KING-GAGE® Marine Systems

Tank Level and Draft Indicating Systems for the Marine and Offshore Industries

Rotameter Bubbler Gauge

Model 5990

- **Integral Rotameter Control for Downpipe Purge**
- **High-Volume Purge Valve for Fast Response**
- **Indicating System for Service or Cargo Tanks**

KING-GAGE Model 5990 Tank Level Indicator is a fully integrated air purge regulator and gauge system. It can be mounted remotely from the tank on a bulkhead or grouped with other indicators on a panel assembly. 3/8" air line tubing connects the indicating system to the pipe extending downward in the tank. A supply of compressed air is required for system operation.

This bubbler system is an extremely simple yet effective method of sensing the hydrostatic pressure due to liquid depth. It has been designed for marine tank gauging or ship's draft measurement.

Indicator includes rotameter and integral high volume purge valve used to ensure fast system response. It also helps clear any debris on the tank bottom that may be present at the outlet of the downpipe. An integral rotameter controls the low-volume air flow to the tank downpipe to provide continuous reading. This system is recommended where continuous indication of liquid level in ballast, potable water, or fuel oil service tanks is required. It is based on a design used in thousands of marine vessels in both freshwater and ocean going fleets worldwide.

KING-GAGE Model 5990 Indicator has a column display read against a custom marked scale in one or two units of measurement (feet/inches, tons, barrels, etc.). It measures hydrostatic pressure as a frictionless force balance for accurate and dependable operation. The system is an extremely rugged design suited to the rigors of marine service. Case construction is stainless steel with durable brushed finish.

Model 5990

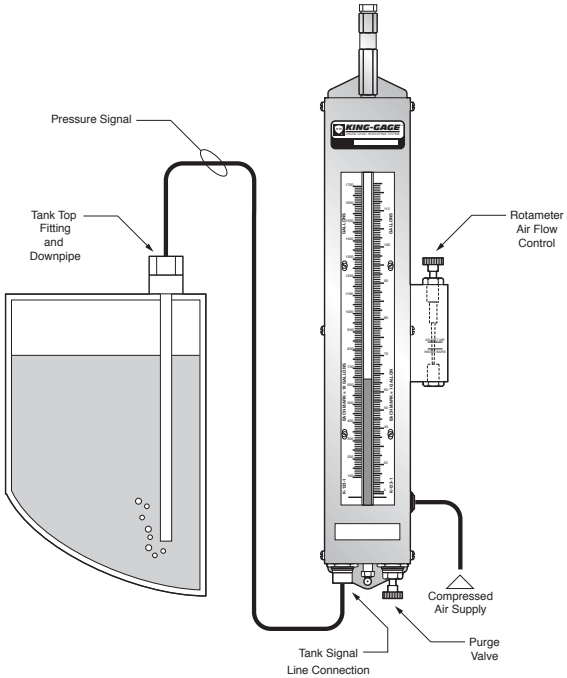
Principles of Operation

The KING-GAGE system uses hydrostatic pressure measurement to determine liquid level. This pressure is created by the actual depth of liquid above the measurement point. Individual indicator scales are calibrated to the pressure range (depth), density (specific gravity) of the liquid and the volumetric capacity of the tank or compartment. For draft measurement, the only factors needed are pressure and density.

The KING-GAGE Model 5990 works as a frictionless hydrostatic force balance. A liquid fill is raised within the glass display tube in direct proportion to the magnitude of pressure applied. The actual pressure range of this instrument is determined by the indicating liquid used (refer to Determining Scale Range).

Bubbler (Downpipe) System - uses compressed air to purge an open ended pipe extending down into the tank. The rotameter on the indicator regulates a continuous flow of air into the downpipe. Pressure is created as liquid is purged from the downpipe, increasing until an equilibrium point is reached (air pressure = hydrostatic pressure). Equilibrium is achieved by excess air escaping through the bottom of the downpipe (and bubbling up through the tank contents).

The resulting downstream pressure (within the pipe) is directly proportional to liquid depth. As depth increases, so does pressure. Conversely, as depth decreases, downstream pressure is equally reduced as excess air flows out the immersed end of the pipe.



