

Dependability You Can Trust

Our Model 524 Differential Pressure (DP) Recorder offers you dependability you can trust from a company you know. Designed primarily for use in the oil and gas industry, Differential Pressure Chart Recorders are ideal for monitoring flow, filtration, and liquid levels. Palmer's DP Recorder measures the differential between two inputs, from 20 to 400 Inches of Water. Maximum input pressure up to 2500 psi.

This model is also available with up to two additional pens for measuring static pressure up to 30,000 PSI or 600 Bar; and/or temperature from -30° to 600°F (0° to 300°C), with non-mercury temperature elements and 10 feet of capillary standard.

The differential pressure cell with dual bellows design is made of 316L SS and features over-range protection dampening to compensate for pulsations in line pressure. The edge welded rupture proof pressure cell provides up to 30% added lifespan and greatly improved linearity.

The fully mechanical differential pressure cell features a temperature compensator to protect the unit from drift caused by ambient temperature changes.

Built in our factory in Asheville, North Carolina, the 12" heavy die cast aluminum case is offered in our pipestand mount style for this application. The case is double protected by a corrosion resistant coating and an additional powder coated finish, making it weather resistant even in harsh conditions. Standard color is White Gloss Powder Coat, with Black Matte or Gray Gloss Powder Coat available as options. Instrument glass window is Standard.

The Palmer DP Recorder comes standard with our PC-11 Multi-Speed Battery Operated Chart Drive (UL listed). PC-12 Chart Drive or Spring Wound Chart Drive are also options.

Also available is our 5 Valve Manifold, Model AWR-3691-01 shown at right.

Sold separately as a kit with connection hardware to connect the DP Recorder to your system.



DP Recorder Features

- All – Welded construction prevents deterioration.
- Made of heavy aluminum, die cast and heat treated to prevent distortion or warping.
- Pressure Recorders have 1/2" diameter air vent holes in case.
- Durable, low maintenance design: thermal system and other parts easily replaced by field technician
- ALL 316 Stainless Steel Pressure Elements.
- One, Two or Three Pen.
- 30% added life span and greatly improved linearity.
- Over-range protection and pulsation dampening.

Differential Pressure Chart Recorder Model 524



DP Recorder shown in Matte Black case with side view of DP unit and remote temperature system.

Specifications subject to change without notice.

May
2021

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Chart Recorder



DP Unit



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BEYOND THE SCALE

Differential Pressure Recorder Specifications

Model 524	Systems	Choose from 1, 2 or 3 Pens: DP only, or DP with Pressure and/or Temperature
	Chart Size	12" Chart
	Arc Line	9-7/16" Arc Line
	Chart Drive	Multi-speed Battery-Operated Chart Drive (BOCD) (UL Approved) or Spring Wound - Specify Speed and Chart
DP Actuator	Range Availability	0 to 20" H ₂ O; 0 to 100" H ₂ O; 0 to 200" H ₂ O; 0 to 300" H ₂ O; 0 to 400" H ₂ O
	Accuracy	± 0.5% of Full Scale
	Temperature Limit	-40° to 180°F (-40° to 82°C)
	Recording Mechanism	All Stainless Steel parts for longer field life
	Maximum Non-Linearity	± 0.5%
	Repeatability	± 0.20%
	Pressure Element	Dual Bellows: 316L SST
	Bellows Fill	Mineral Oil - (M)
	Safe Working Pressure	2,500 PSI (172 Bar) Maximum
	DP Housing/Center Plate	Forged Steel AISI C1018
	Housing Seals	Fiber Gasket
	Torque Tube Material	Beryllium Copper, Hermetically sealed to eliminate friction and leakage
	Torque Tube Rotation	8 Degrees ± 10%
	Range Springs	Inconel
	Bolts	AISI 4140, per ASTM A 320 L7M, Grade 8
	Cleaning	General
Optional Static Pressure Elements	Ranges	25 to 30,000 PSI; 6 to 600 bar
	Accuracy	± 1/2 chart graduation
	Pressure Element	316SS bellow diaphragm, helical coil bourdon tube with stainless steel fittings and tubing.
Optional Temperature Elements	Non-Mercury Ranges	From: -30° to 600°F / 0° to 300°C
	Capillary	316SS Flex Armored Capillary, 1/4" dia, 10 ft incl. Non-Mercury. Custom lengths available.
	Accuracy	± 1 chart graduation
	Element	300 Series stainless steel bulb, interconnection capillary, and armor (depending on design)
Housing	Case Size / Description	12" case with Instrument Glass Window Standard, Pipestand only
	Case Material	Die Cast Aluminum Case with Draw Pull Latch/Hasp and Corrosion Resistant Internals
	Case Color	White Gloss Powder Coat - Standard. Black Matte Powder Coat or Gray Gloss Powder Coat - Optional.
	Dimensions	H: 15-13/16" x W: 13-1/16" x D: 13" (includes DP Cell) (401.66 mm x 331.8 mm x 330.2 mm)
	Weight	55 lbs. (24.94 kg) (includes DP Cell)
Options and Accessories	Options	Door with Safety Glass Window, Door with Plexiglass Window, or Solid Front Door
		Door Stop, Steel, Hinge-style, 10 inch Support Hinge
		Clip-down Chart Hub, includes hex key
	Accessories	5 Valve Manifold Kit, includes Connection Hardware
	Certification	Optional NIST Traceable Certificate of Conformance. Optional User Specified Points

