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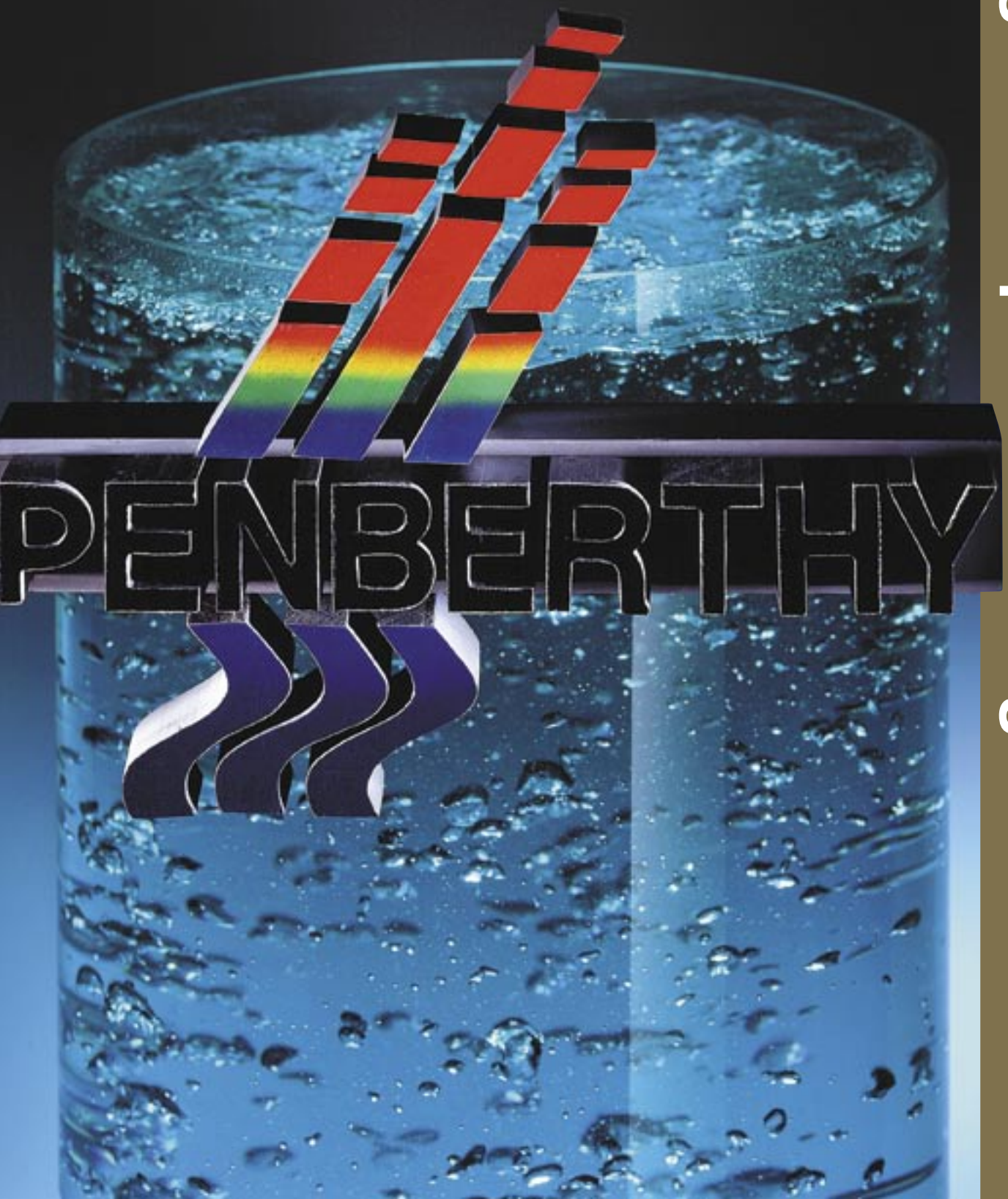
MULTIVIEW™
Magnetic Liquid Level Gages



Worldwide Leadership in Liquid Level Monitoring!

Penberthy has long been recognized as a world leader in manufacturing products for liquid level monitoring. Whether it is direct reading level gages, eductors or sight flow indicators, Penberthy is known for superior products at competitive prices. Penberthy continually strives for excellence in product quality, customer service and on-time deliveries.

It would be easy for a company that has achieved this reputation to become complacent. Not at Penberthy! With the new century in view, Penberthy has made a renewed commitment to striving for excellence, both in product quality and customer support and service. Through the course of many years of research and development, product testing both in the lab and in the field, and monitoring product performance, Penberthy has acquired a vast pool of knowledge...knowledge that has been passed on to our customers in the form of superior products.

This commitment to excellence is the core of Penberthy's business philosophy. For many years, Penberthy has recognized that the only way to truly control product quality is to "do it yourself." Therefore, all components of every product are manufactured to Penberthy's strictest specifications. Along with this single-source responsibility also comes renewed vigor in making certain that process industry needs are met in the most expedient way possible. Penberthy has a proactive business philosophy...anticipate customer needs, offer technical advice, help solve problems. That is today's Penberthy. With this vision in mind, Penberthy offers its MULTIVIEW™ Magnetic Liquid Level Gage product line to the process industry. These liquid level gages offer more versatility, greater durability, more features and more options than any other system on the market today. See why MULTIVIEW™ is the magnetic gage of choice for liquid level monitoring in today's modern processing operations.

