers (NBK Option RT).

<b>Construction:</b>	316-Ti SS
<b>Resolution:</b>	0.4" (10 mm)
<b>Wiring:</b>	3-wire, any length
<b>Terminal Box:</b>	Aluminum 64×58×35 mm NEMA 4

**Remote Level Indication**

For operation of the remote level transducer, one of the following Indicators/Controllers can be used.

- **Model DFM**  
**Output:** 0(4)-20 mA, 0-5 or 0-10 VDC
- **Model DST**  
**Output:** 0(4)-20 mA, 0-5 or 0-10 VDC  
Two adjustable limit switches
- **Model DFA**  
**Output:** 0(4)-20 mA, 0-5 or 0-10 VDC  
**Analog Indicator:** 0-100 %  
Two adjustable limit switches

**Limit Switches**

Bistable limit switches may be clamped to the exterior of the bypass pipe to provide alarm functions. These switches are SPDT reed switches, so they can be wired in either normally-open or normally-closed configurations.

The switches work as follows: As the float passes the reed switch, its magnet actuates the reed switch. The switch remains actuated until the float returns and passes it a second time (traveling in the reverse direction as previously.)

As many switches as desired may be used. Switches may be placed anywhere on the exterior of the bypass tube. The minimum distance between switches is approximately 1 inch.

<b>Switch:</b>	SPDT, bistable 220 VAC max. 0.5 A max. 60 VA max. 0.6"
<b>Hysteresis:</b>	0.6"

<b>Housing</b>	
<b>Switch R:</b>	Nylon
<b>Switch RH &amp; RHH:</b>	Aluminum

<b>Environment</b>	
<b>Max. Temperature:</b>	up to 750 °F
<b>Protection:</b>	NEMA 4X/IP65
<b>Max. Temperature:</b>	
<b>Switch R:</b>	250°F
<b>Switch RH:</b>	392°F
<b>Switch RHH:</b>	750°F

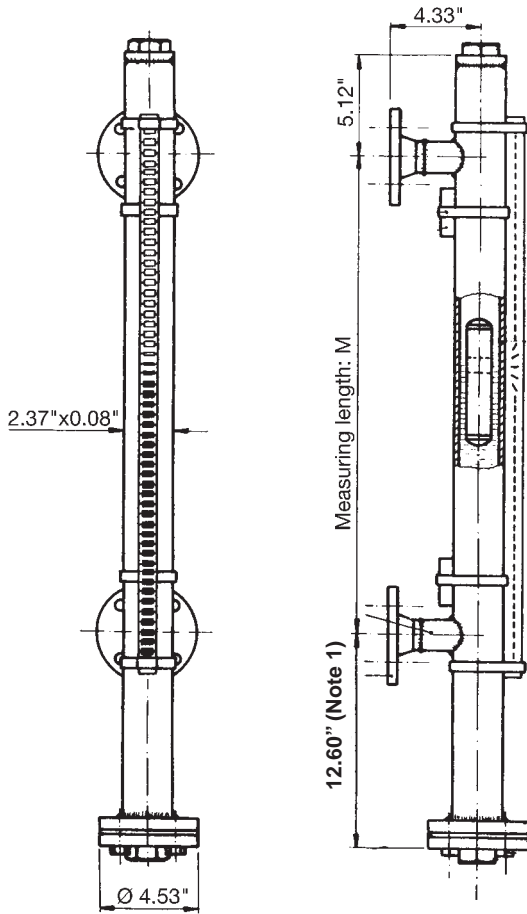
**Hazardous Zone Protection**

All metal Kobold bypass level indicators are suitable for application in hazardous areas. To operate the level transducer or the limit switches in a hazardous area, intrinsically safe barriers must be used.

If unsure of your requirements, call your KOBOLD representative.

