

TORO[®]

Count on it.

2006 / 2007
Micro-Irrigation
Catalog for Landscapes



Introduction

Quality, Innovation, Water Management!

With more than 33 years of experience in drip irrigation, Toro has lead the way in providing quality drip irrigation products for agriculture, mining and landscape applications around the world. With higher water costs, shifting water supplies and outdated irrigation practices, it makes more sense than ever to use drip irrigation in most landscape applications. The advantages are many:

- Water conservation
- System uniformity
- Design flexibility
- Proven reliability
- Reduced plant disease and
- Fertilizer and pesticide savings

The Right Products for Every Landscape

With Toro's broad line of micro-irrigation products, you can be assured that we have the right tools for the job. Our drip irrigation landscape product offering includes:

- DL2000® subsurface irrigation for turf and shrub bed applications
- Drip In® dripline for on-surface irrigation for shrub bed and garden applications
- Blue-Stripe® polyethylene hose available in a wide range of diameters, coil lengths, working pressures and color variations for drip zone identification
- Color-coded emission devices available in a variety of flows and spray patterns such as the NGE® color-coded emitters and Snap-Jet II® Series.
- Fittings, tools and accessories

The Right Company

The Toro solutions have pioneered methods for effective and efficient water use. Backed by the vast resources of The Toro Company, Toro Micro-Irrigation has committed its resources to providing water management tools that respond to the needs of our customers and to our environment. We've made tremendous strides, but there's still more to do. We want to earn your business. And, we know that if we continue to listen to your feedback and understand your needs – and make the investments to meet them - our ability to support your business will only get stronger.

**For additional information or product ordering information,
please call Customer Service at 800-333-8125 and we will assist you.
You can also e-mail us at landscapedrip@toro.com**



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Quality, Innovation, Water Management

Residential, commercial

Feature and Benefit Highlights

- US Government-approved ROOTGUARD® protection uses the non-toxic TREFLAN® that creates a force-field effect, guarding against root intrusion by diverting root growth away from the emitter outlet
- DripIn® PC self-cleaning emitters provide precise, trouble-free water application
- Flexible, sturdy design to fit into unusual spaces



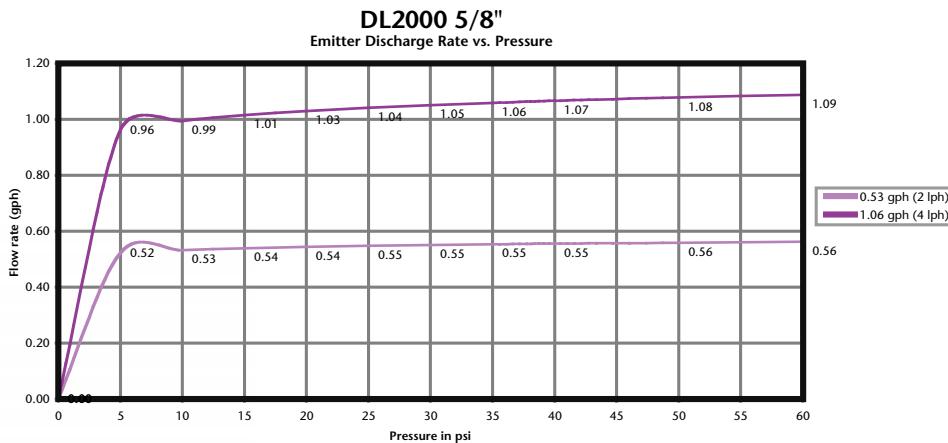
Additional Features

- TREFLAN is impregnated during the manufacturing process and requires no maintenance
- Flexible, sturdy design to fit into unusual spaces
- Easy to install and requires minimal maintenance
- Can be installed at grade or buried 4"-8" (100–200mm) underground, delivering irrigation directly to the plant's root zone
- Optional purple hose available for non-potable applications
- Emitters are inseparably banded to the inside wall of durable polyethylene dripline tubing during manufacturing
- Withstands acids down to pH2 as well as fertilizers, chemicals and chlorine
- Approved fertilizers and chemicals can be added at a central inlet to flow directly to the root zone
- Distinctive red stripes to signify Toro dripline with ROOTGUARD
- Seven-year warranty on DL2000 tubing and seven-year warranty on ROOTGUARD root-intrusion protection

Specifications

- Two flow rates:
 - 0.5 GPH (2.0 LPH)
 - 1.0 GPH (4.0 LPH)
- Maximum operating pressure: 60 psi (3.5 Bar)
- Pressure-compensating dripline emitter spacing: 12", 18", (30,5cm, 45,7cm) emitter spacing
- $\frac{1}{4}$ " (6mm) microline tubing available in 6" or 12" (150 or 300mm) spacing for small, tight areas -see page 5

The DL2000 subsurface irrigation system delivers optimal water application directly to the root zone. It is perfect for odd-shaped designs, median strips, public recreation areas, residential property, as well as golf course applications including bunker edges, bunker tongues, tees and greens.



Specifying Information

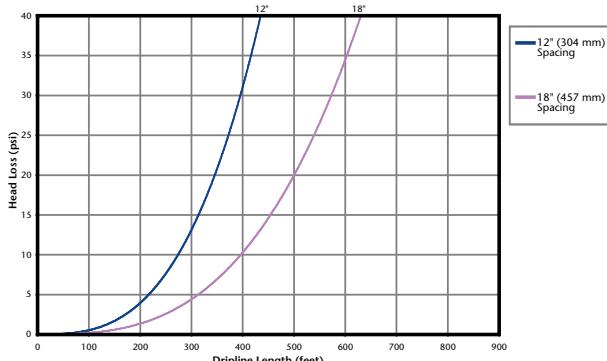
RGP - <input type="text"/>	XX - <input type="text"/>	<input type="text"/> - X
Emitter Flow GPH @ 30 psi (LPH @ 2.07 Bar)	Emitter Spacing	Coil Length
2—50 GPH (1.9 LPH) 4—1.0 GPH (4.0 LPH)	12—12" (30cm) 18—18" (45cm)	01—100' (30m) 05—500' (150m)
		Optional E—Purple Tubing for Non-potable Water

Example: A 500' (150m) coil of Pressure-compensating Dripline with ROOTGUARD, 12" (30cm) emitter spacing and 0.53 GPH (2.0 LPH), would be specified as: **RGP-212-05**

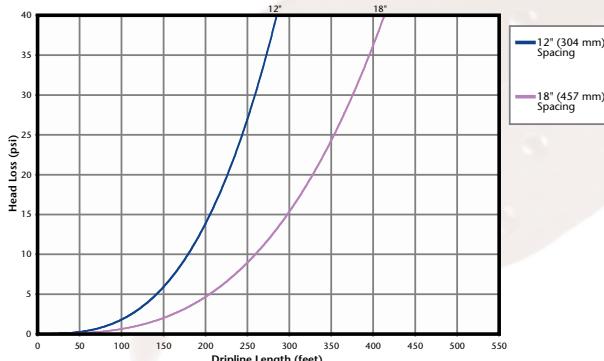
Uses 0.710" (18mm) compression fitting on Toro barb fittings.
DL2000 is a registered trademark of The Toro Company.
Drip In is a registered trademark of The Toro Company.
ROOTGUARD is a registered trademark of A.I. International
and manufactured under U.S. patent no 5116414.
TREFLAN is a registered trademark of DowElanco.

DL2000® Series

Head Loss vs. Dripline Length and Emitter Spacing
DL2000 $\frac{5}{8}$ " , 0.53 GPH (2 LPH) Emitter @ 0% Slope



Head Loss vs. Dripline Length and Emitter Spacing
DL2000 $\frac{5}{8}$ " , 1.06 GPH (4 LPH) Emitter @ 0% Slope



Length of Run Chart—U.S.

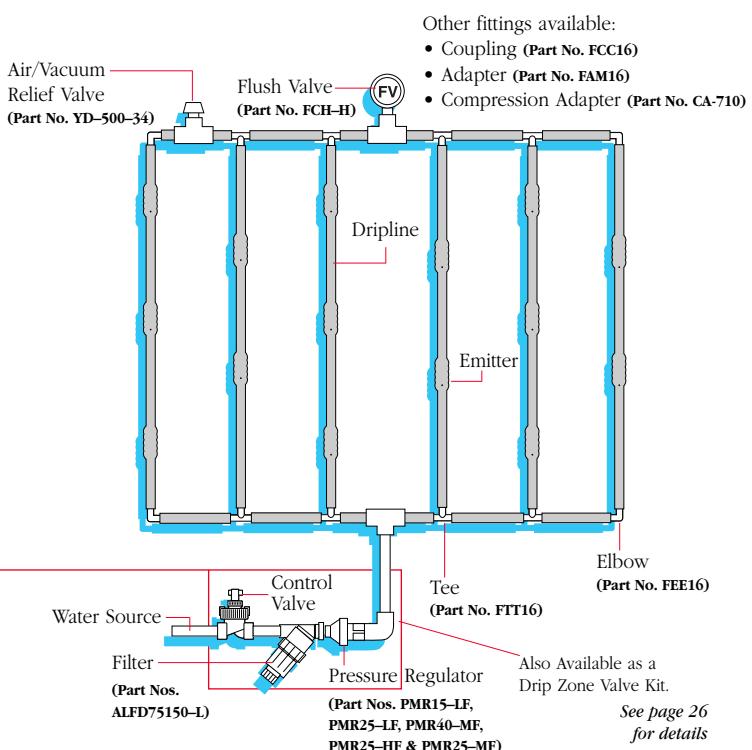
%" (0.620" ID / 0.710" OD)			Inlet Pressure vs. Maximum Length of Run in Feet			
Part Number	Flow Rate	Emitter Spacing	15 psi	25 psi	30 psi	40 psi
RGP-212	.53 GPH	12"	250'	360'	400'	460'
RGP-218	.53 GPH	18"	350'	515'	565'	650'
RGP-412	1.0 GPH	12"	160'	240'	260'	300'
RGP-418	1.0 GPH	18"	240'	340'	375'	430'

Length of Run Chart—Metric

(15.75mm ID/18mm OD)			Inlet Pressure vs. Maximum Length of Run in Meters			
Part Number	Flow Rate	Emitter Spacing	1,03 Bar	1,72 Bar	2,07 Bar	2,76 Bar
RGP-212	2,0 LPH	30,5 cm	76 m	110 m	122 m	140 m
RGP-218	2,0 LPH	45,7 cm	107 m	157 m	172 m	198 m
RGP-412	4,0 LPH	30,5 cm	49 m	73 m	79 m	91 m
RGP-418	4,0 LPH	45,7 cm	73 m	104 m	114 m	131 m

Performance Table		US	Metric
Flow Rate	.53/1.06 gph	2.0/4.0 lph	
Coefficient of Variation (Cv)		$\leq 5\%$	
Flow Exponent (x)		0.05	
Inside Diameter	0.620"	15.75 mm	
Outside Diameter	0.710"	18.03 mm	
Wall	0.045"	1,143 mm	
Operating pressure (P)	15–60 psi	1,03–4,13 Bar	
Minimum filtration requirement	120 Mesh	125 Micron	
Hazen-Williams C factor		140	
Barb loss factor (Kd)		.98	

NEW



DL2000® Series - Fittings and Accessories

Residential, commercial

Specifying Information ¾" Loc-Eze® Fittings

Part Number	Description
FIT16	Loc-Eze Tee
FEE16	Loc-Eze Elbow
FCC16	Loc-Eze Coupling
FAM16	Loc-Eze x 1/2" MPT Male Adapter
FTV16	Loc-Eze x 1/2" Slip Adapter Tee
FTF16	Loc-Eze x 1/2" FPT Tee
FJA16	Loc-Eze x 3/4" MHT Male Adapter
FJJ16	Loc-Eze x 3/4" MHT with Cap
FAS16	Loc Eze x 3/4" FHT Hose Swivel with Screen
FAS16-1	Loc Eze x 3/4" FHT Hose Swivel with Washer
FTS16	Loc-Eze x 3/4" FHT Swivel Tee with Screen
FTS16-1	Loc-Eze x 3/4" FHT Swivel Tee with Washer

Note: ¾" EHW1645 is an equivalent hose size to DL2000 Dripline.



Specifying Information 0.710" OD Compression Fittings

Part Number	Description
CA-710	OD Compression Adapter ¼" Spigot
CEFCH-H	OD Compression Adapter with Flush Valve, 0.8 GPM, 2 psi Sealing



Specifying Information Accessories

Part Number	Description
YD-500-34	Air Vent—½" MIPT Air Release & Vacuum Relief Valve
FCH-H-FIPT	Flush Valve—¾" FPT (Pipe Thread), 0.8 GPM, 2 psi Sealing Pressure
FCH-H-FHT	Flush Valve—¾" FHT (Hose Thread), 0.8 GPM, 2 psi Sealing Pressure
PMR15-LF	Pressure Regulator—¾", 15 psi 1/10-8 GPM Low-flow
PMR25-LF	Pressure Regulator—¾", 25 psi 1/10-8 GPM Low-flow
PMR25-MF	Pressure Regulator—¾", 25 psi 2-20 GPM Medium-flow
PMR40-MF	Pressure Regulator—¾", 40 psi 2-20 GPM Medium-flow
PR25-HF	Pressure Regulator—1½" x 1", 25 psi, 10-32 GPM High-flow
DL-MP9	DL2000 Pop-up Operation Indicator
FJQ16	5/8" (16mm) Figure-eight End Clamp
SS6-50	3/4" (20mm) Steel Soil Staple to Hold Tubing in Place
IPS1500	5/8" (16mm) Plastic Locator Stake to Hold Tubing in Place



Residential, commercial

Feature and Benefit Highlights

- ROOTGUARD protection uses the non-toxic Treflan® creating a force-field effect guarding against root intrusion into the emitters
- 1/4" tubing with built-in emitters allows for ease of installation even to the smallest of areas
- Flexible, sturdy design to fit into unusual spaces
- Easy to install and requires minimal maintenance



Microlines with ROOTGUARD is ideal for small tight areas such as planter boxes, small flowerbeds or under narrow strips of turf.

Length of Run Chart—U.S.