Differential Pressure Unit

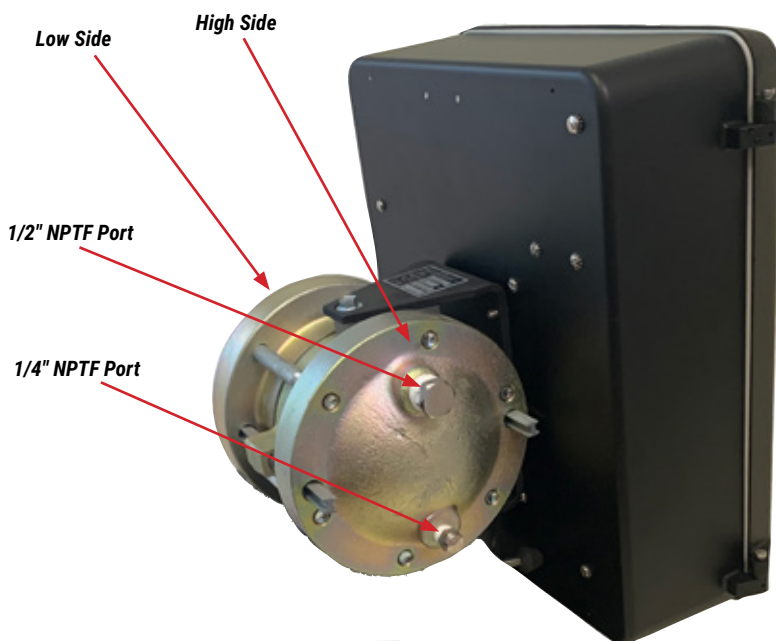
The Palmer Model 524 Differential Recorder graphically records differential pressures up to 400 inches of water column at base pressures of up to 2500 PSI. An additional static pressure element up to 30,000 PSI/600 Bar and/or temperature element up to 600°F/300°C may be added. Measurement of gas or liquid flow rates, liquid level, or other process variables may be determined from these measurements.

The Differential Pressure Unit (DPU) is a dual bellows assembly enclosed within high pressure housings. The bellows are liquid-filled and withstand over-range pressures equal to the working pressure of the housing without change to calibration. The torque tube transfers the motion of the bellows to the recording mechanism as rotary motion, and is hermetically sealed to eliminate leakage and does not require lubrication.

