Senninger®

NURSERY IRRIGATION GUIDE

CONTENTS

Evaluating System Installation Options 04
WinSIPP™3 05
mini-Wobbler™ 06
Xcel-Wobbler ™ 07
Smooth Drive™ 08
Impact Sprinklers 10
Pressure Regulators 12
Sennode-BT 13
Riser Adapter Assembly 13
Precipitation Rates - US 13
Precipitation Rates - Metric 13
Friction Loss - PVC Pipe 200 IPS 13
Friction Loss - PVC Pipe 40 IPS 13
Friction Loss - Polyethylene 13

MAKING THE BEST CHOICES

The most important goal in designing an efficient container irrigation system is achieving the highest uniformity possible while taking spacing, operating pressure and application rate into consideration.

The chart below shows several Senninger sprinklers and their ideal design parameters, as needed to achieve an average application rate of approximately 0.5 in/hr (12.7 mm/hr).

SPRINKLER	CU %	DU %	SC	Square Spacing		Operating Pressure		Nozzle	Application Rate	
				feet	meters	psi	bar		In./hr	mm/hr
mini-Wobbler™	92.4	88.7	1.17	20 x 20	6.1 x 6.1	20	1.38	8	0.47	11.94
Xcel-Wobbler™	86.7	81.0	1.29	25 x 25	7.62 x 7.62	25	1.72	10	0.54	13.72
Smooth Drive™	92.8	89.8	1.21	25 x 25	7.62 x 7.62	30	2.07	8	0.40	10.16
Impact - 2023 (sgl nozzle)	89.4	82.6	1.24	30 x 30	9.14 x 9.14	40	2.76	9	0.40	10.16
Impact - 2023 (sgl nozzle)	96.1	92.6	1.15	25 x 25	7.62 x 7.62	45	3.10	8SQ*	0.46	11.68
Impact - 3023 (dbl nozzle)	87.1	83.3	1.23	35 x 35	10.7 x 10.7	45	3.10	10 x 5	0.41	10.41
Impact - 4023 (dbl nozzle)	91.2	89.0	1.15	40 x 40	12.2 x 12.2	45	3.10	12 x 6	0.51	12.95
Impact - 5023 (dbl nozzle)	87.3	86.6	1.19	45 x 45	13.7 x 13.7	50	3.45	13 x 8	0.51	12.95

Other spacing options are available. For those performance parameters, please consult Senninger or refer to the WinSIPP3 software.

EVALUATING SYSTEM INSTALLATION OPTIONS

The uniformity and application rate of overlapping sprinklers is an important factor to consider when designing an irrigation system for maximum efficiency.

Uniformity refers to how evenly a sprinkler delivers water over the ground. A sprinkler's uniformity is determined by collecting and measuring water depth in a catch can test at regular intervals. This data is then used to create a sprinkler's profile. The profile illustrates the amount of water that would be delivered at various intervals and the radius of throw.

When using irrigation design software to test different sprinkler heads at varying operating parameters and spacing constraints, the sprinkler profiles are what is used to determine factors like average application rate, coefficient of uniformity, and distribution uniformity.

This is all shown visually in a densogram, which illustrates the uniformity, wetted diameter, and application pattern of multiple overlapping devices.

IMPORTANT TERMS IN THIS DOCUMENT

A sprinkler profile illustrates the coefficient of uniformity, distribution uniformity, and the scheduling coefficient to determine which spacing would be optimum. We will refer to these terms throughout the document and have included their definitions below.

- **Coefficient of Uniformity**

  The Coefficient of Uniformity (CU) is a measure of system performance compared to an absolute uniformity of 100%. A coefficient of uniformity of 100% means there is no variation in water distribution. Numbers above 85% are considered good for container irrigation.

- **Distribution of Uniformity**

  The Distribution Uniformity (DU) is a measure of how evenly water is applied to an area. It provides guidance regarding the amount of water to apply to ensure that the entire area receives the required water. Numbers above 85% are considered good for container irrigation.

- **Scheduling Coefficient**

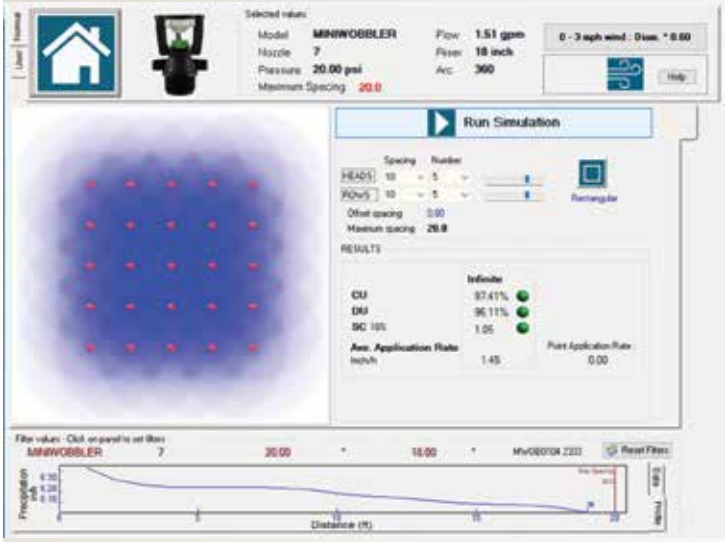
  The Scheduling Coefficient (SC) is a run-time multiplier. It measures how much you would need to over-irrigate to adequately water the driest areas. Results closer to 1 are considered ideal.

- **Average Application Rate**

  The Average Application Rate is a measure of the average depth of water applied over a given interval of time. This can be shown as inches per hour (in/hr) or millimeters per hour (mm/hr).

WinSIPP3 is an irrigation design program that helps you select the best irrigation products by comparing different sprinkler layouts before installation. It lets you compare different sprinkler spacings, sprinkler models, nozzle sizes, and operating pressures to determine which would be best for a specific application.

Available for free online at Senninger.com

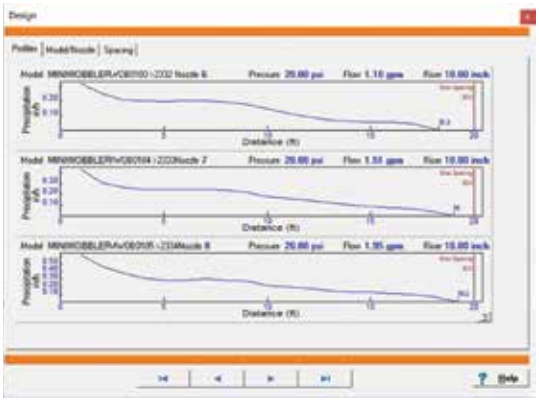


The densogram shows the overlap of multiple sprinklers. In this example, a mini-Wobbler™ sprinkler with a #7 nozzle operating at 20 psi (1.38 bar) and installed on an 18-inch (46 cm riser is evaluated at 10 x 10 ft (3 x 3 m) spacing.

This installation has a CU of 97.41% and a DU of 96.11%. The SC is 1.05, and the Average Application Rate is 1.45 in/hr.

FEATURES

- Aids in the selection of the best irrigation products for each soil and installation type
- Tests the application uniformity of sprinkler layouts before the system is installed
- Compares different sprinklers, models, operating pressure, nozzle size/flow, riser height, spacing, layout, and area
- Illustrates the uniformity of overlapping sprinklers and the individual sprinkler profile for each scenario
- Calculates the application rate and scheduling coefficient for each set of parameters



The sprinkler profiles show the amount of water delivered at various intervals and the sprinkler's radius of throw.

In this example, the radius of the mini-Wobbler is shown at three different nozzle sizes (#7, 8, and 9) with the sprinkler installed on an 18-inch (46 cm) riser and operating at 20 psi (1.38 bar). The flow and radius of throw changes based on nozzle size.

