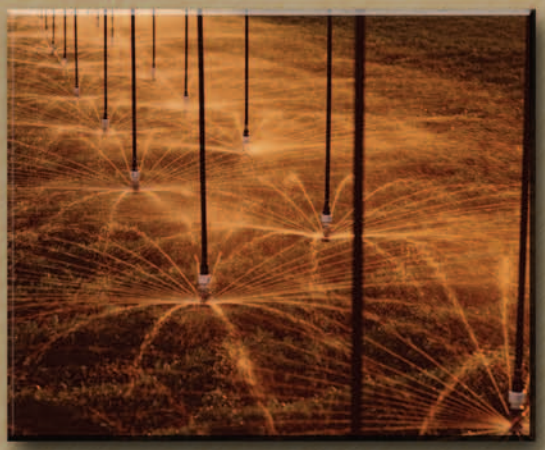
Senninger



Pivot-Master®

IRRIGATION PRODUCTS

About Senninger

For over 40 years, we at Senninger Irrigation Inc. have maintained a commitment to innovation — responding to changing industry needs with new and better products. We've been at the forefront in product research and testing, not only at our Clermont facilities, but more importantly, in the field working closely with researchers, government groups, dealers and growers.

With this philosophy, we have designed and manufactured long-lasting quality sprinklers, spray nozzles and pressure regulators for agriculture, wastewater and nursery irrigation. These products have earned the respect and recognition of industry people worldwide, setting the standard for reliability and superior performance.

The outstanding reputation of these products has helped us establish a network of more than 1,500 knowledgeable dealers and distributors who sell and service our products all across the USA - and in many countries throughout the world.

This catalog outlines our pivot product line. Please use it to help select the proper models for your particular application. Senninger products are sold only through qualified Senninger dealers and O.E.M. accounts. Please contact your nearest dealer regarding specific application of Senninger products for your irrigation system.

Our price lists are printed separately and are available at your dealer or by calling one of our offices.

Senninger Innovations

1962 After having serious problems with mud dauber wasps plugging nozzles, Joe Senninger develops the world's first Insect-Proof™ sprinkler. During the next 15 years, over two million of these sprinklers are sold for use in Florida citrus groves.

1966 Recognizing the importance of maintaining correct system pressure, Senninger introduces the first high-quality in-line pressure regulator to the irrigation industry.

1969 Senninger develops the color-coded nozzle system which has become the standard for pivot sprinklers and spray nozzles.

1973 Senninger's low-angle undertree plastic sprinklers are introduced.

1974 High pumping costs and the need to conserve water led Senninger to develop the industry's first low-angle pivot impact sprinkler, the Windfighter™.

1975 Senninger begins production on Pivot-Master® Sprinklers with brass and plastic components designed specifically for center pivots.

1979 The world's largest thermoplastic impact sprinkler, the 8025, is introduced for higher volume and land treatment applications.

1980 Senninger introduces the Super Spray®, the industry's most versatile spray nozzle.

1980 Senninger begins manufacturing the Wobbler® family of spray heads, which are still the most uniform low-pressure pivot sprinklers available anywhere.

1983 Senninger responds to the challenge of low water availability in West Texas with the first drag hose adapter for spray nozzles.

1986 Senninger enhances the cutting edge technology of Low Energy Precision Application with a four-mode LEPA head, the Quad-Spray®, which quickly becomes the top selling LEPA applicator.

1990 The Senninger Low-Drift Nozzle (LDN®) improves pivot irrigation as the first spray nozzle with multiple pads that help reduce water lost to wind drift. The LDN is also the first spray head with high or low profile crop chemigation.

1994 The Irrigation Association presents Senninger Irrigation Inc. with the **Industry Achievement Award** for "Outstanding contributions to the development of the irrigation industry and the products used by it."

1997 The PSR (Pivot-Special Regulator™) with a 1/2 to 15 gpm flow range is introduced. With already over a million units put into service, it's proving to be the most reliable regulator on the market.

1999 The i-Wob's® (Inverted Pivot Wobbler) full scale release brings an outstanding new tool to pivot irrigators worldwide, including the introduction of the industry's first below-the-nozzle weight.

2000 The integral weight concept is adapted for the LDN and significantly enhanced with a bubbler pad that allows gentle in-the-furrow application.

2003 Senninger introduces the double barb gooseneck and truss rod hose sling allowing two applicators to be used from each pivot outlet thus dramatically decreasing application intensity.

Table of Contents

Equipment Selection

Center pivot irrigators must constantly look for ways to reduce water usage and energy costs while at the same time increasing crop yields. A properly designed sprinkler package using state-of-the-art Senninger products will help ensure that these goals are met.

The selection of a sprinkler package should be based on several factors:

1) wind / evaporative conditions
2) soil types / potential runoff
3) crop type / value
4) available water / crop requirements
5) field elevation / pressure regulation
6) pumping costs / operating hours
7) farming practices
8) chemigation potential
9) machine characteristics
10) uniformity of water application
11) cost vs. benefits of package

Evaporative losses will decrease with:

regulated pressure
lower spray height
lower pressure
lower trajectory
deeper pad grooves
larger nozzles
lower winds
lower temperature
higher humidity
a properly designed sprinkler package

In order to assist in the selection of equipment, the following chart will appear on the top right-hand corner of the product pages:

PRODUCT APPLICATION PARAMETERS

WIND	
SOIL	
MIN. END PSI [1]	

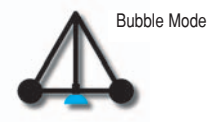
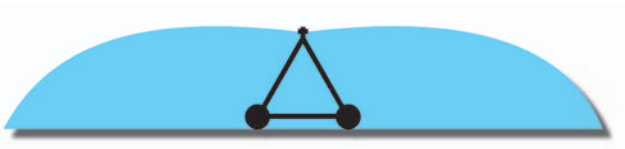
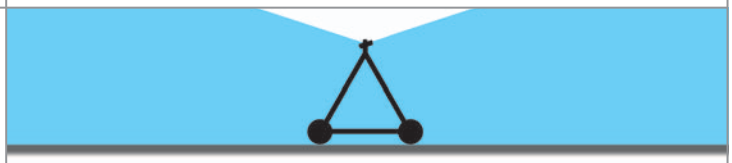
[1] minimum end psi when the end of the system is at its highest point in the field

The information contained in this catalog is intended to be used as a general guideline only. Your local Senninger dealer, who lives and works under similar conditions as you do, will be happy to advise you on, review and/or quote any sprinkler package listed in this catalog.

Product Comparison

PRODUCT	NOZZLE PRESSURE RANGE [1]	PIVOT PRESSURE RANGE [2]	NOZZLE HEIGHT	
 I-WOB®	10 - 20 psi .69 - 1.38 bars	20 - 30 psi 1.38 - 2.07 bars	3 - 9 ft .92 - 2.75 m	
 LDN®	10 - 20 psi .69 - 1.38 bars	15 - 20 psi 1.04 - 1.38 bars	1.5 - 14 ft .46 - 4.27 m	
 SUPER SPRAY®	10 - 25 psi .69 - 1.72 bars	15 - 25 psi 1.04 - 1.73 bars	1.5 - 14 ft .46 - 4.27 m	
 QUAD-SPRAY®	6 - 10 psi .42 - .69 bars	10 - 20 psi .69 - 1.38 bars	8 in - 1.5 ft .20 - .46 m	
 6° IMPACT	25 - 70 psi 1.72 - 4.83 bars	35 - 70 psi 2.42 - 4.83 bars	10 - 14 ft 3.05 - 4.27 m	
 8025 HD	35 - 75 psi 2.42 - 5.18 bars	45 - 75 psi 3.11 - 5.18 bars	10 - 14 ft 3.05 - 4.27 m	

[1] Lower end of pressure range on some products allows larger droplets which can cause compaction in some soil conditions
[2] Pivot Pressure = pressure at top of mainline at the first outlet (range given is assuming 1300' of 6-5/8" galvanized pipe and < 800 gpm)