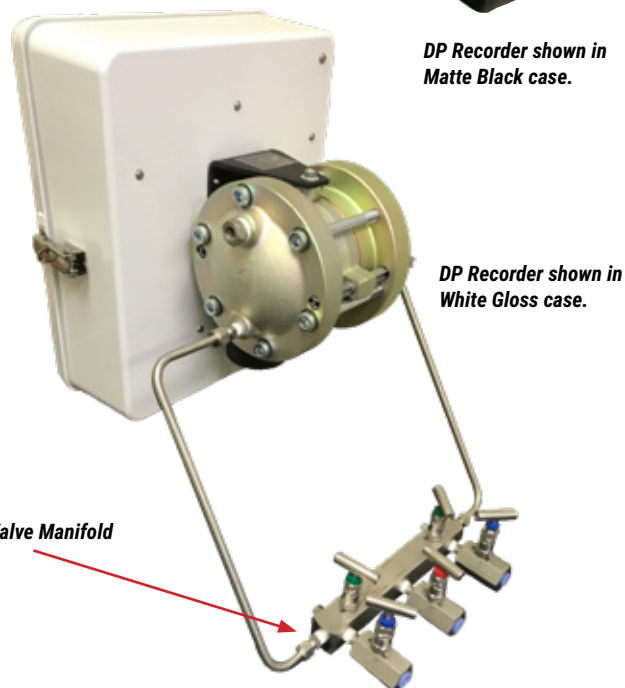
The DPU is mounted to the back of the recorder case and includes an integral 2" pipestand mounting system.

Piping – The DPU is equipped with both a ¼" NPTF and ½" NPTF input fitting on the low and high pressure sides. The unused input must be plugged for proper operation. (Plugs included). Use of a 5 valve manifold (shown below right) in the connection of the DPU to the differential pressure source will facilitate in the operation and checking of the DPU.

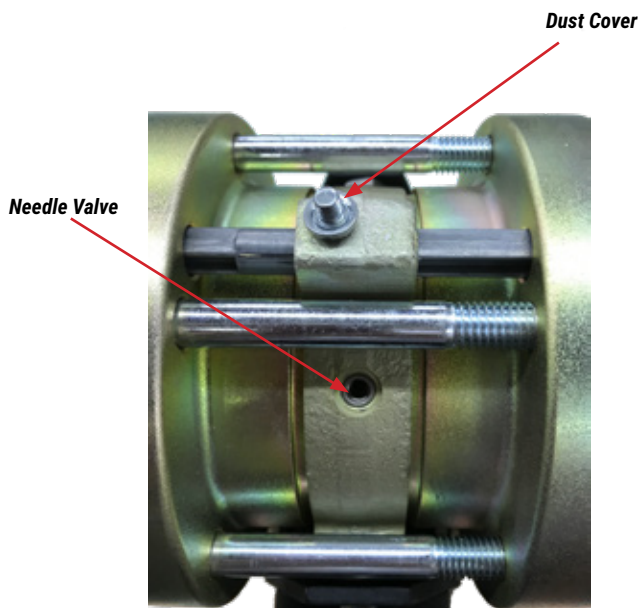
Pulse Dampener – The built-in pulsation dampener controls the flow of fill-liquid between the high and low pressure bellows via an externally adjustable needle valve. In applications where pulsation is not a problem, the needle valve should be set to the full open position (counter-clockwise).



DP Recorder shown in Matte Black case.



DP Recorder shown in White Gloss case.



Differential Pressure Ranges

DP Pressure Unit Ranges
0-20 H ₂ O
0-100 H ₂ O
0-200 H ₂ O
0-300 H ₂ O
0-400 H ₂ O

DP Recorder differential pressure unit is not included in the 10 year warranty.

Specifications subject to change without notice.

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DP Unit

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Chart Drives - Flexibility for the Field

Quartz Multi-Speed Chart Drives offer complete flexibility for recording - even in the most demanding applications

Designed for outdoor use, Palmer's hermetically sealed PC-11 and PC-12 chart drives have a broad operating temperature range of -40°F to 160°F and operate reliably even in wet or dirty environments. Freezer tested to -40°F, they will withstand extreme temperatures below 10°F when used with a "C" size 3.6V Lithium Thionyl Chloride Battery. The highly adaptable design will fit any chart recorder, and makes exchange in the field a snap.

The multi speed dial on the front of the case allows field selectable recording intervals from 30 minutes (PC-12) to 32 days (PC-11). The dial also turns the unit off to conserve battery power (PC-11 model). A pulsating LED indicator behind the dial shows that the battery is charged and that the unit is operating.