MINI-WOBBLER^{T}

Flow: 0.50 to 2.18 gpm
(114 to 495 L/hr)
based on the model

Pressure: 15 to 25 psi
(1.03 to 1.72 bar)

FEATURES

- Outstanding uniformity
- Large diameter of coverage at low pressures
- Gentle rain-like pattern
- Very low evaporative loss
- Only one moving part helps ensure product longevity

DESIGN AN IRRIGATION SYSTEM WITH THE MINI-WOBBLER

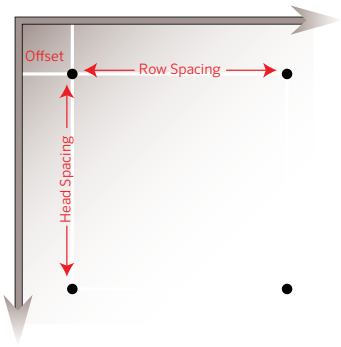
Use this table to compare different spacing options and application rates.
This will help identify the nozzle size needed.
For example, with 20 x 20 ft (6.1 x 6.1 m) spacing, select the mini-Wobbler with a #8 nozzle for an application rate around 0.5 inches/hr (12.7 mm/hr).

DATA SHOWN AT **20 PSI (1.28 BAR)** OPERATING PRESSURE

Nozzle Number	Square Spacing		CU %	DU %	SC	Riser Height		Application Rate	
	feet	meters				in.	cm	in./hr	mm/hr
4	15 x 15	4.57 x 4.57	92.4	87.8	1.18	36	90	0.21	5.3
5	15 x 15	4.57 x 4.57	96.6	94.5	1.08	36	90	0.32	8.1
6	15 x 15	4.57 x 4.57	97.5	96.8	1.05	36	90	0.47	11.9
7	15 x 15	4.57 x 4.57	95.8	94.1	1.09	36	90	0.65	16.5
8	15 x 15	4.57 x 4.57	94.8	94.7	1.07	36	90	0.83	21.1
5	20 x 20	6.1 x 6.1	93.2	89.4	1.17	36	90	0.18	4.6
6	20 x 20	6.1 x 6.1	91.0	88.1	1.16	36	90	0.26	6.6
7	20 x 20	6.1 x 6.1	90.7	88.3	1.15	36	90	0.36	9.1
8	20 x 20	6.1 x 6.1	89.7	87.0	1.17	36	90	0.47	11.9

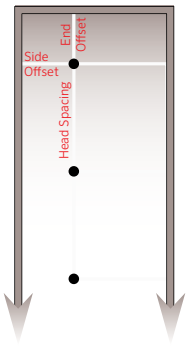
SQUARE SPACING

Head Spacing: 20 ft (6.10 m)
Row Spacing: 20 ft (6.10 m)
Offset from sides: 5 ft (1.52 m)
Offset from ends: 5 ft (1.52 m)



SINGLE ROW SPACING

Head Spacing: 10 ft (3.05 m)
Offset from sides: 7.5 ft (2.87 m)
Offset from ends: 5 ft (1.52 m)



XCEL-WOBBLER HIGH-ANGLE

Flow: 0.78 to 6.97 gpm (177 to 1583 L/hr)
based on the model

Pressure: 10 to 25 psi (0.69 to 1.72 bar)

FEATURES

- Outstanding uniformity
- Large diameter of coverage at low pressures
- Gentle rain-like pattern
- Very low evaporative loss
- Replace this bullet with: Only one moving part helps ensure product longevity.
- Mid-angle model also available

DESIGN AN IRRIGATION SYSTEM WITH THE XCEL-WOBBLER

Use these tables to compare different spacing options and application rates.
This will help identify the nozzle size needed.
For example, with 20 x 20 ft (6.1 x 6.1 m) spacing, select the Xcel-Wobbler with a #10 nozzle for an application rate around 0.5 inches/hr (12.7 mm/hr).

DATA SHOWN AT **20 PSI (1.28 BAR)** OPERATING PRESSURE

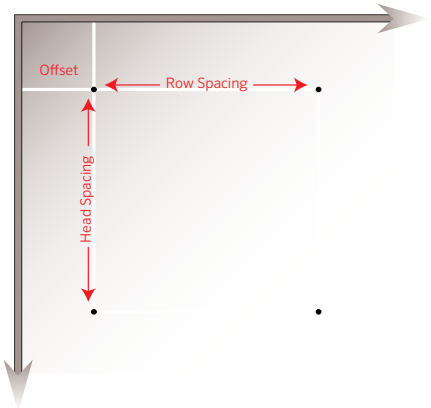
Nozzle Number	Square Spacing		CU %	DU %	SC	Riser Height		Application Rate	
	feet	meters				in.	cm	in./hr	mm/hr
6	20 x 20	6.1 x 6.1	87.9	86.7	1.19	36	91	0.26	6.6
7	20 x 20	6.1 x 6.1	90.2	87.7	1.17	36	91	0.36	9.1
8	20 x 20	6.1 x 6.1	88.4	86.0	1.19	36	91	0.48	12.2
9	20 x 20	6.1 x 6.1	88.7	88.2	1.16	36	91	0.61	15.5
10	20 X 20	6.1 x 6.1	88.5	84.8	1.18	36	91	0.76	19.3

DATA SHOWN AT **25 PSI (1.72 BAR)** OPERATING PRESSURE

Nozzle Number	Square Spacing		CU %	DU %	SC	Riser Height		Application Rate	
	feet	meters				in.	cm	in./hr	mm/hr
6	20 x 20	6.1 x 6.1	85.8	86.5	1.19	36	91	0.30	7.6
7	20 x 20	6.1 x 6.1	91.8	91.8	1.10	36	91	0.40	10.2
8	20 x 20	6.1 x 6.1	86.5	86.5	1.17	36	91	0.53	13.5
9	20 x 20	6.1 x 6.1	89.0	84.5	1.19	36	91	0.68	17.3
10	20 X 20	6.1 x 6.1	90.5	87.3	1.15	36	91	0.85	21.6

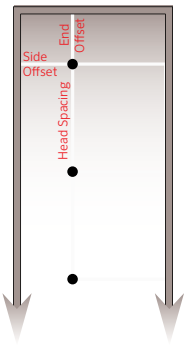
SQUARE SPACING

Head Spacing: 25 ft (7.62 m)
Row Spacing: 25 ft (7.62 m)
Offset from sides: 5 ft (1.52 m)
Offset from ends: 5 ft (1.52 m)



SINGLE ROW SPACING

Head Spacing: 20 ft (6.10 m)
Offset from sides: 10 ft (3.05 m)
Offset from ends: 5 ft (1.52 m)



SMOOTH DRIVE LOW-ANGLE

Flow: 0.78 to 6.97 gpm
(177 to 1583 L/hr)
based on the model

Pressure: 10 to 25 psi
(0.69 to 1.72 bar)

FEATURES

- Unique walking diffuser eliminates bracket leg shadows for an unobstructed, uniform distribution pattern
- Advanced braking mechanism provides a smooth, consistent rotation speed and minimal riser stress
- Precision-contoured deflector provides greater throw and enhanced distribution
- High-angle model also available

DESIGN AN IRRIGATION SYSTEM WITH THE SMOOTH DRIVE

Use these tables to compare different spacing options and application rates.
This will help identify the nozzle size needed.
For example, with 25 x 25 ft (7.62 x 7.62 m) spacing, select the Smooth Drive with a #8 nozzle for an application rate around 0.5 inches/hr (12.7 mm/hr).