	APPLICATION INTENSITY	APPLICATION EFFICIENCY [3]	DIAMETER OF COVERAGE [4]
	Low - Medium	85 - 95 %	 40 - 57 ft 12.2 - 17.4 m
	Medium - High Multi-Pad = Medium Single Pad = High	80 - 95 %	 30 - 48 ft 9.2 - 14.6 m
	Medium - High	75 - 95 %	 25 - 48 ft 7.6 - 14.6 m
	Very High	95 - 98 %	 1 - 2 ft .3 - .6 m
	High	65 - 80 %	 70 - 100 ft 21.4 - 30.5 m
	High	65 - 80 %	 150 - 220 ft 45.8 - 67.1 m

[3] Application efficiency = percent of water pumped that reaches the soil surface (may vary significantly depending on actual nozzle pressure and where applicable, pad selection) [4] SPACING - Senninger recommends a minimum of 150% overlap (nozzles spaced no farther apart than 2/3 of throw radius) for all sprinklers and spray nozzles. In windier conditions, a 200% overlap is preferable. (exception: The Quad-Spray should be spaced to travel down every other furrow.)

i-Wob®

- Off-center rotary action for outstanding spray pattern
- Exclusive below-the-nozzle weight eliminates the need for heavier, conventional drop weights
- Easy to change nozzles - color coded for size identification
- Resilient wear sleeve cushions contact surfaces resulting in a longer wearing, more reliable product
- Standard-angle and two low-angle models available
- 3/4" NPT male thread or hosebarb base
- Two-year warranty on materials, workmanship and performance

The Senninger i-Wob uses a unique off-center rotary action to provide outstanding uniformity at low pressures. Its new below-the-nozzle weight creates less stress on flexible drops.

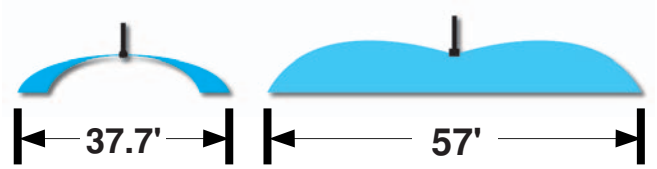
Three Models Available

Standard
• **black** deflector
• 9-grooves
• largest area of coverage

Low-Angle - 9
• **blue** deflector
• 9-grooves
• gentler application/ fights wind

Low-Angle - 6
• **white** deflector
• 6-grooves
• large droplets/ fights wind

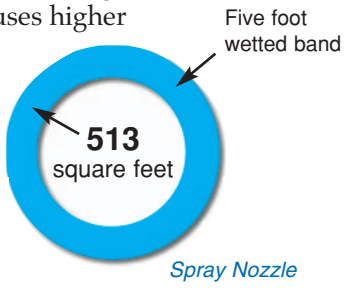
Excellent Distance of Throw



The action of its wobbling shroud allows the i-Wob to throw water much farther than spray nozzles with stationary deflector pads. *(In this example, nozzles are at 20 psi, a 6' height, using a 11/32" nozzle, with a flow of 14.3 gpm in no-wind conditions.)*

Lowest Instantaneous Application Rate

Ordinary spray nozzles place water in a ring at the outer edge of their wetted circle. This causes higher application rates, soil compaction and an increased chance of runoff.



The i-Wob uniformly covers the inside of its wetted circle. This means it is wetting a much larger area at a much lower instantaneous application rate.

In this example, the i-Wob is wetting over four and a half times the area of the spray nozzle. *(Nozzles are at 20 psi, a **6' height**, using a 11/32" nozzle, with a flow of 14.3 gpm in no-wind conditions.)*

overhead view

Senninger

The i-Wob provides an extremely uniform, rain-like pattern at very low pressures (from 10 to 20 psi).

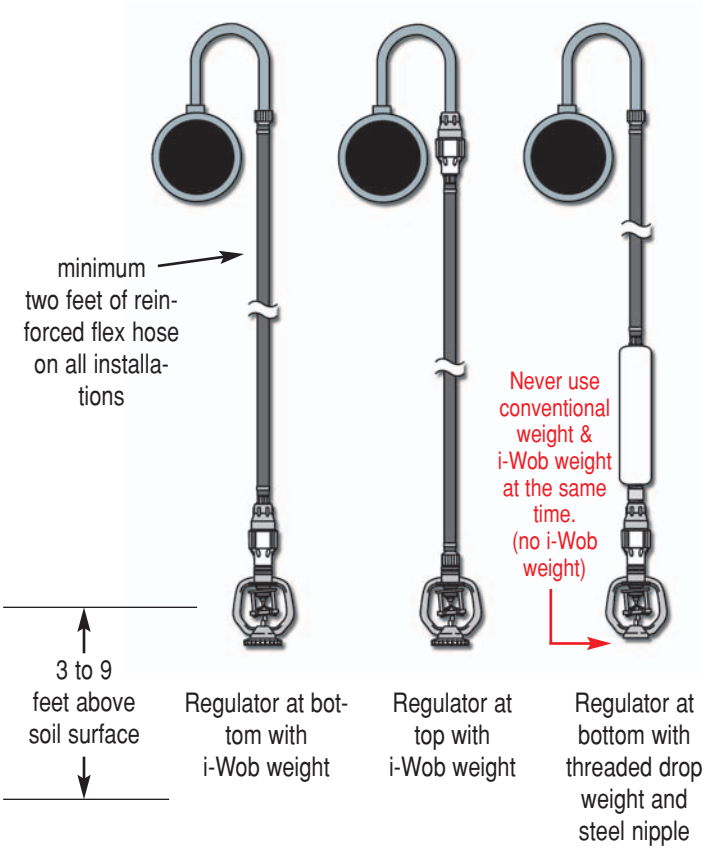
PRODUCT APPLICATION PARAMETERS

WIND	All
SOIL	All
MIN. END PSI [1]	10 - 15

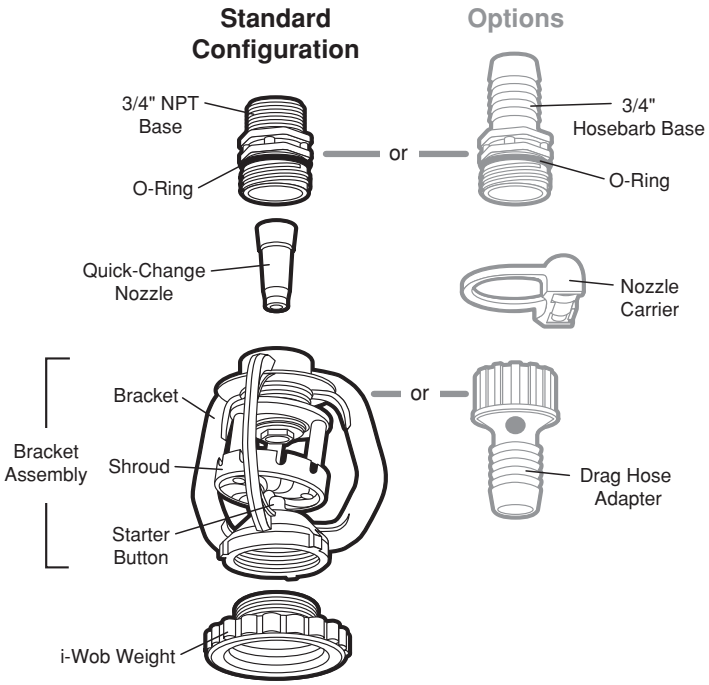
[1] minimum end psi when the end of the system is at its highest point in the field

Typical Installations

(cross section view of pivot mainline)



i-Wob Components



Patented i-Wob Weight

When compared to conventional drop weights, the i-Wob weight provides:

- a lower position on drop for better stability
- less stress on flexible drops
- less weight needed for counteracting wind (a 3/4 lb i-Wob weight is as effective as a 2 lb polyethylene weight)
- easier installation

The i-Wob weight is available in 1/2, 3/4 and 1 pound sizes.