Part Number	Tubing Size	Flow Rate	Emitter Spacing	Inlet Pressure	Max Length of Run
MCRG-206	1/4"	.53 GPH	6"	15 psi	19'
MCRG-212	1/4"	.53 GPH	12"	15 psi	33'

Length of Run Chart—metric

Part Number	Tubing Size	Flow Rate	Emitter Spacing	Inlet Pressure	Max Length of Run
MCRG-206	4mm	2 LPH	15,2cm	1 Bar	6m
MCRG-212	4mm	2 LPH	30,2cm	1 Bar	10m

Specifying Information Microline 1/4" Fittings

Part Number	Description
FTT0400	Tee (Barb x Barb)
FEE0400	Elbow (Barb x Barb)
FCC0400	Coupling (Barb x Barb)
FCV-BB	Microflow Valve (Barb x Barb)
FMP08	Hose Punch for 1/4" barbed fittings and emitter
IPS0104	1/4" (4mm) plastic locator stake to hold tubing in place



Performance Table	US	Metric
Inside Diameter	0.170"	4,32 mm
Outside Diameter	0.250"	6,35 mm
Wall	0.040"	1,02 mm
Operating pressure	15–60 psi	1,03–4,13 Bar
Minimum filtration requirement	140 Mesh	105 Micron
Nominal Flow Rate (Q)	0.53 gph	2 lph



Specifying Information Microline

Part Number	Description
MCRG-206	DL2000 100' (30m) Roll, 1/4" (4mm) Non-pressure-compensating Microline Dripline w/ROOTGUARD, 6" (150mm) Emitter Spacing, 0.50 GPH (2,0 LPH)
MCRG-212	DL2000 100' (30m) Roll, 1/4" (4mm) Non-pressure-compensating Microline Dripline w/ROOTGUARD, 12" (300mm) Emitter Spacing, 0.50 GPH (2,0 LPH)

Drip In®PC - pressure compensating dripline

Residential, commercial

Feature and Benefit Highlights

- Drip In PC has built-in emitters that deliver precise water application directly to the root zone
- Fully pressure-compensating from 15 – 60 psi
- The pressure compensating design makes it ideal for slopes, high wind areas and areas with limited water supply or low pressure
- Highly clog-resistant due to the dual opposed outlet emitters

Additional Features

- Built in emitters
- Works well with fittings: Inside diameter fittings and OD compression fittings
- Ease of installation
- Keeps water off hardscapes preventing unsightly water stains
- Works well in odd shaped areas

Specifications

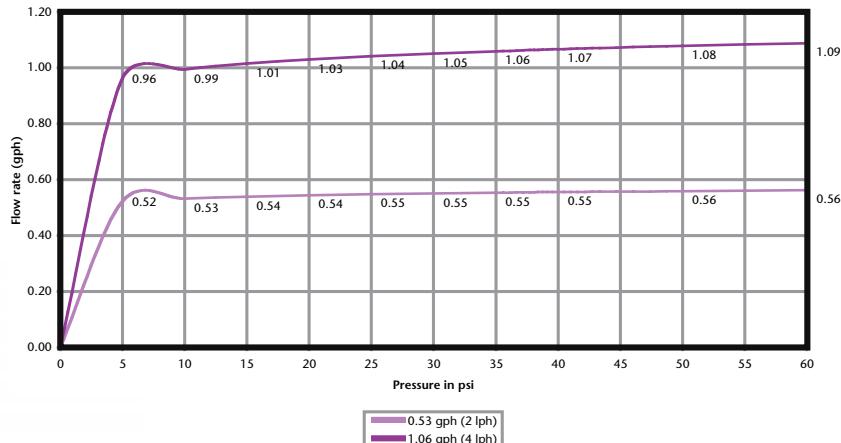
- 12", 18" and 24" spacing is available
- Coil lengths of 100', 500' and 1000'



DripIn pressure compensating dripline comes standard with the blue stripe of quality. DripIn PC is also available in solid brown or in solid purple for reclaimed water applications.

Drip In PC 5/8"

0.620" ID Emitter discharge rate vs. pressure



Specifying Information

PCX 18 XX-XX-XXX

Pressure Compensation	Tubing size	Emitter flow, gph (lph) @ 30 psi (2.07 bar)	Emitter spacing	Coil length
PCS-Blue Stripe	18-5/8" (0.620" ID)	53-0.53 gph (2.00 lph) 10-1.00 gph (4.00 lph)	12-12" (30.5 cm) 18-18" (45cm) 24-24" (60cm)	100-100' (30m) 500-500' (150m) -1000' (300m)
PCB-Brown				

Example: A coil of 5/8" (0.620" ID) pressure compensating .53 gph (2.00 lph) emitters spaced at 12" (30cm) on a 500' (150m) coil would have the following part number: **PCS1853-12-500**

*Other DripIn dripline sizes (0.550" ID and 0.710" ID) available upon request.
DripIn is a registered trademark of The Toro Company.

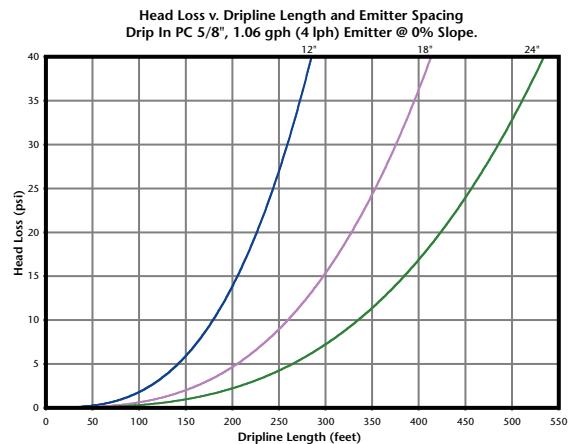
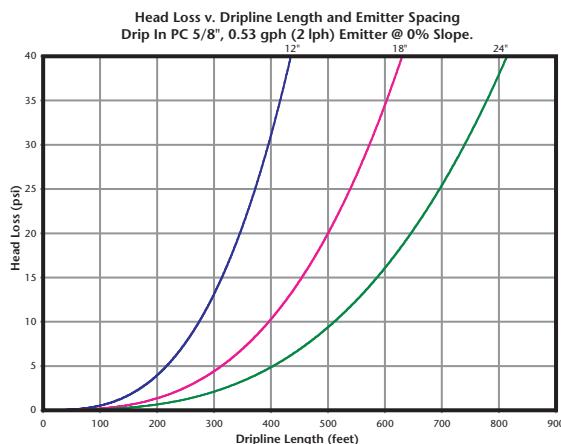
Note: Fittings specifications found on page 9.

Length of Run Chart—U.S.

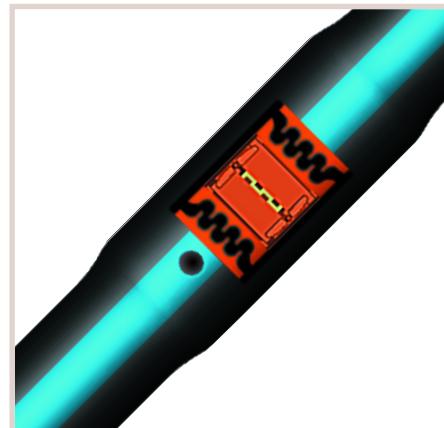
5/8" (0.620" ID / 0.710" OD)				Inlet pressure vs. Max length of run in Feet			
Part Number	Tubing Size	Flow Rate	Emitter Spacing	15 psi	25 psi	30 psi	40 psi
PCS1853-12	.620" ID	.53 gph	12"	250'	360'	400'	460'
PCS1853-18	.620" ID	.53 gph	18"	350'	515'	565'	650'
PCS1853-24	.620" ID	.53 gph	24"	450'	650'	720'	825'
PCS1810-12	.620" ID	1.0 gph	12"	160'	240'	260'	300'
PCS1810-18	.620" ID	1.0 gph	18"	240'	340'	375'	430'
PCS1810-24	.620" ID	1.0 gph	24"	300'	425'	475'	540'

Length of Run Chart—metric

15.75mm ID / 18mm OD)				Inlet pressure vs. Max length of run in Meters			
Part Number	Tubing Size	Flow Rate	Emitter Spacing	1.03 bar	1.72 bar	2.07 bar	2.76 bar
PCS1853-12	15.75 mm ID	2.0 lph	30.5 cm	76 m	110 m	122 m	140 m
PCS1853-18	15.75 mm ID	2.0 lph	45.7 cm	107 m	157 m	172 m	198 m
PCS1853-24	15.75 mm ID	2.0 lph	61.0 cm	137 m	198 m	219 m	251 m
PCS1810-12	15.75 mm ID	4.0 lph	30.5 cm	49 m	73 m	79 m	91 m
PCS1810-18	15.75 mm ID	4.0 lph	45.7 cm	73 m	104 m	114 m	131 m
PCS1810-24	15.75 mm ID	4.0 lph	61.0 cm	91 m	130 m	145 m	165 m



Performance Table	US	Metric
Flow Rate	.53/1.06 gph	2.0/4.0 lph
Coefficient of Variation (Cv)	≤ 5%	
Flow Exponent (x)	0.05	
Inside Diameter	0.620"	15.75 mm
Outside Diameter	0.710"	18.03 mm
Wall	0.045"	1.143 mm
Operating pressure (P)	15–60 psi	1,03–4,13 Bar
Minimum filtration requirement	120 Mesh	125 Micron
Hazen-Williams C factor	140	
Barb loss factor (Kd)	.98	



Cut-away illustration of the
DripIn built-in emitter

Residential, commercial

Feature and Benefit Highlights

- Manufactured from premium grade linear low density polyethylene for the most dependable operation
- Minimum 2% carbon black added for ultraviolet (UV) deterioration
- Available in a wide range of diameters, wall thicknesses, coil lengths and working pressures
- Available with a blue, white or purple stripe for easy on-site identification of drip zones or applications during installation and operation



Additional Features

- | | |
|--|---|
| • Conforms to A.S.A.E. standards for minimum inside diameters and wall thickness | • Superior quality and durability |
| • Available in OD Controlled configurations | • Available in purple for reclaimed water applications or in brown as another alternative |
| • High manufacturing quality control standards & specifications | • 7 year non-prorated warranty - longest in business |

Blue Stripe hose is available in a variety of sizes, lengths and color configurations to meet any landscape application.

Specifications

ID Controlled Hose

Part Number	Hose Size		Nominal Hose Size			Coil Length	Internal Diameter		Wall Thickness		Coil Weight		Pressure Rating
	ID Inch	ID mm	ID Inch	OD Inch	Wall Inch		Min. Inch	Max. Inch	Min. Inch	Max. Inch	Min. Lbs.	Max. Lbs.	
Blue Stripe® Round Hose - Coil Stretch Wrapped													
EHW1554-050	-	15	0.570	0.685	0.058	500	0.569	0.574	0.054	0.059	21.5	23.9	77
EHW1645-010	5/8"	16	0.620	0.710	0.045	100	0.613	0.618	0.047	0.052	4.0	4.5	64
EHW1645-050	5/8"	16	0.620	0.710	0.045	500	0.613	0.618	0.045	0.050	18.9	21.3	61
Blue Stripe® Round Hose - Coil Banded													
EHD1554-050	-	15	0.570	0.685	0.058	500	0.569	0.574	0.054	0.059	21.5	23.9	77
x EHD1554-100	-	15	0.570	0.685	0.058	1,000	0.569	0.574	0.054	0.059	43.0	47.7	77
pxw EHD1645-050	5/8"	16	0.620	0.710	0.045	500	0.613	0.618	0.045	0.050	18.9	21.3	61
pxw EHD1645-100	5/8"	16	0.620	0.710	0.045	1,000	0.613	0.618	0.045	0.050	37.8	42.7	61
pxw EHD2057-050	3/4"	20	0.805	0.925	0.060	500	0.804	0.809	0.057	0.063	31.4	35.1	59
px EHD2057-100	3/4"	20	0.805	0.925	0.060	1,000	0.804	0.809	0.057	0.063	62.7	70.2	59
pw EHD2667-066	1"	26	1.060	1.200	0.070	660	1.056	1.061	0.067	0.073	63.4	69.8	53

OD Controlled Hose

Part Number	Hose Size		Nominal Hose Size			Coil Length	Outside Diameter		Wall Thickness		Coil Weight		Pressure Rating
	ID Inch	ID mm	ID Inch	OD Inch	Wall Inch		Min. Inch	Max. Inch	Min. Inch	Max. Inch	Min. Lbs.	Max. Lbs.	
Blue Stripe® OD Controlled Hose - Coil Stretch Wrapped													
EHW1650-010	5/8"	16	0.600	0.700	0.050	100	0.697	0.702	0.047	0.052	3.9	4.4	65
EHW1650-050	5/8"	16	0.600	0.700	0.050	500	0.697	0.702	0.047	0.052	19.4	21.8	65
Blue Stripe® OD Controlled Hose - Coil Banded													
EHO1650-050	5/8"	16	0.600	0.700	0.050	500	0.697	0.702	0.047	0.052	19.4	21.8	65
EHO1650-100	5/8"	16	0.600	0.700	0.050	1,000	0.697	0.702	0.047	0.052	38.7	43.5	65
EHO2055-050	3/4"	20	0.830	0.940	0.055	500	0.935	0.940	0.052	0.057	29.2	32.3	53
EHO2055-100	3/4"	20	0.830	0.940	0.055	1,000	0.935	0.940	0.052	0.057	58.3	64.7	53

Blue Stripe is a registered trademark of The Toro Company.

- p = Also available as Purple Stripe Hose for reclaimed water
- x = Also available as White Blue Stripe Hose
- w= Also available as Blue Stripe White Hose
- Also available without stripe on special request

Note: Please refer to page 9 for fittings and accessories information.

Residential, commercial

Specifying Information ½" Loc-Eze Fittings

Part Number	Description
FTT16	Loc-Eze Tee
FEE16	Loc-Eze Elbow
FCC16	Loc-Eze Coupling
FAM16	Loc-Eze x 1/2" MHT Male Adapter
FTV16	Loc-Eze x 1/2" Slip Adapter Tee
FTP16	Loc-Eze x 1/2" FPT Tee
FJA16	Loc-Eze x 3/4" MHT Male Adapter
FJJ16	Loc-Eze x 3/4" MHT with Cap
FAS16	Loc-Eze x 3/4" FHT Swivel with Screen
FAS16-1	Loc-Eze x 3/4" FHT Swivel with Cap
FTS16	Loc-Eze x 3/4" FHT Swivel Tee with Screen
FTS16-1	Loc-Eze x 3/4" FHT Swivel Tee with Washer



Specifying Information 15 mm Barbed Fittings

Part Number	Description
FCC15	Loc-Eze Coupling
FCC1500	Barbed Coupling
FAM1500	Barbed x 1/2" MPT Male Adapter
FAS1500	Barbed x 3/4" FHT Swivel with Screen
FAS1500-1	Barbed x 3/4" FHT Swivel with Washer
FEE1500	Barbed Elbow
FJA1500	Barbed x 3/4" MHT Male Adapter
FJJ1500	Barbed x 3/4" MHT with Cap
FTS1500	Barbed x 3/4" FHT Swivel Tee with Screen
FTS1500-1	Barbed x 3/4" FHT Swivel Tee with Washer
FTT1500	Barbed Tee



Specifying Information Compression Fittings

Part Number	Description
CA-710	OD Compression Adapter for 0.71 OD Tubing (Blue)
CEFC-H	OD Compression Adapter with Flush Valve, 0.8 GPM, 2 psi Sealing



Specifying Information Accessories

Part Number	Description
FCH-H-FIPT	Flush Valve—¾" FNPT (Pipe Thread), 0.8 GPM, 2 psi Sealing Pressure
FCH-H-FHT	Flush Valve—¾" FHT (Hose Thread), 0.8 GPM, 2 psi Sealing Pressure
FJQ16	5/8" (16mm) Figure-eight End Clamp
SS6-50	3/4" (20mm) Steel Soil Staple to Hold Tubing in Place
IPS1500	5/8" (16mm) Plastic Locator Stake to Hold Tubing in Place



Soakerline™ - 1/4" classic dripline

Residential, commercial

Feature and Benefit Highlights

- Soakerline 1/4" dripline has a flexible and sturdy design making it ideal for small landscape applications
- Built-in emitters allow for ease of installation
- Available in brown to blend into landscape areas

Specifications

- 6" and 12" spacing
- Coil lengths of 100' and 3,000' coils
- Full line of 1/4" fittings are available

Length of Run Chart—U.S.