DATA SHOWN AT **25 PSI (1.72 BAR)** OPERATING PRESSURE

Nozzle Number	Square Spacing		CU %	DU %	SC	Riser Height		Application Rate	
	feet	meters				in.	cm	in./hr	mm/hr
6	25 x 25	7.62 x 7.62	92.4	90.6	1.12	18	45	0.19	4.8
7	25 x 25	7.62 x 7.62	97.1	95.4	1.07	18	45	0.26	6.6
8	25 x 25	7.62 x 7.62	83.5	76.8	1.33	18	45	0.34	8.6
6	30 x 30	9.14 x 9.14	85.4	76.9	1.36	18	45	0.13	3.3
7	30 x 30	9.14 x 9.14	89.2	85.2	1.24	18	45	0.18	4.6
8	30 x 30	9.14 x 9.14	89.0	81.2	1.39	18	45	0.24	6.1

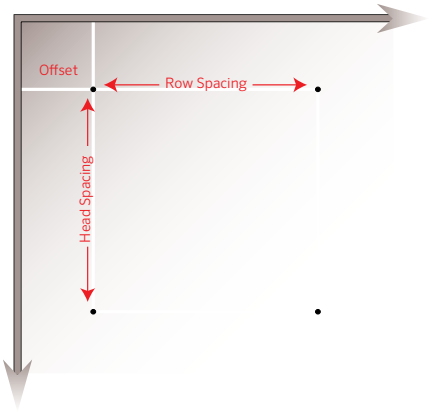
DATA SHOWN AT **30 PSI (2.07 BAR)** OPERATING PRESSURE

Nozzle Number	Square Spacing		CU %	DU %	SC	Riser Height		Application Rate	
	feet	meters				in.	cm	in./hr	mm/hr
6	25 x 25	7.62 x 7.62	94.8	92.9	1.09	18	45	0.21	5.3
7	25 x 25	7.62 x 7.62	91.9	87.4	1.18	18	45	0.28	7.1
8	25 x 25	7.62 x 7.62	90.7	87.0	1.16	18	45	0.37	9.4
6	30 x 30	9.14 x 9.14	90.6	84.5	1.26	18	45	0.14	3.6
7	30 x 30	9.14 x 9.14	89.9	81.5	1.13	18	45	0.20	5.1
8	30 x 30	9.14 x 9.14	93.5	89.0	1.21	18	45	0.26	6.6

SQUARE SPACING

Head Spacing: 30 ft (9.14 m)
Row Spacing: 30 ft (9.14 m)
Offset from sides: 10 ft (3.05 m)
Offset from ends: 10 ft (3.05 m)

Head Spacing: 25 ft (7.62 m)
Row Spacing: 25 ft (7.62 m)
Offset from sides: 8 ft (2.44 m)
Offset from ends: 8 ft (2.44 m)



IMPACT SPRINKLERS

Flow: 1.34 to 17.5 gpm (304 to 3975 L/hr)
based on the model

Pressure: 30 to 50 psi (2.07 to 3.45 bar)

FEATURES

- Double-nozzle models for enhanced distribution
- Various trajectory models available
- Hand-tight nozzles for tool-free convenience
- Part-Circle models also available

DESIGN AN IRRIGATION SYSTEM WITH IMPACT SPRINKLERS

Use these tables to compare different spacing options and application rates.
This will help identify the nozzle size needed.
For example, with 30 x 30 ft (9.14 x 9.14 m) spacing, select the 2023 impact sprinkler model with a #9 nozzle for an application rate around 0.5 inches/hr (12.7 mm/hr).

2023-1 IMPACT SPRINKLER

Nozzle Number	Square Spacing		CU %	DU %	SC	Riser Height		Application Rate	
	feet	meters				in.	cm	in./hr	mm/hr
6SQ	30 x 30	9.14 x 9.14	91.3	87.6	1.18	18	45	0.18	4.6
7SQ	30 x 30	9.14 x 9.14	92.3	90.0	1.13	18	45	0.24	6.1
8SQ	30 x 30	9.14 x 9.14	92.9	91.7	1.12	18	45	0.32	8.1
9	30 x 30	9.14 x 9.14	89.4	82.6	1.24	18	45	0.40	10.2

All data above shown at 45 psi (3.10 bar) operating pressure.

3023-2 IMPACT SPRINKLER

Nozzle Number	Square Spacing		CU %	DU %	SC	Riser Height		Application Rate	
	feet	meters				in.	cm	in./hr	mm/hr
7 x 4	40 x 40	12.2 x 12.2	85.6	80.2	1.40	18	45	0.21	5.3
8 x 5	40 x 40	12.2 x 12.2	85.9	79.9	1.42	18	45	0.25	6.4
9 x 5	40 x 40	12.2 x 12.2	85.9	76.6	1.47	18	45	0.29	7.4
10 x 5	40 x 40	12.2 x 12.2	88.9	81.0	1.38	18	45	0.35	8.9

All data above shown at 40 psi (2.76 bar) operating pressure.

4023-2 IMPACT SPRINKLER

Nozzle Number	Square Spacing		CU %	DU %	SC	Riser Height		Application Rate	
	feet	meters				in.	cm	in./hr	mm/hr
10 x 6	55 x 55	16.8 x 16.8	88.2	84.1	1.23	18	45	0.20	5.1
11 x 6	55 x 55	16.8 x 16.8	89.5	87.7	1.17	18	45	0.24	6.1
12 x 6	55 x 55	16.8 x 16.8	89.6	89.0	1.15	18	45	0.27	6.9
13 x 6	55 x 55	16.8 x 16.8	88.2	88.1	1.16	18	45	0.31	7.9
14 x 6	55 x 55	16.8 x 16.8	87.4	84.8	1.19	18	45	0.35	8.9

All data above shown at 45 psi (3.10 bar) operating pressure.

5023-2 IMPACT SPRINKLER

Nozzle Number	Square Spacing		CU %	DU %	SC	Riser Height		Application Rate	
	feet	meters				in.	cm	in./hr	mm/hr
13 x 8	65 x 65	19.8 x 19.8	86.9	84.0	1.32	18	45	0.24	6.1
14 x 8	65 x 65	19.8 x 19.8	86.9	86.0	1.20	18	45	0.28	7.1
15 x 8	65 x 65	19.8 x 19.8	88.0	84.3	1.28	18	45	0.30	7.6
16 x 8	65 x 65	19.8 x 19.8	86.3	84.8	1.23	18	45	0.34	8.6
17 x 8	65 x 65	19.8 x 19.8	85.7	85.0	1.19	18	45	0.37	9.4

All data above shown at 50 psi (3.45 bar) operating pressure.

3023-2 SQUARE SPACING

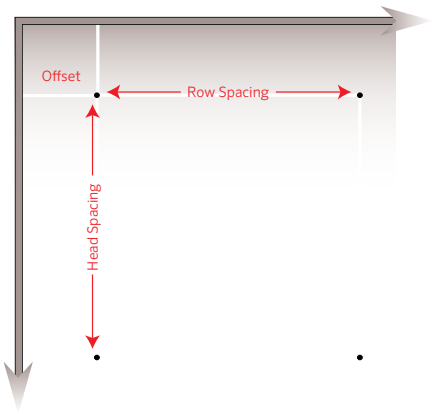
Head Spacing: 40 ft (12.2 m)
Row Spacing: 40 ft (12.2 m)
Offset from sides: 10 ft (3.05 m)
Offset from ends: 10 ft (3.05 m)

4023-2 SQUARE SPACING

Head Spacing: 55 ft (16.8 m)
Row Spacing: 55 ft (16.8 m)
Offset from sides: 10 ft (3.05 m)
Offset from ends: 10 ft (3.05 m)

5023-2 SQUARE SPACING

Head Spacing: 65 ft (19.8 m)
Row Spacing: 65 ft (19.8 m)
Offset from sides: 10 ft (3.05 m)
Offset from ends: 10 ft (3.05 m)



PRESSURE REGULATORS

Every system experiences pressure fluctuations resulting in unwanted flow deviations and over and under-watering. These fluctuations occur with the activation of different zones, variations in field elevation, or changes in water supply. Pressure regulators help maintain the overall efficiency of an irrigation system. They assure proper sprinkler performance and can help save water by maintaining the sprinkler's pattern and application uniformity.