IMPORTANT NOTES:

For an accurate pivot package printout, it is critical that you let us know whether regulators are being mounted at the top or bottom of the drop tubes.

Because of its off-center rotary action, it is necessary that the i-Wob be mounted with a minimum of two feet of reinforced flex hose.

If you are using conventional weights (above nozzle), be sure to use threaded weights, do not use slip over weights with the i-Wob.

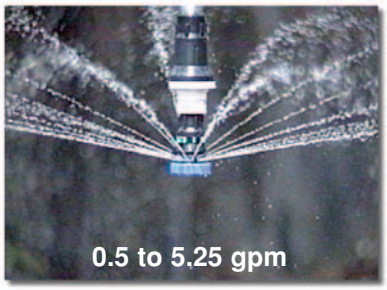
When using a steel nipple as a drop weight, Senninger does not recommend using a rigid nipple over 12" (30 cm) in length.

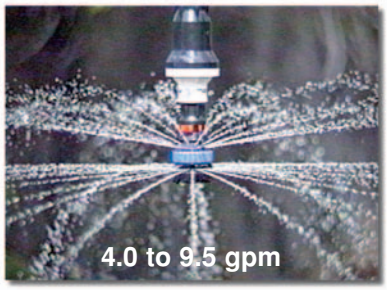
LDN®
Low-Drift Nozzle

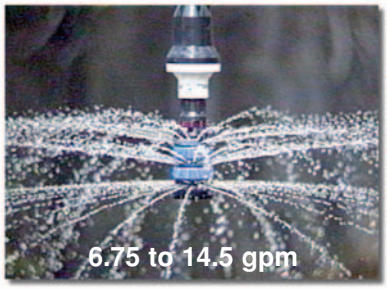
- Multiple-level deflector pads to handle the higher flows on the middle to outer spans
- Mini deflector pads available for smaller nozzles
- Chemigate pads available: Corn (58° upward throw) and Cotton (15° - 30° multi-level upward throw)
- Hosebarb adapter available for direct furrow water application
- Color coded nozzles for easy size identification
- 3/4" NPT male thread
- Two-year warranty on materials, workmanship and performance

The Senninger Low-Drift Nozzle (LDN®) features a unique multiple deflector pad design. This allows it to produce uniform sized droplets through the wide range of nozzle flows found on center pivots. The result is extremely efficient water application with minimized losses to wind drift, evaporation and runoff.

Water and energy savings make the LDN a very smart investment.







As nozzle sizes increase along the length of a pivot, extra deflector pads are added to accommodate the higher flow. The increased area of coverage provided by this multi-pad system aids in the reduction of instantaneous application rate, reducing runoff and surface compaction.

LDN Weight and Bubbler Pad

The LDN is now available with a new **slip-over weight** for better stability in high wind and a **bubbler pad** for gentle direct-to-furrow water delivery.

3/4 & 1 lb. sizes available

Also available: The **LDN Bubble Ring** attachment. Ideal for a quick low-cost conversion to a LEPA-style pattern when not using the LDN weight.

PRODUCT APPLICATION PARAMETERS

WIND	All
SOIL	Loose / Medium
MIN. END PSI [1]	6 - 10

[1] minimum end psi when the end of the system is at its highest point in the field

Hosebarb Adapter

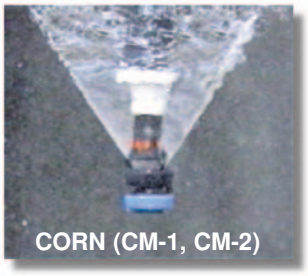
With the LDN hosebarb adapter and a drag hose, you can apply water directly into the furrow. The adapter snaps right onto the LDN.

NEW

Barbed Base

For direct-to-hose connection without the use of an NPT fitting.

Chemigation



Any LDN Pad (single, double or triple) can be backed with a corn chemigation pad (58° upward throw) or a cotton chemigation pad (15° - 30° multi-level upward throw).

Changing Modes

To change modes from irrigate to chemigate, simply twist and unlock the deflector pad, flip it over, twist and lock it back on.

Typical Installations

(cross section view of pivot mainline)

For an accurate pivot package printout, it is critical that you let us know whether regulators are being mounted at the top or bottom of the drop tubes.

*Also see the **Part-Circle LDN®** on page 12*

Part-Circle LDN®

NEW

- Distributes water in a 170-degree pattern
- Binds water into 17 discreet streams for minimum evaporative loss
- Maximum radius of throw
- 10-degree trajectory
- Fits on standard LDN base, nozzle & cage
- Available for nozzle sizes 6-18

The new Part-Circle LDN is specially designed to help center pivot operators manage the difficult-to-irrigate areas near towers. The Part-Circle LDN distributes water away from wheel tracks and minimizes rutting. Part-Circle LDNs can be used in conjunction with standard full circle LDNs or other Senninger sprinklers on the remainder of the machine.

Part-Circle LDN Pad

The Part-Circle LDN distributes water away from wheel tracks. (For use on rigid drops.)

Super Spray®

- Wide variety of color-coded deflector pads provide a choice of spray patterns
- Chemigate pads available: Corn (58° upward throw) and Cotton (15° - 30° multi-level upward throw)
- Hosebarb adapter available for direct furrow water application
- Color coded nozzles for easy size identification
- 3/4" NPT male thread
- Two-year warranty on materials, workmanship and performance

The Super Spray was introduced in the early 1980's to help reduce water and energy requirements on center pivots. It's interchangeable parts and wide range of spray patterns helped it quickly become the world's best selling ag spray nozzle. Today, several million Super Sprays are in operation throughout the world.

Super Spray®

PRODUCT APPLICATION PARAMETERS

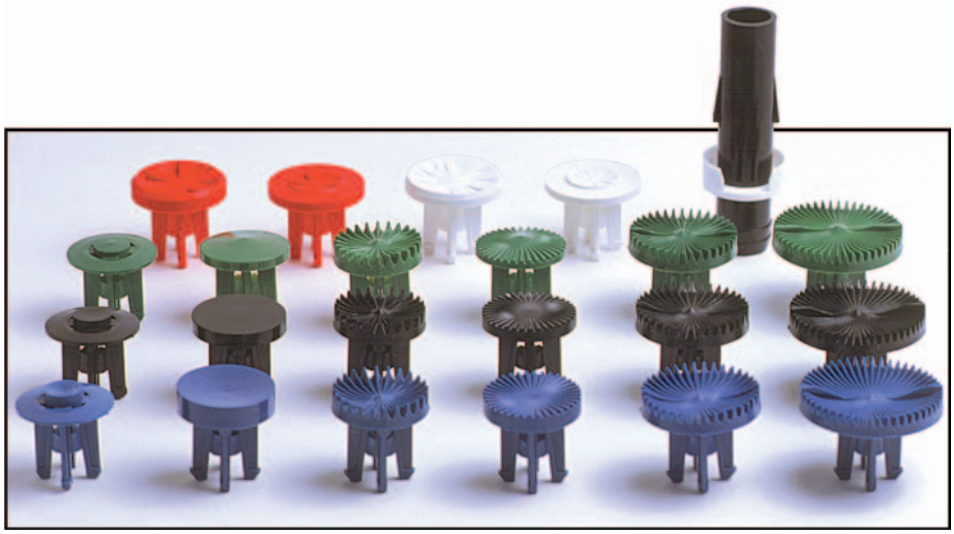
	ON DROPS	ON TOP
WIND	All	Low
SOIL	— Loose/Medium—	
MIN. END PSI [1]	——— 6 - 10 ———	

[1] minimum end psi when the end of the system is at its highest point in the field