Soakerline - 1/4" classic dripline					
Part Number	Tubing Size	Flow Rate	Emitter Spacing	Inlet Pressure	Max Length of Run
SDx252-6-xxx	1/4"	.53 gph	6"	15 psi	19'
SDx252-12-xxx	1/4"	.53 gph	12"	15 psi	33'

Length of Run Chart—metric

Soakerline - 1/4" classic dripline					
Part Number	Tubing Size	Flow Rate	Emitter Spacing	Inlet Pressure	Max Length of Run
SDx252-6-xxx	4 mm	2 lph	15.2 cm	1 bar	6 M
SDx252-12-xxx	4 mm	2 lph	30.5 cm	1 bar	10 M



Soakerline is ideal to use around plants trees and shrubs. The built-in emitters make installation easy.

Specifying Information Soakerline & Micro-Distribution Hose Fittings

Part Number	Description
FIT0400	Tee (Barb x Barb)
FEE0400	Elbow (Barb x Barb)
FCC0400	Coupling (Barb x Barb)
FCV-BB	Microflow Valve (Barb x Barb)
FMP08	Hose Punch for 1/4" barbed fittings and emitter
IPS0104	1/4" (4mm) plastic locator stake to hold tubing in place



Performance Table	US	Metric
Inside Diameter	0.170"	4.32 mm
Outside Diameter	0.250"	6.35 mm
Wall	0.040"	1.02 mm
Operating pressure	15–60 psi	1.03–4.13 Bar
Minimum filtration requirement	140 Mesh	105 Micron
Nominal Flow Rate (Q)	0.53 gph	2 lph

Specifying Information

SD[X]252 - [XX] - [XXX]	Dripline Type	Emitter spacing	length
	S-Blue Stripe	6–6" (15 cm)	100–100 Ft. Coil
	B-Brown tubing	12–12" (30 cm)	3000–3,000 Ft. Reel

Example: A coil of Soaker dripline Brown 1/4" 0.53 gph (2.00 lph) classic emitters, spaced at 12" (30 cm) spacing in a 3,000 Ft. (915 m) Coil would have part number: **SDB252-12-3000**

Residential, commercial

Feature and Benefit Highlights

- Manufactured from premium grade linear low density polyethylene for dependable operation
- Minimum 2% carbon black added for ultraviolet (UV) deterioration
- Available in a wide range of diameters, wall thicknesses, coil lengths and working pressures

Additional Features

- Conforms to A.S.A.E. standards for minimum inside diameters and wall thickness
- Manufactured to stringent quality control standards and specifications
- Superior quality and durability
- Carries the Blue Stripe of Quality Trademark
- 7 year non-prorated warranty



Micro-distribution hose can be used to easily convey water to an emitter or used as exit tubing from emission devices.

Specifications

Blue Stripe® Micro-Distribution Hose

ID Controlled Hose

Part Number	Hose Size		Nominal Hose Size			Coil Length	Internal Diameter		Wall Thickness		Coil Weight		Pressure Rating
	ID Inch	ID mm	ID Inch	OD Inch	Wall Inch		Ft.	Min. Inch	Max. Inch	Min. Inch	Max. Inch	Min. Lbs.	Max. Lbs.
Blue Stripe Round Hose - Coil Stretch Wrapped													
EHW0437-100	1/4"	4	0.170	0.250	0.040	1,000	0.167	0.172	0.037	0.042	9.64	11.48	161
EHW0645-050	-	6	0.250	0.346	0.048	500	0.245	0.255	0.045	0.050	8.34	9.74	137
Blue Stripe Round Hose - Coil Banded													
EHD0437-010	1/4"	4	0.170	0.250	0.040	100	0.167	0.172	0.037	0.042	-	1.5	161
Blue Stripe Round Hose - Reel Boxed													
EVRO332-250	1/4"	4	0.126	0.196	0.035	2,500	0.126	0.129	0.032	0.037	-	-	-
EVRO332-100	1/4"	4	0.126	0.196	0.035	1,000	0.126	0.129	0.032	0.037	-	-	-

Note: Please refer to pages 10 for fittings and accessories information.



Residential, commercial

Feature and Benefit Highlights

- Uniform flow rates make NGE ideal for use in difficult topographical conditions
- The unique emitter design and pressure compensating diaphragm:
- Allows the emitter to 'self-flush' during operation and shut-down to facilitate cleaning. This ensures the emitter is free of debris at start-up and during times contaminated with debris, siphoned back into the system at shut-down
- Stops the emitter from draining below 2–3 psi (0,1–0,2 Bar) and prevents complete drainage of system and thus reduces the time to refill the system at the emitter operation
- Allows the emitter to 'close' to inhibit back siphoning and prevents the emitter from heating up, improving system uniformity
- With a Coefficient of Variation (Cv) of 3% or less, as tested by Toro and independent labs, the NGE is one of the best performing pressure-compensating emitters available
- Color-coded snap-on dust cap for easy on-site identification:
 - 0.5—Blue
 - 1.0—Black
 - 2.0—Red



This unique design allows flushing and anti-siphoning during the emitter's operation and shutdown, giving it added protection from clogging.

Additional Features

- Barbed inlet allows emitters to be installed directly onto hose or used with $\frac{1}{4}$ " (4mm) leader tubing (Part No. EHD0437)
- Available with Male Adapter (-MA) or Snap-on Dust Cap (-DC):
 - Male Adapter option with bug shield deters the entry of insects, but also can be used with $\frac{1}{4}$ " (4mm) exit tubing for precision water placement
 - The Dust Cap option deters dust and insects from entering the emitter

Specifications

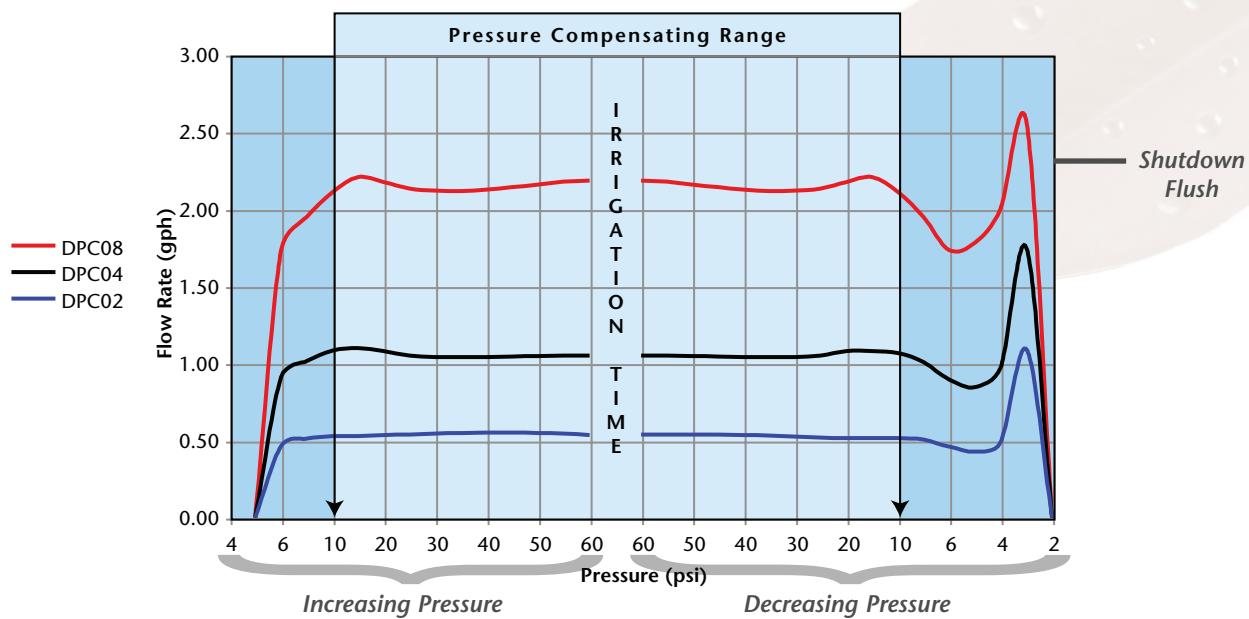
- Recommended operating pressure: 8–60 psi (0,5–4,1 Bar)
- Flow rates:
 - DPC02—0.5 GPH (2,0 LPH)
 - DPC04—1.0 GPH (4,0 LPH)
 - DPC08—2.0 GPH (8,0 LPH)

Specifying Information

Part Number	Description
DPC02-MA	NGE SF (Self-flushing) Pressure-compensating Turbulent Flow Emitter with Male Adapter 0.5 GPH (2 LPH) NGE Self-flushing Pressure-compensating Emitter w/Male Adapter (black)
DPC04-MA	1.0 GPH (4 LPH) NGE Self-flushing Pressure-compensating Emitter w/Male Adapter (black)
DPC08-MA	2.0 GPH (8 LPH) NGE Self-flushing Pressure-compensating Emitter w/Male Adapter (black)
DPC02-DC-BLUE	NGE SF (Self-flushing) Pressure-compensating Turbulent Flow Emitter with Dust Cap 0.5 GPH (2 LPH) NGE Self-flushing Pressure-compensating Emitter w/Dust Cap (blue)
DPC04-DC	1.0 GPH (4 LPH) NGE Self-flushing Pressure-compensating Emitter w/Dust Cap (black)
DPC08-DC-RED	2.0 GPH (8 LPH) NGE Self-flushing Pressure-compensating Emitter w/Dust Cap (red)

NGE is a registered trademark of The Toro Company.





Flow Rates—U.S. and Metric

Pressure		DPC02		DPC04		DPC08	
psi	Bar	GPH	LPH	GPH	LPH	GPH	LPH
6	0,41	0,46	1,76	0,91	3,44	1,73	6,56
8	0,55	0,51	1,93	1,01	3,84	1,95	7,37
10	0,69	0,53	2,00	1,08	4,10	2,11	7,98
15	1,03	0,53	2,00	1,10	4,16	2,21	8,35
20	1,38	0,53	2,02	1,08	4,08	2,17	8,23
25	1,72	0,54	2,04	1,05	3,97	2,13	8,07
30*	2,07	0,54	2,06	1,04	3,94	2,12	8,02
35	2,41	0,55	2,08	1,04	3,94	2,12	8,01
40	2,76	0,55	2,09	1,04	3,94	2,12	8,04
45	3,10	0,55	2,08	1,04	3,95	2,14	8,11
50	3,45	0,55	2,07	1,05	3,96	2,16	8,17
55	3,79	0,54	2,06	1,05	3,97	2,18	8,24
60	4,14	0,54	2,03	1,05	3,97	2,18	8,27

* Recommended operating pressure

Performance Table	DPC02	DPC04	DPC08
Nominal Flow Rate (Q)	GPH	0.53 GPH	1.06 GPH
	LPH	2,0 LPH	4,0 LPH
Recom. Pressure Range (P)	psi	8–60 psi	
	Bar	0,6–4,1 Bar	
Emitter Exponent (x)	0,000	0,000	0,002
Coefficient of Variation (Cv)	3%		
Min. Filtration Requirement	140 Mesh (105 Micron)		
Optional Outlet	-MA (Male Adapter)	-DC (Snap-on Dust Cap)	
Color (Cap)	Blue	Black	Red



Male adapter option can be used with 1/4" (4 mm) exit tubing for precision water placement.

Black Spider® - multi-outlet device for NGE® emitters

Residential, commercial

Feature and Benefit Highlights

- Used in conjunction with our NGE-MA (male adapter) emitter for precise water placement – suited for use where pot watering and hanging basket irrigation systems are used
- Add-on assembly allows additional distribution for directing water to plants



One outlet configuration – DBS1

Additional Features

- Easy to install on the NGE-MA as well as other emitters with a 1/4" (4mm) male spigot outlet.
- Available in one, two or four outlet configuration
- Length are 18" (45.7 cm); 24" (61.0 cm); 32" (81.3 cm); 36" (91.4 cm)



Two outlet configuration – DBS2



Four outlet configuration – DBS4Q

Accessories:



Specifying Accessories

Part Number	Description
FBS1E	1 outlet barbed elbow x female adaptor
FBS1S	1 outlet barbed straight x female adaptor
FBS2	2 outlet barbed tee x female adaptor
FBS2-MA	2 outlet barbed manifold x female/male adaptor
IPS0301	Turbulent flow straight stake
IPS0301BQ	Barbed elbowed stake
IPS0301Q	Turbulent flow elbowed stake
SFH0332-24	1/8" PEVA Leader Tube -24" (61cm)
SFH0332-36	1/8" PEVA Leader Tube -36" (91.4cm)

Specifying Information

Part Number	Description
DBS1-XX	Black Spider-1-Single outlet elbow configuration with barbed elbow stake
DBS1S-XX	Black Spider-1S-Single outlet straight configuration with barbed elbow stake
DBS2Q-XX	Black Spider-2Q-Two outlet configuration with turbulent elbow stakes
DBS2S-XX	Black Spider-2S-Two outlet configuration with turbulent straight stakes
DBS4Q-XX	Black Spider-4Q-Four outlet configuration with turbulent elbow stakes
DBS4S-XX	Black Spider-4S-Four outlet configuration with turbulent straight stakes

Example: XX denotes the length of the micro-tube in inches. Substitute XX with the following available micro-tube lengths: 18", 24", 32" and 36". A single outlet configuration with a 18" micro-tube would have Part no: **DBS1-18**

Note: The emitter must be inserted into the female adapter at least half the length of the emitters male adapter to insure a positive fit.
Black Spider is a registered trademark of The Toro Company.