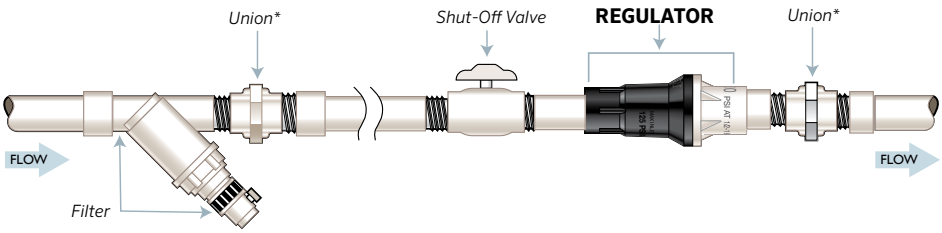
FEATURES

- Constructed out of high-impact thermoplastics with a stainless-steel compression spring
- 100% pressure tested to ensure quality and performance
- Very low hysteresis and friction loss
- Several models available based on pressures, flow range, and connection options
- Can be installed above or below ground

	PRLG	PRL	PSR-2	PMR-MF	PR-HF	PRU
Flow Range	0.5 – 7 gpm (114 – 1590 L/hr)	0.5 – 8 gpm (114 – 1817 L/hr)	0.5 – 15 gpm (114 – 3407 L/hr)	2 – 20 gpm (454 – 4543 L/hr)	10 – 32 gpm (2271 – 7268 L/hr)	20 -100 gpm (4543 - 22713 L/hr)
Preset Operating Pressure	10 – 40 psi (0.69 – 2.76 bar)	6 – 40 psi (0.41 – 2.76 bar)	6 – 50 psi (0.41 – 3.45 bar)	6 – 60 psi (0.41 – 4.14 bar)	10 – 50 psi (0.69 – 3.45 bar)	10 – 60 psi (0.69 – 4.14 bar)
Maximum Inlet Pressure	120 psi (8.27 bar)	120 psi (8.27 bar)	130 psi (8.96 bar)	140 psi (9.65 bar)	130 psi (8.96 bar)	140 psi (9.65 bar)
Inlet Sizes	¾" F hose, ¾" F NPT	¾" F NPT, ¾" F hose	¾" F NPT	¾" F NPT, 1" F NPT, 1" F BSPT	1 ¼" F NPT, 1 ¼" F BSPT	2" F NPT, 2" F BSPT
Outlet Sizes	¾" M hose, ¾" M NPT	¾" F NPT	¾" F NPT	¾" F NPT, 1" F NPT, 1" F BSPT	1" F NPT, 1 ¼" F NPT, 1" F BSPT, 1 ¼" F BSPT	2" F NPT, 2" F BSPT

RECOMMENDED INSTALLATION

Pressure regulators must always be installed downstream from all shut-off valves and filters in the proper direction. Each model has a directional arrow on the side that shows the direction of the flow. This arrow should point downstream, toward the sprinklers and emitters.



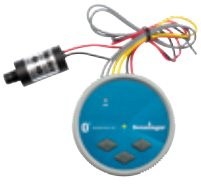
SENNODE-BT

The battery-operated SENNODE-BT controller is enabled with powerful wireless Bluetooth® technology that can be easily managed from a smartphone. It is a reliable choice for greenhouses, nurseries, open fields, and other areas where AC power is unavailable.

FEATURES

- Bluetooth® control for wireless configuration of schedules and sensors from 50 ft (15 m) away
- Perfect for time-sensitive applications like propagation with run times in seconds, which allows for misting
- Controlled via user-friendly iOS® and Android™ app with selectable language options and secure passcode protection
- Unlimited device control and mapping via the same app and phone
- Offline programming for quick and easy field adjustments to deploy at a later time

SENNODEBT1



Single Station with DC-Latching Solenoid

SENNODEBT1LS

Single Station, less Solenoid

SENNODEBT2

Two Station, less Solenoid

SENNODEBT4

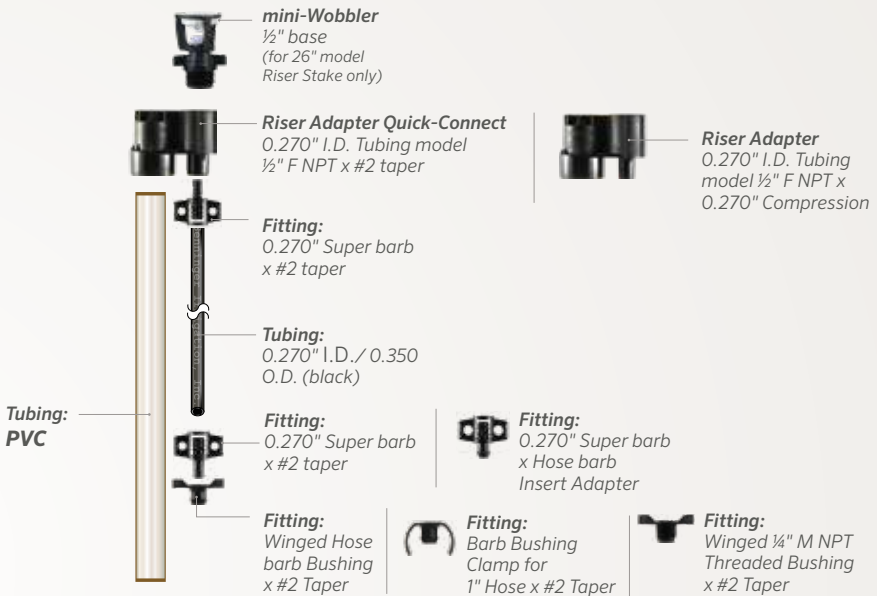
Four Station, less Solenoid

RISER ADAPTER

The Senninger® Riser Adapters make irrigating easier in hard to reach places and are ideal for temporary and portable systems. Riser Adapters are connected to the laterals allowing the sprinklers on each to be repositioned as needed.

- No gluing or fusing required
- Suitable for sprinkler or spray nozzles with a ½" NPT male base connection
- Components available for 0.345" and 0.270" PE tubing
- Riser adapter suitable for the 26" Riser Stakes as well as ½" PVC, ¾" PVC, or 5⁄16" steel rod

RISER ADAPTER ASSEMBLIES



Components are also available for 0.345" tubing.

inches per/hr.

Spacing	Flow (gpm)																			
Feet	0.30	0.50	0.75	1.00	1.50	2.00	3.00	4.00	5.00	6.00	8.00	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
5 x 5	1.16	1.93	2.89	3.85	5.78	7.70	11.55													
6 x 6	0.80	1.34	2.01	2.67	4.01	5.35	8.02													
7 x 7	0.59	0.98	1.47	1.96	2.95	3.93	5.89													
8 x 8	0.45	0.75	1.13	1.50	2.26	3.01	4.51	6.02												
9 x 9	0.36	0.59	0.89	1.19	1.78	2.38	3.56	4.75	5.94											
10 x 10	0.29	0.48	0.72	0.96	1.44	1.93	2.89	3.85	4.81	5.78										
12 x 12	0.20	0.33	0.50	0.67	1.00	1.34	2.01	2.67	3.34	4.01	5.35	6.68								
15 x 15	0.13	0.21	0.32	0.43	0.64	0.86	1.28	1.71	2.14	2.57	3.42	4.28	6.42							
20 x 20		0.12	0.18	0.24	0.36	0.48	0.72	0.96	1.20	1.44	1.93	2.41	3.61	4.81	6.02					
25 x 25			0.12	0.15	0.23	0.31	0.46	0.62	0.77	0.92	1.23	1.54	2.31	3.08	3.85					
30 x 30				0.11	0.16	0.21	0.32	0.43	0.53	0.64	0.86	1.07	1.60	2.14	2.67					
35 x 35					0.12	0.16	0.24	0.31	0.39	0.47	0.63	0.79	1.18	1.57	1.96					
40 x 40						0.12	0.18	0.24	0.30	0.36	0.48	0.60	0.90	1.20	1.50	1.80	2.11	2.41		
40 x 50						0.10	0.14	0.19	0.24	0.29	0.39	0.48	0.72	0.96	1.20	1.44	1.68	1.93	2.17	
40 x 60							0.12	0.16	0.20	0.24	0.32	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.01
40 x 80							0.09	0.12	0.15	0.18	0.24	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50
45 x 45							0.14	0.19	0.24	0.29	0.38	0.48	0.71	0.95	1.19	1.43	1.66	1.90	2.14	2.38
50 x 50							0.11	0.15	0.19	0.23	0.31	0.39	0.58	0.77	0.96	1.16	1.35	1.54	1.73	1.93
50 x 60								0.13	0.16	0.19	0.26	0.32	0.48	0.64	0.80	0.96	1.12	1.28	1.44	1.60
50 x 70								0.11	0.14	0.17	0.22	0.28	0.41	0.55	0.69	0.83	0.96	1.10	1.24	1.38
50 x 80								0.10	0.12	0.14	0.19	0.24	0.36	0.48	0.60	0.72	0.84	0.96	1.08	1.20
55 x 55								0.13	0.16	0.19	0.25	0.32	0.48	0.64	0.80	0.95	1.11	1.27	1.43	1.59
60 x 60								0.11	0.13	0.16	0.21	0.27	0.40	0.53	0.67	0.80	0.94	1.07	1.20	1.34
60 x 70									0.11	0.14	0.18	0.23	0.34	0.46	0.57	0.69	0.80	0.92	1.03	1.15
60 x 80									0.10	0.12	0.16	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.0
70 x 70									0.10	0.12	0.16	0.20	0.29	0.39	0.49	0.59	0.69	0.79	0.88	0.98
70 x 80										0.10	0.14	0.17	0.26	0.34	0.43	0.52	0.60	0.69	0.77	0.86
70 x 90											0.12	0.15	0.23	0.31	0.38	0.46	0.53	0.61	0.69	0.76
80 x 80											0.12	0.15	0.23	0.30	0.38	0.45	0.53	0.60	0.68	0.75
80 x 90											0.11	0.13	0.20	0.27	0.33	0.40	0.47	0.53	0.60	0.67
80 x 100											0.10	0.12	0.18	0.24	0.30	0.36	0.42	0.48	0.54	0.60
100 x 100												0.10	0.14	0.19	0.24	0.29	0.34	0.39	0.43	0.48