Deflector Pads

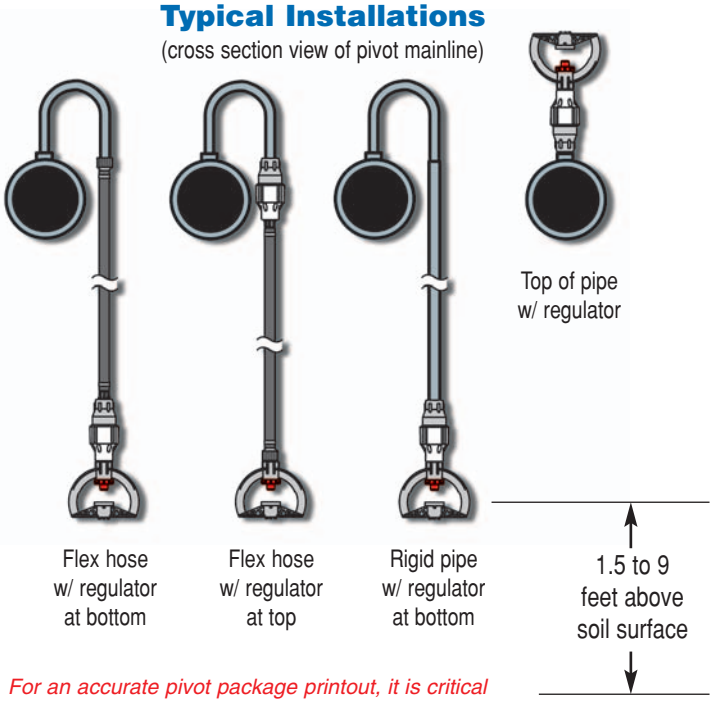
The Super Spray is available with a variety of interchangeable deflector pads. They are identified both by shape (flat, concave or convex) and type of surface (smooth, medium-grooved or deep-grooved). The shape and surface help control spray pattern and droplet size.

Chemigation pads are available in high profile (corn chemigate) and low profile (cotton chemigate).



Typical Installations

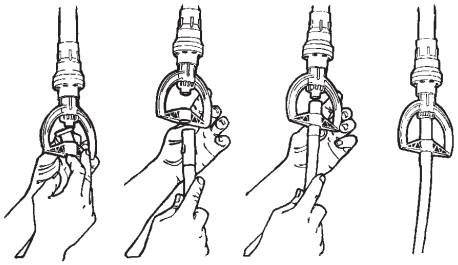
(cross section view of pivot mainline)



For an accurate pivot package printout, it is critical that you let us know whether regulators are being mounted at the top or bottom of the drop tubes.

Hosebarb Adapter

With the Super Spray hosebarb adapter and a drag sock, you can apply water directly into the furrow. The adapter snaps right into the Super Spray, replacing the deflector pad.



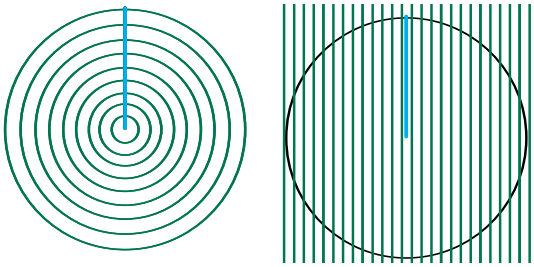
Quad-Spray®

- Two bubble modes eliminate misting and reduce soil redistribution
- Spray irrigate mode to wet entire soil surface when needed
- Chemigate pads available: Corn (58° upward throw) and Cotton (15° - 30° multi-level upward throw)
- Standard model includes internal Pressure-Master Regulator®
- Color coded nozzles for easy size identification
- 3/4" NPT female thread
- Two-year warranty on materials, workmanship and performance

The Senninger Quad-Spray was developed in the mid-1980's specifically for Low Energy Precision Application (LEPA). LEPA is a relatively new irrigation practice that requires very little water and energy to operate. One of the biggest benefits of LEPA is that it makes pivot irrigation possible in regions previously hindered by limited water supplies.

With LEPA, the plant canopy remains dry and less than one-half of the soil surface is wetted — surface evaporation losses are dramatically reduced.

When crops are planted in a circle, the pivot never dumps all the water into a few furrows as it can when it parallels straight planted rows.



Bubble (LEPA 1)

Aerated Bubble (LEPA 2)

Spray Irrigate

Chemigate

PRODUCT APPLICATION PARAMETERS

WIND	All
SOIL	Loose / Medium
MIN. END PSI [1]	6-8

[1] minimum end psi when the end of the system is at its highest point in the field

The Quad-Spray has four different modes of operation. The **Bubble** and **Aerated Bubble** modes gently deposit water directly into furrow basins. The **Spray Irrigate** mode is used to wet the entire soil surface. This is desirable for seed germination, for some chemical applications and for irrigation of close-seeded crops. The fourth mode is the **Chemigate** mode. This mode provides an upward spray that is very effective at washing away insects from the underside of the crop canopy.

Recommendations for Efficient LEPA Irrigation

Level Fields - LEPA is primarily for use on relatively flat land. The maximum recommended slope is one percent.

Deep Chiseling or Ripping - Used to loosen soil and improve infiltration.

Furrow Diking - This creates small storage basins to hold water until it can infiltrate the soil.

Soil Moisture Monitoring - Scheduling irrigation using soil moisture monitoring devices helps reduce deep percolation losses and avoid plant stress.

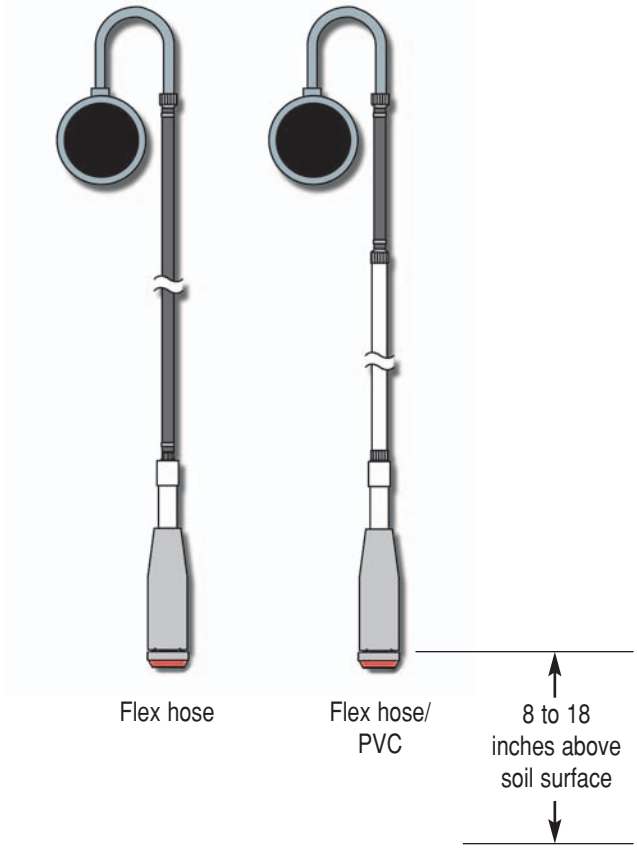
Soft Middles - Because a LEPA applicator is located in every other furrow, it is recommended that these furrows be left as uncompacted as possible.

Crop Residue - This increases surface storage capacity and helps prevent soil redistribution.

Circle Planting - This is necessary to keep the applicator head centered in the furrow. Circular rows also play an important role in reducing runoff.