tyco

Tyco Valves & Controls

PENBERTHY®

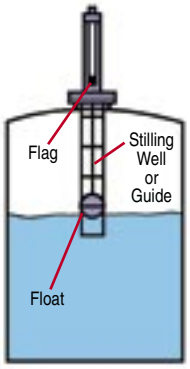
FM APPROVED

ISO 9001
Certificate Number 30053

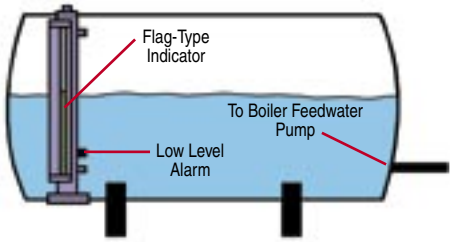
Typical Process Applications

- Sodium Hypochlorite
- Boiler Feedwater Tank
- Hydrochloric Acid
- Stop Oil
- LPG
- Interface
- Dowtherm®
- Sulfuric Acid
- Hydrogen Sulfide
- Oil/Water Separator
- Sodium Hydroxide
- Liquid Nitrogen
- Flare Drums
- Phosgene
- Ammonia
- Butane
- Seal Oil Pots
- Black Liquor
- Drip Pot
- Boiler Steam Drums
- Glycol
- Propane
- Hydraulic Oil
- Feedwater Heaters
- Extreme Flashing
- Hydrazine
- Caustic Chemicals
- Fuel Oil
- Hydrofluoric Acid
- Jet Fuel
- Molten Sulfur
- Sour Oil
- Diesel Fuel
- Deionized Water
- Sumps
- Freon
- Liquid Ethylene
- Water
- Underground Storage
- Benzene
- Asphalt Settler
- Acetic Acid
- Liquids & Slurries