MAXIMUM PRECIPITATION RATES FOR LEVEL GROUND

Soil	Rate
Coarse Sands	0.75 - 1.00 inches/hr
Fine Sands	0.50 - 0.75 inches/hr
Fine Sandy Loams	0.35 - 0.50 inches/hr
Silt Loams	0.25 - 0.40 inches/hr
Clay Loams	0.10 - 0.30 inches/hr

MAXIMUM SPRINKLER SPACINGS

Wind Speed	Spacing
5 mph or less	60% of wetted diameter
5 - 10 mph	50% of wetted diameter
over 10 mph	25 - 30% of wetted diameter

Consult factory for specific information on uniformity based on your particular application

KEY

GPM = flow per sprinkler

S = spacing of sprinklers along the lateral (in feet)

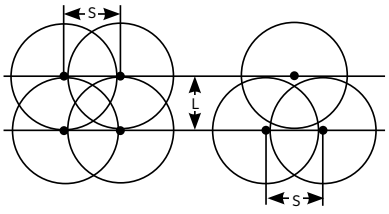
L = spacing between laterals *(in feet)*

(This applies to square, rectangular, or triangular spacing)

PRECIPITATION RATE FORMULA

$$\text{Application Rate (inches per hour)} = \frac{\text{GPM} \times 96.3}{S \times L}$$

Square Spacing *Triangular Spacing*



millimeters per/hr.

Spacing	Flow (m^3/hr)																			
Meters	0.07	0.11	0.18	0.36	0.56	0.72	0.90	1.08	1.44	1.80	2.16	2.52	2.88	3.24	3.60	3.96	4.32	5.40	6.40	7.20
1.5 x 1.5	32.0	48.0	80.0	160.0	240.0	320.0														
2 x 2	18.0	27.0	45.0	90.0	135.0	180.0														
2.5 x 2.5	11.5	17.3	28.8	57.6	86.4	115.2	144.0													
3 x 3	8.0	12.0	20.0	40.0	60.0	80.0	100.0	120.0	160.0											
3.5 x 3.5	5.9	8.8	14.7	29.4	44.1	58.8	73.5	88.2	117.6	146.9	176.3									
4 x 4	4.5	6.8	11.3	22.5	33.8	45.0	56.3	67.5	90.0	112.5	135.0									
5 x 5	2.9	4.3	7.2	14.4	21.6	28.8	36.0	43.2	57.6	72.0	86.4									
6 x 6	2.0	3.0	5.0	10.0	15.0	20.0	25.0	30.0	40.0	50.0	60.0									
6 x 9			3.3	6.6	10.0	13.3	16.6	20.0	26.6	33.3	40.0	46.6	53.0							
6 x 12			2.5	5.0	7.5	10.0	12.5	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0					
8 x 8			2.8	5.6	8.4	11.2	14.0	16.9	22.5	28.1	33.7	39.4	45.0	50.0						
9 x 9			2.2	4.4	6.6	8.9	11.1	13.3	17.8	22.2	26.6	31.1	35.5	40.0	44.4	48.8	53.3			
9 x 12			1.6	3.3	5.0	6.6	8.3	10.0	13.3	16.6	20.0	23.3	26.6	30.0	33.3	36.6	40.0	50.0	59.2	
9 x 14			1.4	2.8	4.3	5.7	7.1	8,6	11.4	14.3	17.1	20.0	22.8	25.7	28.5	31.4	34.3	42.8	50.8	
9 x 15			1.3	2.7	4.0	5.3	6.6	8.0	10.6	13.3	16.0	18.6	21.3	24.0	26.6	29.4	32.0	40.0	47.4	
9 x 18				2.2	3.3	4.4	5.5	6.6	8.9	11.1	13.3	15.5	17.8	20.0	22.2	24.4	26.6	33.3	39.5	44.4
12 x 12				2.5	3.7	5.0	6.2	7.5	10.0	12.5	15.0	17.5	20.0	22.5	25.0	27.5	30.0	37.5	44.4	50.0
12 x 15				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	30.0	35.5	40.0
12 x 18				1.6	2.5	3.3	4.2	5.0	6.6	8.3	10.0	11.6	13.3	15.0	16.6	18.3	20.0	25.0	29.6	33.3
15 x 15						3,2	4.0	4.8	6.4	8.0	9.6	11.2	12.8	14.4	16.0	17.6	19.2	24.0	28.4	32.0
15 x 18						2.6	3.3	4.0	5.3	6.6	8.0	9.3	10.6	12.0	13.3	14.6	16.0	20.0	23.7	26.6
15 x 21						2.3	2.8	3.4	4.6	5.7	6.8	8.0	9.1	10.3	11.4	12.6	13.7	17.1	20.3	22.8
18 x 18								3.3	4.4	5.5	6.6	7.8	8.9	10.0	11.1	12.2	13.3	16.6	20.0	22.2
18 x 21								2.8	3.8	4.7	5.7	6.6	7.6	8.6	9.5	10.5	11.4	14.3	16.9	19.0
18 x 24								2.5	3.3	4.2	5.0	5.8	6.6	7.5	8.3	9.1	10.0	12.5	14.8	16.6
21 x 21								2.4	3.2	4.1	4.9	5.7	6.5	7.3	8.1	8.9	9.8	12.2	14.5	16.3
21 x 24									2.8	3.6	4.3	5.0	5.7	6.4	7.1	7.8	8.6	10.7	12.7	14.3
21 x 27									2.5	3.2	3.8	4.4	5.1	5.7	6.3	7.0	7.6	9.5	11.3	12.7
24 x 24										3.1	3.7	4.3	5.0	5.6	6.2	6.9	7.5	9.4	11.1	12.5
24 x 30										2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.5	8.9	10.0
28 x 33											2.3	2.7	3.1	3.5	3.9	4.3	4.7	5.8	6.9	7.8
30 x 30											2.4	2.8	3.2	3.9	4.0	4.4	4.8	6.0	7.1	8.0

MAXIMUM PRECIPITATION RATES FOR LEVEL GROUND

Soil	Rate
Coarse Sands	19.0 - 25.4 mm/hr
Fine Sands	12.7 - 19.0 mm/hr
Fine Sandy Loams	8.9 - 12.7 mm/hr
Silt Loams	6.3 - 10.2 mm/hr
Clay Loams	2.5 - 7.6 mm/hr

KEY

M3/hr = flow per sprinkler

S = spacing of sprinklers along the lateral (in meters)

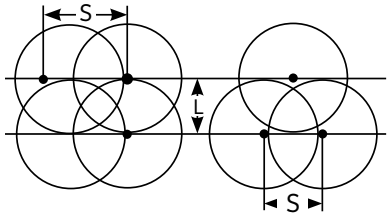
L = spacing between laterals (in meters)

(This applies to square, rectangular, or triangular spacing)

PRECIPITATION RATE FORMULA

$$\text{Application Rate (mm per hour)} = \frac{\text{M3/hr} \times 1000}{S \times L}$$