Residential, commercial

Feature and Benefit Highlights

- Take-apart feature permits fast, easy on-site inspection and cleaning
- Color-coded base for easy on-site identification:
Blue—0.5 GPH (2,0 LPH)
Black—1.0 GPH (4,0 LPH)
Red—2.0 GPH (8,0 LPH)
- Large self-flushing, turbulent flow path for higher resistance to plugging where water conditions may be a problem



Additional Features

- Proven PC (pressure-compensating) emitter design
- Available in three flow rates
- Barbed inlet allows emitters to be installed directly onto hose or used with $\frac{1}{4}$ " (4mm) leader tubing (Part No. EHD0437)
- Male Adapter with bug shield deters the entry of insects, but also can be used with $\frac{1}{4}$ " (4mm) exit tubing for precision water placement
- High quality diaphragm for improved pressure compensation and uniformity over a wide range of pressure
- Outlet baffle to deter entry of insects

Specifications

- Flow rates:
 - Turbo-SC® Plus
 - DPJ02-A—0.5 GPH (2,0 LPH)
 - DPJ04-A—1.0 GPH (4,0 LPH)
 - Turbo-SC*
 - DPJ08-A—2.0 GPH (8,0 LPH)

* Same features as Turbo-SC Plus except for turbulent flow path

Flow Rate—U.S.

psi	DPJ02-A	DPJ04-A	DPJ08-A
5	0.42	0.73	1.41
10	0.44	0.97	1.80
15	0.47	0.96	2.00
20	0.49	0.97	2.12
25	0.50	1.00	2.15
* 30	0.51	1.01	2.15
35	0.51	1.01	2.11
40	0.50	1.00	2.04
45	0.49	0.98	1.95
50	0.47	0.95	1.84
55	0.45	0.91	

* Recommended operating pressure

Values listed in gallons per hour.

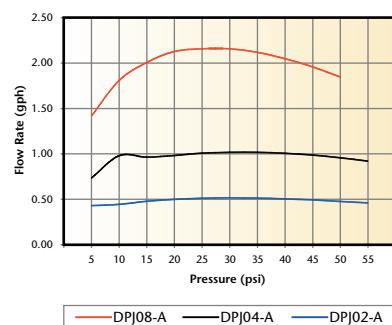
Flow Rate—Metric

Bar	DPJ02-A	DPJ04-A	DPJ08-A
0,5	1,60	2,94	6,01
1,0	1,74	3,49	7,42
1,5	1,95	3,69	8,40
* 2,0	1,90	3,77	8,02
2,5	1,94	3,32	8,11
3,0	1,82	3,69	7,29
3,5	1,78	3,61	6,97
4,0	1,74	3,49	

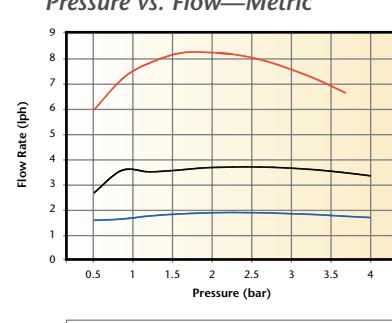
* Recommended operating pressure

Values listed in liters per hour.

Pressure vs. Flow—U.S.



Pressure vs. Flow—Metric



Performance Table

	DPJ02-A	DPJ04-A	DPJ08-A
Nominal Flow Rate (Q)	0.53 GPH 2,0 LPH	1.06 GPH 4,0 LPH	2.11 GPH 8,0 LPH
Recom. Pressure Range (P)	psi 0,7–3,5 Bar	10–50 psi	0,7–3,5 Bar
Emitter Exponent (x)	0.02	-0.04	0.01
Min. Filtration Requirement	140 Mesh (105 Micron)		
Color (Base)	Blue	Black	Red

Specifying Information

Part Number	Description
DPJ02-A-BLUE	0.5 GPH (2 LPH) Pressure-compensating Emitter w/Male Adapter (Blue)
DPJ04-A	1.0 GPH (4 LPH) Pressure-compensating Emitter w/Male Adapter (Black)
DPJ08-A-RED	2.0 GPH (8 LPH) Pressure-compensating Emitter w/Male Adapter (Red)

Turbo-SC Plus is a registered trademark of The Toro Company.

Residential, commercial

Feature and Benefit Highlights

- Take-apart feature permits fast, easy on-site inspection and cleaning
- Barbed inlet allows emitters to be installed directly onto hose or used with $\frac{1}{4}$ " (4mm) leader tubing (Part No. EHD0437)
- Large, turbulent flow path for higher resistance to plugging where water conditions may be a problem
- New self-piercing barb inlet

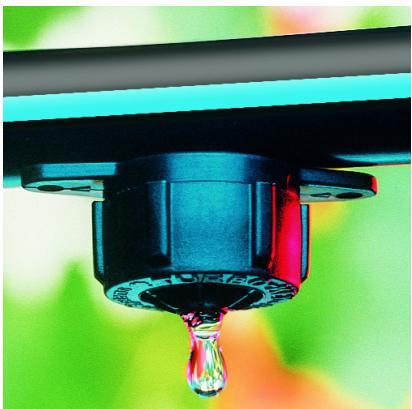


Additional Features

- Proven Classic® (non-pressure-compensating) emitter design

Specifications

- Flow rates:
 - Turbo-Key II
 - DNK-02-3—0.5 GPH (2,0 LPH)
 - DNK-04-3—1.0 GPH (4,0 LPH)
 - DNK-08-3—2.0 GPH (8,0 LPH)



Flow Rate—U.S.

psi	DNK02-3	DNK04-3	DNK08-3
5	0.31	0.63	1.23
10	0.43	0.88	1.75
* 15	0.53	1.08	2.14
20	0.61	1.25	2.47
25	0.68	1.40	2.76
30	0.75	1.53	3.02
35	0.81	1.65	3.25
40	0.86	1.77	3.48
45	0.92	1.88	
50	0.96	1.98	

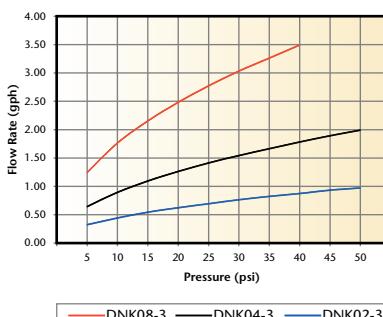
* Recommended operating pressure
Values listed in gallons per hour.

Flow Rate—Metric

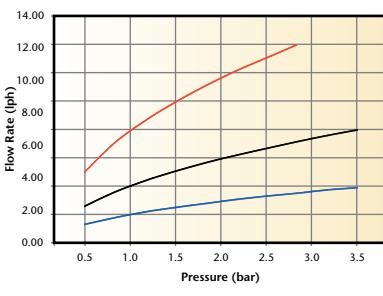
Bar	DNK02-3	DNK04-3	DNK08-3
0,5	1,40	2,84	5,64
* 1,0	1,97	4,02	7,97
1,5	2,41	4,92	9,75
2,0	2,78	5,68	11,26
2,5	3,11	6,35	12,58
3,0	3,40	6,96	
3,5	3,67	7,51	

* Recommended operating pressure
Values listed in liters per hour.

Pressure vs. Flow—U.S.



Pressure vs. Flow—Metric



Performance Table		DNK02-3	DNK04-3	DNK08-3
Nominal Flow Rate (Q)	GPH @ 15 psi	0.53 GPH	1.06 GPH	2.11 GPH
	LPH @ 1 Bar	2,0 LPH	4,0 LPH	8,0 LPH
Recom. Pressure Range (P)	psi	0–50 psi		
	Bar	0–3,5 Bar		
Emitter Exponent (x)		0.49	0.50	0.50
Min. Filtration Requirement		140 Mesh (105 Micron)		
Color (Internal Pill)		White	Blue/Black	Green

Specifying Information

Part Number	Description
DNK02-3	0.5 GPH (2 LPH) Turbulent Flow Emitter (Black Base/White Pill)
DNK04-3	1.0 GPH (4 LPH) Turbulent Flow Emitter (Black Base/Blue Pill)
DNK08-3	2.0 GPH (8 LPH) Turbulent Flow Emitter (Black Base/Green Pill)

Turbo-Key is a registered trademark of The Toro Company.

Residential, commercial

Feature and Benefit Highlights

- Fast single-barb installation directly onto the hose
- Large open flow path for resistance to plugging
- Take-apart feature, allows fast simple field inspection



Additional Features

- Proven Classic® (non-pressure-compensating) hydraulic design
- Economic emitter for trouble-free applications
- Barbed inlet allows emitters to be installed directly onto hose or used with $\frac{1}{4}$ " (4mm) leader tubing (Part No. EHD0437)
- Exit barb may be used with $\frac{1}{4}$ " (4mm) exit tubing for precision water placement



Specifications

- Three flow rates:
 - DBK04—1.0 GPH (4,0 LPH)
 - DBK08—2.0 GPH (8,0 LPH)
 - DBK16—4.0 GPH (16,0 LPH)

Flow Rate—U.S.

psi	DBK04	DBK08	DBK16
5	0.58	1.03	2.09
10	0.88	1.53	3.08
* 15	1.12	1.93	3.87
20	1.33	2.27	4.55
25	1.52	2.58	5.15
30	1.70	2.87	5.71
35	1.87	3.13	6.23
40	2.03	3.38	6.71
45	2.17	3.62	7.17
50	2.32	3.84	7.61

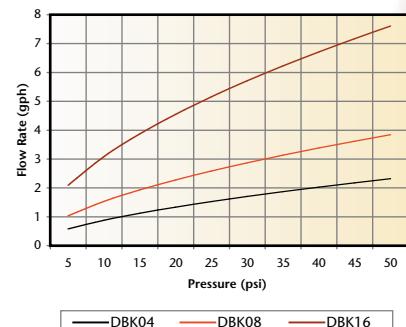
* Recommended operating pressure
Values listed in gallons per hour.

Flow Rate—Metric

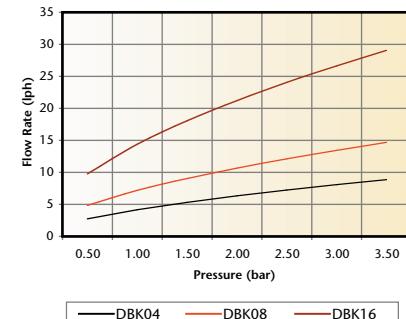
Bar	DBK04	DBK08	DBK16
0,50	2,73	4,82	9,74
* 1,00	4,15	7,17	14,38
1,50	5,31	9,04	18,05
2,00	6,31	10,65	21,21
2,50	7,22	12,10	24,04
3,00	8,07	13,43	26,63
3,50	8,85	14,66	29,04

* Recommended operating pressure
Values listed in liters per hour.

Pressure vs. Flow—U.S.



Pressure vs. Flow—Metric



Performance Table		DBK04	DBK08	DBK16
Nominal Flow Rate (Q)	GPH @ 15 psi	1.06 GPH	2.11 GPH	4.23 GPH
	LPH @ 1 Bar	4 LPH	8 LPH	16 LPH
Flow Coefficient (K)	U.S. Units	0.22	0.41	0.85
	Metric Units	4,15	7,17	14,38
Operating Pressure Range (P)	psi	0–50 psi		
	Bar	0–3,5 Bar		
Flow Exponent (x)		0.60	0.57	0.56
Coefficient of Variation (Cv)		≤ 5%	≤ 6%	≤ 6.5%
Min. Filtration Requirement		140 Mesh (105 Micron)		

Specifying Information

Part Number	Description
DBK04	1.0 GPH (4.0 LPH)
DBK08	2.0 GPH (8.0 LPH)
DBK16	4.0 GPH (16.0 LPH)

E-2 is a registered trademark of The Toro Company.

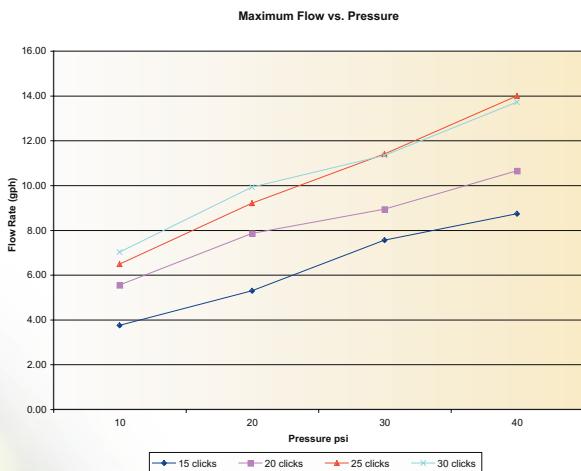
Residential, commercial**Feature and Benefit Highlights**

- Varis Emitter has 8 outlets for uniform 360° water application
- The adjustable flow rate (0 to 14.0 GPH) makes this emitter ideal for potted and container plants
- Flow is regulated with a ratchet mechanism and is easy to inspect for trouble-free maintenance
- The emitter is available on a stake assembly (Varistake) or alone for attachment to 1/4" micro-tube for placement at the plant

**Specifications**

- Maximum working pressure 45 psi (3 bar)
- 20" (50 cm) diameter at 15 psi (1 bar)
- Varis adjustable emitter with 1/4" (4 mm) barbed inlet (Part No. DAK05)
- Varistake adjustable emitter with 4-3/4" (12 cm) stake & 1/4" (4 mm) barbed inlet suitable for 1/4" (4 mm) leader tubing (Part No. EHD0437)
- Adjustable flow rate from 0 to 14.0 gph (0 to 40 lph)

- Diameter of throw (maximum opening @ 30 clicks)
 - At height of 1 inch above grade
 - At 20 psi - Diameter: 6 inches
 - At 30 psi - Diameter: 13.5 inches
 - At 40 psi - Diameter: 21 inches
 - At height of 2.5 inches above grade
 - At 20 psi - Diameter: 8 inches
 - At 30 psi - Diameter: 15.5 inches
 - At 40 psi - Diameter: 27 inches



The Varis Emitter has 8 outlets with an adjustable flow rate of 0 – 14.0 gph.

**Specifying Information**

Part Number	Description
DAK05	Varis adjustable emitter with 1/4" (4 mm) barbed inlet
DAK15	Varistake adjustable emitter with 4-3/4" (12 cm) stake & 1/4" (4 mm) barbed inlet

Fogger

Residential, commercial

Feature and Benefit Highlights

- Sprays a fine mist at a low volume and low pressure; ideal to increase humidity in hot, dry climates
- Proven hydraulic vortex design
- The rugged nylon construction has no moving parts and disassembles for ease of servicing
- Offered in two versions:
 - a barbed fogger attached directly onto LLDPE hose or 1/4" micro-distribution hose
 - a threaded fogger attaches directly to 1/8" threaded connection



SFJ4xx

SFL4xx

Additional Features

- Rugged nylon construction with no moving parts
- Barbed fogger (SFJ4xx) attaches directly onto LLDPE Hose or 1/4" (4mm) micro-distribution hose (Part no. EHD0437) and can be used with locator stake (Part no. IPS0104)
- 1/8" NPT threaded fogger (SFL4xx) attaches directly to 1/8" threaded connection or threaded fogger stake (Part no. IPS0409)

Specifications

- Available in three nominal flow rates:

SFL/SFJ 408	2 gph	(8 lph)
SFL/SFJ 412	3 gph	(12 lph)
SFL/SFJ 416	4 gph	(16 lph)
- Recommended operating pressure: 20 psi. (2,25 Bar)
- Diameter of throw is approximately: 2 to 5 Ft. (0,6 to 1,5 meters)

Replacement Nozzles:

Part No.	For Model
DEP3263-08	SFJ408 & SFL408
DEP3263-12	SFJ412 & SFL412
DEP3263-16	SFJ416 & SFL416

The Fogger sprays a fine mist at low volumes. It is available in 3 nominal flow rates in a barbed or threaded configuration.