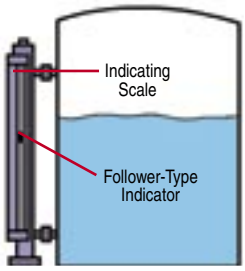
Typical Tank Configurations



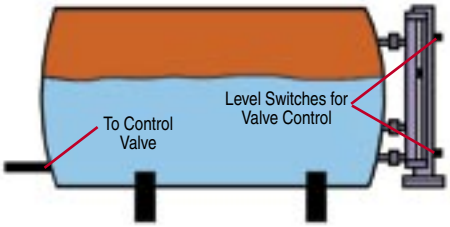
Top-Mounted Indicator



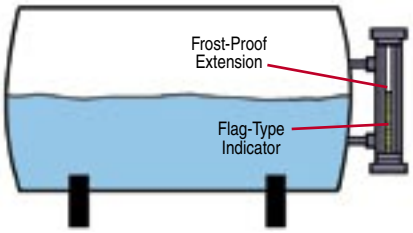
Boiler Feedwater Tank



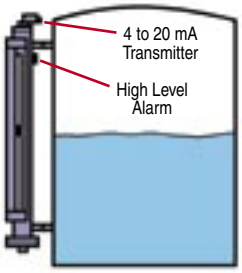
Sodium Hypochlorite



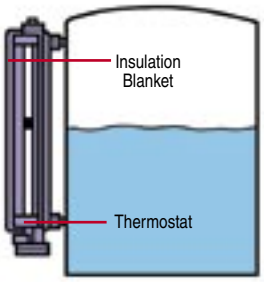
Oil/Water Separator



Liquid Nitrogen



Hydrochloric Acid



Sodium Hydroxide

Optional Transmitter

Choice of Indicators

Flag-Type

Follower-Type

Fluid Contained in Standpipe Chamber

Magnetic Float

Follower Temperature Test Comparison

Conventional Follower

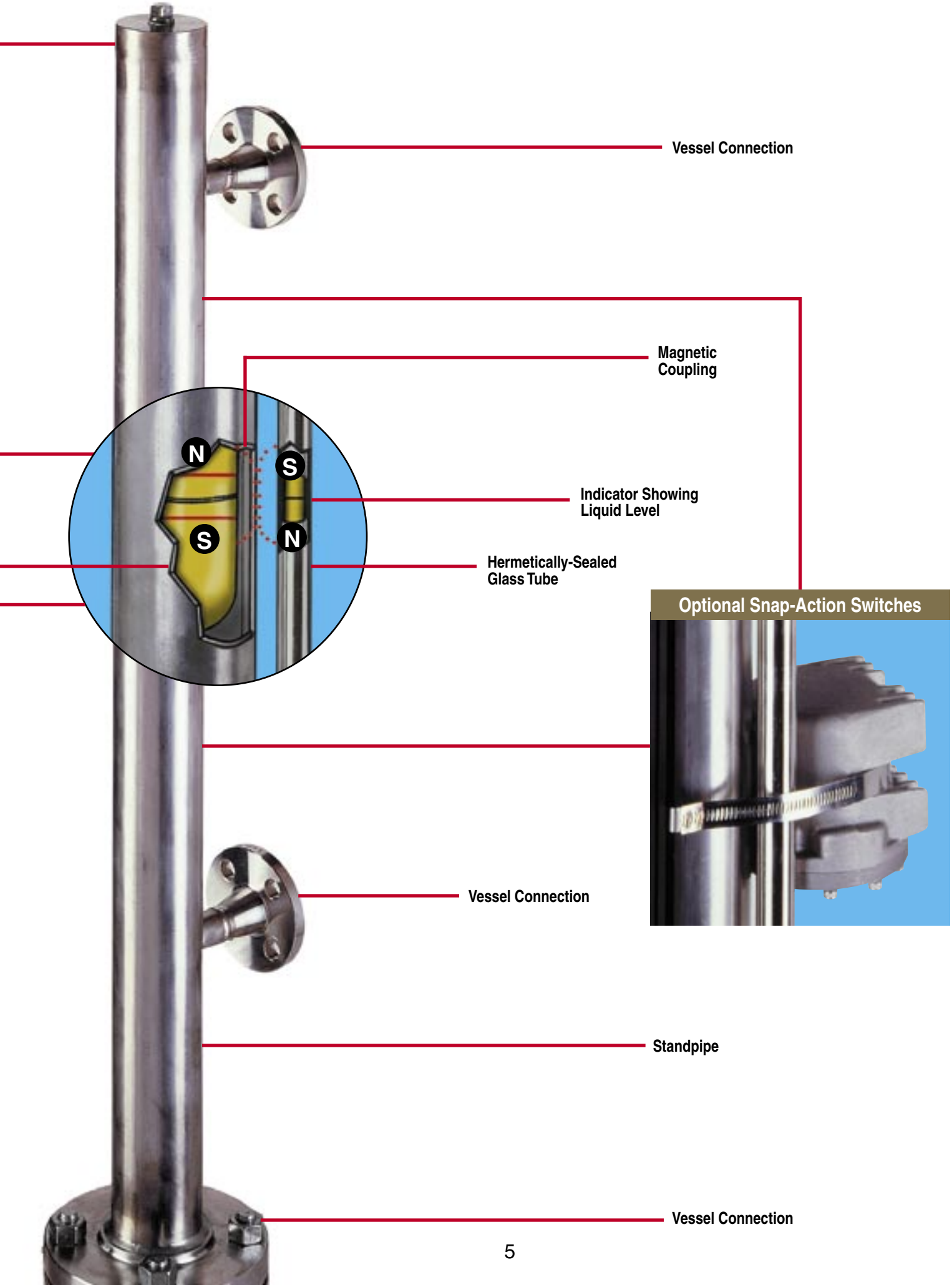
Ambient 400° F

Penberthy Anodized Gold

Ambient 800° F

Rugged, Versatile Options for a Wide Range of Applications

Penberthy MULTIVIEW™ Magnetic Liquid Level Gages can be built to serve practically any process industry situation. From the simplest operation to the most severe, corrosive environment, Penberthy can construct a system to best suit your company's requirements. As pioneers in magnetic gage level indication and as creators of the unique concentric magnet design, Penberthy has the expertise to know what design, specifications and options best fit any given application. Contact a Penberthy representative to discuss specific duty requirements in your operation.


Vessel Connection
Magnetic Coupling
N
S
S
N
Indicator Showing Liquid Level
Hermetically-Sealed Glass Tube
Optional Snap-Action Switches
Vessel Connection
Standpipe
Vessel Connection

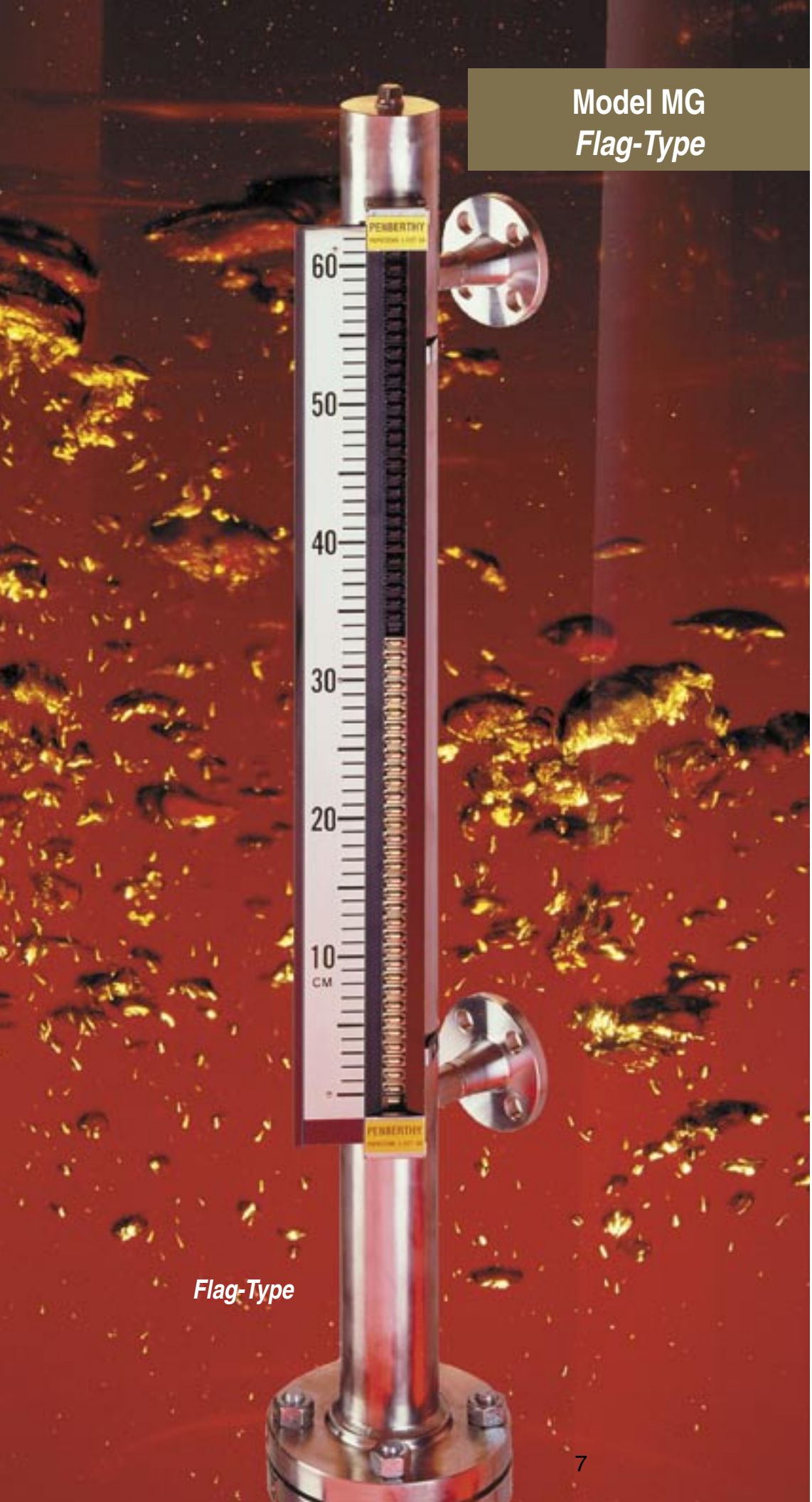
Model MG
Follower-Type

Follower-Type

MULTIVIEW™ Magnetic Liquid Level Gages utilize a standpipe constructed of 2-1/2" pipe which is connected to the process tank with either side or end connections. A float with a self-enclosed magnet is custom sized and weighted to float at the surface of the process liquid to be monitored. The float is then installed in the standpipe.