Typical Downpipe System

High-Volume Purge Valve

A manually operated valve provides high volume air flow through the system tubing to quickly purge the downpipe. This ensures faster system response during filling or loading operations. Afterward, the system returns to normal operation using continuous low volume air flow through the rotameter.

Indicator Scales

Each system scale is individually calibrated and custom marked in any specified unit of measurement (depth, total weight or volume). An optional 2nd scale unit can be included to combine different measurements such as depth and volume. Scales are manufactured for the individual tank geometry and specific gravity of tank contents. Due to the factory calibrated scale, the KING-GAGE Tank Level Indicator can be used for almost any kind and shape of tank.

Determining Scale Range

Overall length of the scale can vary depending upon the range and degree of readability necessary for the application. This "readability" refers to the minimum readable change in liquid depth that can be observed at the indicator.

Three factors must be applied to determine scale length:

- Maximum tank depth
- Specific gravity (density) of tank product
- Type of indicating liquid (scale factor)

A simple calculation using these factors will yield the minimum scale length required:

D (depth) x **G** (sp. gr.) x **L** (liquid scale factor) = **Scale Length**

The resulting value represents the scale length in inches. Refer to the scale sizes available for the type of indicator and select one that will accommodate the calculated length for your application.

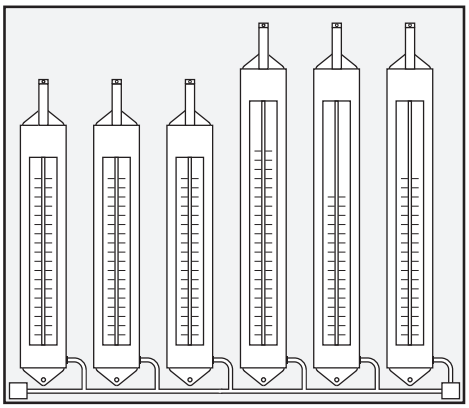
Liquid	Color	Specific Gravity	Liquid Scale Factor
Mercury	Silver	13.546	0.074
No. 294	Red	2.940	0.337
No. 175	Purple	1.750	0.566

Tank Level and Draft Applications

The KING-GAGE indicators can be mounted directly to a panel, bulkhead or other rigid structural member. Depending upon the application, indicators can be located in the engine room, control center or ship's bridge.

Applications Include:

- Ship's draft measurement
- Ballast water tanks
- Fuel oil tanks
- Day tanks
- Bunker oil tanks
- Drill water tanks
- Liquid cargo tanks