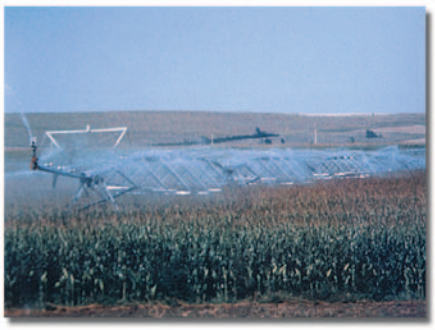
Typical Installations

(cross section view of pivot mainline)



Pivot-Master Impacts®

- 6° trajectory fights wind drift and evaporation
- Double nozzle models available for good low-pressure performance
- Enclosed splasharm spring and bearing for protection from elements
- Color coded nozzles for easy size identification
- 3/4" brass swivel for use in galvanized steel fittings
- Two-year warranty on materials, workmanship and performance



For over 30 years, growers have depended on Senninger low-angle Pivot-Master impacts.

In 1974, Senninger developed the **Windfighter**™, the first low-angle sprinkler ever designed for use on center-pivot systems. University studies showed that it was saving up to 25% of the water formerly lost to wind drift. By the end of 1975, Senninger low-angle impacts were in service on over 100 pivots in a 5-state area. By 1982, this number had jumped to over 10,000 center pivots worldwide using Senninger Windfighter™ sprinkler heads. Today, Senninger is still the most trusted name for high-quality center-pivot impact sprinklers.

MODEL	NOZZLES (in 1/64") *	FLOW (gpm / L/s)		DIAMETER (ft / m) **	
2014 -1 PM	6-7	1.2 - 2.4	.08 - .15	69 - 79	21.0 - 24.1
3006 -1 PM	7 - 9	1.7 - 4.8	.11 - .30	64 - 98	19.5 - 29.9
4006 -1 PM	10 - 12	3.5 - 8.6	.22 - .54	71 - 106	21.7 - 32.3
5006 -1 PM	13 - 18	6.0 - 18.8	.38 - 1.18	73 - 122	22.3 - 37.2
5006 -2 PM	13 x 7 - 18 x 18	6.8 - 25.6	.43 - 1.61	82 - 112	25.0 - 34.2

* *These are the recommended nozzle sizes for maximum product life and maintaining a consistent rotation speed. Incorrect nozzle placement may cause excessive wear and/or incorrect rotation speed.*

** *Height at 12 ft. (3.66 m)*

For higher flow requirements, 70 Series (8 - 39 gpm) and 80 Series (23 - 107 gpm) models are available.

PRODUCT APPLICATION PARAMETERS

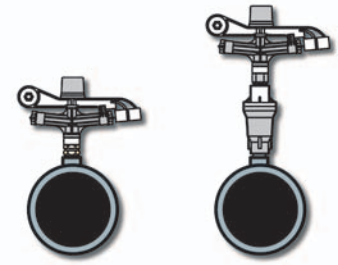
WIND	Low / Medium
SOIL	All
MIN. END PSI [1]	25

[1] minimum end psi when the end of the system is at its highest point in the field

The double-nozzle impact allows better distribution and increased flow over a single nozzle model. Combining the spiral vane with the standard stream-straightening vane further enhances distribution.

Typical Installations

(cross section view of pivot mainline)



Top of pipe

Top of pipe w/ regulator

Note: Brass swivel is recommended for use in galvanized steel fittings.

New 2014 Pivot Model has a weighted splasharm and a 3/4" brass base.

Senninger also offers additional components to complete drop assemblies.

Hose & Fittings

Single Gooseneck (125°) Barbed or Threaded

Double Gooseneck (125°) Barbed or Threaded

NEW

125° Goosenecks (above) must be used in conjunction with **Truss Rod Hose Slings** (below).

Single Gooseneck (180°) Barbed or Threaded

Hose Barb Adapters

NEW

Pressure Drop

Hose

Ball Valve

Clamps

Couplings & Nipples

Available in Standard & Frost-Proof Models

Pressure Regulators

- Maintain a constant preset outlet pressure while handling high inlet pressures
- Withstand severe water hammer
- 100% water tested for accuracy, no adjustments ever needed
- Strong, durable construction
- Very low hysteresis and friction losses
- 3/4" NPT female x 3/4" NPT female thread
- Two-year warranty on materials, workmanship and performance

Senninger introduced the first high-quality in-line pressure regulator to the irrigation industry back in 1966. Since then, Senninger Regulators have become an integral part of modern irrigation systems. They set the standards by which all regulators are judged.

Pivot-Special Regulator (PSR)™

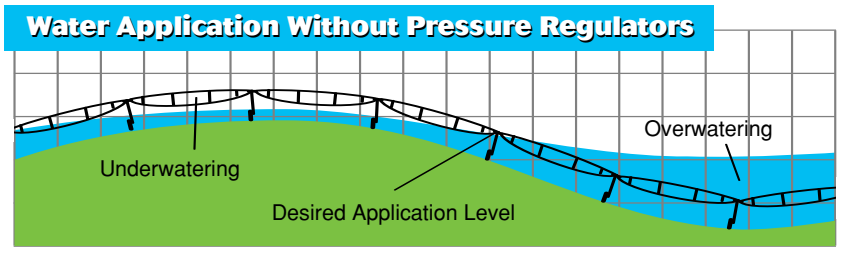
- 10 factory preset operating pressures (6, 10, 12, 15, 17, 20, 25, 30, 35, 40 & 50 psi)
- Flow range from 1/2 to 15 gpm

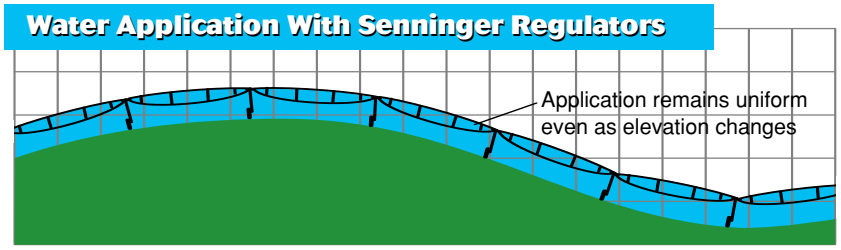
Pressure-Master Regulator® Low-Flow (PMR-LF)

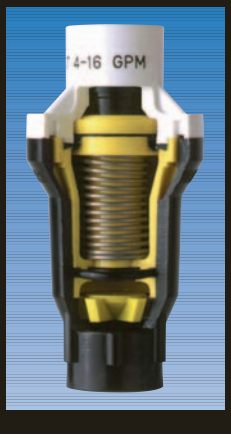
- 9 factory preset operating pressures (6, 10, 12, 15, 20, 25, 30, 35 & 40 psi)
- Flow range from 1/10 to 8 gpm

Pressure-Master Regulator® Medium-Flow (PMR-MF)

- 10 factory preset operating pressures (6, 10, 15, 20, 25, 30, 35, 40, 50 & 60 psi)
- Flow range from 2 to 20 gpm







Restriction through a Senninger Regulator is negligible until the exact operating pressure is reached. At this point, the regulator goes into action and automatically maintains its designed downstream pressure and flow to the spray nozzle or sprinkler head.