*In **MG Follower-Type** models, the unit consists of a hermetically-sealed tube in a protective view housing. Within this tube is a gold anodized aluminum follower which will mirror level changes in the process tank. This entire assembly is attached to the standpipe where the follower is magnetically coupled with the float. Because the follower and float are magnetically linked, liquid level changes in the process tank will cause both float and follower to rise and fall in unison. The result is a precise indication of the liquid level within the vessel.*

The anodized gold follower can withstand extreme heat up to 800° F without adverse wear and discoloration. Follower-type monitoring is suitable for most applications, except where violent changes in level can cause the follower to de-couple from the float. In these types of applications, flag-type indication is recommended.



Model MG
Flag-Type

Flag-Type

MG Flag-Type *monitors provide a more secure link between indicator and float. The view housing is sealed and consists of a single column assembly of aluminum flags within an extruded aluminum channel. These flags are anodized with black on one side and gold on the other. Each flag houses a small magnet and is assembled on a single, individual axle. As the float in the standpipe rises and falls, the magnetic interaction between float and flag magnets cause the flags to rotate 180°. These changes are shown through contrasting colors – black above and gold below the liquid level.*

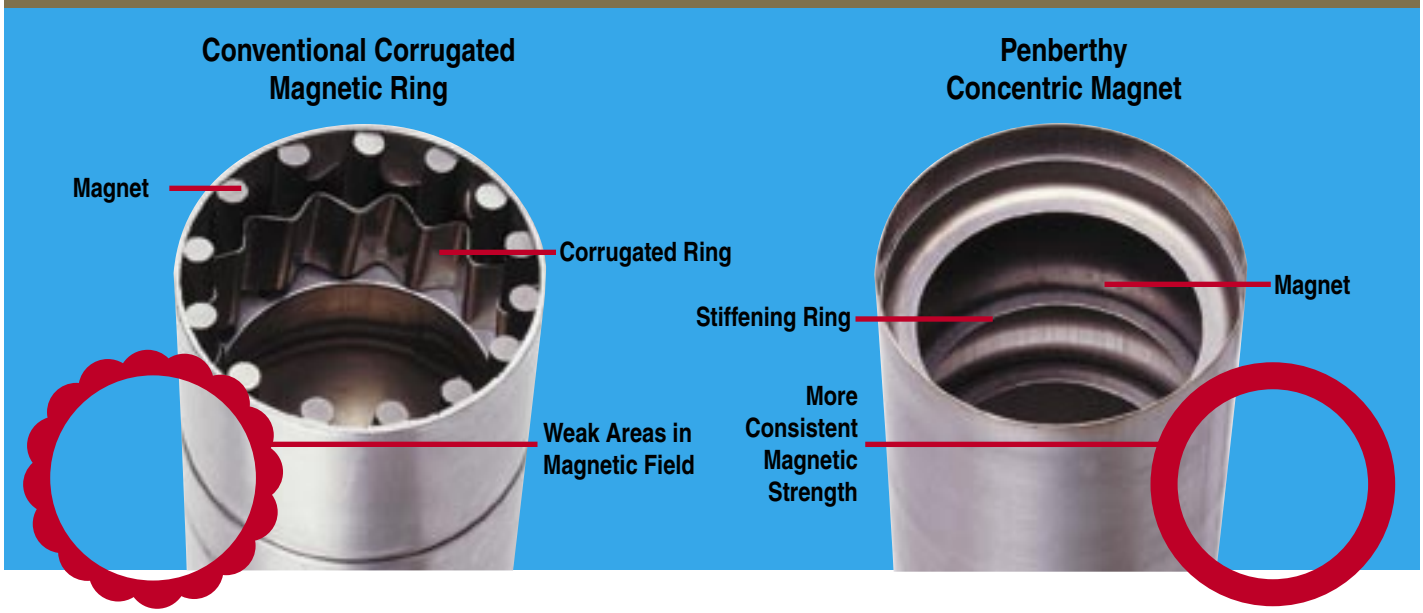
Follower-Type and Flag-Type indicators are both available with stainless steel housings.

To insure trouble-free operation, Penberthy's flags are magnetically interlocked and utilize mechanical stops. This prevents over-rotation. Penberthy's redundant axle system prevents binding, with each flag allowed to rotate on the axle and each axle free to rotate in the channel. This method of indication is always accurate, regardless of the speed of process level change or vibration.

Installation of a point-level switch can provide highly accurate, non-intrusive high/low point monitoring. For continuous level monitoring from a remote location, a level transmitter can be installed on either model as well.

For more information on switches and transmitters, see pages 14 and 15, or contact a Penberthy representative for specific details.

Magnet Design Comparison



Float Design

Conventional floats have 12 to 15 small magnets contained by a corrugated stainless steel ring as shown above. To provide internal support necessary to operate at higher pressures, a typical float contains stiffening rings throughout. It is not possible to place an effective stiffening ring within the corrugated ring design. In other words, there is no internal support in the part of the float containing the magnets. This can cause the float to collapse under higher pressure. Also, the magnetic field in the corrugated magnet design has weak areas, causing float and follower to lose magnetic contact. And, if a switch or transmitter is mounted in-line with a low point, the magnetic field may not be strong enough to actuate these devices.

The concentric magnet design of MULTIVIEW™ allows for the use of stiffening rings. This means strong internal support to prevent collapse when operating in higher pressure applications. It also allows for more consistent magnetic strength than the conventional designs.

Other float types offered in the MULTIVIEW™ product line include standard ANSI Class 150, 300, 600, 900 pressure/temperature rated floats, Super Magnet floats with > 6 times the B-H product for high vibration or other environments and Vented floats. Also available are Interface floats designed so that 50% of the float's length rides in the heavier of the two liquids; 50% in the lighter liquid. At least 0.2 difference in specific gravity is required.

Standpipe Design

Professionals in the process industry realize the importance of solid construction in their containment vessels. That applies not only to the tank, but to the level monitoring equipment as well. Level gages must be built to withstand the rigors of continuous use, often in less than ideal conditions.