Our PC-11 and PC-12 are rated Intrinsically Safe, which makes them ideal for use by gas utility companies and in other situations where hazardous or combustible materials are present.



PC-11 & PC-12 Clock Features

- PC-11 - 11 Speeds: switch selectable, choose from 60 min., 96 min., 12 hr., 24 hr., 48 hr., 7 day, 8 day, 14 day, 16 day, 31 day or 32 day recording intervals and OFF.
- PC-12 - 12 Speeds: switch selectable, choose from 30 min., 60 min., 2 hr., 4 hr., 6 hr., 8 hr., 12 hr., 24 hr., 48 hr., 3 day, 4 day, or 7 day recording intervals. No OFF.
- Universal Mounting Bracket: fits all chart recorders for easy replacement.
- .25" Drive Shaft with flat: accepts different drive hubs.
- High Torque: 25 oz/in torque increases life and improves accuracy.
- No Axial or Angular Backlash: charts don't shift.
- Battery: 1.5 volt "C" alkaline battery (not included). For temperatures below 10°F use with a "C" size 3.6V Lithium Thionyl Chloride Battery.
- Molded Body Pilot: Permits field exchange without recalibration.
- Maintenance-Free: Closed construction case protects all moving parts.
- Separate Battery Compartment: prevents drive damage from corrosion.
- UL Listed: Class I, Groups C and D, Intrinsically Safe, CSA Certified.

Spring Wound Chart Drive

Switchable Dual Speed Clock. - By use of a shift lever, the drive can be set for 24 hour or 7 day rotation. Rotation is set at factory to conform to your specifications. Verify that the drive is set properly. To wind the drive, remove chart and use the key furnished with the recorder.

Standard Rotation: 24 hour / 7 day

Special Order Rotations:

Dual Speed: 15 minute / 1 hour

1 hour / 3 hour

2 hour / 8 hour

96 minute / 24 hour

Single Speed: 4 hour



Available clock rotations FOR ALL CLOCKS: Select one for Factory Setting

Code	Rotation Options	PC-11	PC-12	Spring Wound
A	15 Min			Special Order
B	30 Min		✓	
C	60 Min	✓	✓	Special Order
D	96 Min	✓		Special Order
E	2 Hour		✓	Special Order
X	3 Hour			Special Order
F	4 Hour		✓	Special Order
G	6 Hour		✓	
H	8 Hour		✓	Special Order
J	12 Hour	✓	✓	
K	24 Hour	✓	✓	✓
L	48 Hour	✓	✓	
M	3 Day		✓	
N	4 Day		✓	
P	7 Day	✓	✓	✓
R	8 Day	✓		
S	14 Day	✓		
T	16 Day	✓		
U	31 Day	✓		
V	32 Day	✓		

Clocks, batteries, charts, pens, liquid infiltration, case finish, and window are not included in the 10 year warranty.

Specifications subject to change without notice.

Optional Static Pressure Elements and Process Connections

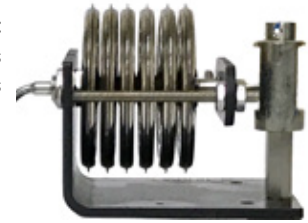
Static Pressure Elements

Each Palmer Pressure Element is individually designed and calibrated for each selected pressure range span. Palmer subjects these elements to extensive testing during calibration to ensure better than specified accuracy. The all-welded system prevents deterioration.

- Accuracy: $\pm 1/2$ chart graduation.
Optional: $\pm 1/4$ chart graduation - available on the Top Pen only, for ranges 30 to 10,000 PSI only (using the Standard Pressure Element only). (Factory setting only). Not available on DP Recorder.
- Angular deflection of the pen arm of 22.5° for 8" Case and 36° for 12" Case.
- Standard pressure ranges are available in pounds per square inch, bar, inches of water, inches of mercury, kilopascals, and ounces per square inch.
- All welded construction offers over-range protection for ranges over 10,000 PSI and up to 30,000 PSI.
- Ranges 10,000 PSI and under come standard with 1/4" NPT female connection. 10,000 PSI may choose an optional Autoclave fitting. Ranges above 10,000 require a 9/16"-18 UNF high pressure female Autoclave style fitting. (Also requires user supplied tubing assembly).
- Pre-calibrated pressure elements for field replacement are also available.