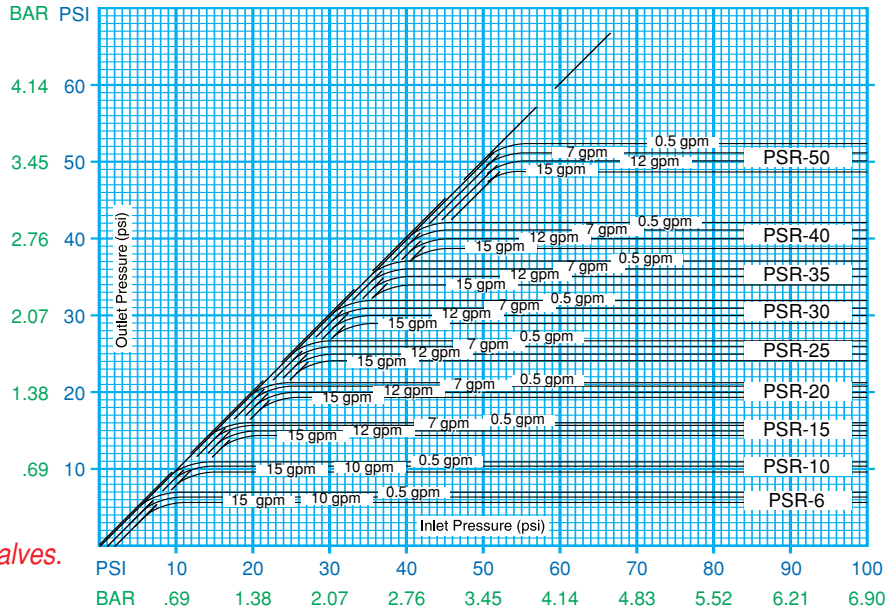
Senninger

PSR Performance[1]

Model Number	Preset Operating Pressure (psi)	(bar)	Maximum Inlet Pressure (psi)	(bar)	Flow Range (gpm)	(L/s)
PSR - 6	6	0.41	100	6.90	1/2 - 15	0.032 - 0.945
PSR - 10	10	0.69	120	8.28	1/2 - 15	0.032 - 0.945
PSR - 12	12	0.83	135	9.31	1/2 - 15	0.032 - 0.945
PSR - 15	15	1.04	135	9.31	1/2 - 15	0.032 - 0.945
PSR - 17	17	1.17	135	9.31	1/2 - 15	0.032 - 0.945
PSR - 20	20	1.38	135	9.31	1/2 - 15	0.032 - 0.945
PSR - 25	25	1.73	135	9.31	1/2 - 15	0.032 - 0.945
PSR - 30	30	2.07	135	9.31	1/2 - 15	0.032 - 0.945
PSR - 35	35	2.42	135	9.31	1/2 - 15	0.032 - 0.945
PSR - 40	40	2.76	135	9.31	1/2 - 15	0.032 - 0.945
PSR - 50	50	3.45	135	9.31	1/2 - 15	0.032 - 0.945

[1] Regulated pressure is 1/2 psi (0.03 bar) higher with increasing inlet pressure than with decreasing inlet pressure

CAUTION: Always install downstream from all shut-off valves.

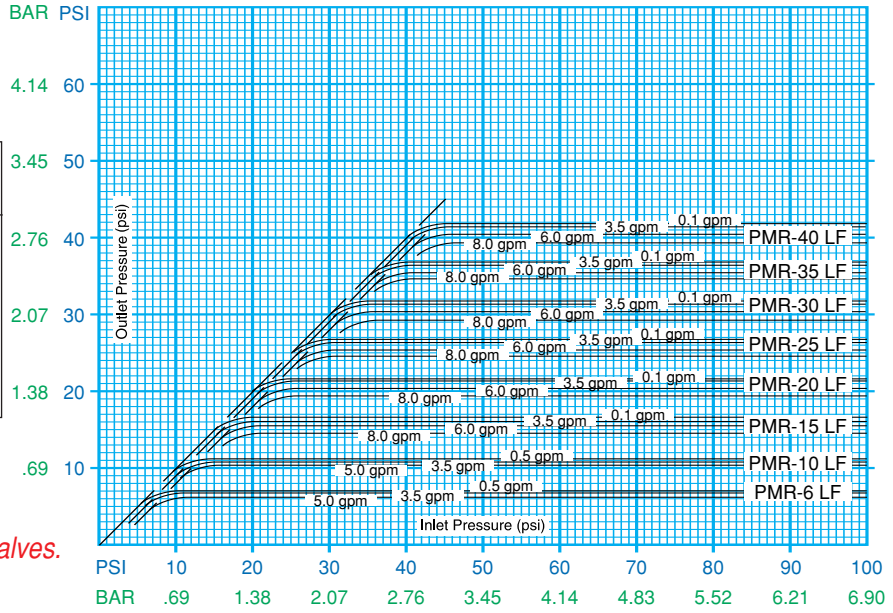


PMR-LF Performance[1]

Model Number	Preset Operating Pressure (psi)	(bar)	Maximum Inlet Pressure (psi)	(bar)	Flow Range (gpm)	(L/s)
PMR - 6 LF	6	0.41	100	6.90	1/2 - 5	0.032 - 0.315
PMR - 10 LF	10	0.69	120	8.28	1/2 - 5	0.032 - 0.315
PMR - 12 LF	12	0.83	135	9.31	1/10 - 8	0.006 - 0.504
PMR - 15 LF	15	1.04	150	10.35	1/10 - 8	0.006 - 0.504
PMR - 20 LF	20	1.38	150	10.35	1/10 - 8	0.006 - 0.504
PMR - 25 LF	25	1.73	150	10.35	1/10 - 8	0.006 - 0.504
PMR - 30 LF	30	2.07	150	10.35	1/10 - 8	0.006 - 0.504
PMR - 35 LF	35	2.42	150	10.35	1/10 - 8	0.006 - 0.504
PMR - 40 LF	40	2.76	150	10.35	1/10 - 8	0.006 - 0.504

[1] Regulated pressure is 1/2 psi (0.03 bar) higher with increasing inlet pressure than with decreasing inlet pressure
[2] Inlet also available in 3/4" F hose thread
[3] Outlet also available in 3/4" M hose thread

CAUTION: Always install downstream from all shut-off valves.

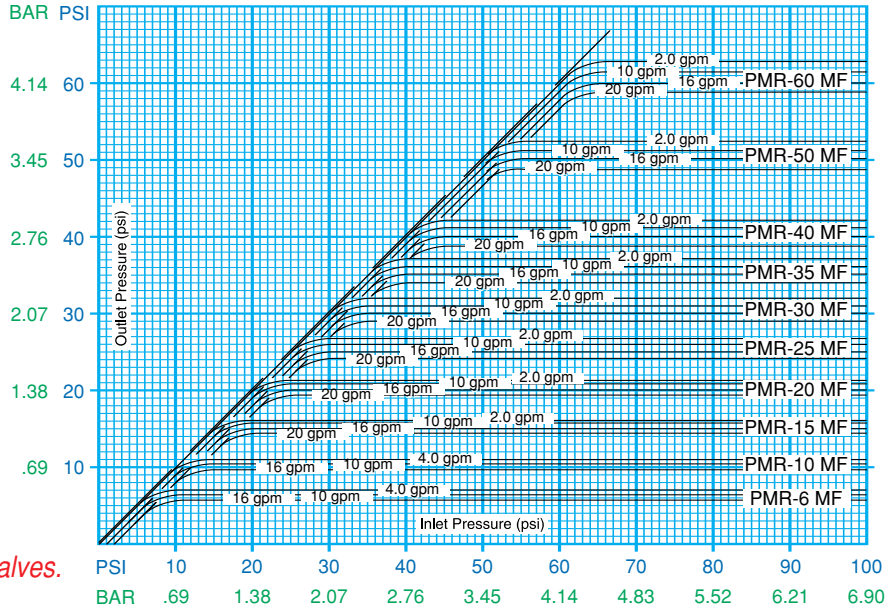


PMR-MF Performance[1]

Model Number	Preset Operating Pressure (psi)	(bar)	Maximum Inlet Pressure (psi)	(bar)	Flow Range (gpm)	(L/s)
PMR - 6 MF	6	0.41	100	6.90	4 - 16	0.252 - 1.01
PMR - 10 MF	10	0.69	120	8.28	4 - 16	0.252 - 1.01
PMR - 12 MF	12	0.83	135	9.31	2 - 20	0.126 - 1.26
PMR - 15 MF	15	1.04	150	10.35	2 - 20	0.126 - 1.26
PMR - 20 MF	20	1.38	150	10.35	2 - 20	0.126 - 1.26
PMR - 25 MF	25	1.73	150	10.35	2 - 20	0.126 - 1.26
PMR - 30 MF	30	2.07	150	10.35	2 - 20	0.126 - 1.26
PMR - 35 MF	35	2.42	150	10.35	2 - 20	0.126 - 1.26
PMR - 40 MF	40	2.76	150	10.35	2 - 20	0.126 - 1.26
PMR - 50 MF	50	3.45	150	10.35	2 - 20	0.126 - 1.26
PMR - 60 MF	60	4.14	150	10.35	2 - 20	0.126 - 1.26

[1] Regulated pressure is 1/2 psi (0.03 bar) higher with increasing inlet pressure than with decreasing inlet pressure

CAUTION: Always install downstream from all shut-off valves.