Penberthy's answer to these customer demands is to design and build equipment that meets the highest construction standards. That is why all metallic MULTIVIEW™ standpipes are rated to the ANSI/ASME Boiler and Pressure Vessel Code and ANSI/ASME B31.1 and B31.3, making them perfect for use in all kinds of storage and pressure vessel applications in the most extreme duty conditions. These metallic standpipes are constructed of 2-1/2" Schedule 10 or 40 pipe and are available in a wide array of materials and/or linings (see chart on next page). Weldneck flanges, weldolets, threadolets, sockolets, 3000# threaded process couplings, and other plumbing options are offered to meet specific vessel connection requirements.

Additionally, Penberthy offers PVC and CPVC versions constructed of 2" Schedule 40 pipe for low pressure applications where cost-effectiveness and corrosion-resistance are of primary concern. These varied options make Penberthy MULTIVIEW™ products some of the most versatile on the market.

Construction Materials Available

- 304/304L STS
- 316/316L STS
- Alloy-20
- Monel
- Titanium
- Hastelloy-C
- PVC
- CPVC
- PVDF
- Tefzel® Lined
- Halar® Lined

Float Minimum Specific Gravity

Float Material	Min. Specific Gravity
316/316L STS	0.49
304/304L STS	0.49
Titanium	0.37
Monel	0.51
Alloy-20	0.47
Hastelloy-C	0.53
PVC	0.79
CPVC	0.86
Other	Consult Factory

Stated Specific Gravity is for metallic ANSI 150 Schedule 10 extended length float except for polymers.

Standard Chamber Lengths

		Overall (mm)	Vessel Centers (mm)
Side Connection	Minimum	20-7/16" (519)	4-1/4" (108)
	Maximum	258-15/16" (6577)	236" (5994)
End Connection	Minimum	20-7/16" (519)	4-1/4" (108)
	Maximum	254-15/16" (6475)	236" (5994)

Consult the factory for lengths outside of stated maximum or minimum.

Temperature Ranges

Float/Standpipe Material	Minimum Temp. °F (°C)	Maximum Temp. °F (°C)
Metallic	-325°F (-198°C)	750°F (400°C)
PVC	-20°F (-28°C)	140°F (60°C)
CPVC	-20°F (-28°C)	200°F (93°C)

Note: Specification data subject to change without notice.

Pressure Ratings (Float Limited)

Float/Standpipe Material	Standpipe Schedule 10 psig @ 100° F (kPag @38° C)	Standpipe Schedule 40 psig @ 100° F (kPag @38° C)	Float @ 100° F ANSI/psig
316/316L STS	1270 (8756)	2200 (15168)	900#/2160
304/304L STS	1270 (8756)	2200 (15168)	900#/2160
Titanium	915 (6309)	1580 (10894)	900#/1800
Monel	1400 (9653)	2430 (16754)	900#/1800
Alloy 20	1240 (8549)	2140 (15444)	900#/1800
Hastelloy -C	1480 (10204)	2560 (17651)	900#/2250
PVC	N/A	250 (1724)	150 psig
CPVC	N/A	250 (1724)	150 psig
Other		Consult Factory	

Metallic standpipe based on: $P = \frac{2\,S\,Et}{D-2yt}$ Stresses from ANSI B31.1 or ASME Section II-D

These pressure ratings assume that all fittings are equal to or exceed the standpipe ratings.

For Halar®/Tefzel® lining and other float materials, contact the factory for details.

Follower-Type with Transmitter & Switch

Flag-Type with Transmitter & Switch

Model MGVB
Vapor Bypass

Vapor Bypass

The MULTIVIEW™ Vapor Bypass Magnetic Liquid Level Gage is designed for processes where flashing may occur. Standard magnetic liquid level gages fail in these types of processes. When flashing occurs, the vapor build-up beneath the float cannot escape quickly enough due to the limited clearance between the float and the chamber wall, causing the float to rocket to the top of the chamber, where it is crushed or damaged. The Vapor Bypass variation of the Penberthy MULTIVIEW™ Magnetic Liquid Level Gage features a large chamber in combination with a unique cage system which confines the float to one side of the chamber. This allows maximum area for vapor to bypass the float and ensures proper magnetic coupling to the indicator.

No more crushed floats!
The unique guide cage design of the MULTIVIEW™ Vapor Bypass Magnetic Liquid Level Gage eliminates the risk of crushed floats due to flashing vapors.

An Effective Solution For Gauging Flashing Liquids!

Features – MGVB Vapor Bypass

- Larger chamber and unique internal float cage
- Magnetically interlocked flag type indication
- Custom weighted magnetic float
- Designed in accordance with ASME B31.3
- Easy installation
- Virtually maintenance-free
- Optional transmitter or switches

Illustration Key	
1	Standpipe
2	Vessel Connections
3	Internal Guide Cage
4	Clamp
5	Magnetic Float
6	Flag Indicator
7	Indicator Scale