Square Spacing *Triangular Spacing*



FRICTION LOSS CHARACTERISTICS
PVC CLASS 200 IPS PLASTIC PIPE (1120, 1220) SDR 21 C=150

Size	¾"		1"		1 ¼"		1 ½"		2"		2 ½"		3"		4"		6"	
OD	1.050		1.315		1.660		1.900		2.375		2.875		3.500		4.500		6.625	
ID	0.930		1.189		1.502		1.720		2.149		2.601		3.166		4.072		5.993	
Wall Thick	0.60		0.063		0.79		0.090		0.113		0.137		0.167		0.214		0.316	
flow g.p.m	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss
1	0.47	0.06	0.28	0.02	0.18	0.01	0.13	0.00										
2	0.94	0.22	0.57	0.07	0.36	0.02	0.27	0.01	0.17	0.00								
3	1.42	0.46	0.86	0.14	0.54	0.04	0.41	0.02	0.26	0.01	0.18	0.00						
4	1.89	0.79	1.15	0.24	0.72	0.08	0.55	0.04	0.35	0.01	0.24	0.01						
5	2.36	1.20	1.44	0.36	0.90	0.12	0.68	0.06	0.44	0.02	0.30	0.01						
6	2.83	1.68	1.73	0.51	1.08	0.16	0.82	0.08	0.53	0.03	0.36	0.01	0.24	0.00				
7	3.30	2.23	2.02	0.67	1.26	0.22	0.96	0.11	0.61	0.04	0.42	0.01	0.28	0.01				
8	3.77	2.85	2.30	0.86	1.44	0.28	1.10	0.14	0.70	0.05	0.48	0.02	0.32	0.01				
9	4.25	3.55	2.59	1.07	1.62	0.34	1.24	0.18	0.79	0.06	0.54	0.02	0.36	0.01				
10	4.72	4.31	2.88	1.30	1.80	0.42	1.37	0.22	0.88	0.07	0.60	0.03	0.40	0.01				
11	5.19	5.15	3.17	1.56	1.98	0.50	1.51	0.26	0.97	0.09	0.66	0.03	0.44	0.01				
12	5.66	6.05	3.46	1.83	2.17	0.59	1.65	0.30	1.06	0.10	0.72	0.04	0.48	0.02	0.29	0.00		
14	6.60	8.05	4.04	2.43	2.53	0.78	1.93	0.40	1.23	0.14	0.84	0.05	0.56	0.02	0.34	0.01		
16	7.55	10.30	4.61	3.11	2.89	1.00	2.20	0.52	1.41	0.17	0.96	0.07	0.65	0.03	0.39	0.01		
18	8.49	12.81	5.19	3.87	3.25	1.24	2.48	0.64	1.59	0.22	1.08	0.09	0.73	0.03	0.44	0.01		
20	9.43	15.58	5.77	4.71	3.61	1.51	2.75	0.78	1.76	0.26	1.20	0.10	0.81	0.04	0.49	0.01		
22	10.38	18.58	6.34	5.62	3.97	1.80	3.03	0.93	1.94	0.32	1.32	0.12	0.89	0.05	0.54	0.01		
24	11.32	21.83	6.92	6.60	4.34	2.12	3.30	1.09	2.12	0.37	1.44	0.15	0.97	0.06	0.59	0.02		
26	12.27	25.32	7.50	7.65	4.70	2.46	3.58	1.27	2.29	0.43	1.56	0.17	1.05	0.07	0.63	0.02		
28	13.21	29.04	8.08	8.78	5.06	2.82	3.86	1.46	2.47	0.49	1.68	0.19	1.13	0.07	0.68	0.02		
30	14.15	33.00	8.65	9.98	5.42	3.20	4.13	1.66	2.65	0.56	1.80	0.22	1.22	0.09	0.73	0.02	0.34	0.00
35	16.51	43.91	10.10	13.27	6.32	4.26	4.82	2.20	3.09	0.75	2.11	0.29	1.42	0.11	0.86	0.03	0.39	0.01
40	18.87	56.23	11.54	17.00	7.23	5.45	5.51	2.82	3.53	0.95	2.41	0.38	1.62	0.14	0.98	0.04	0.45	0.01
45			12.98	21.14	8.13	6.78	6.20	3.51	3.97	1.19	2.71	0.47	1.83	0.18	1.10	0.05	0.51	0.01
50			14.42	25.70	9.04	8.24	6.89	4.26	4.41	1.44	3.01	0.57	2.03	0.22	1.23	0.06	0.56	0.01
55			15.87	30.66	9.94	9.83	7.58	5.09	4.85	1.72	3.31	0.68	2.23	0.26	1.35	0.08	0.62	0.01
60			17.31	36.02	10.85	11.55	8.27	5.97	5.30	2.02	3.61	0.80	2.44	0.31	1.47	0.09	0.68	0.01
65			18.75	41.77	11.75	13.40	8.96	6.93	5.74	2.35	3.92	0.93	2.64	0.36	1.59	0.10	0.73	0.02
70					12.65	15.37	9.65	7.95	6.18	2.69	4.22	1.06	2.84	0.41	1.72	0.12	0.79	0.02
75					13.56	17.47	10.34	9.03	6.62	3.06	4.52	1.21	3.05	0.46	1.84	0.14	0.85	0.02
80					14.46	19.68	11.03	10.18	7.06	3.44	4.82	1.36	3.25	0.52	1.96	0.15	0.90	0.02
85					15.37	22.02	11.72	11.39	7.50	3.85	5.12	1.52	3.45	0.59	2.09	0.17	0.96	0.03
90					16.27	24.48	12.41	12.66	7.95	4.28	5.42	1.69	3.66	0.65	2.21	0.19	1.02	0.03
95					17.18	27.06	13.10	13.99	8.39	4.74	5.72	1.87	3.86	0.72	2.33	0.21	1.07	0.03
100					18.08	29.76	13.79	15.39	8.83	5.21	6.03	2.06	4.07	0.79	2.46	0.23	1.13	0.04
110					19.89	35.50	15.17	18.36	9.71	6.21	6.63	2.45	4.47	0.94	2.70	0.28	1.24	0.04
120							16.54	21.57	10.60	7.30	7.23	2.88	4.88	1.11	2.95	0.33	1.36	0.05
130							17.92	25.02	11.48	8.47	7.84	3.34	5.29	1.29	3.19	0.38	1.47	0.06
140							19.30	28.70	12.36	9.71	8.44	3.84	5.69	1.47	3.44	0.43	1.59	0.07
150									13.25	11.04	9.04	4.36	6.10	1.68	3.69	0.49	1.70	0.08
160									14.13	12.44	9.64	4.91	6.51	1.89	3.93	0.55	1.81	0.08
170									15.01	13.91	10.25	5.50	6.91	2.11	4.18	0.62	1.93	0.09
180									15.09	15.47	10.85	6.11	7.32	2.35	4.42	0.69	2.04	0.11
190									16.78	17.10	11.45	6.75	7.73	2.60	4.67	0.76	2.15	0.12
200									17.66	18.80	12.06	7.43	8.14	2.85	4.92	0.84	2.27	0.13
225									19.87	23.38	13.56	9.24	9.15	3.55	5.53	1.04	2.55	0.16
250											15.07	11.23	10.17	4.31	6.15	1.27	2.83	0.19
275											16.58	13.39	11.19	5.15	6.76	1.51	3.12	0.23
300											18.09	15.74	12.21	6.05	7.38	1.78	3.40	0.27
325											19.60	18.25	13.22	7.01	7.99	2.06	3.69	0.31
350													14.24	8.05	8.61	2.36	3.97	0.36
375													15.26	9.14	9.22	2.69	4.25	0.41
400													16.28	10.30	9.84	3.03	4.54	0.46
425													17.29	11.53	10.45	3.39	4.82	0.52
450													18.31	12.81	11.07	3.77	5.11	0.57
475													19.33	14.16	11.68	4.16	5.39	0.63
500															12.30	4.58	5.67	0.70
550															13.53	5.46	6.24	0.83
600															14.76	6.42	6.81	0.98

PSI loss per 100 feet of tube (PSI/100 ft). Sizes ¾" thru 6". Flow gpm 1 through 600.
NOTE: *Shaded areas of the chart indicate velocities over 5 feet per second.* ***Use with caution.***