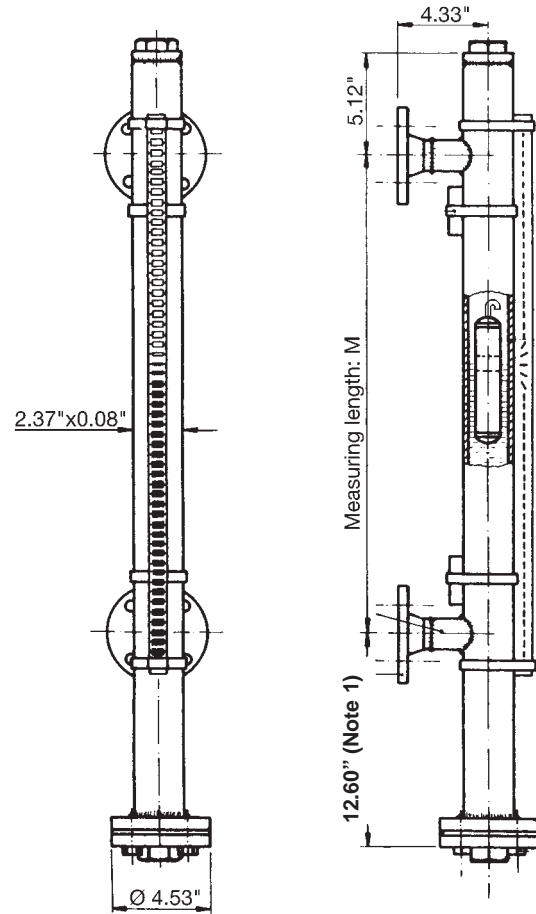


Note 1: Dimension is for specific gravity = 1.0.  
Floats for lighter liquids can increase this dimension.



**NBK-0300**

Note 1: Dimension is for specific gravity = 1.0.  
Floats for lighter liquids can increase this dimension.



**NBK-0600**

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**Technical Data**

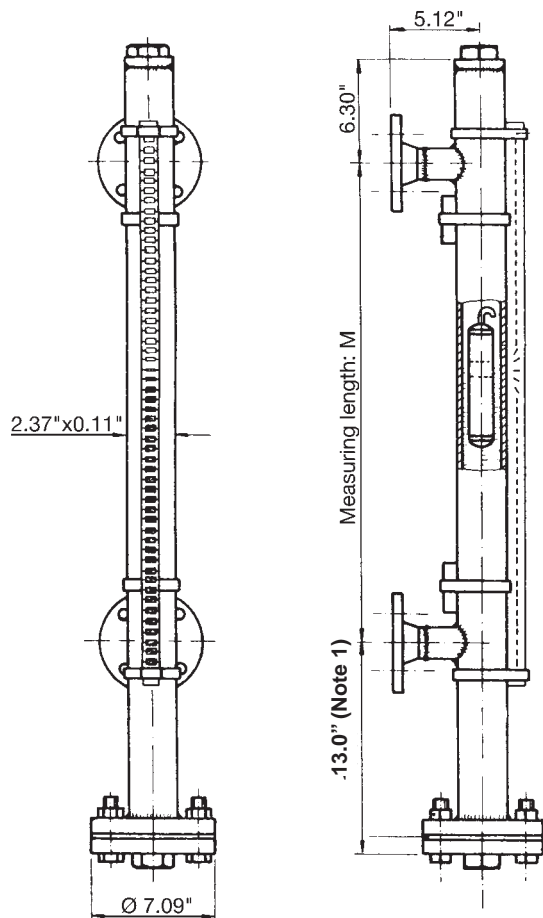
**Bypass Pipe:** 316-Ti SS,  
**Gasket:** PTFE  
**Fittings:**  
**Flanges:**  
 NBK-0300: 150LB ANSI, 316 SS  
 NBK-0600: 300LB ANSI, 316 SS  
**Threads:** NPT Male  
**Length**  
**Single Section:** 19.7 feet max.  
**Multiple Sections:** As desired