Typical Applications

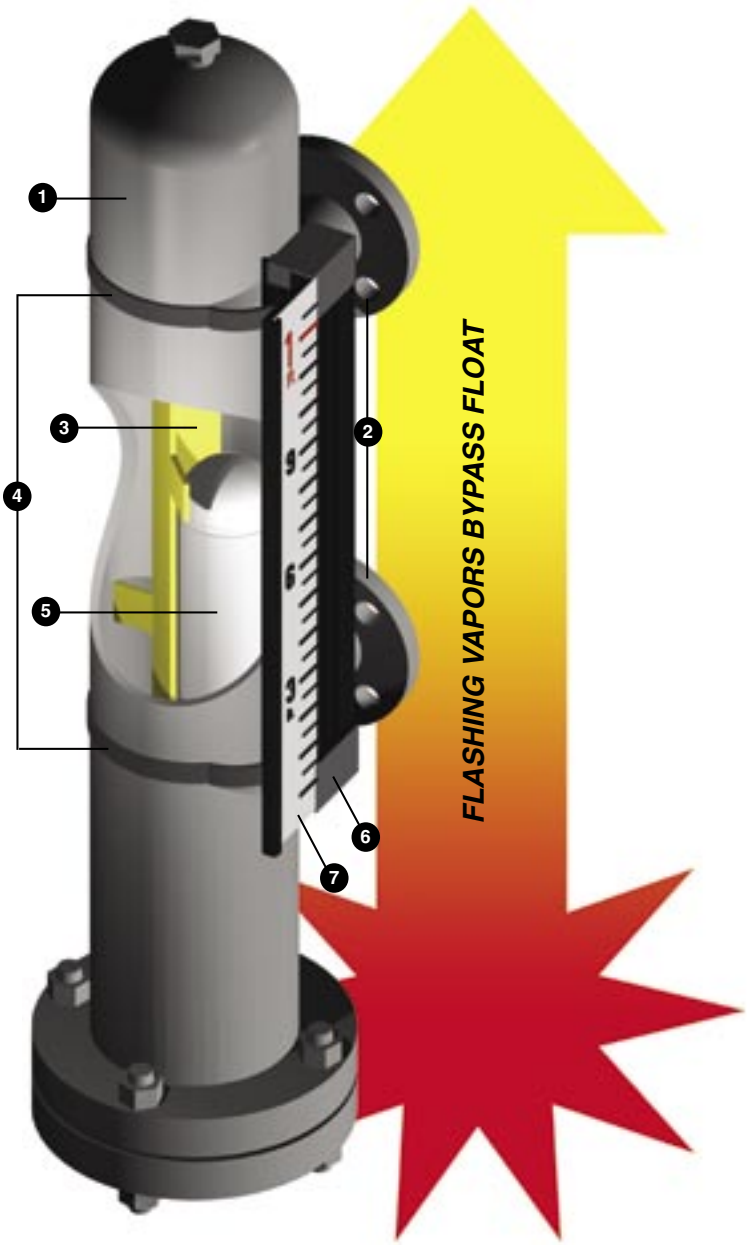
This magnetic liquid level gage provides benefits when used in the following applications:

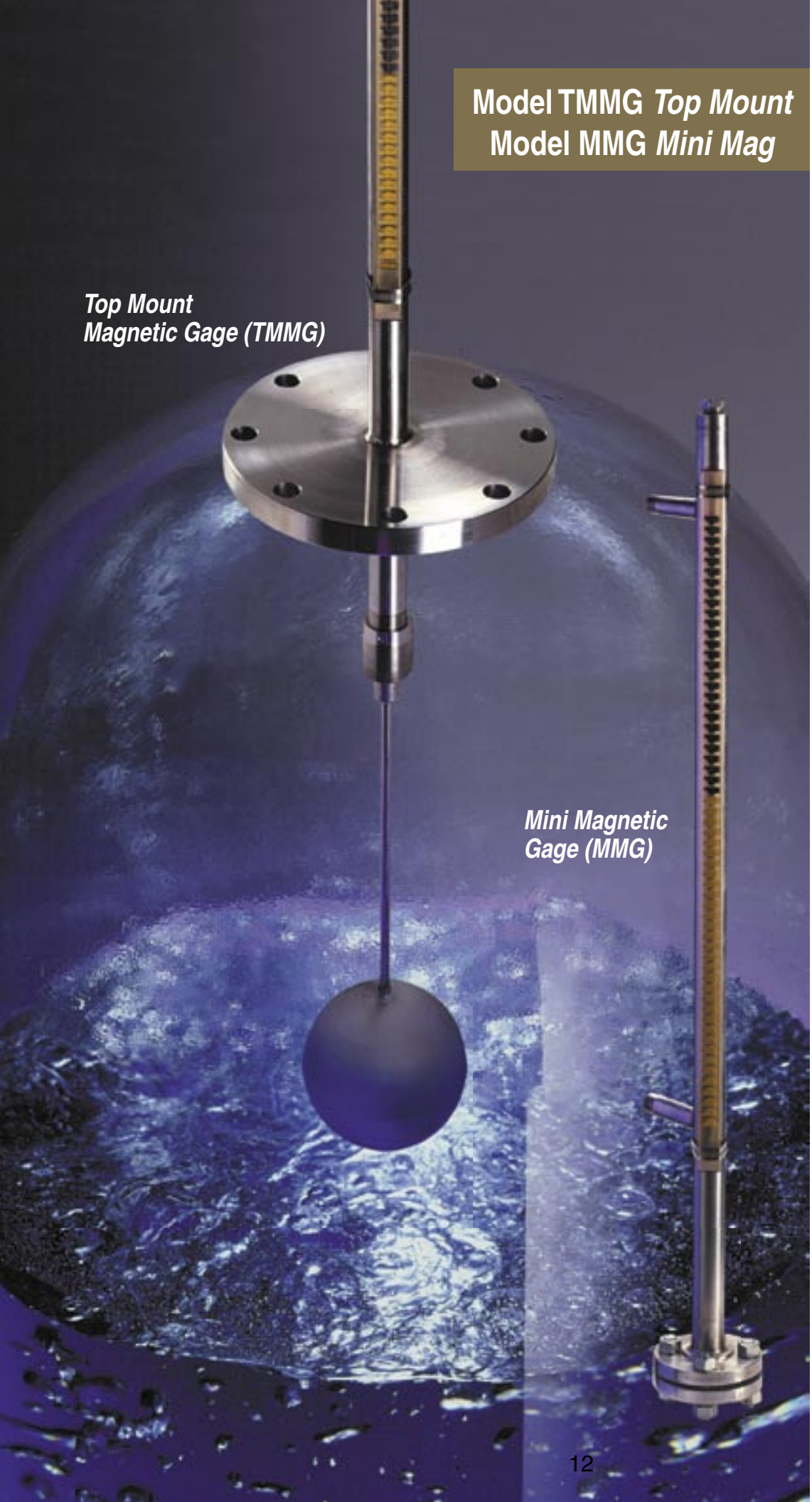
- Light Hydrocarbons
- Liquid Nitrogen
- Propane
- Methane
- Carbon Dioxide
- Anhydrous Ammonia or any pressure liquefied gas

Technical Data

- Constructed of 4" NPS Schedule 40 pipe
- Size Range: Vessel Centers: 4.25" – 236" [108 mm – 5994 mm]
- Minimum specific gravity of 0.47*
- Up to 300# ANSI rating
- Temperature range: -325°F – 750°F [-198°C – 400°C]
- Refer to previous pages in this bulletin for other features shared with the standard MULTIVIEW™.