Performance Table		SFL/SFJ 408	SFL/SFJ 412	SFL/SFJ 416
Nominal Flow Rate (Q)				
	gph @ 20 psi	2 gph	3 gph	4 gph
	lph @ 1.5 bar	8 lph	12 lph	16 lph
Operating Pressure Range (P)				
	psi	10 to 35 psi		
	bar	0.75 to 2.25 bar		
Flow Exponent (x)		0.43	0.38	0.42
Minimum filtration requirement				
200 Mesh (74 Micron)				



Fogger shown used with a barbed stake. (Part No. SFL4xx1)

Specifying Information

Part Number	Description
SFJ4xx	Barbed Fogger
SFL4xx	Threaded Fogger
SFL4xx1	Threaded Fogger with Stake
IPS0409	Barbed Fogger with Stake
	Replace xx with flow rate, 08 (2.0 gph / 8 lph), 12 (3.0 gph / 12 lph) or 16 (4 gph / 16 lph).

Example: A 3.0 gph (12 lph) Threaded Fogger with Stake would have the following part number: **SFL4121**

Residential, commercial

Feature and Benefit Highlights

- Unique pressure-compensating device ensures uniform flows and diameter of throw over a wide range of pressures and run lengths
- The spinner retracts to protect the nozzle when not in operation. This allows for resistance to insects and dust as well as ease of inspection and maintenance
- Nozzles are color coded for ease of flow rate identification
- Large wetting patterns with uniform water application

Additional Features

- Splash plate patterns interchange to accommodate the various growth stages and sizes of crops

Specifications

- Recommended operating pressure:
20 psi (1,38 Bar)
- Flow rates:
 - SSJ30X—6.0 GPH (22,7 LPH)
 - SSJ35X—8.4 GPH (31,8 LPH)
 - SSJ40X—10.7 GPH (40,5 LPH)
 - SSJ45X—14.1 GPH (53,4 LPH)
 - SSJ50X—16.7 GPH (63,2 LPH)
 - SSJ55X—20.6 GPH (77,6 LPH)
 - SSJ60X—24,0 GPH (90,9 LPH)



The Snap-Jet is a versatile, low maintenance jet for the use in landscapes. With a choice of 8 snap-fit spray patterns and 7 flow rates, it easily accommodates various plant growth stages and soil types.

Performance Table		SSJ30x Black	SSJ35x Orange	SSJ40x Blue	SSJ45x Purple	SSJ50x Green	SSJ55x Yellow	SSJ60x Red
Nominal Flow Rate (Q)	GPH	6.0	8.4	10.7	14.1	16.7	20.6	24.0
	LPH	22,71	31,80	40,50	53,37	63,22	77,60	90,85
Recom. Pressure Range (P)		0.5–30 psi						
		0.3–2 Bar						
Flow Exponent (x)		00.5						
Coefficient of Variation (Cv)		≤5%						
Recom. Filtration Requirement	Mesh	140	120	120	100	100	80	70
	Micron	105	125	125	150	150	177	210



Specifying Information

SJA	40	A	03	-36	X
Snap-Jet Assembly	Orifice Size	Splash Plate Pattern	Stake Part Number	Lead Length	Optional
SJA— Prefix to Represent Snap-Jet Assembly	40—.040" Dia. (Orifice Size of Jet Body)	A—Splash Plate Pattern Letter	03—IPSO403 (Last Two Digits of Stake Part Number)	-24" (61cm) -30" (76cm) -36" (91cm)	D—Barb Stake Assembly C—Clip Stake Hose
Example: A Snap-Jet II assembly with a clip stake hose on a 36" lead would be specified as: SJA40A03-36C					

Snap-Jet is a registered trademark of The Toro Company.

Spray Patterns:				A	B	C	D	E	F	H	J	K				
Jet Trajectory:		24°														
- High		18°														
- Low		13°														
- Flat		0°														
Nozzle		Pressure	Flow Rate	Small Full Circle 360° x 16 streams	Large Full Circle 360° x 16 streams	Hi-Lo Full Circle 360° x 16 streams	Hi-Lo Part Circle 330° x 11 streams	Half Circle 180° x 9 streams	Deflector 360° solid	Hi-Lo Butterfly 2 x 120° 10 streams	Solid Butterfly 2 x 120° solid	Solid Part Circle 1 x 90° solid				
Model	Size / Color	psi	gph	Std Ft.	Std Ft.	Flat Ft.	Std Ft.	Lo Ft.	Hi Ft.	Std Ft.	Down Inch	Lo Ft.	Hi Ft.	Flat W x L Ft.	Std Ft.	
SSJ30x	30 Black	10	4.2	7.8	8.8	5.7	7.8	7.8	9.9	3.5	16.0	11.3	12.0	6.7	9.1	6.4
		15	5.2	9.5	10.8	6.9	9.5	9.5	12.1	4.3	16.0	13.7	14.3	6.5	8.9	7.8
		20	6.0	11.0	12.5	8.0	11.0	11.0	14.0	5.0	16.0	13.0	14.0	5.2	9.2	9.0
		25	6.7	12.3	14.0	8.9	12.3	12.3	15.7	5.6	16.0	11.5	14.0	4.7	9.6	10.1
		30	7.3	13.5	15.3	9.8	13.5	13.5	17.1	6.1	16.0	10.8	14.8	4.7	10.2	11.0
SSJ35x	35 Orange	10	5.9	8.1	9.9	6.4	8.5	9.5	12.7	4.2	16.0	11.3	13.0	6.5	8.9	6.8
		15	7.3	10.0	12.1	7.8	10.4	11.7	15.6	5.2	16.0	13.0	13.3	5.2	10.3	8.4
		20	8.4	11.5	14.0	9.0	12.0	13.5	18.0	6.0	16.0	14.0	14.7	5.0	10.8	9.6
		25	9.4	12.9	15.7	10.1	13.4	15.1	20.1	6.7	16.0	13.3	16.0	4.7	11.1	10.8
		30	10.3	14.1	17.1	11.0	14.7	16.5	22.0	7.3	16.0	11.3	17.0	4.7	12.5	11.8
SSJ40x	40 Blue	10	7.6	8.5	11.0	7.1	9.2	13.3	15.2	4.9	16.0	14.8	15.3	7.0	9.4	7.3
		15	9.3	10.4	13.4	8.7	11.3	13.9	18.6	6.1	16.0	18.7	18.7	4.7	10.5	8.9
		20	10.7	12.0	15.5	10.0	13.0	16.0	21.5	7.0	16.0	19.7	21.0	4.5	11.6	10.3
		25	12.0	13.4	17.3	11.2	14.5	17.9	24.0	7.8	16.0	22.0	22.3	4.7	11.7	11.5
		30	13.1	14.7	19.0	12.2	15.9	19.6	26.3	8.6	16.0	22.0	22.7	4.8	12.1	12.6
SSJ45x	45 Purple	10	10.0	8.8	12.0	7.4	9.9	13.1	16.6	5.3	16.0	12.7	14.0	6.0	9.1	7.7
		15	12.2	10.8	14.7	9.1	12.1	16.0	20.4	6.5	16.0	16.0	16.7	4.0	11.1	9.4
		20	14.1	12.5	17.0	10.5	14.0	18.5	23.5	7.5	16.0	18.0	19.0	4.0	11.9	10.9
		25	15.8	14.0	19.0	11.7	15.7	20.7	26.3	8.4	16.0	20.0	21.0	4.2	11.9	12.2
		30	17.3	15.3	20.8	12.9	17.1	22.7	28.8	9.2	16.0	22.3	23.0	4.3	11.6	13.4
SSJ50x	50 Green	10	11.8	9.2	13.1	7.8	10.6	13.8	17.7	5.7	16.0	17.0	18.0	5.0	9.7	8.2
		15	14.5	11.3	16.0	9.5	13.0	16.9	21.7	6.9	16.0	21.0	22.7	4.7	11.0	10.1
		20	16.7	13.0	18.5	11.0	15.0	19.5	25.0	8.0	16.0	23.3	24.7	4.8	11.3	11.6
		25	18.7	14.5	20.7	12.3	16.8	21.8	28.0	8.9	16.0	25.3	27.7	5.0	12.2	12.9
		30	20.5	15.9	22.7	13.5	18.4	23.9	30.6	9.8	16.0	27.0	29.0	5.0	12.4	14.2
SSJ55x	55 Yellow	10	14.5	9.5	14.1	8.1	11.0	14.5	18.4	6.0	16.0	19.7	21.0	5.0	9.2	8.6
		15	17.8	11.7	17.3	10.0	13.4	17.8	22.5	7.4	16.0	22.7	25.0	5.7	10.0	10.6
		20	20.5	13.5	20.0	11.5	15.5	20.5	26.0	8.5	16.0	25.3	27.7	6.2	10.8	12.3
		25	22.9	15.1	22.4	12.9	17.3	22.9	29.1	9.5	16.0	29.3	31.3	6.5	11.1	13.7
		30	25.1	16.5	24.5	14.1	19.0	25.1	31.8	10.4	16.0	32.0	32.7	6.5	11.4	15.0
SSJ60x	60 Red	10	17.0	9.9	15.2	8.1	11.3	15.2	18.7	6.4	16.0	19.0	21.3	4.7	10.0	9.2
		15	20.8	12.1	18.6	10.0	13.9	18.6	23.0	7.8	16.0	22.7	28.0	4.8	10.8	11.2
		20	24.0	14.0	21.5	11.5	16.0	21.5	26.5	9.0	16.0	26.7	30.3	5.3	11.3	13.0
		25	26.8	15.7	24.0	12.9	17.9	24.0	29.6	10.1	16.0	31.3	33.3	5.3	11.6	14.6
		30	29.4	17.1	26.3	14.1	19.6	26.3	32.5	11.0	16.0	32.7	34.0	5.8	12.2	15.9

= Recommended operating pressure.



Specifying Information Stakes

Part Number	Description
IPS0400	Clip Stake - Black
IPS0403	Barbed Stake 4mm x 10-32 UNF (self-tapping threads) for Snap-Jets - Black
IPS0403xx	Barbed Stake Assy. 4mm x 10-32 UNF (self tapping threads) with Leader Tube & 4mm Take-off 24", 30" or 36" length.

Micro-Sprinkler VI PC

Feature and Benefit Highlights

- Unique pressure-compensating device ensures uniform flows and diameter of throw over a wide range of pressures and run lengths
- The spinner retracts to protect the nozzle when not in operation. This allows for resistance to insects and dust as well as ease of inspection and maintenance
- Nozzles are color coded for ease of flow rate identification
- Optional Break off deflector tab allows the sprinkler to be placed near a new planted tree to concentrate water where the roots are developing



Additional Features

- Fully pressure compensating.
- Components designed for easy take apart for maintenance.
- Optional break off deflector tab allows the sprinkler to be placed near a new-planted tree to concentrate water where the roots are developing

Specifications

- Recommended operation pressure range: 25 – 60 psi.
- Available in five flow rates:

SSA630	9.3 gph	35 lph
SSA632	12.4 gph	47 lph
SSA634	14.6 gph	55 lph
SSA636	18.4 gph	70 lph
SSA638	23.6 gph	90 lph

- Length are 18" (45.7 cm); 24" (61.0 cm); 30" (76.2 cm); 36" (91.4 cm); 48" (121.9 cm)
- 3/8" MPT inlet

The Micro-Sprinkler VI PC is fully pressure-compensating and available in five flow rates. Nozzles are color-coded for easy flow rate identification.

Performance Chart

Model No.	Model No. with Deflector Tab	Nozzle Color	Pressure		Flow Rates		Diameter		Approx. Diameter with Deflector Tab	
			psi	bar	gph	lph	Feet	Meters	Feet	Meters
SSA630	SSA630-D	Brown	20	1.38	9.3	35.2	13.9	4.23	4.2	1.27
			30	2.07	9.3	35.1	13.4	4.08	4.0	1.22
			40	2.76	9.2	34.9	13.2	4.02	4.0	1.21
			50	3.45	9.2	34.8	13.1	4.00	3.9	1.20
			60	4.14	9.2	34.8	13.1	4.00	3.9	1.20
SSA632	SSA632-D	Light Blue	20	1.38	12.4	46.9	15.5	4.73	4.7	1.42
			30	2.07	12.4	46.9	15.0	4.58	4.5	1.37
			40	2.76	12.4	47.1	14.8	4.52	4.4	1.35
			50	3.45	12.5	47.5	14.8	4.50	4.4	1.35
			60	4.14	12.5	47.2	14.8	4.50	4.4	1.35
SSA634	SSA634-D	Light Green	20	1.38	14.6	55.2	15.5	4.73	4.7	1.42
			30	2.07	14.6	55.2	15.0	4.58	4.5	1.37
			40	2.76	14.6	55.2	14.8	4.52	4.4	1.35
			50	3.45	14.5	54.8	14.8	4.50	4.4	1.35
			60	4.14	14.6	55.2	14.8	4.50	4.4	1.35
SSA636	SSA636-D	Orange	20	1.38	18.0	68.2	20.8	6.32	6.2	1.90
			30	2.07	18.4	69.6	20.0	6.11	6.0	1.83
			40	2.76	18.2	69.0	19.8	6.02	5.9	1.81
			50	3.45	18.2	69.0	19.7	6.00	5.9	1.80
			60	4.14	18.4	69.8	19.7	6.00	5.9	1.80
SSA638	-	Gray	20	1.38	21.6	81.8	29.7	9.07	8.9	2.72
			30	2.07	23.6	89.2	28.7	8.76	8.6	2.63
			40	2.76	23.3	88.0	28.3	8.63	8.5	2.59
			50	3.45	23.0	87.1	28.2	8.60	8.5	2.58
			60	4.14	23.9	90.5	28.2	8.60	8.5	2.58

Diameters are quoted according to ASAE S398.1. Actual diameter may exceed diameter quoted

note: Filtration requirement is 140 mesh (105 micron).

Micro-Sprinkler VI PC Assemblies

Feature and Benefit Highlights

- Designed for quick and easy installation
- Length are 18" (45.7cm); 24" (61.0cm); 30" (76.2cm); 36" (91.4cm); 48" (121.9cm)
- Assemblies for SSA630 thru SSA638 will include Micro-Sprinkler; IPS1004 Stake; 4mm Leader Tube 24", 30", 36" or 48" Length and 4mm Coupling.