FRICTION LOSS CHARACTERISTICS
PVC SCHEDULE 40 IPS PLASTIC PIPE (1120, 1220) C=150

Size	½"		¾"		1"		1 ¼"		1 ½"		2"		2 ½"		3"		4"		6"	
OD	0.840		1.050		1.315		1.660		1.900		2.375		2.875		3.500		4.500		6.625	
ID	0.622		0.824		1.049		1.380		1.610		2.067		2.469		3.068		4.026		6.065	
Wall Thick	0.109		0.113		0.133		0.140		0.145		0.154		0.203		0.216		0.237		0.280	
flow g.p.m	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss
1	1.05	0.43	0.60	0.11	0.37	0.03	0.21	0.01	0.15	0.00										
2	2.11	1.55	1.20	0.39	0.74	0.12	0.42	0.03	0.31	0.02	0.19	0.00								
3	3.16	3.28	1.80	0.84	1.11	0.26	0.64	0.07	0.47	0.03	0.28	0.01	0.20	0.00						
4	4.22	5.60	2.40	1.42	1.48	0.44	0.85	0.12	0.62	0.05	0.38	0.02	0.26	0.01						
5	5.27	8.46	3.00	2.15	1.85	0.66	1.07	0.18	0.78	0.08	0.47	0.02	0.33	0.01	0.21	0.00				
6	6.33	11.86	3.60	3.02	2.22	0.93	1.28	0.25	0.94	0.12	0.57	0.03	0.40	0.01	0.26	0.01				
7	7.38	15.77	4.20	4.01	2.59	1.24	1.49	0.33	1.10	0.15	0.66	0.05	0.46	0.02	0.30	0.01				
8	8.44	20.20	4.80	5.14	2.96	1.59	1.71	0.42	1.25	0.20	0.76	0.06	0.53	0.02	0.34	0.01				
9	9.49	25.12	5.40	6.39	3.33	1.97	1.92	0.52	1.41	0.25	0.85	0.07	0.60	0.03	0.39	0.01				
10	10.55	30.54	6.00	7.77	3.70	2.40	2.14	0.63	1.57	0.30	0.95	0.09	0.66	0.04	0.43	0.01				
11	11.60	36.43	6.60	9.27	4.07	2.86	2.35	0.75	1.73	0.36	1.05	0.11	0.73	0.04	0.47	0.02				
12	12.65	42.80	7.21	10.89	4.44	3.36	2.57	0.89	1.88	0.42	1.14	0.12	0.80	0.05	0.52	0.02	0.30	0.00		
14	14.76	56.94	8.41	14.48	5.19	4.47	2.99	1.18	2.20	0.56	1.33	0.17	0.93	0.07	0.60	0.02	0.35	0.01		
16	16.87	72.92	9.61	18.55	5.93	5.73	3.42	1.51	2.51	0.71	1.52	0.21	1.07	0.09	0.69	0.03	0.40	0.01		
18	18.98	90.69	10.81	23.07	6.67	7.13	3.85	1.88	2.83	0.89	1.71	0.26	1.20	0.11	0.78	0.04	0.45	0.01		
20	21.09	110.23	12.01	28.04	7.41	8.66	4.28	2.28	3.14	1.08	1.90	0.32	1.33	0.13	0.86	0.05	0.50	0.01		
22			13.21	33.45	8.15	10.33	4.71	2.72	3.46	1.29	2.10	0.38	1.47	0.16	0.95	0.06	0.55	0.01		
24			14.42	39.30	8.89	12.14	5.14	3.20	3.77	1.51	2.29	0.45	1.60	0.19	1.04	0.07	0.60	0.02		
26			15.62	45.58	9.64	14.08	5.57	3.17	4.09	1.75	2.48	0.52	1.74	0.22	1.12	0.08	0.65	0.02		
28			16.82	52.28	10.38	16.15	5.99	4.25	4.40	2.01	2.67	0.60	1.87	0.25	1.21	0.09	0.70	0.02		
30			18.02	59.41	11.12	18.35	6.42	4.83	4.72	2.28	2.86	0.68	2.00	0.29	1.30	0.10	0.75	0.03		
35					12.97	24.42	7.49	6.43	5.50	3.04	3.34	0.90	2.34	0.38	1.51	0.13	0.88	0.04	0.38	0.00
40					14.83	31.27	8.56	8.23	6.29	3.89	3.81	1.15	2.67	0.49	1.73	0.17	1.00	0.04	0.44	0.01
45					16.68	38.89	9.64	10.24	7.08	4.84	4.29	1.43	3.01	0.60	1.95	0.21	1.13	0.06	0.49	0.01
50					18.53	47.27	10.71	12.45	7.87	5.88	4.77	1.74	3.34	0.73	2.16	0.26	1.25	0.07	1.55	0.01
55							11.78	14.85	8.65	7.01	5.25	2.08	3.68	0.88	2.38	0.30	1.38	0.08	0.61	0.01
60							12.85	17.45	9.44	8.24	5.72	2.44	4.01	1.03	2.60	0.36	1.51	0.10	0.66	0.01
65							13.92	20.23	10.23	9.56	6.20	2.83	4.35	1.19	2.81	0.41	1.63	0.11	0.72	0.02
70							14.99	23.21	11.01	10.96	6.68	3.25	4.68	1.37	3.03	0.48	1.76	0.13	0.77	0.02
75							16.06	26.37	11.80	12.46	7.16	3.69	5.01	1.56	3.25	0.54	1.88	0.14	0.83	0.02
80							17.13	29.72	12.59	14.04	7.63	4.16	5.35	1.75	3.46	0.61	2.01	0.16	0.88	0.02
85							18.21	33.26	13.37	15.71	8.11	4.66	5.68	1.96	3.68	0.68	2.13	0.18	0.94	0.02
90							19.28	36.97	14.16	17.46	8.59	5.18	6.02	2.18	3.90	0.76	2.26	0.20	0.99	0.03
95									14.95	19.30	9.07	5.72	6.35	2.41	4.11	0.84	2.39	0.22	1.05	0.03
100									15.74	21.22	9.54	6.29	6.69	2.65	4.33	0.92	2.51	0.25	1.10	0.03
110									17.31	25.32	10.50	7.51	7.36	3.16	4.76	1.10	2.76	0.29	1.22	0.04
120									18.88	29.75	11.45	8.82	8.03	3.72	5.20	1.29	3.02	0.34	1.33	0.05
130											12.41	10.23	8.70	4.31	5.63	1.50	3.27	0.40	1.44	0.05
140											13.36	11.74	9.37	4.94	6.06	1.72	3.52	0.46	1.55	0.06
150											14.32	13.33	10.03	5.62	6.50	1.95	3.77	0.52	1.66	0.07
160											15.27	15.03	10.70	6.33	6.93	2.20	4.02	0.59	1.77	0.08
170											16.23	16.81	11.37	7.08	7.36	2.46	4.27	0.66	1.88	0.09
180											17.18	18.69	12.04	7.87	7.80	2.74	4.53	0.73	1.99	0.10
190											18.14	20.66	12.71	8.70	8.23	3.02	4.78	0.81	2.10	0.11
200											19.09	22.72	13.38	9.57	8.66	3.33	5.03	0.89	2.21	0.12
225													15.05	11.90	9.75	4.14	5.66	1.10	2.49	0.15
250													16.73	14.47	10.83	5.03	6.29	1.34	2.77	0.18
275													18.40	17.26	11.92	6.00	6.92	1.60	3.05	0.22
300															13.00	7.05	7.55	1.88	3.32	0.26
325															14.08	8.17	8.18	2.18	3.60	0.30
350															15.17	9.38	8.81	2.50	3.88	0.34
375															16.25	10.65	9.43	2.84	4.15	0.39
400															17.33	12.01	10.06	3.20	4.43	0.44
425															18.42	13.43	10.69	3.58	4.71	0.49
450															19.50	14.93	11.32	3.98	4.99	0.54
475																	11.95	4.40	5.26	0.60
500																	12.58	4.84	5.54	0.66
550																	13.84	5.77	6.10	0.79
600																	15.10	6.78	6.65	0.92

PSI loss per 100 feet of tube (PSI/100 ft). Sizes ½" thru 6". Flow gpm 1 through 600.
NOTE: *Shaded areas of the chart indicate velocities over 5 feet per second.* ***Use with caution.***