*Based upon Titanium float





When side-mounted level monitoring is not feasible or impractical, Penberthy offers the MULTIVIEW™ ***Top Mount Magnetic Gage (TMMG)****. The TMMG features the same trouble-free method of operation as a standard MULTIVIEW™ Magnetic Liquid Level Gage.*

A stilling well is recommended for protecting against both float and tube damage... the primary cause of top mount failure. In vessels where large particulates can become trapped between float and stilling well, Penberthy's unique guide system limits the contact area, virtually eliminating the chance that particulates will clog and hinder float movement.

In applications where monitoring will operate at or near ambient temperature, the ***Mini Magnetic Gage (MMG)*** *is recommended. This system reduces initial customer cost without sacrificing performance and is perfect for applications such as air conditioning and refrigeration, filter manufacturers, waste water treatment, oil/chemical storage, skid system and tank manufacturers, and boiler feedwater tanks.*

Only flag-type level indication is offered with both the TMMG and MMG.

Features – TMMG Top Mount

The TMMG float is located in the containment vessel while the magnet assembly is at the opposite end of a tube in the standpipe. As the float level changes, so does the magnetic position. The level change is visually conveyed to the operator via the indicator mounted to the standpipe.

Options – TMMG Top Mount

- Both point level and continuous electronic level indication can be added by using Penberthy's third party approved switches and transmitters
- Optional stilling well can be installed for additional protection of both float and tube
- Unique guide system can be added to minimize the risk of particulate matter/crystalization adversely affecting float operation

Guide System

Float Minimum Specific Gravity	
Float Diameter (mm)	**Min. Specific Gravity**
3.5" (89)	0.50
4.5" (114)	0.32
6" (152)	0.21
8" (203)	0.20
10" (254)	0.15

Specific Gravities are based upon multiple ANSI 150# Titanium floats. Your actual minimum specific gravity will be application-based.

Minimum Vessel Opening Requirements	
Float Diameter (mm)	**Min. Flange Conn. Req.**
3.5" (89)	4"
4.5" (114)	5"
6" (152)	6"
8" (203)	8"
10" (254)	10"

Minimum connection sizes assume the use of a schedule 10 stilling well equal to the flange size. If a higher schedule or Penberthy's guide system is used, consult factory for sizing.

Features – MMG Mini Magnetic Gage

MMG Mini Magnetic Gages feature a nominal 1" Schedule 10 standpipe with flag-type level indication. Because of the smaller float diameter, the MMG features a conventional 6 magnet configuration with a magnetic field similar to other MULTIVIEW™ models. The MMG carries a true 150# ANSI rating. Standard material of construction for the standpipe is 316/316L STS, although 304/304L may also be specified. Float material of construction is 316/316L STS.

Options – MMG Mini Magnetic Gage

- 1 Amp Point Level Switch available for level control
- Penberthy's standard third party approved Transmitter can be added for continuous level monitoring

MMG Specifications	
Materials of Construction	Standpipe: 316/316L STS 304/304L STS Float: 316 STS
Standpipe Diameter	Nominal 1" Schedule 10
Minimum Specific Gravity	Standard Length: 0.70 Extended Length: 0.65
Maximum C-C Dimension (Indication Length)	222-5/8" * (5655 mm)
Pressure Rating	150# ANSI (PN 16/25)
Temperature Rating	Determined by chosen design of flag-type indicator

* Indication lengths greater than this require a staggered bridle arrangement. Consult factory for additional information.
Note: Specification data subject to change without notice.

Construction Materials Available – TMMG		
	Standpipe	**Float**
304/304L STS	●	
316/316L STS	●	●
Titanium	●	●
Monel	●	●
Inconel 625	●	●
Alloy-20	●	●
Hastelloy-C	●	●
Other – Consult Factory		

Model MGS *Switches* & Model MGT *Transmitters*

Both point level control and/or continuous level measurement are available with MULTIVIEW™. These options can be ordered with your magnetic gage or can be added to existing units.

***MGS Switches** provide non-intrusive point-level control and contain no mercury. They allow you to be environmentally safe without sacrificing accuracy.*

- ***MGS-314:***
  SPDT (Form C) 5A service
- ***MGS-314D:***
  DPDT (2x Form C) 10A service
- ***MGS-314L:***
  SPDT (Form C) 1A service Used with standard MULTIVIEW™
- ***MGS-314M:***
  SPDT (Form C) 1A service Used with either TMMG or MMG
- ***MGS-314P:***
  A latching pneumatic switch

***MGT Transmitters** provide continuous level indication to remote locations via 4 to 20 mA loop-powered transmitters.*

- ***MGT-362:***
  A reed switch based unit available in integral and remote mounting styles
- ***MGT-362B or C:***
  An in-tank reed switch based unit. The MGT-362B is an NPT-mounted assembly. The MGT-362C is a flange-mounted assembly. Both are available in integral or remote mounting styles.
- ***MGT-367:***
  A magnetostrictive transmitter available with HART protocol. MGT-367 - HART