Specifying Information Micro-Sprinkler VI PC Assemblies

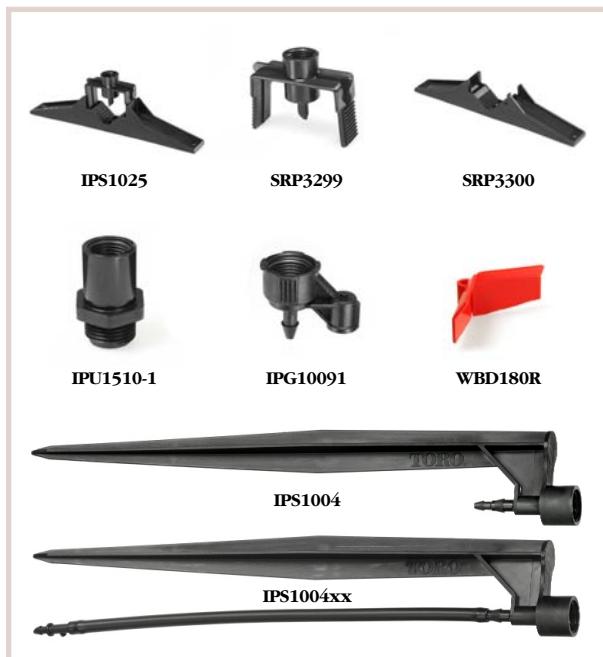
Micro-Sprinkler VI PC	Nozzle Type	Lead Length
SSA - Prefix to represent Micro-Sprinkler VI PC	630—9.20 gph Brown Nozzle 632—12.4 gph Blue Nozzle 634—14.6 gph Green Nozzle 636—18.2 gph Orange Nozzle 638—23.8 gph Grey Nozzle	24—24" (61cm) 30—30" (76cm) 36—36" (91cm) 48—48" (122cm)

Example: A Micro-Sprinkler VI PC assembly with a brown nozzle and 24" lead would be part number: **SSA63024**



The Micro-Sprinkler VI PC stake assemblies come with the color-coded nozzle and leader tube length requested.

Micro-Sprinkler VI PC Accessories



Specifying Accessories

Part Number	Description
IPS1004	3/8" FPT x 4mm or 6mm Barbed Stake - Black for Micro-Sprinklers
IPS1025	3/8" FPT Clamp & Sta-Base - Black for Micro-Sprinklers (Unassembled)
SRP3299	Replacement 3/8" FPT Clamp for Sta-Base
SRP3300	Replacement Base for Sta-Base
IPS1004xx	Micro-Sprinkler 4mm Barbed Assembly with Leader Tube & 4mm Take-off 24", 30" or 36" length
IPU1510-1	3/8" FPT x 1/2" MPT Reducing Adapter
IPG10091	3/8" FPT x 4mm Barb Adaptor with 5mm Stake Insert for Micro-Sprinkler
WBD180R	Micro-Sprinkler® 180 Deg. Red Deflector

Pot Spray Stake

NEW

Residential, commercial

Feature and Benefit Highlights

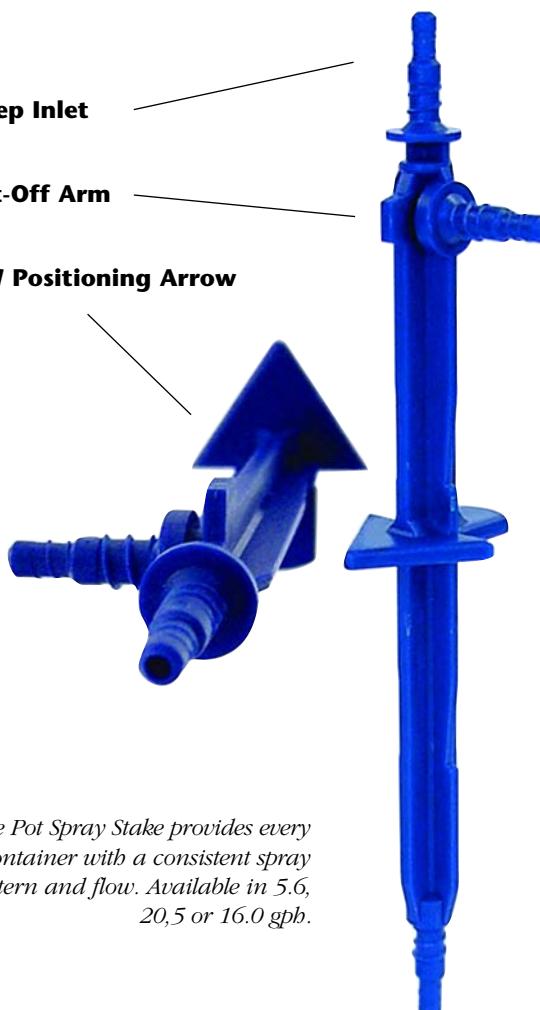
- Unique positioning arrow ensures that water sprays toward the plant
- Stake sets the proper height in the pot
- Spray pattern works well from low to high water pressures
- 160° low angle spray pattern designed for round pots to reduce overspray
- Side arm shut-off with ring gives a water-tight seals preventing debris from getting into the tube

Additional Features

- Steep angle threads easily lock tubing onto the stake
- 2 step threaded inlet easily accommodates most popular polyethylene and vinyl tubing sizes
- Designed with wide ribs and steps so the stake stays where you place it
- Traditional shut off stake end
- Made with UV resistant resin
- Length are 24" (61.0cm); 36" (91.4cm)

Specifications

- Available in 3 flow rates:
IPS03BK 5.6 gph (21.2 lph)
IPS03BL 10.5 gph (39.7 lph)
IPS03GR 16.0 gph (60.6 lph)



The Pot Spray Stake provides every container with a consistent spray pattern and flow. Available in 5.6, 10.5 or 16.0 gph.



Specifying Information

Part Number	Description
IPS03BK	5.6 gph (21.2 lph) @ 20 psi (1.4 bar) 0.03" Orifice - Black
IPS03BL	10.5 gph (39.7 lph) @ 20 psi (1.4 bar) 0.04" Orifice - Blue
IPS03GR	16.0 gph (60.6 lph) @ 20 psi (1.4 bar) 0.05" Orifice - Green
SFH0332-24	1/8" PEVA leader tubing - 24" (61.0cm)
SFH0332-36	1/8" PEVA leader tubing - 36" (91.4cm)

Residential, commercial

Pressure-compensating Modules

- Provides low-flow rates to reduce runoff in compacted soils and deep percolation in sandy soils
- Color coded by flow rate for easy identification
- Ideal for customizing water-use for varying plant material
- A fit for long runs or elevation changes
- Quantity per package: 5

Specifying Information

Part Number	Description
PCM-6	6.5 gph (25 lph), gray
PCM-9	9.5 gph (36 lph), orange
PCM-11	11 gph (42 lph), blue
PCM-17	17 gph (64 lph), green
PCM-21	21 gph (80 lph), yellow
PCM-25	25 gph (95 lph), red



Specifying Information Pressure Regulators

Part Number	Description
PMR15-LF	3/4", 15 psi, 1/10-8 gpm Low Flow Pressure Regulator
PMR25-LF	3/4", 25 psi, 1/10-8 gpm Low Flow Pressure Regulator
PMR40-MF	3/4", 40 psi, 2-20 gpm Medium Flow Pressure Regulator
PMR25-HF	1-1/4" x 1", 25 psi, 10 – 32 gpm, High Flow Pressure Regulator
PMR25-MF	3/4", 25 psi, 2 – 20 gpm, Medium Flow Pressure Regulator



Specifying Information Drip Stake and Accessories

Part Number	Description
IPS0104	1/4" (4mm) plastic locator stake to hold tubing in place
FPG02	Double-sided goof plug
BC-025	Bug cap for 1/4" (4mm) tubing
FMP08	Plastic insertion tool for 1/4" (4mm) barbed fittings and emitters
FMP16	Stainless steel insertion tool for 1/4" (4mm) barbed fittings and emitters



Specifying Information Leader Tube with Take-Off

Part Number	Description
HWF4XX	4mm leader tube/ 4mm barb for 4mm clip stake
HWF3XX	4mm leader tube/ 4mm barb for 4mm barb stake
HWF6XX	6mm leader tube/ 6mm barb for 6mm barb stake

Note: Leader tubing available in 24" (61.0cm), 30" (76.2cm), or 36" (91.4cm) length

Example: 4mm leader tube/ 4mm barb for 4 mm clip stake with a 24" lead length, part number: **HWF424**



Drip Zone Valve Kits

NEW

Residential, commercial

Feature and Benefit Highlights

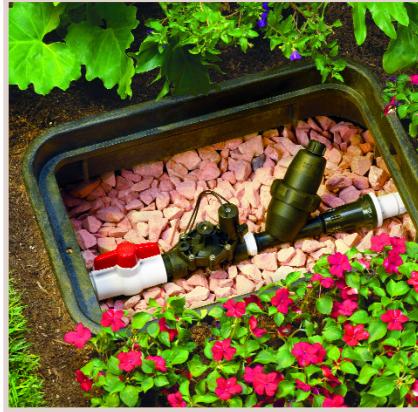
- No need to purchase separate parts—all you need is in the kit
- Kit comes complete with:
 - Toro Y-Filter—protects against contamination
 - Control Valve—controls the flow of water
 - Pressure Regulator—reduces system pressure to levels suitable for drip irrigation
 - Ball Valve—allows for maintenance without the need to turn off the water source

Additional Features

- Minimizes installation time
- Available for these Toro and Irritrol Systems brand valves:
 - **EZ-Flo® Plus**—1" In-line
 - **EZ-Flo® Plus**— $\frac{3}{4}$ " AVB
 - **700 (UltraFlow)**—1" In-line
 - **2711**— $\frac{3}{4}$ " AVB
- Drip Zone kits fit into a standard valve box



Specially designed for low-volume residential and commercial drip applications, these kits are a simple, one-stop package available in $\frac{3}{4}$ " and 1" sizes.



Specifying Information

Drip Zone Kit	Valve Type	Flow Rate
DZK—Drip Zone Kit	EZF-075— $\frac{3}{4}$ " EZ-Flo Plus AVB EZF-1—1" EZ-Flo In-line 2711— $\frac{3}{4}$ " AVB 700 (UltraFlow)—1" In-line	LF—Low Flow MF—Medium Flow

Example: A Drip Zone kit with an EZ-Flo Plus $\frac{3}{4}$ ", low-flow AVB valve, would be specified as: **DZK-EZF-075-LF**

EZ-Flo Plus is a registered trademark of The Toro Company.

Drip Zone Valve Kits

Specifications

	Toro EZ-Flo Plus AVB*		Irritrol Systems 2711 DPR AVB*		Toro EZ-Flo Plus In-line		Irritrol Systems 700 UltraFlow In-line	
Part Number	DZK-EZF-075-LF	DZK-EZF-075-MF	DZK-2711-075-LF	DZK-2711-075-MF	DZK-EZF-1-LF	DZK-EZF-1-MF	DZK-700-1-LF	DZK-700-1-MF
Description	Drip Zone Valve Kit, ¾" EZ-Flo Plus, AVB, Low-flow	Drip Zone Valve Kit, ¾" EZ-Flo Plus, AVB, Medium-flow	Drip Zone Valve Kit, ¾" Irritrol 2711 AVB, Low-flow	Drip Zone Valve Kit, ¾" Irritrol 2711 AVB, Medium-flow	Drip Zone Valve Kit, 1" EZ-Flo Plus, In-line, Low-flow	Drip Zone Valve Kit, 1" 700 UltraFlow, In-line, Medium-flow	Drip Zone Valve Kit, 1" 700 UltraFlow, In-line, Low-flow	Drip Zone Valve Kit, 1" 700 UltraFlow, In-line, Medium-flow
Connection Size	¾"	¾"	¾"	¾"	1"	1"	1"	1"
Control Valve Solenoid	24 V a.c., Inrush: 0.4 amps, 11.5 VA, Holding 0.20 amps, 5.75 VA							
Minimum Flow Rate	0.25 GPM	2 GPM	.25 GPM	2 GPM	0.25 GPM	2 GPM	0.1 GPM	2 GPM
Maximum Flow Rate	8 GPM	20 GPM	8 GPM	20 GPM	8 GPM	20 GPM	8 GPM	20 GPM
Maximum Pressure	150 psi	150 psi	150 psi	150 psi	150 psi	150 psi	150 psi	150 psi
Y-Filter—Degree of Filtration	150 Mesh/100 Microns	150 Mesh/100 Microns	150 Mesh/100 Microns	150 Mesh/100 Microns	150 Mesh/100 Microns	150 Mesh/100 Microns	150 Mesh/100 Microns	150 Mesh/100 Microns
Regulator—Preset Pressure	25 psi	25 psi	25 psi	25 psi	25 psi	25 psi	25 psi	25 psi
Thread Connection—Upstream	Female NPT	Female NPT	Female NPT	Female NPT	Female NPT	Female NPT	Female NPT	Female NPT
Thread Connection—Downstream	Female NPT	Female NPT	Female NPT	Female NPT	Male NPT	Female NPT	Male NPT	Female NPT
Minimum Number of Emitters								
0.5 gph	30	240	30	240	30	240	12	240
1 gph	15	120	15	120	15	120	6	120
2 gph	8	60	8	60	8	60	3	60
Maximum Number of Emitters								
0.5 gph	960	2400	960	2400	960	2400	960	2400
1 gph	490	1200	480	1200	480	1200	480	1200
2 gph	240	600	240	500	240	600	240	600

Note: Consult your local plumbing code for backflow prevention requirements.