Low Pressure Element:

316 Stainless Steel bellows diaphragm, tubing and fittings for ranges below 30 PSI with 1/4" NPT.



Standard Pressure Element:

316 Stainless Steel helical coil bourdon tube with Stainless Steel Fittings and tubing for ranges 30 to 10,000 PSI, with 1/4" NPT.



High Pressure Element:

316 Stainless Steel helical coil bourdon tube for ranges 10,000 PSI, 15,000, 20,000 and 30,000 PSI with autoclave fitting (with calibration on rise only for 15,000 and above.)



Process Connections

- 1/4" FNPT, Standard
- 1/2" FNPT, Optional
- 9/16"-18 UNF High Pressure Female Autoclave style fitting required on PSI ranges 15,000 and above, optional for 10,000 PSI.

Standard Pressure Connection:

1/4" FNPT Female pressure connections for ranges up to 10,000 PSI.



Autoclave Pressure Connection:

9/16"-18 UNF High Pressure Female Autoclave style fitting - optional for 10,000 PSI, required for ranges 15,000 and above. (Also requires user supplied tubing assembly).



Static Pressure Ranges

DP Recorder Optional	
PSI Ranges	
0 to 25 PSI	0 to 600 PSI
0 to 30 PSI	0 to 750 PSI
0 to 35 PSI	0 to 800 PSI
0 to 45 PSI	0 to 1000 PSI
0 to 50 PSI	0 to 1500 PSI
0 to 60 PSI	0 to 2000 PSI
0 to 75 PSI	0 to 2500 PSI
0 to 100 PSI	0 to 3000 PSI
0 to 120 PSI	0 to 4000 PSI
0 to 150 PSI	0 to 5000 PSI
0 to 200 PSI	0 to 6000 PSI
0 to 250 PSI	0 to 8000 PSI
0 to 300 PSI	0 to 10,000 PSI*
0 to 350 PSI	0 to 15,000 PSI**
0 to 400 PSI	0 to 20,000 PSI**
0 to 500 PSI	0 to 30,000 PSI**

DP Recorder Optional
Bar Ranges
0/6 Bar
0/10 Bar
0/16 Bar
0/25 Bar
0/40 Bar
0/50 Bar
0/60 Bar
0/100 Bar
0/160 Bar
0/200 Bar
0/250 Bar
0/300 Bar
0/400 Bar
0/500 Bar
0/600 Bar

* Optional Autoclave Fitting

**Requires Autoclave Fitting

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Temperature Elements

Palmer Temperature Elements (or bulbs) must pass the same stringent quality control as the most precise scientific laboratory thermometers. All mercury filled systems conform to ASME 5B. Non-mercury systems conform to 1A over 30 feet and 1B under 30 feet. Each system is pressurized after filling for overrange capabilities above and below its specified range.

Rapid response to changes in temperature make it extremely accurate and reliable. The system is completely welded to prevent deterioration. Points most susceptible to physical damage are reinforced with added flexible armor.

Temperature elements are remote from the recorder case and offered in a choice of standard Mercury filled and Non-Mercury filled probes. Our engineering department can also custom design probes for a wide variety of applications.

- Accuracy ± 1 chart graduation.
- Heat treated coil provides superior spring action.
- Durable, low maintenance design: thermal system and other parts can be easily replaced by field technician.
- 300 Series stainless steel bulb, interconnection capillary, and armor available on certain designs.
- Standard case compensated system for uncompensated capillary lengths not exceeding 25 feet.
- Pre-calibrated temperature elements for field replacement are also available.

Temperature Ranges

DP Recorder Optional Temperature Ranges	
°F Ranges	°C Ranges
-30° to 120°F	0° to 60°C
0° to 100°F	0° to 100°C
0° to 120°F	0° to 120°C
0° to 150°F	0° to 150°C
0° to 200°F	0° to 200°C
0° to 250°F	0° to 250°C
0° to 300°F	0° to 300°C*
0° to 400°F	
0° to 500°F	
0° to 600°F*	

* Hydrocarbon Fill only

We offer a wide variety of standard temperature ranges to meet the needs of many different applications.