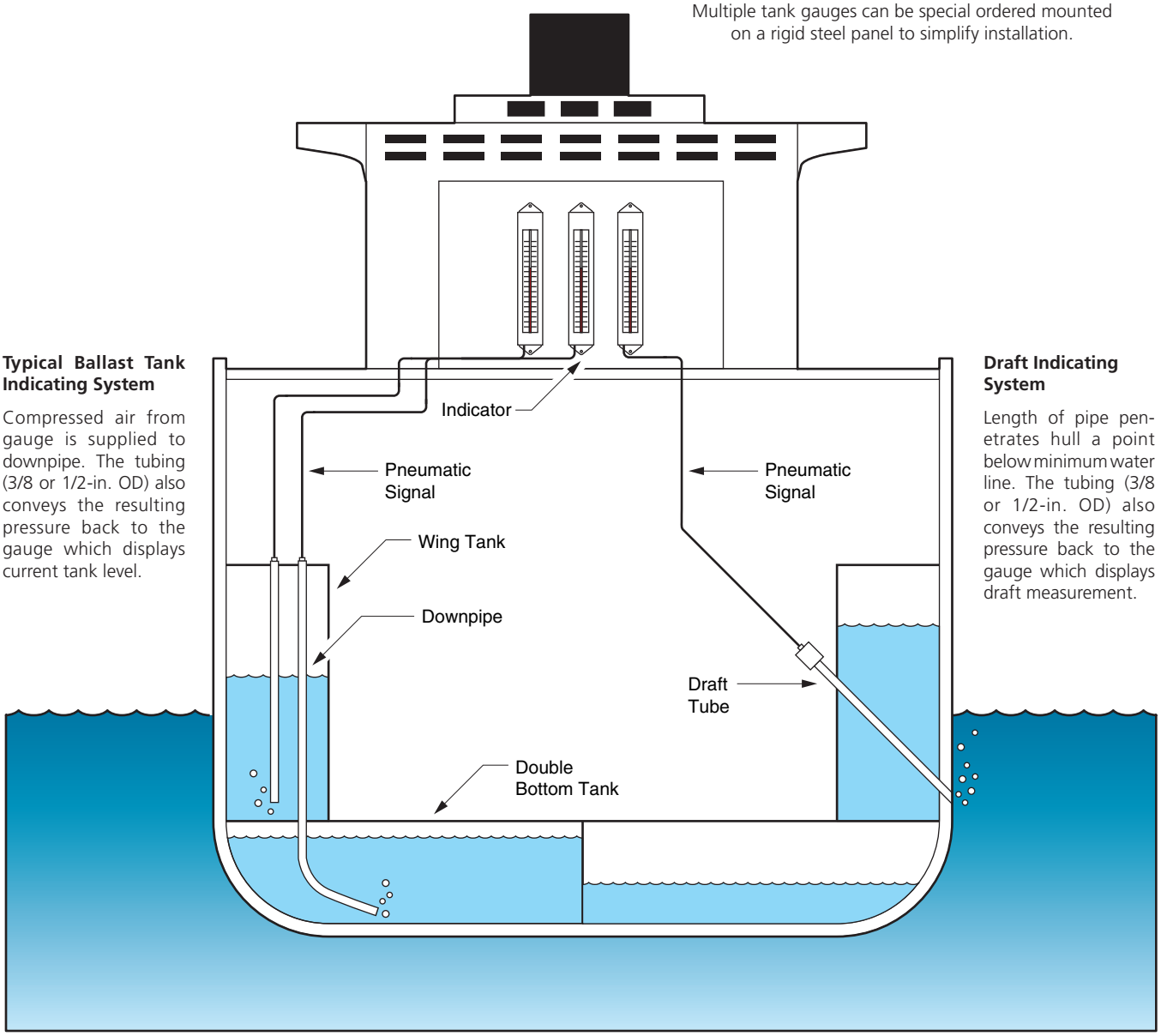


Optional Gauge Panel Assemblies

Multiple tank gauges can be special ordered mounted on a rigid steel panel to simplify installation.

Typical Ballast Tank Indicating System

Compressed air from gauge is supplied to downpipe. The tubing (3/8 or 1/2-in. OD) also conveys the resulting pressure back to the gauge which displays current tank level.



Draft Indicating System

Length of pipe penetrates hull a point below minimum water line. The tubing (3/8 or 1/2-in. OD) also conveys the resulting pressure back to the gauge which displays draft measurement.

Model 5990 Tank Level and Draft Indicating Systems

KING-GAGE® Marine Systems

KING-GAGE Marine Indicator

Single tank display surface mounts to bulkhead or other structural surface. Optional multiple gauge panel assembly available on special order.

The KING-GAGE Intermittent Purge System has been previously approved by the U.S. Public Health Service for use on potable (fresh) water tanks when used in conjunction with a KING Filter or Air Control Station.

Operating Principle
Well-type manometer acts as a frictionless hydrostatic force-balance. A liquid fill is raised in direct proportion to the magnitude of pressure applied. (Varies based on type of indicating liquid employed.)

Resolution
Infinite based on type of indicating liquid employed.