Nozzle Color Code & Pivot Packages

Senninger's Nozzle Color Code

Senninger nozzles are available in 45 different size orifices (1/16" to 13/32" in 1/128" increments). They are color-coded to make size identification easy.

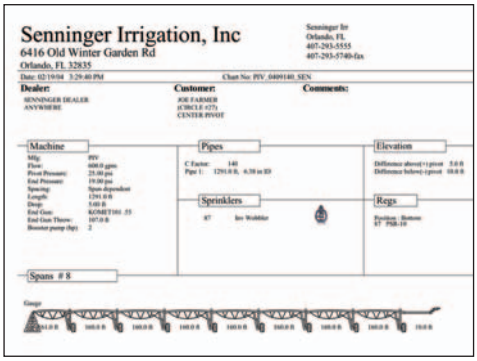
Nozzle Number	Nozzle Color	Orifice Diameter *(in.)*	Orifice Diameter *(mm.)*
4	Light Blue	1/16 (.063)	1.59
5	Beige	5/64 (.078)	1.98
6	Gold	3/32 (.094)	2.38
7	Lime	7/64 (.109)	2.78
8	Lavender	1/8 (.125)	3.18
9	Grey	9/64 (.141)	3.57
10	Turquoise	5/32 (.156)	3.97
11	Yellow	11/64 (.172)	4.37
12	Red	3/16 (.188)	4.76
13	White	13/64 (.203)	5.16
14	Blue	7/32 (.219)	5.56
15	Dark Brown	15/64 (.234)	5.95
16	Orange	1/4 (.250)	6.35
17	Dark Green	17/64 (.266)	6.75
18	Purple	9/32 (.281)	7.14
19	Black	19/64 (.297)	7.54
20	Dark Turquoise	5/16 (.313)	7.94
21	Mustard	21/64 (.328)	8.33
22	Maroon	11/32 (.344)	8.73
23	Cream	23/64 (.359)	9.13
24	Dark Blue	3/8 (.375)	9.53
25	Copper	25/64 (.391)	9.92
26	Bronze	13/32 (.406)	10.32

NOTE: Half sizes (1/128th inch increments) are also available. Consult factory for more information.

Pivot Packages

To help your pivot perform its best, Senninger will create the ideal irrigation package for your specific machine, field and climate.

With the purchase of a complete pivot package, you will receive a computer printout showing the location of each spray head and regulator on your machine. When your order arrives, the products will be numbered and sequence packed for easy installation.



Your dealer can help you fill out the Senninger Pivot Data Form (shown at right). This provides us with such information as system make, span lengths, pipe sizes, water pressure and gpm.

It is extremely important to furnish accurate and complete information to produce a top-notch water application printout. The quality of the printout is directly affected by the quality of the information furnished. Please include as a minimum: pivot manufacturer, model and type of system, product selection, pressure (pivot or end), system flow, mechanical characteristics (number of spans, length, pipe size and finish, outlet spacing, end gun model (if any), soil type, elevation, and pressure regulation option.

NUMBER OF SETS _____

PRINTOUT ONLY _____

PIVOT DATA FORM

For Office Use

PERSON PLACING ORDER _____ PO# _____ DATE _____

CUSTOMER CODE _____ ☐ QUOTE

SOLD TO (Senninger Dealer) _____ **SHIP TO CODE** _____

(P.O. Box #) _____ **SHIP TO** _____

(City, State, Zip) _____ (Street Address) _____

(Phone) _____ (City, State, Zip) _____

PIVOT MANUFACTURER _____ **MODEL #** _____

TYPE OF DRIVE ☐ ELECTRIC (OR AIR OR OIL) ☐ WATER CYLINDER ☐ WATER SPINNER MOTOR **YEAR** _____

SERIAL # _____ **OWNER'S NAME** _____ **CIRCLE #** _____

☐ SPRAY NOZZLES
- ☐ TOP OF PIPE
- ☐ ON _____ DROPS
- ☐ FLEX DROPS
- ___FT. GALV. ___
- ___FT. HOSE ___
- ___FT. POLY/HOSE ___

☐ IMPACTS
- ☐ 23°
- ☐ 12° ANGLE
- ☐ 6°

- ☐ I-WOB
  - ☐ LOW-ANGLE
    - ☐ 6 GROOVE
    - ☐ 9 GROOVE
  - ☐ STANDARD
  - ☐ WEIGHTS - SIZE ____
  - ☐ BARBED BASE
- ☐ PC LDN
- ☐ LEPA
- ☐ SUPER SPRAY
- ☐ LDN
  - ☐ WEIGHTS - SIZE _____
  - ☐ BARBED BASE

- ☐ CONCAVE
- ☐ FLAT
- ☐ CONVEX
- ☐ SINGLE
- ☐ MULTIPLE
- ☐ CHEM.
  - ☐ COTTON
  - ☐ CORN
  - ☐ BUBBLER

☐ DOUBLE BARB GOOSENECK
☐ SPLIT SPACING
☐ SPEC SPACING_____ ft.

- ☐ SMOOTH PAD (Fine droplets)
- ☐ MED. GROOVED (Medium droplets)
- ☐ DEEP GROOVED (24) (Large Droplets)
- ☐ DEEP GROOVED (36) (Large Droplets)
- ☐ DEEP GROOVED (48) (Large Droplets)
- ☐ MULTI-GROOVED (24-36-48) (Large Droplets)

☐ TRUSS ROD SIZE _____

C= 150 Plastic Pipe C= 145 Aluminum Pipe C= 140 Galvanized Steel Pipe C= 135 Painted Corten Pipe C= 130 Painted Carbon Steel Pipe C= 120 Rusted Carbon Steel Pipe
Subtract 3 from above C numbers if pipe has internal couplings
C NUMBER = (friction factor)

PIVOT PSI

GROUND CLEARANCE_____

END PSI OR

NUMBER OF SPANS_____ END GUN MODEL # _____ BOOSTER PUMP HP_____

END GUN NOZZLE SIZE(S) WILL BE SELECTED TO BALANCE OVERALL SYSTEM

TOTAL GPM

SPAN	LENGTH	PIPE O.D.	SPRINKLER SPACING	OUTLETS PER SPAN
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
OH				

TOTAL LENGTH _____ **TOTAL # OF OUTLETS** _____ (not including end gun)

MAX. FIELD ELEVATION — — —
- ABOVE PIVOT_____ FT.
- BELOW PIVOT_____ FT.

☐ USE NO PRESSURE REGULATORS
☐ USE MINIMUM NUMBER OF PRESSURE REGULATORS
☐ USE PRESSURE REGULATORS ON ENTIRE SYSTEM
☐ USE PIVOT-SPECIAL REGULATORS (PSR) ☐ LF ☐ MF
☐ USE _____ PSI REGULATORS ON ☐ TOP OF PIPE ☐ BOTTOM OF PIPE

OPTIONS

CAN PIVOT PRESSURE BE VARIED ±10%?	☐ YES	☐ NO
DO YOU WANT PIPE FITTINGS SUPPLIED?	☐ YES	☐ NO
CAN OUTLETS BE ADDED IN MAIN PIPE?	☐ YES	☐ NO
INCLUDE PRESSURE GAUGE?	☐ YES	☐ NO

YOUR SOIL DESCRIPTION

☐ TIGHT (much clay) ☐ MEDIUM ☐ LOOSE (sandy)

PRECIPITATION CHART INFORMATION

CROP _____

TIMER AT 100%, LAST TOWER TRAVELS _____ FT./MIN.