Each temperature element is precisely calibrated to the required range. Each temperature element is precisely calibrated to the required range. If you require a range not shown we can manufacture to your specifications. Call for more information.

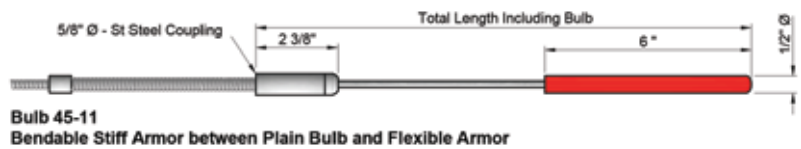
Temperature System Capillary

Standard capillary length for DP Recorders is 10 ft, in 1/4" diameter flex armor. Capillary for non-mercury systems is 316SS, with optional lengths up to 99 feet.

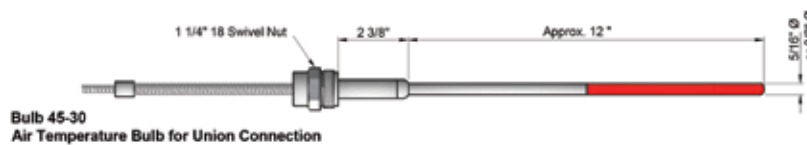
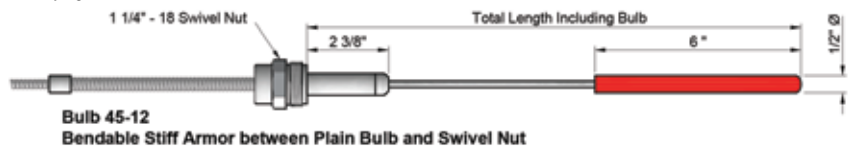
NON-TOXIC LIQUID FILLED TEMPERATURE ELEMENTS

Models 45-5 and 45-11 are bulb and capillary systems designed to be dropped into a tank or bin and hung from the capillary. **Model 45-11** has a bendable section in the middle to expand possible insertion options.

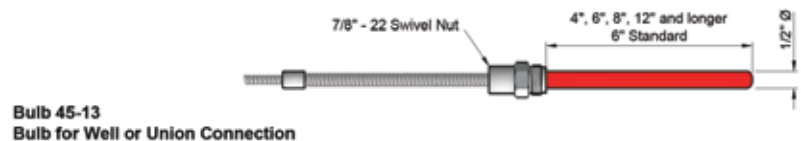
Model 45-29 is a bulb and capillary system designed to be hung by two mounting rings for air temperature measurement. For best results, bulb should be mounted in the center of the flow.



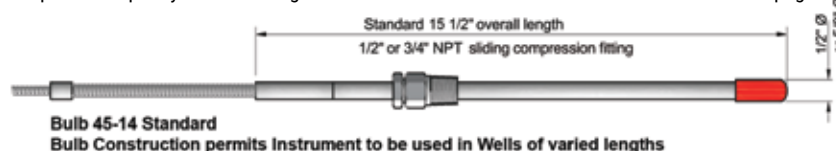
Models 45-12 and 45-30 are bulb and capillary systems designed to be hung from a threaded connection and dropped into a tank or bin. See compatible connectors listed in table on next page.



Model 45-13 is a bulb and capillary system designed to be inserted into a thermowell (closed receptacle) in the process or through a union hub (open end) directly into the process. See compatible connectors and thermowells listed in table on next page.



Model 45-14 is a bulb and capillary system designed to be inserted into thermowells of various lengths (closed receptacle) in the process or through a union hub (open end) directly into the process, or using the 1/2" NPT or 3/4" NPT probe sliding compression fitting directly into the process. Specify desired fitting. See connectors and thermowells listed in table on next page.



We build to order: if your process requires an option not shown here please call Customer Service.