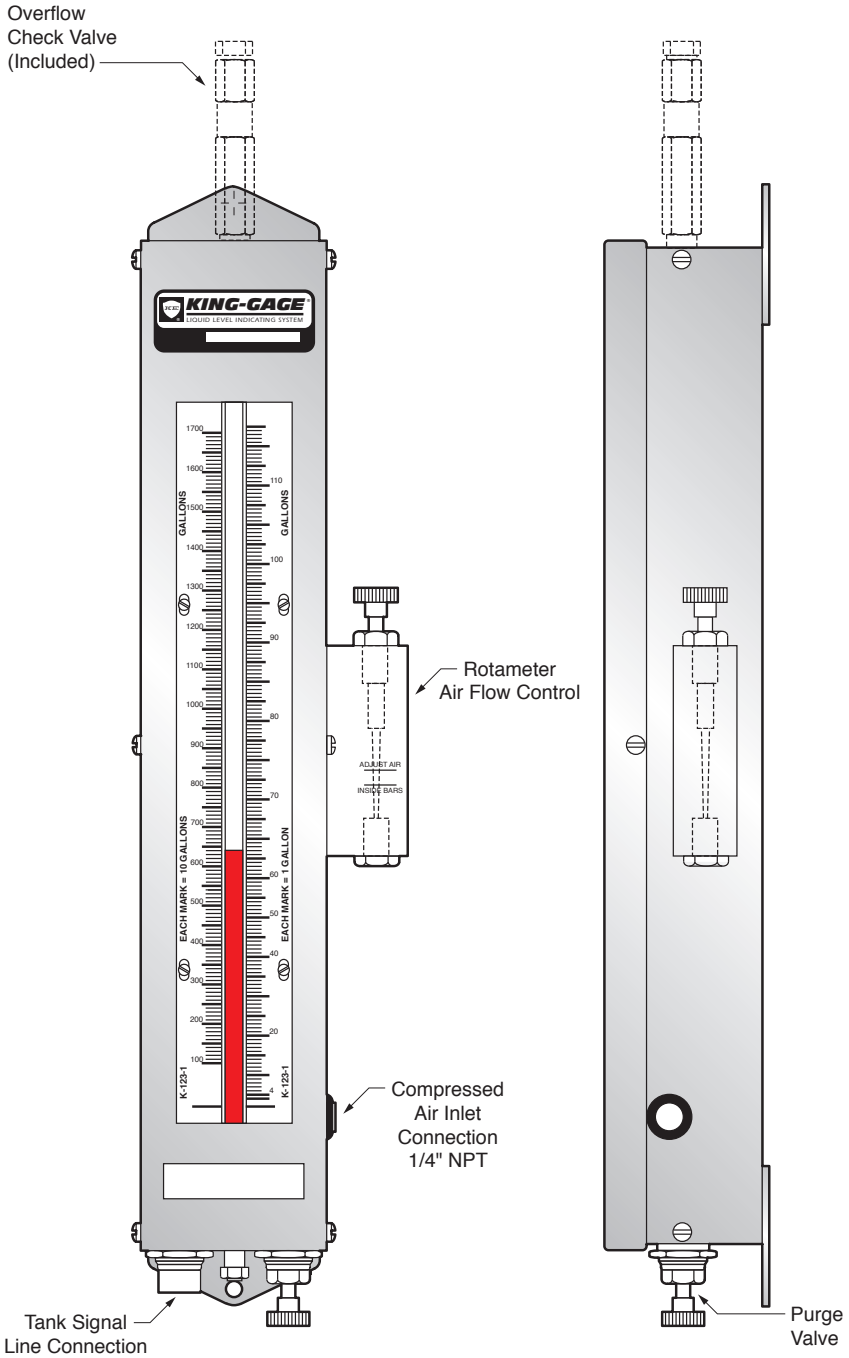
Input Connection(s)
1/4" NPT tapped connection for typical tube fittings. Accepts pneumatic air/gas pressure input; high and low pressure inputs.

Materials of Construction
Formed channel indicator housing; 304 stainless steel with brushed finish. Heavy plate glass window; acrylic plastic window available as special order.

Wetted Parts
316 stainless steel liquid well and tubing.

Indicating Tube
High strength, fully annealed glass (Pyrex ®)

Compressed Air Supply
Compressed air supply that is clean, dry and oil-free is required for operation of the system. Under normal operating conditions, supply pressure required is 55-60 psig.



Range Overall Dimensions (inches)

Range	Overall Dim. (H x W x D)
20	29" x 4-3/8" x 2-7/8"
35	45" x 4-3/8" x 2-7/8"
43	53" x 4-3/8" x 2-7/8"
51	61" x 4-3/8" x 2-7/8"
66	77" x 4-3/8" x 2-7/8"

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