**Maximum Pressure**  
 NBK-0300  
 NPT Threaded: 230 PSIG  
 Flanged: Per ANSI B16.5 for class 150 to 230 PSIG Max.

**Maximum Pressure (continued)...**  
 NBK-0600  
 NPT Threaded: 580 PSIG  
 Flanged: Per ANSI B16.5 for class 300 to 580 PSIG Max.  
**Allowable Media Temperature**  
**Standard:** - 58 °F to + 750 °F  
**With Options...**  
**Ri:** - 58 °F to + 250°F  
**RHi:** - 58 °F to + 392°F  
**RHHi:** - 58 °F to + 750°F  
**RP:** - 58 °F to + 212°F  
**RK:** - 50 °F to + 750°F  
**W:** - 58 °F to + 390°F  
**WHT:** - 58 °F to + 750°F

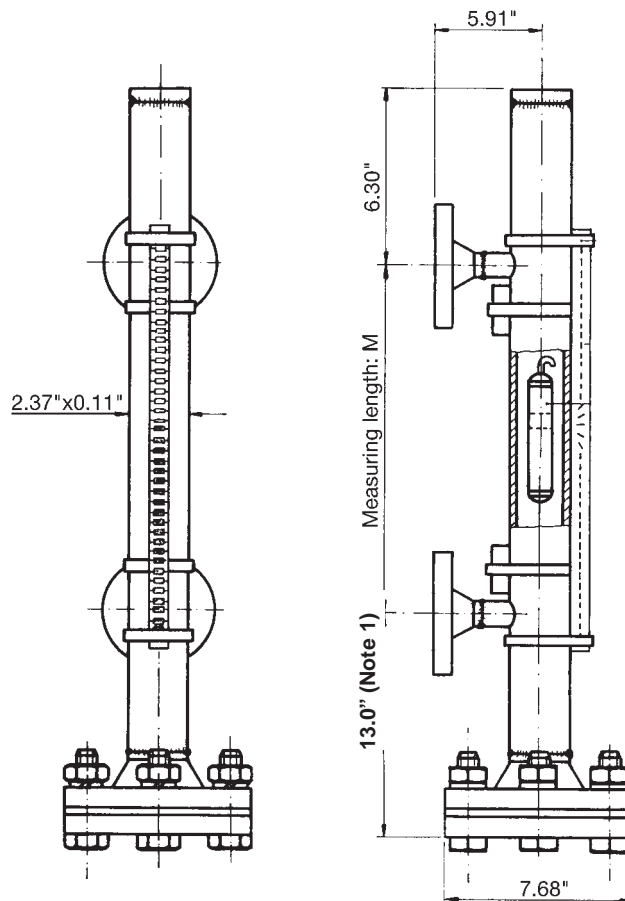
**Cylindrical Float**  
**Material:** 316-Ti stainless steel or titanium see Table 1 for float material and dimensions

Note 1: Dimension is for specific gravity = 1.0.  
Floats for lighter liquids can increase this dimension.



**NBK-0700**

Note 1: Dimension is for specific gravity = 1.0.  
Floats for lighter liquids can increase this dimension.



**NBK-1000**

**Technical Data**

<b>Bypass Pipe:</b>	316-Ti SS,
<b>Gasket:</b>	PTFE
<b>Fittings</b>	
<b>Flanges:</b>	
NBK-0700:	600LB ANSI, 316 SS
NBK-1000:	900LB ANSI, 316 SS
<b>Threads:</b>	NPT Male
<b>Length:</b>	19.7 feet max.
<b>Maximum Pressure</b>	
NBK-0700	
NPT Threaded:	930 PSIG
Flanged:	Per ANSI B16.5 for class 600 to 930 PSIG Max.