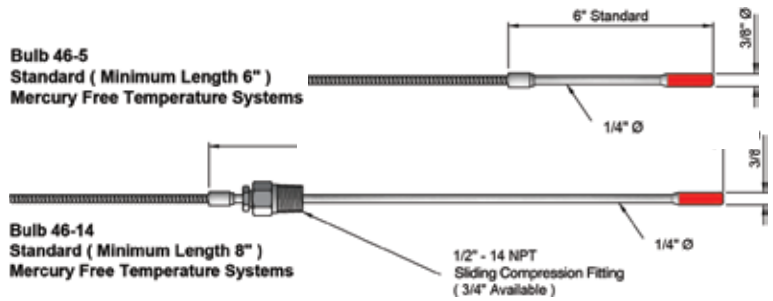
Specifications subject to change without notice.

Optional Non-Mercury Temperature Elements and Capillary

HYDROCARBON FILLED TEMPERATURE ELEMENTS

Model 46-5 is a bulb and capillary system designed for air temperature or to be dropped into a tank or bin and hung from the capillary.

Model 46-14 is a bulb and capillary system designed to be inserted into a thermowell (closed receptacle) in the process or through a union hub (open end) directly into the process or using the 1/2" NPT or 3/4" NPT probe sliding compression fitting directly into the process. Specify desired fitting. See compatible connectors listed in the table below.



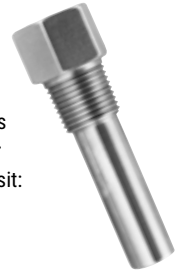
Palmer Connections and Thermowells

Palmer has manufactured a wide selection of thermowells and fittings since the 1940's. Our machined wells are built in our factory in Asheville, North Carolina for complete control of the production process. Our attention to detail allows us to produce precision products to meet your needs.

Below is a reference chart to help direct you to the correct connectors or thermowells compatible with our temperature bulbs.

If your application requires use of a flange, or other options not shown here please call our Customer Service department.

For a complete selection, dimensions and material options for all thermowells and connections please see the Palmer Thermowells and Fittings catalog, or visit: www.palmerwahl.com.



Thermowells • Union Connections • Flange Options for Temperature Bulbs

	Bulb Type	Mercury Filled Bulbs								Non-Mercury Bulbs	
	Bulb Model Number	45-12	45-13	45-14				45-30		46-14	
	Bulb Diameter	1/2"	1/2"	1/2"	1/2"	5/8"	5/8"	5/16"	3/8"	3/8"	3/8"
	Probe Connection	1-1/4"-18 Swivel Nut*	7/8"-22 Swivel Nut*	1/2" NPT	3/4" NPT	1/2" NPT	3/4" NPT	1-1/4"-18 Swivel Nut*	1-1/4"-18 Swivel Nut*	1/2" NPT	3/4" NPT
OPEN ENDED	Standard Union Connection 3/4" NPT*	1140-7	1150-7	1120-7	NA	1120-7	NA	1140-7	1140-7	1120-7	NA
	Standard Union Connection 1" NPT*	1140-8	1150-8	1120-8	NA	1120-8	NA	1140-8	1140-8	1120-8	NA
	Extension Neck Lagging Union Connection 3/4" NPT*	1141-7	1151-7	1121-7	NA	1121-7	NA	1141-7	1141-7	1121-7	NA
	Extension Neck Lagging Union Connection 1" NPT*	1141-8	1151-8	1121-8	NA	1121-8	NA	1141-8	1141-8	1121-8	NA
	Surface Mount Flanged Union Connection	1140-9	1150-9	1120-9	NA	1120-9	NA	1140-9	1140-9	1120-9	NA
CLOSED RECEPTACLE	Standard Thermowell	NA	1150	CP-2083	NA	CP-970	NA	NA	NA	1130	NA
	Extension Neck Lagging Thermowell	NA	1151	NA	NA	NA	NA	NA	NA	1131	NA
	Built-up Heavy Wall Thermowell	NA	1154	NA	NA	NA	NA	NA	NA	NA	NA
	Built-up Extension Neck Lagging Heavy Wall Thermowell	NA	1155	NA	NA	NA	NA	NA	NA	NA	NA
	Weld-in Thermowell	NA	1156	NA	NA	NA	NA	NA	NA	1136	NA
	Flanged Thermowell	NA	1157	NA	NA	NA	NA	NA	NA	1137	NA

* Requires use of Thermowell or Union Hub. See same column as desired Bulb.