* AVB = Atmospheric Vacuum Breaker (Anti-siphon Valve)

Flow vs. Friction Loss—U.S. Friction Loss (psi)

Part Number	GPM	0.25	5	8	15	20
DZK-EZF-075-LF	Minimum Inlet Pressure Required	3	5	5	n/a	n/a
	Minimum Inlet Pressure Required (psi)	30	32	32	34	39
DZK-EZF-075-MF	Minimum Inlet Pressure Required	3	5	5	7	13
	Minimum Inlet Pressure Required (psi)	30	32	32	34	39
DZK-EZF-1-LF	Minimum Inlet Pressure Required	3	5	5	n/a	n/a
	Minimum Inlet Pressure Required (psi)	30	32	32	34	39
DZK-EZF-1-MF	Minimum Inlet Pressure Required	3	5	5	5	8
	Minimum Inlet Pressure Required (psi)	30	32	32	32	35

Flow vs. Friction Loss—Metric Friction Loss (bars)

Part Number	LPM	1	19	30	57	76
DZK-EZF-075-LF	Minimum Inlet Pressure Required	0,21	0,34	0,34	n/a	n/a
	Minimum Inlet Pressure Required (Bar)	2,01	2,21	2,21	2,34	2,69
DZK-EZF-075-MF	Minimum Inlet Pressure Required	0,21	0,34	0,34	0,48	0,90
	Minimum Inlet Pressure Required (Bar)	2,01	2,21	2,21	2,34	2,69
DZK-EZF-1-LF	Minimum Inlet Pressure Required	0,21	0,34	0,34	n/a	n/a
	Minimum Inlet Pressure Required (Bar)	2,01	2,21	2,21	2,21	2,41
DZK-EZF-1-MF	Minimum Inlet Pressure Required	0,21	0,34	0,34	0,34	0,55
	Minimum Inlet Pressure Required (Bar)	2,01	2,21	2,21	2,21	2,41

Part Number	GPM	0.25	5	8	15	20
DZK-2711-075-LF	Minimum Inlet Pressure Required	3	5	5	n/a	n/a
	Minimum Inlet Pressure Required (psi)	30	32	32	34	39
DZK-2711-075-MF	Minimum Inlet Pressure Required	3	5	5	7	13
	Minimum Inlet Pressure Required (psi)	30	32	32	34	39
DZK-700-1-LF	Minimum Inlet Pressure Required	3	3	3	n/a	n/a
	Minimum Inlet Pressure Required (psi)	30	30	30	32	34
DZK-700-1-MF	Minimum Inlet Pressure Required	3	3	3	4.5	7
	Minimum Inlet Pressure Required (psi)	30	30	30	32	34

Part Number	LPM	1	19	30	57	76
DZK-2711-075-LF	Minimum Inlet Pressure Required	0,21	0,34	0,34	n/a	n/a
	Minimum Inlet Pressure Required (Bar)	2,01	2,21	2,21	2,34	2,69
DZK-2711-075-MF	Minimum Inlet Pressure Required	0,21	0,34	0,34	0,48	0,90
	Minimum Inlet Pressure Required (Bar)	2,01	2,21	2,21	2,34	2,69
DZK-700-1-LF	Minimum Inlet Pressure Required	0,21	0,21	0,21	n/a	n/a
	Minimum Inlet Pressure Required (Bar)	30	30	30	32	34
DZK-700-1-MF	Minimum Inlet Pressure Required	0,21	0,21	0,21	0,31	0,48
	Minimum Inlet Pressure Required (Bar)	2,01	2,01	2,01	2,21	2,34

Air Release Valves

Feature and Benefit Highlights

- Essential element in a pressurized irrigation system:
- Allows air to escape the pipelines at system start up
- Prevents air pockets from forming in the irrigation system which can restrict flow
- Provides vacuum relief at shutdown preventing irrigation equipment from being damaged
- Provides pipeline protection due to water hammer
- Continuous acting air vents remove excess air while the system is charged



YD-500-34



ARV-2-KA



ARV-1-A



ARV-2-K



ARV-1-K

Performance Table

Part Number	YD-500-34	ARV-1-K	ARV-2-K	ARV-1-A	ARV-2-KA
Valve Type	Air/Vacuum Relief	Air/Vacuum Relief Non-Continuous	Single Acting Continuous	Dual Acting Continuous	
Working Pressure	150	225	225	170	225
Totally sealed from (psi)	3	3	3	3	3
Volume of air release in CFM without valve closing and without the presence of water	N/A	295	590	41.2	590
Release air volume @ 5 psi	N/A	26 CFM	260 CFM	8.8 CFM	140 CFM
Units per bag	10	1	1	1	1

Specifying Information

Part number	Description
ARV-2-KA	2" MNPT large acting and continuous acting air vent
ARV-1-A	1" MNPT continuous acting air vent
ARV-2-K	2" MNPT large acting air vent
ARV-1-K	1" MNPT large acting air vent
YD-500-34	1/2" MNPT large acting air vent

Residential, commercial

Feature and Benefit Highlights

- Aerates the rootzone in subsurface irrigation applications every time you irrigate
- Designed to introduce the proper amount of air into the subsurface system through a Mazzei injector
- Increases root mass for healthier and increased vitality in turf and plants
- Less stress on plants allowing for greater absorption of water, air and soil nutrients simultaneously during the irrigation cycle

Specifications

- Sizes available:
2" and 3 PVC slip
1/2" and 3/4" MNPT models
- Flow Rates:
0.9 gpm (3.4 lpm) to 13.77 gpm (52.11 lpm)

A-Series Injectors

Inlet pressure psi	Motive Flow - Gallons Per Minute (gpm)								
	MAI-A3	MAI-A5	MAI-A7	MAI-A10	MAI-A12	MAI-A14	MAI-A16	MAI-A20	MAI-A24
20	0.90	1.47	1.87	2.63	3.00	3.67	4.33	5.63	7.30
25	1.00	1.67	2.17	2.93	3.30	4.03	4.83	6.30	7.83
30	1.10	1.80	2.37	3.20	3.57	4.47	5.23	6.87	8.43
35	1.20	1.97	2.53	3.50	3.93	4.80	5.67	7.33	9.27
40	1.30	2.10	2.73	3.73	4.20	5.03	6.10	7.80	9.80
45	1.40	2.27	2.90	4.00	4.47	5.47	6.43	8.23	10.57
50	1.47	2.37	3.07	4.13	4.73	5.77	6.70	8.83	10.93
60	1.60	2.57	3.30	4.57	5.17	6.40	7.37	9.53	12.00
70	1.70	2.77	3.63	4.90	5.53	6.83	7.87	10.37	12.90
80	1.83	2.97	3.87	5.17	5.90	7.30	8.50	11.03	13.77
	Red	Orange	Yellow	Green	Blue	Purple	Gray	Tan	Brown



Color coded injectors available to accommodate lateral or multiple lateral

Inlet pressure Kg/cm²	Motive Flow - Liters Per Minute (l/m)								
	MAI-A3	MAI-A5	MAI-A7	MAI-A10	MAI-A12	MAI-A14	MAI-A16	MAI-A20	MAI-A24
1.41	3.41	5.55	7.07	9.97	11.36	13.88	16.40	21.32	27.63
1.76	3.79	6.31	8.20	11.10	12.49	15.27	18.29	23.85	29.65
2.11	4.16	6.81	8.96	12.11	13.50	16.91	19.81	26.00	31.92
2.46	4.54	7.44	9.59	13.25	14.89	18.17	21.45	27.76	35.07
2.81	4.92	7.95	10.35	14.13	15.90	19.05	23.09	29.52	37.09
3.16	5.30	8.58	10.98	15.14	16.91	20.69	24.35	31.16	40.00
3.52	5.55	8.96	11.61	15.64	17.92	21.83	25.36	33.43	41.38
4.22	6.06	9.71	12.49	17.28	19.56	24.22	27.88	36.08	45.42
4.92	6.43	10.47	13.75	18.55	20.94	25.86	29.78	39.24	48.83
5.62	6.94	11.23	14.64	19.56	22.33	27.63	32.17	41.76	52.11
	Red	Orange	Yellow	Green	Blue	Purple	Gray	Tan	Brown

The Models A-3 to A-16 have 1/2" (0.50") MNPT threaded connections.

The Models A-20 and A-24 have 3/4" (0.75") MNPT threaded connections.

Plastic Y-Filters

Residential, commercial

Feature and Benefit Highlights

- Plastic Y-model filters are available in a $\frac{3}{4}$ ", 1" and $1\frac{1}{2}$ " MPT
- Constructed of the highest quality plastics for durability and corrosion resistance
- Available in plastic disc and stainless steel screen

Additional Features

- $\frac{3}{4}$ " & 1" screen filters are available in small- and large-size bodies
- Easy element access for trouble-free maintenance
- $\frac{1}{2}$ " male thread outlet with cap for quick flush cleaning
- Body and cap constructed of nylon
- Locking ring constructed of glass reinforced nylon
- O-Ring constructed of Buna-N

Specifications

- Recommended pressure range: 5–142 psi (0,3–9,8 Bar)
- Flow rate: 5–80 GPM (22,7–363,6 LPM)



Ideal for landscape applications. The "F" Series family of plastic Y-model filters offers superior performance and durability under demanding conditions. Screen filters are available in small- and large-size bodies. Small-size filters are ideal for tight installations and large-size filters provide a larger filtration area.

Specifying Information Disc Filters

Model	Size	Maximum Flow Rate	Element	Mesh	Body	Head Loss Curve
ALFD75150-L	$\frac{3}{4}$ "	25 GPM	Disc	150	Large	B
ALFD10150-L	1"	35 GPM	Disc	150	Large	C
ALFD15150-L	$1\frac{1}{2}$ "	80 GPM	Disc	150	Large	D

Specifying Information Screen Filters

Model	Size	Maximum Flow Rate	Element	Mesh	Body	Head Loss Curve
ALFS75150-S	$\frac{3}{4}$ "	18 GPM	Screen	150	Small	A
ALFS75150-L	$\frac{3}{4}$ "	25 GPM	Screen	150	Large	B
ALFS10150-S	1"	25 GPM	Screen	150	Small	B
ALFS10150-L	1"	35 GPM	Screen	150	Large	C
ALFS15150-L	$1\frac{1}{2}$ "	80 GPM	Screen	150	Large	D

Specifying Information Replacement Filters

Model	Size	Element	Mesh	Body
AMP0004-4F	$\frac{3}{4}$ ", 1" and $1\frac{1}{2}$ "	Disc	150	Large Body Size Filters
AMP0004-1S	$\frac{3}{4}$ " and 1"	Screen	150	Small Body Size Filters
AMP0004-2F	$\frac{3}{4}$ ", 1" and $1\frac{1}{2}$ "	Screen	150	Large Body Size Filters

When installing the disc filter, the flow direction is opposite to the screen filter.

Residential, commercial

Feature and Benefit Highlights

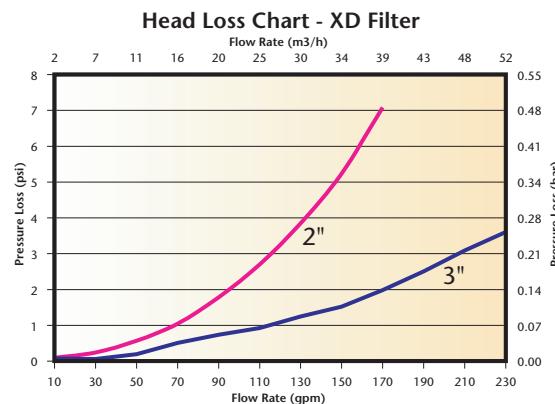
- Glass reinforced nylon body construction provides durability and reliability that will extend product life
- Specially designed disc rings provide greater surface area resulting in a longer time between cleaning and less filter maintenance
- Includes a ball plastic valve that has the ability to flush out the filter without stopping the irrigation cycle
- Two downstream exit ports mean the filter can be installed in an angle or globe configuration, reducing the need to re-do piping

Additional Features

- O-ring between cover and body prevents leakage
- Ring-nut is easy to tighten and provides a tight seal
- Location of pre-molded threaded holes for the pressure gauges allows for readings up and downstream pressures

Specifications

Color Coded Disc Rings		
Mesh	Micron	Color
120	125	blue
150	100	red
200	75	brown



Performance Table

Part Number	IT-ABF50XX-3X-N	IT-ABF50XX-3X	IT-ABF75XX-3X-N	IT-ABF75XX-3X
Description	2" XD Filter		3" XD Filter	
Element Type		Disc		
Degree of Filtration	120, 150, 200 Mesh (125, 100, 75 micron)			
Filtration area	1,674 in ²	10,800 cm ²	2,790 in ²	18,000 cm ²
Maximum Flow Rate	110 gpm	25 m ³ /h	220 gpm	50 m ³ /h
Maximum Pressure	145 psi	10 bars	145 psi	10 bars
Connection Size	2 in. / 50 mm		3 in. / 76 mm	
Connection Type	Male Threaded NPT	Male Threaded BSP	Male Threaded NPT	Male Threaded BSP
Distance Between Threads	10 $\frac{4}{5}$ in. / 274 mm		12 $\frac{3}{5}$ in. / 320 mm	
Weight	14 lbs / 6.5 kgs		18 lbs / 8 kgs	

Note: Insert required mesh size of 120 = 12, 150 = 15 or 200 = 20 in place of XX.



XD Filter is designed for use as a primary or secondary safety filter. Ideal for applications such as; well water containing light amounts of sand, water sources with low solids concentration or surface water containing small amounts of organic material.

Specifying Information

Part Number	Description
IT-ABF5012-3X-n	2", 110 mesh disc filter
IT-ABF5015-3X-n	2", 115 mesh disc filter
IT-ABF5020-3X-n	2", 120 mesh disc filter
IT-ABF7512-3X-n	3", 110 mesh disc filter
IT-ABF7515-3X-n	3", 115 mesh disc filter
IT-ABF7520-3X-n	3", 120 mesh disc filter

Notes



RESOURCES

Drip Irrigation Equations

Number of Emitters per Plant

$$\text{Emitters per tree} = \frac{\text{canopy area (sq. ft.)} \times 0.75}{\text{wetted area per emitter (sq. ft.)}}$$

Soil Type	Wetted Area	
	Diameter (ft.)	Area (sq. ft.)
Sand	2 - 3	3 - 7
Sandy Loam	3 - 4.5	7 - 16
Loam	3 - 5	7 - 20
Clay-Loam	4 - 6	13 - 28
Clay	5 - 7	20 - 38

Flow per zone

$$\text{Flow per zone (gpm)} = \frac{\text{Total number of drippers} \times \text{dripper flow rate (gph)}}{60 \text{ (minutes)}}$$

Precipitation Rate for Evenly Spaced Laterals and Emitters

Precipitation Rate for Drip Laterals (inches/hour)						
Emitter Flow	Emitter Spacing	Spacing Between Drip Laterals				
		6 in.	12 in.	18 in.	24 in.	30 in.
0.53 gph	12 in.	1.62	0.81	0.54	0.40	0.32
0.53 gph	18 in.	1.08	0.54	0.36	0.27	0.22
0.53 gph	24 in.	0.81	0.40	0.27	0.20	0.16
1.02 gph	12 in.	3.11	1.56	1.04	0.78	0.62
1.02 gph	18 in.	2.07	1.04	0.69	0.52	0.41
1.02 gph	24 in.	1.56	0.78	0.52	0.39	0.31

Precipitation Rate Formula:

$$\text{Precipitation Rate (in./hr)} = \frac{231.1 \times \text{Emitter Flow (gph)}}{\text{Lateral Spacing (in.)} \times \text{Emitter Spacing (in.)}}$$

Note: This formula applies to evenly spaced drip irrigation laterals and emitters

Precipitation Rate for a Single Lateral

Precipitation Rate (in/hr) of a Single Row of Dripline In a Contained Landscape						
Emitter Flow	Emitter Spacing	Width of Contained Landscape				
		1 ft.	2 ft.	3 ft.	4 ft.	5 ft.
0.53 gph	12 in.	0.81	0.40	0.27	0.20	0.16
0.53 gph	18 in.	0.54	0.27	0.18	0.13	0.11
0.53 gph	24 in.	0.40	0.20	0.13	0.10	0.08
1.02 gph	12 in.	1.56	0.78	0.52	0.39	0.31
1.02 gph	18 in.	1.04	0.52	0.35	0.26	0.21
1.02 gph	24 in.	0.78	0.39	0.26	0.19	0.16

Precipitation Rate Formula:

$$\text{Precipitation Rate (in./hr)} = \frac{231.1 \times \text{Emitter Flow (gph)}}{\text{Width of Contained Area (in.)} \times \text{Emitter Spacing (in.)}}$$

Formulas for Standard Sprinkler Irrigation

Precipitation Rates

U.S.