NBK-1000	
NPT Threaded:	1450 PSIG
Flanged:	Per ANSI B16.5 for class 900 to 1450 PSIG Max.
<b>Allowable Media Temperature</b>	
<b>Standard:</b>	- 58 °F to + 750 °F
<b>With Options...</b>	
<b>Ri:</b>	- 58 °F to + 250°F
<b>RHi:</b>	- 58 °F to + 392°F
<b>RHHi:</b>	- 58 °F to + 750°F
<b>RP:</b>	- 58 °F to + 212°F
<b>RK:</b>	- 50 °F to + 750°F
<b>W:</b>	- 58 °F to + 390°F
<b>WHT:</b>	- 58 °F to + 750°F

<b>Cylindrical Float</b>	
<b>Material:</b>	Titanium see Table 1 for float material and dimensions



**NBK Ordering Information**

NBK-	XX = Pressure Rating	Y = Fitting Style	Z = Fitting Size
	XX = 03: 230 PSIG Max. XX = 06: 580 PSIG Max. XX = 07: 930 PSIG Max. XX = 10: 1450 PSIG Max.	Y = 1: Stainless Steel DIN Flange Y = 3: bsp Threads Y = 4: Stainless Steel ANSI Flange Y = 6: NPT Threads	Z = 1: 1/2" (DIN: 15 mm) Z = 2: 3/4" (DIN: 20 mm) Z = 3: 1" (DIN: 25 mm) Z = 4: 1 1/4" (DIN 32 mm) Z = 5: 1 1/2" (DIN 40 mm) Z = 6: 2" (DIN 50 mm)

**NBK Option Information**

Part Number Suffix	Description
-RP	Polypropylene Magnetic Indicating Roller Assembly. Operating Temperature Range: - 58 °F to + 212 °F
-RK	Ceramic Magnetic Indicating Roller Assembly. Operating Temperature Range: - 58 °F to + 750 °F
-Ri	Adjustable Reed Contact Limit Switch. Process Temperature: - 10 to 250 °F. Ambient Temperature: - 10 to 160 °F i = number of switches desired. Example: Two reed switches = »-R2«.
-RHi	High Temperature Reed Switch. Process Temperature: - 10 to 392 °F. Ambient Temperature: - 10 to 160 °F
-RHHi	Very High Temperature Reed Switch. Process Temperature: - 10 to 750 °F. Ambient Temperature: - 10 to 160 °F
-W	Analog Level Transducer. Kobold Transmitter must be used to produce 0(4)-20 mA signal. Process Temp.: - 58 to 390 °F
-WHT	High temperature analog level transducer. Process Temperature: - 58 to 750 °F
-RT	2-wire 4-20 mA Integral Transmitter, Requires Option W or WHT
-A	Connecting Flanges for two part design (Models NBK-0300 & NBK-0600 only).
-F	Drain Valve. 1/2" NPT. 316-Ti Stainless Steel. 400 °F Max. at atmospheric pressure
-J	Top and Bottom Cleanout Flanges
-S	Level Measuring Scale
-T3	Low Specific Gravity to Titanium Float for NBK-0300, 0.54-0.79 Specific gravity
-T7	Low Specific Gravity to Titanium Float for NBK-0600 & NBK-0700, 0.54-0.79 Specific gravity
-T10	Low Specific Gravity Titanium Float for NBK-1000 , 0.54-0.79 Specific gravity

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**Example Order**

Kobold's bypass level gauges are customized to your specific application. Our part numbering system is designed to make the process of specifying a gauge as easy as possible. To help you create the part number for the bypass gauge you need, an example is given below:

Assume you want a level gauge to meter the liquid in a tank. The tank has 3/4" NPT fittings, spaced 4 feet apart. The maximum operating pressure and temperature are 20 PSIG and 90 °F respectively. You want an analog output to be sent to a Kobold Transmitter (purchased separately) and a 1/2" NPT drain valve. You do not need any local level indication.

Use the NBK Application Datasheet to document all required process information.