HP_____ TIRE SIZE _____

CENTER GEAR RATIO _____ :1 WHEEL GEAR RATIO _____ :1

REF. PRINTOUT # _____ **DATE** _____

SPECIAL NOTES _____

Senninger Irrigation Inc.

16220 E. Highway 50
Clermont, FL 34711 USA
Phone: (407) 877-5655
Fax: (407) 905-8249
Website: www.senninger.com

REC. BY_____ SALES ORDER # _____

Formulas

Area of a Circle

$$\text{Area} = \text{Radius}^2 \times 3.1416$$

Circumference of a Circle

$$\text{Circumference} = \text{Diameter} \times 3.1416$$

Pivot Acreage *

$$\text{Acres} = \frac{(L+E)^2 \times 3.1416}{43{,}560}$$

L = Pivot Length (in feet)
E = End Gun Radius (in feet)

* *Assuming end gun operating continuously*

Time for Full Rotation by Pivot

$$\text{Hours} = \frac{2L \times 3.1416}{S \times 60}$$

L = Distance from pivot point to last wheel track (in feet)
S = Tower speed (in feet per minute)

Approximate Percentage Timer Setting

$$\text{Percentage} = \frac{H}{T \times A}$$

H = Hours for full rotation at 100%
T = Time for 1" application (in hours)
A = Application required (in inches)

Time for 1" Application

$$\text{Hours} = \frac{452.6 \times \text{Acres}}{\text{GPM}}$$

New GPM

$$\text{New GPM} = Q \times \sqrt{N / D}$$

Q = Old gpm
N = New psi
D = Old design psi

Flow vs Pressure Relationship

$$\%F = \frac{\%P}{2}$$

% F = Percent flow deviation
% P = Percent pressure deviation

Water Velocity Inside Pipe

$$V = .408 \frac{GPM}{ID^2}$$

V = Velocity (in feet per second)
GPM = Gallons per minute
ID = Inside diameter of pipe (in inches)

Estimating Brake Horsepower Required

$$BHP = \frac{GPM \times TDH}{3960 \times EFF}$$

BHP = Brake horsepower required
GPM = Flow required (in gallons per minute)
TDH = Total dynamic head (in feet)
EFF = Pump efficiency stated as a decimal

Estimating System Pumping Requirements

$$GPM = \frac{27154 \times IN \times Acres}{60 \times Hours \times Days}$$

GPM = Total flow required to operate system
IN = Net application required per week in inches*
Acres = Total acreage to be irrigated
Hours = Total hours available to operate system / day
Days = Total days available to operate system / week

*System efficiency should be taken into consideration.

Estimating Irrigation System Efficiencies

Arid Regions	65%
Semi-Arid Regions	70%
Semi-Humid Regions	75%
Humid Regions	80%

Friction Loss for 100 Feet of Pipe (Hazen - Williams)

$$Hf = 1045 \frac{(Q / C)^{1.852}}{ID^{4.857}}$$

Hf = Friction loss in feet of water (Head)
ID = Pipe inside diameter (in inches)
C = Pipe coefficient
- a) PVC = 150
- b) Aluminum w/couplers = 145
- c) Galv. Steel/Asb.-cement = 140
- d) Cast Iron = 100

Q = Flow (in gallons per minute)

Conversion Factors

To Convert	Into	Multiply by
FLOW		
Acre-Inch/Hr	Gallons/Min (gpm)	452.6
Acre-Inch	Gallons	27,154.0
Cubic Feet	Gallons (US)	7.481
Cubic Feet/Sec	Gallons/Min (gpm)	448.831
Cubic Meters	Gallons (US)	264.2
Cubic Meters/Hr	Gallons/Min (gpm)	4.403
Cubic Meters/Hr	Liters/Sec (L/s)	0.278
Gallons	Liters	3.785
Gallons/Min (gpm)	Cubic Meter/Hr (m^3/hr)	0.227
Gallons/Min (gpm)	Liters/Sec (L/s)	0.063
Liters	Gallons (US)	0.264
Liters/Sec	Gallons/Min (gpm)	15.852
Liters/Sec	Cubic Meters/Hr (m^3/hr)	3.598
AREA & LINEAR		
Acres	Hectares	0.405
Acres	Square Feet	43,560.0
Centimeters	Inches	0.394
Feet	Meters	0.305
Hectares	Acres	2.471
Inches	Millimeters	25.40
Meters	Feet	3.281
Miles	Kilometers	1.609
Miles	Feet	5,280.0
Millimeters	Inches	0.0394
PRESSURE		
Atmospheres	Kg/Sq Cm	1.033
Atmospheres	Pounds/Sq In (psi)	14.70
Bars	Pounds/Sq In (psi)	14.50
Feet of Water	Pounds/Sq In (psi)	0.434
Gallons of Water	Pounds	8.33
Kilograms/Sq Cm	Pounds/Sq In (psi)	14.22
KiloPascals (kPa)	Pounds/Sq In (psi)	0.145
Pounds/Sq In (psi)	Atmospheres	0.068
Pounds/Sq In (psi)	Bars	0.069
Pounds/Sq In (psi)	Feet of Water	2.307
Pounds/Sq In (psi)	KiloPascals (kPa)	6.895
POWER		
Horsepower	Kilowatts	0.746
Kilowatts	Horsepower	1.341

Expressly Limited
Product Warranty
and Disclaimer

Warning – Disclaimer

This warranty is the full and complete product warranty and is expressly in lieu of any and all representations or warranties, expressed or implied, including any implied warranties of merchantability or fitness for particular purpose, whether arising from statute, common law, custom, course of dealing, usage of trade, or otherwise. No person has the authority to incur or assume for Senninger any other liability as to products manufactured by Senninger.

This warranty shall not apply to any product which shall have been repaired or altered in any way outside the Senninger factory so as to affect its use or operation as determined by Senninger, nor shall it apply to any such product which has been subject to misuse, negligence or accident, or has been operated contrary to Senninger's printed instructions.

Senninger shall not be liable for any consequential and incidental damages resulting from the use of said products or caused by any defects, failure or malfunction, whether a claim for such damages is based on warranty, product design, system engineering, contract negligence or otherwise. Senninger makes no warranty whatsoever with respect to products manufactured by others to which Senninger's products may be attached, whether or not warranted by such other manufacturers.

Materials & Workmanship

Products manufactured by Senninger Irrigation Inc. are warranted for a period of two years from date of original shipment to be free of any defects in material or workmanship, with the exception of PRLV and mining models, which are warranted for one year.

Performance

Products manufactured by Senninger and used for ag, turf and nursery irrigation are warranted to maintain their original nozzle orifice size for a period of five years. Senninger also warrants these products to maintain their original performance for a period of two years from date of original shipment when installed and operated in accordance with Senninger's written specifications and used for their ordinary purpose.

Repair or Replacement

If a product is suspected of failure under terms of the above provisions, it must first be reported in writing to the attention of the Material Review Engineer at the company's Clermont, Florida office. An authorization may then be issued to return the product(s), shipping charges prepaid, to Clermont for inspection. If in the opinion of the Material Review Engineer the product has failed, a repair or replacement will be authorized as required.

Senninger's obligation with respect to the above provisions concerning material, workmanship and performance is limited to the repair or replacement of the particular product involved. Senninger is not obligated to pay for repairs or replacements made by anyone other than itself.

No labor allowances will be made for removal or replacement of said parts nor for any travel to and from the product to make said repairs or replacement without prior written authorization from an officer of Senninger Irrigation.

Suitability

There is positively no warranty relating to the fitness of the product(s) for any particular purpose or use. It is the sole responsibility of the purchaser to consider and analyze the product and its design to be suitable for specific applications.

Senninger Irrigation Inc.
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