MGS-314 Switch Specifications

	MGS-314/314D*		MGS-314L*/314M*
FM-Approved/ CSA-Certified Ex d Explosion-Proof:	Division 1,2 Class I: Groups B,C,D Class II: Groups E,F,G Class III: Type 4 When installed in accordance with Penberthy Drawing #7E741-009		Division 1,2 Class I: Groups B,C,D Class II: Groups E,F,G Class III: Type 4 When installed in accordance with Penberthy Drawing #7E741-009
FM-Approved/ CSA-Certified Exi a Intrinsically Safe:	Division 1, 2 Class I: Groups A,B,C,D Class II: Groups E,F,G Class III: Type 4 When installed in accordance with Penberthy Drawing #7E742-009		Division 1, 2 Class I: Groups A,B,C,D Class II: Groups E,F,G Class III: Type 4 When installed in accordance with Penberthy Drawing #7E742-009
Enclosures:	Watertight (Type 4) Explosion-Proof cast aluminum		Watertight (Type 4) Explosion-Proof STS
Output:	MGS-314: SPDT (Form C) 5A @ 125/250/ 277 Vac non-inductive load	MGS-314D: DPDT (2x Form C) 10A @ 125/250 Vac non-inductive load	SPDT (Form C) 1A @ 130 V ac/dc non-inductive load
Repeatability:	Better than 0.032" (0.8mm)		Better than 0.032" (0.8mm)
Response Time:	<100 milliseconds		<100 milliseconds
Deadband:	0.5" (12.7mm) of float movement		0.5" (12.7mm) of float movement
Operating Temperature:	-40°C to 185°C (-40°F to 365°F) with third party approvals -162°C to 340°C (-260°F to 645°F) without third party approvals		-40°C to 107°C (-40°F to 225°F)

*Third party approvals pending

MGS-314P Switch Specifications

Operating Medium:	Filtered Plant or Instrument Air
Enclosures:	Watertight (Type 4) STS
Operating Pressure Range:	17 to 100 psig (117 to 690 kPaG)
Air Consumption:	1.4 scfm @ 100 psig
Connections:	1/4" NPT-F
Deadband:	0.5" (12.7mm) of float movement
Operating Temperature:	-198°C to 232°C (-325°F to 450°F)

MGT-362 / 362B / 362C Transmitter Specifications

FM-Approved/ CSA-Certified Ex d Explosion-Proof:	Division 1,2 Class I: Groups B,C,D Class II: Groups E,F,G Class III: Type 4 When installed in accordance with Penberthy Drawing #18F51-009
FM-Approved/ CSA-Certified Ex d Intrinsically Safe:	Division 1, 2 Class I: Groups A,B,C,D Class II: Groups E,F,G Class III: Type 4 When installed in accordance with Penberthy Drawing #18F52-009
Enclosures:	Watertight (Type 4) Explosion-Proof cast aluminum
Loop Voltage:	11 to 30 Vdc
Output:	4 to 20 mA continuous; 22 mA failure indication
Resolution:	0.375"
Response Time:	<30 milliseconds
Operating Temperature:	-40°C to 70°C (-40°F to 160°F) transmitter -162°C to 125°C (-260°F to 257°F) sensor (unprotected)

MGT-367 Transmitter Specifications

FM-Approved/ CSA-Certified Ex d Explosion-Proof:	Division 1, 2 Class I: Groups B,C,D Class II: Groups E,F,G Class III: Type 4X
Enclosures:	Watertight (Type 4X) Explosion-Proof cast aluminum
Loop Voltage:	10.5 to 36.1 Vdc
Output:	4 to 20 mA continuous
Repeatability:	0.01% F.S. or 0.015" (0.381mm)*
Hart Protocol:	Base HART Command Capability
Operating Temperature:	-34°C to 70°C (-30°F to 160°F) electronics -34°C to 149°C (-30°F to 300°F) sensor

* Whichever is greater
Note: Specification data subject to change without notice.

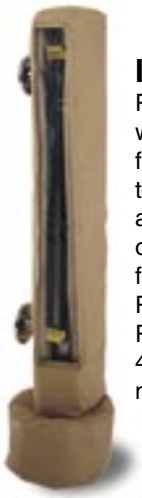
Options and Accessories

Sanitary MULTIVIEW™

To meet sanitary requirements necessary in the production of food, beverage, dairy, biomedical and pharmaceutical products and in other sanitary applications, Penberthy recommends the Sanitary MULTIVIEW™. Designed to 3A standards, this system is constructed of standard 316L SS materials with other construction materials available. Fittings and clamps meet industry sanitary regulations and allow for quick disassembly and cleaning.

Explosion-Proof (XP) Illuminator

To improve visibility in low-light environments, an Explosion-Proof Illuminator can be a valuable addition to many level monitoring situations. This option also works well when an insulation blanket is in use. The illuminator is FM-Approved/CSA-Certified for explosion-proof usage: Class 1 Groups B, C, D, 125/250 Vac, maximum 25 or 60 watts, depending on the length required.



Insulation Blankets

Penberthy Insulation Blankets can withstand temperatures ranging from -300° F to 750° F (-184° C to 400° C). Flexible blankets are available in thicknesses of 1/2", 1" or 2". Materials available include fiberglass cloth coated with either PTFE Teflon® or silicone rubber. Rigid blankets in thicknesses of 4" - 12" are available in other materials on request.

Frost-Free Extensions

In super-frigid applications such as liquid nitrogen or liquefied ethylene, Frost-Free Extensions should be utilized. Both types of monitoring systems can be equipped with PMMA frost-free features. This low-coefficient thermal transmitting material resists frost buildup to maintain clear visibility. With widths ranging from 2" to 12", these extensions can be paired with virtually any thickness of insulation blanket.

Thermal Tracing

MULTIVIEW™ Magnetic Liquid Level Meters can be equipped with electrical heat tracing or piped for either refrigerant use or steam use. To determine the temperature differential, subtract the minimum expected ambient temperature from the desired maintenance temperature. An insulation blanket is highly recommended in cases such as these.

Drum Level Indicator

Combining MULTIVIEW™ monitoring with an integrally-mounted armored gage, Penberthy's Drum Level Indicator offers improved safety, convenience and versatility, meeting ASME Boiler Code, Section 1, PG-60 requirements for Water Level Indicators.
By adding the MGS-314 switch and MGT-362 transmitter, remote level measurement transmission and precise control capability is possible.

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