The part number for the main component (the bypass element) can be assembled from the data in the »Ordering Information« table at the top of this page. The part numbers for the optional accessory products are found in the left hand column of the »NBK Options Table.«

The complete part number is assembled as follows:

1. A 230 PSIG bypass tube with 3/4" NPT fittings is an NBK-XXYZ, where:  
 XX = 03 (230 PSIG)  
 Y = 6 (NPT threads)  
 Z = 2 (3/4" thread size)

The complete order number is:

**NBK-0362**

2. Drain Valve: **-F**
3. Analog Transducer: **-W**
4. Length: **-Length = 4 ft.**

The ordering information for the above item must include the part number, the measuring length and the process information listed above:

**NBK-0362-F-W**

**Length = 4 ft.**



<b>NBK Bypass Level Gauge Application Guide</b> Form #NBK-002 Rev. 02/01/04  FAX to: KOBOLD Instruments Inc. 412-788-4890 (USA) 514-428-8899 (Canada)	<b>Customer Name:</b> _____  <b>Company Name:</b> _____  <b>Phone:</b> _____  <b>Fax:</b> _____
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Quote #: \_\_\_\_\_ Date: \_\_\_\_\_ Price: \_\_\_\_\_ Each Part Number: \_\_\_\_\_

**Material**

- 316 Stainless Steel (PVC Polypropylene and PVDF available upon request)
- Teflon Lined 316 Stainless Steel

\* To ensure fast order processing, please retain the completed quote form and send it along with your purchase order.

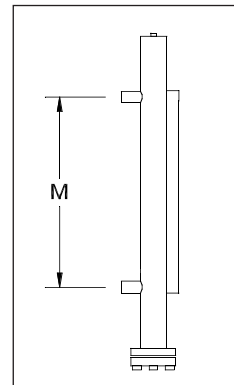
- 1. **Pressure:** Normal \_\_\_\_\_ PSIG Maximum \_\_\_\_\_ PSIG
- 2. **Temperature:** Normal \_\_\_\_\_ °F Maximum \_\_\_\_\_ °F
- 3. **Liquid Type:** \_\_\_\_\_
- 4. **Liquid Specific Gravity at Normal Operating Temp:** \_\_\_\_\_
- 5. **Liquid Viscosity:** \_\_\_\_\_ Centistoke

**Process Conditions**

Accurate process information is essential to ensure the proper operation of your level indicator. Please fill out accurately and completely.

**Mounting Configuration**

- 1. **Measuring Length M:** \_\_\_\_\_ Inches (M=center to center length between fittings)
- 2. **Fitting Size:**  1/2"  3/4"  1"  1-1/4"  1-1/2"  2"
- 3. **Fitting Type:**
  - NPT Thread  150 LB ANSI Flange  300 LB ANSI Flange
  - Other (specify): \_\_\_\_\_



**Indicator Type**

- Polypropylene (212°F Max. Temp.) Suffix-RP
- Ceramic (750°F Max. Temp.) Suffix-RK

**Options**

- 1. **Switches (SPDT):** Quantity \_\_\_\_\_ (See catalog for switch specifications)
  - Standard Switch (250°F Max. Temp.) Suffix -R  Hi-Temp Switch (392°F Max. Temp.) Suffix -RH
  - Very Hi-Temp (750°F) Suffix -RHH
- 2. **Analog Transducer and Signal Conditioner:**
  - Power Requirement \_\_\_\_\_  VAC  VDC
  - Transducer w/ integral 4-20 mA transmitter (2-wire, 16-32 VDC)
  - Transducer only. For use w/ remote mounted signal conditioner/transmitter. (signal conditioner/transmitter sold separately. See catalog for DFM, DST or DFA series.)
  - Drain Valve** Suffix -F
  - Level Measuring Scale** Suffix -S (Scale in inches)
    - Scale mounted on left
    - Scale mounted on right
  - Top and Bottom Cleanout Flanges** Suffix -J
- 3. **Other Options/ Custom Configurations / Special Requirements (specify):** \_\_\_\_\_