FRICTION LOSS CHARACTERISTICS POLYETHYLENE (PE)
SDR-PRESSURE RATED TUBE (2306, 3206, 3306) SDR 7, 9, 11.5, 15 C=14

Size	½"		¾"		1"		1 ¼"		1 ½"		2"		2 ½"		3"		4"		6"	
ID	0.622		0.824		1.049		1.380		1.610		2.067		2.469		3.068		4.026		6.065	
flow g.p.m	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss	vel f.f.s	psi loss
1	1.05	0.49	0.60	0.12	0.37	0.04	0.21	0.01	0.15	0.00	0.09	0.00								
2	2.10	1.76	1.20	0.45	0.74	0.14	0.42	0.04	0.31	0.02	0.19	0.01								
3	3.16	3.73	1.80	0.95	1.11	0.29	0.64	0.08	0.47	0.04	0.28	0.01	0.20	0.00						
4	4.21	6.35	2.40	1.62	1.48	0.50	0.85	0.13	0.62	0.06	0.38	0.02	0.26	0.01						
5	5.27	9.60	3.00	2.44	1.85	0.76	1.07	0.20	0.78	0.09	0.47	0.03	0.33	0.01	0.21	0.00				
6	6.32	13.46	3.60	3.43	2.22	1.06	1.28	0.28	0.94	0.13	0.57	0.04	0.40	0.02	0.26	0.01				
7	7.38	17.91	4.20	4.56	2.59	1.41	1.49	0.37	1.10	0.18	0.66	0.05	0.46	0.02	0.30	0.01				
8	8.43	22.93	4.80	5.84	2.96	1.80	1.71	0.47	1.25	0.22	0.76	0.07	0.53	0.03	0.34	0.01				
9	9.49	28.52	5.40	7.26	3.33	2.24	1.92	0.59	1.41	0.28	0.85	0.08	0.60	0.03	0.39	0.01				
10	10.54	34.67	6.00	8.82	3.70	2.73	2.14	0.72	1.57	0.34	0.95	0.10	0.66	0.04	0.43	0.01				
11	11.60	41.36	6.00	10.53	4.07	3.25	2.35	0.86	1.73	0.40	1.05	0.12	0.73	0.05	0.47	0.02	0.27	0.00		
12	12.65	48.60	7.21	12.37	4.44	3.82	2.57	1.01	1.88	0.48	1.14	0.14	0.80	0.06	0.52	0.02	0.30	0.01		
14	14.76	64.65	8.41	16.46	5.19	5.08	2.99	1.34	2.20	0.63	1.33	0.19	0.93	0.08	0.60	0.03	0.35	0.01		
16	16.87	82.79	9.61	21.07	5.93	6.51	3.42	1.71	2.51	0.81	1.52	0.24	1.07	0.10	0.69	0.04	0.40	0.01		
18	18.98	102.97	10.81	26.21	6.67	8.10	3.85	2.13	2.83	1.01	1.71	0.30	1.20	0.13	0.78	0.04	0.45	0.01		
20			12.01	31.86	7.41	9.84	4.28	2.59	3.14	1.22	1.90	0.36	1.33	0.15	0.86	0.05	0.50	0.01		
22			13.21	38.01	8.15	11.74	4.71	3.09	3.46	1.46	2.10	0.43	1.47	0.18	0.95	0.06	0.55	0.02		
24			14.42	44.65	8.89	13.79	5.14	3.63	3.77	1.72	2.29	0.51	1.60	0.21	1.04	0.07	0.60	0.02		
26			15.62	41.79	9.64	16.00	5.57	4.21	4.09	1.99	2.48	0.59	1.74	0.25	1.12	0.09	0.65	0.02		
28			16.82	59.41	10.38	18.35	5.99	4.83	4.40	2.28	2.67	0.68	1.87	0.29	1.21	0.10	0.70	0.03		
30			18.02	67.50	11.12	20.85	6.42	5.49	4.72	2.59	2.86	0.77	2.00	0.32	1.30	0.11	0.75	0.03	0.33	0.00
35					12.97	27.74	7.49	7.31	5.50	3.45	3.34	1.02	2.34	0.43	1.51	0.15	0.88	0.04	0.38	0.01
40					14.83	35.53	8.56	9.36	6.29	4.42	3.81	1.31	2.67	0.55	1.73	0.19	1.00	0.05	0.44	0.01
45					16.68	44.19	9.64	11.64	7.08	5.50	4.29	1.63	3.01	0.69	1.95	0.24	1.13	0.06	0.49	0.01
50					18.53	53.71	10.71	14.14	7.87	6.68	4.77	1.98	3.34	0.83	2.16	0.29	1.25	0.08	0.55	0.01
55							11.78	16.87	8.65	7.97	5.25	2.36	3.68	1.00	2.38	0.35	1.38	0.09	0.61	0.01
60							12.85	19.82	9.44	9.36	5.72	2.78	4.01	1.17	2.60	0.41	1.51	0.11	0.66	0.01
65							13.92	22.99	10.23	10.86	6.20	3.22	4.35	1.36	2.81	0.47	1.63	0.13	0.72	0.02
70							14.99	26.37	11.01	12.46	6.68	3.69	4.68	1.56	3.03	0.54	1.76	0.14	0.77	0.02
75							16.06	29.97	11.80	14.16	7.16	4.20	5.01	1.77	3.25	0.61	1.88	0.16	0.83	0.02
80							17.13	33.77	12.59	15.95	7.63	4.73	5.35	1.99	3.46	0.69	2.01	0.18	0.88	0.03
85							18.21	37.79	13.37	17.85	8.11	5.29	5.68	2.23	3.68	0.77	2.13	0.21	0.94	0.03
90							19.28	42.01	14.16	19.84	8.59	5.88	6.02	2.48	3.90	0.86	2.26	0.23	0.99	0.03
95									14.95	21.93	9.07	6.50	6.35	2.74	4.11	0.95	2.39	0.25	1.05	0.03
100									15.74	24.12	9.54	7.15	6.69	3.01	4.33	1.05	2.51	0.28	1.10	0.04
110									17.31	28.77	10.50	8.53	7.36	3.59	4.76	1.25	2.76	0.33	1.22	0.05
120									18.88	33.80	11.45	10.02	8.03	4.22	5.20	1.47	3.02	0.39	1.33	0.05
130											12.41	11.62	8.70	4.90	5.63	1.70	3.27	0.45	1.44	0.06
140											13.36	13.33	9.37	5.62	6.06	1.95	3.52	0.52	1.55	0.07
150											14.32	15.15	10.03	6.38	6.50	2.22	3.77	0.59	1.66	0.08
160											15.27	17.08	10.70	7.19	6.93	2.50	4.02	0.67	1.77	0.09
170											16.23	19.11	11.37	8.05	7.36	2.80	4.27	0.75	1.88	0.10
180											17.18	21.24	12.04	8.95	7.08	3.11	4.53	0.83	1.99	0.11
190											18.14	23.48	12.71	9.89	8.23	3.44	4.78	0.92	2.10	0.12
200											19.09	25.81	13.38	10.87	8.66	3.78	5.03	1.01	2.21	0.14
225													15.05	13.52	9.75	4.70	5.66	1.25	2.49	0.17
250													16.73	16.44	10.83	5.71	6.29	1.52	2.77	0.21
275													18.40	19.61	11.92	6.82	6.92	1.82	3.05	0.25
300															13.00	8.01	7.55	2.13	3.32	0.29
325															14.08	9.29	8.18	2.48	3.60	0.34
350															15.17	10.65	8.81	2.84	3.88	0.39
375															16.25	12.10	9.43	3.23	4.15	0.44
400															17.33	13.64	10.06	3.64	4.43	0.50
425															18.42	15.26	10.69	4.07	4.71	0.55
450															19.50	16.97	11.32	4.52	4.99	0.62
475																	11.95	5.00	5.26	0.68
500																	12.58	5.50	5.54	0.75
550																	13.84	6.56	6.10	0.89
600																	15.10	7.70	6.65	1.05

PSI loss per 100 feet of tube (PSI/100 ft). Sizes ½" thru 6". Flow gpm 1 through 600.
NOTE: *Shaded areas of the chart indicate velocities over 5 feet per second.* ***Use with caution.***

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