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DP Recorder Charts

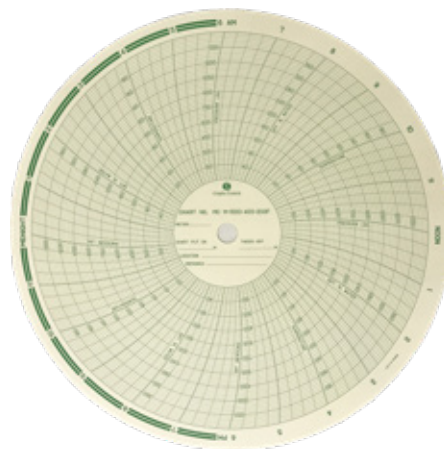
Palmer Recorders use superior quality chart paper and pens engineered to work together for optimum performance and accuracy.

DP Recorder Charts

Palmer DP Recorder Charts: have a 9-7/16" arc line and are fully compatible and interchangeable with the famous maker model charts. They are engineered to work together with our DP Recorder pens for optimum performance and accuracy. Our superior quality charts meet or exceed OEM standards and are designed specifically for the gas industry. Charts are manufactured to provide stiffness and curl control for use in the field for normal and high stress conditions. Charts are packaged 100 per box.

Chart Size: 12"

Arc Line: 9-7/16"



DP Recorder Pens

DP Recorder Pens

Palmer DP Recorder Pens: Scannable pens designed specifically to produce consistently clean, scannable charts for the Gas Industry. Fully compatible and interchangeable with famous maker model pens.

DP Pens feature:

- Broader line width to assure reliable scanner processing.
- Exclusive inks which virtually eliminate skips and estimations.
- All temperature inks for a solid, scannable trace in all types of climates.
- Pen arrays can be calibrated to a 15 minute time lag (.090") between Differential and Static pens on the Zero Line of a 24 hour chart.

Palmer Differential Pressure Recorders have an Arc Line of 9-7/16". The Differential Pressure Pen follows the Arc Line.

Standard DP Pen is Red



Standard Temperature System Pen is Green



Standard Static Pressure System Pens are Black or Blue



Clocks, batteries, charts, pens, liquid infiltration, case finish, and window are not included in the 10 year warranty.

DP Recorder Pens Ordering Information		
Color	Part Number	System
Red	AR-3713-02-6	Differential
Green	AR-3713-01-6	Temperature Scan
Black*	AR-3713-04-6	Static Pressure
Blue*	AR-3713-03-6	Static Pressure

* Choose preferred pen color for Static Pressure.

DP Aluminum Case Style and Dimensional Drawings

Pipestand Mount - Supplied with capillary connection at the bottom of case unless otherwise specified.

Case Dimensions: (Exterior box only, without DP cell)

12 inch Case - 13-1/16" Wide x 15-13/16" High x 4-7/8" Deep, (331.8 x 401.6 x 123.8 mm). Depth with DP cell: 13" (330.2 mm)

Case Weight: (Empty box only, without DP cell)

12 inch Case - approx 16 lbs (7.25 kg). Weight with DP cell: 55 lbs, \ (24.94 kg)

BEP-Bestobell / Bestobell-Aquatronix

2880 Argentia Road, Unit 3

Mississauga, ON, L5N 7X8

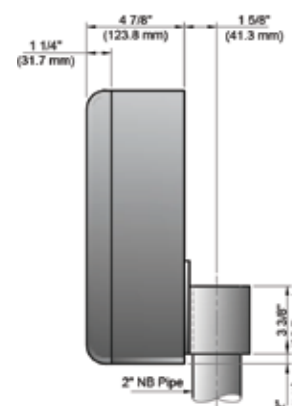
Tel. 905-826-1953 / Fax 905-826-1778

www.bestobell.com



Pipestand Mount

Pipestand Mounted



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