Equilateral Triangular Spacing

$$P.R. = \frac{(GPM \text{ of } 360) \times 96.25}{(\text{in/hr}) \times (\text{Head Spacing})^2 \times .866}$$

Metric

$$P.R. = \frac{m^3/\text{hr} \text{ of } 360 \times 1000}{(\text{mm/hr}) \times (\text{m}^2) \times .866}$$

Square/Rectangular Spacing

$$P.R. = \frac{(GPM \text{ of } 360) \times 96.25}{(\text{in/hr}) \times (\text{Head Spacing} \times \text{Row Spacing})}$$

$$P.R. = \frac{m^3/\text{hr} \text{ of } 360 \times 1000}{(\text{mm/hr}) \times (\text{Head Spacing} \times \text{Row Spacing})}$$

Square/Rectangular Spacing for Specific Arc

$$P.R. = \frac{34650 \times GPM \text{ (for any arc)}}{(\text{in/hr}) \times (\text{Degrees of Arc} \times \text{Head Spacing} \times \text{Row Spacing})}$$

$$P.R. = \frac{m^3/\text{hr} \text{ (for any arc)} \times 1000}{(\text{mm/hr}) \times (\text{Degrees of Arc} \times \text{Head Spacing} \times \text{Row Spacing})}$$

Horsepower

$$H.P. = \frac{GPM \times \text{Ft of Head}}{3,960 \times \text{Pump Efficiency} \text{ (expressed as a decimal)}}$$

Station Run Time

$$S.R.T. = \frac{\text{Total Weekly Req'd (inch/wk)} \times 60 \text{ (min/hr)}}{(\text{min/wk}) \text{ Precipitation Rate (in/hr)}}$$

$$S.R.T. = \frac{\text{Total Weekly Req'd (mm/wk)} \times 60 \text{ (min/hr)}}{(\text{min/wk}) \text{ Precipitation Rate (mm/hr)}}$$

Pipe Velocity

$$V = \frac{0.4085 \times \text{Flow (GPM)}}{(\text{ft/sec}) \times (\text{Inside Pipe Diameter in Inches})^2}$$

$$V = \frac{1273.24 \times \text{Flow (l/sec)}}{(\text{m/sec}) \times (\text{Inside Pipe Diameter in Millimeters})^2}$$

Slope

$$S = \frac{\text{Rise (Measure of Length)}}{\text{Run (Measure of Length)}}$$

Friction Loss Characteristics

ID Controlled Round Hose

Losses in psi per 100 feet of hose (psi/100 ft) for hose sizes: 13 mm (.509") ID through 16 mm (.627") ID																		
Part No.		EHD1335		EHD1348		EHD1350		EHD1443		EHD1554		EHD1635		EHD1642		EHD1645		
Nom. ID		0.509"		0.510"		0.520"		0.550"		0.572		0.616"		0.627"		0.616"		
Min. ID		0.506"		0.510"		0.516"		0.547"		0.569"		0.613"		0.624"		0.613"		
Min. Wall		0.035"		0.048"		0.050"		0.043"		0.054"		0.035"		0.042"		0.045"		
Flow	Velocity	Loss																
GPM	GPS	FPS	Psi															
0.5	30	0.80	0.37	0.79	0.35	0.77	0.34	0.68	0.25	0.63	0.21	0.54	0.14	0.52	0.13	0.54	0.14	
1.0	60	1.60	1.33	1.57	1.28	1.53	1.21	1.37	0.91	1.26	0.75	1.09	0.52	1.05	0.48	1.09	0.52	
1.5	90	2.39	2.82	2.36	2.71	2.30	2.56	2.05	1.93	1.89	1.59	1.63	1.11	1.57	1.02	1.63	1.11	
2.0	120	3.19	4.80	3.14	4.62	3.07	4.37	2.73	3.29	2.52	2.71	2.17	1.89	2.10	1.73	2.17	1.89	
2.5	150	3.99	7.26	3.93	6.99	3.84	6.60	3.41	4.97	3.15	4.10	2.72	2.85	2.62	2.72	2.85		
3.0	180	4.79	10.18	4.71	9.80	4.60	9.26	4.10	6.97	3.79	5.75	3.26	4.00	3.15	3.67	3.26	4.00	
3.5	210	5.58	13.55	5.50	13.04	5.37	12.31	4.78	9.27	4.42	7.65	3.80	5.32	3.67	4.88	3.80	5.32	
4.0	240	6.38	17.35	6.28	16.69	6.14	15.77	5.46	11.87	5.05	9.79	4.35	6.81	4.20	6.25	4.35	6.81	
4.5	270	7.18	21.57	7.07	20.76	6.90	19.61	6.14	14.76	5.68	12.18	4.89	8.48	4.72	7.77	4.89	8.48	
5.0	300	7.98	26.22	7.85	25.24	7.67	23.84	6.83	17.94	6.31	14.81	5.44	10.30	5.25	9.45	5.44	10.30	
6.0	360	9.57	36.75	9.42	35.37	9.21	33.41	8.19	25.15	7.57	20.75	6.52	14.44	6.29	13.24	6.52	14.44	
7.0	420	11.17	48.90	10.99	47.06	10.74	44.45	9.56	33.46	8.83	27.61	7.61	19.21	7.34	17.62	7.61	19.21	
8.0	480				12.56	60.26	12.27	56.92	10.92	42.85	10.09	35.36	8.70	24.60	8.39	22.56	8.70	24.60
9.0	540				14.13	74.95	13.81	70.80	12.29	53.29	11.36	43.98	9.78	30.60	9.44	28.06	9.78	30.60
10.0	600								13.65	64.77	12.62	53.45	10.87	37.19	10.49	34.11	10.87	37.19
11.0	660									13.88	63.77	11.96	44.37	11.54	40.69	11.96	44.37	
ID12.0	720									15.14	74.93			12.59	47.81	13.05	52.13	

Losses in psi per 100 feet of hose (psi/100 ft) for hose sizes: 18 mm (.726") ID through 35 mm (1.360") ID																		
Part No.		EHD1845		EHD1847		EHD1850		EHF2052		EHF2057		EHF2662		EHD2667		EHD3580		
Nom. ID		0.710"		0.729"		0.729"		0.807"		0.807"		1.060"		1.060"		1.365"		
Min. ID		0.707"		0.726"		0.726"		0.804"		0.804"		1.056"		1.056"		1.360"		
Min. Wall		0.045"		0.047"		0.050"		0.052"		0.057"		0.062"		0.067"		0.084"		
Flow	Velocity	Loss																
GPM	GPS	FPS	Psi															
1	60	0.82	0.26	0.78	0.23	0.78	0.23	0.63	0.14	0.63	0.14	0.37	0.04	0.37	0.04	0.22	0.01	
2	120	1.63	0.94	1.55	0.83	1.55	0.83	1.26	0.50	1.26	0.50	0.73	0.13	0.73	0.13	0.44	0.04	
3	180	2.45	2.00	2.33	1.75	2.33	1.75	1.90	1.07	1.90	1.07	1.10	0.28	1.10	0.28	0.66	0.08	
4	240	3.27	3.40	3.10	2.99	3.10	2.99	2.53	1.82	2.53	1.82	1.47	0.48	1.47	0.48	0.88	0.14	
5	300	4.09	5.14	3.88	4.52	3.88	4.52	3.16	2.75	3.16	2.75	1.83	0.73	1.83	0.73	1.10	0.21	
6	360	4.90	7.21	4.65	6.34	4.65	6.34	3.79	3.85	3.79	3.85	2.20	1.02	2.20	1.02	1.33	0.30	
7	420	5.72	9.59	5.43	8.45	5.43	8.43	4.42	5.13	4.42	5.13	2.56	1.36	2.56	1.36	1.55	0.40	
8	480	6.54	12.28	6.20	10.79	6.20	10.79	5.06	6.57	5.06	6.57	2.93	1.74	2.93	1.74	1.77	0.51	
9	540	7.36	15.27	6.98	13.42	6.98	13.42	5.69	8.17	5.69	8.17	3.30	2.16	3.30	2.16	1.99	0.63	
10	600	8.17	18.57	7.75	16.32	7.75	16.32	6.32	9.93	6.32	9.93	3.66	2.63	3.66	2.63	2.21	0.77	
11	660	8.99	22.15	8.53	19.47	8.53	19.47	6.95	11.84	6.95	11.84	4.05	3.14	4.05	3.14	2.43	0.92	
12	720	9.81	26.02	9.30	22.87	9.30	22.87	7.58	13.91	7.58	13.91	4.40	3.69	4.40	3.69	2.65	1.08	
13	780	10.62	30.18	10.08	26.52	10.08	26.52	8.22	16.14	8.22	16.14	4.76	4.28	4.76	4.28	2.87	1.25	
14	858	11.69	36.04	11.09	31.68	11.09	31.68	9.04	19.27	9.04	19.27	5.24	5.11	5.24	5.11	3.16	1.49	
15	920	12.54	41.01	11.89	36.04	11.89	36.04	9.69	21.93	9.69	21.93	5.62	5.81	5.62	5.81	3.39	1.70	
16	982	13.38	46.27	12.69	40.66	12.69	40.66	10.35	24.74	10.35	24.74	6.00	6.56	6.00	6.56	3.62	1.91	
17	1,044	14.23	51.82	13.49	45.54	13.49	45.54	11.00	27.71	11.00	27.71	6.38	7.34	6.38	7.34	3.84	2.14	
18	1,080				13.95	48.46	13.95	48.46	11.38	29.48	11.38	29.48	6.59	7.81	6.59	7.81	3.98	2.28
19	1,140				14.73	53.56	14.73	53.56	12.01	32.59	12.01	32.59	6.96	8.64	6.96	8.64	4.20	2.52
20	1,200							12.64	35.88	12.64	35.88	7.33	9.50	7.33	9.50	4.42	2.77	
22	1,320							13.90	42.75	13.90	42.75	8.06	11.33	8.06	11.33	4.86	3.31	
24	1,440							15.17	50.23	15.17	50.23	8.79	13.31	8.79	13.31	5.30	3.88	
26	1,560							16.43	58.25	16.43	58.25	9.52	15.44	9.52	15.44	5.74	4.50	
28	1,680							17.69	66.82	17.69	66.82	10.26	17.71	10.26	17.71	6.18	5.17	
30	1,800							18.96	75.93	18.96	75.93	10.99	20.13	10.99	20.13	6.63	5.87	
32	1,920								20.22	85.57	11.72	22.68	11.72	22.68	7.07	6.62		
34	2,040									12.45	25.38	12.45	25.38	7.51	7.40			
36	2,160									13.19	28.21	13.19	28.21	7.95	8.23			
38	2,280									13.92	31.18	13.92	31.18	8.39	9.10			
40	2,400									14.65	34.29	14.65	34.29	8.83	10.00			
45	2,700									16.48	42.65	16.48	42.65	9.94	12.44			
50	3,000									18.32	51.84	18.32	51.84	11.04	15.12			
55	3,300									20.15	61.84	20.15	61.84	12.15	18.04			
60	3,600									21.98	72.66	21.98	72.66	13.25	21.19			
65	3,900											23.81	84.27	14.36	24.58			
70	4,200													15.46	28.19			
75	4,500													16.56	32.04			
80	4,800													17.67	36.11			
85	5,100													18.77	40.40			
90	5,400													19.88	44.91			
95	5,700													20.98	49.64			

Friction Loss Characteristics

OD Controlled Round Hose

Losses in psi per 100 feet of hose (psi/100 ft). for hose sizes: 16 mm (.596") ID through 22 mm (.870") ID									
Part No.		EHO1650		EHO2055		EHO2060		HDO2255	
Nom. ID		0.600"		0.830"		0.820"		0.870"	
Min. ID		0.596"		0.821"		0.811"		0.870"	
Nom. Wall		0.050"		0.055"		0.060"		0.055"	
Flow		Velocity	Loss	Velocity	Loss	Velocity	Loss	Velocity	Loss
GPM	GPH	FPS	Psi	FPS	Psi	FPS	Psi	FPS	Psi
0.5	30	0.58	0.17	0.30	0.03	0.31	0.04	0.27	0.03
1.0	60	1.15	0.60	0.61	0.13	0.62	0.13	0.54	0.10
1.5	90	1.73	1.27	0.91	0.27	0.93	0.28	0.81	0.20
2.0	120	2.30	2.16	1.21	0.46	1.24	0.48	1.08	0.34
2.5	150	2.88	3.27	1.52	0.69	1.55	0.73	1.35	0.52
3.0	180	3.45	4.59	1.82	0.96	1.86	1.02	1.62	0.73
3.5	210	4.03	6.10	2.12	1.28	2.17	1.36	1.89	0.97
4.0	240	4.60	7.82	2.42	1.64	2.48	1.74	2.16	1.24
4.5	270	5.18	9.72	2.73	2.04	2.79	2.17	2.43	1.54
5.0	300	5.75	11.81	3.03	2.48	3.11	2.64	2.70	1.87
6.0	360	6.90	16.56	3.64	3.48	3.73	3.69	3.24	2.62
7.0	420	8.05	22.03	4.24	4.63	4.35	4.92	3.78	3.49
8.0	480	9.20	28.21	4.85	5.93	4.97	6.29	4.32	4.47
9.0	540	10.35	35.09	5.45	7.38	5.59	7.83	4.86	5.56
10.0	600	11.50	42.65	6.06	8.96	6.21	9.52	5.40	6.76
11.0	660	12.65	50.89	6.67	10.70	6.83	11.35	5.94	8.06
12.0	720	13.80	59.78	7.27	12.57	7.45	13.34	6.48	9.47
13.0	780			7.88	14.57	8.07	15.47	7.02	10.99
14.0	840			8.48	16.72	8.70	17.75	7.56	12.61
15.0	900			9.09	19.00	9.32	20.16	8.10	14.32
16.0	960			9.70	21.41	9.94	22.72	8.64	16.14
17.0	1,020			10.30	23.95	10.56	25.42	9.17	18.06
18.0	1,080			10.91	26.63	11.18	28.26	9.71	20.08
19.0	1,140			11.51	29.43	11.80	31.24	10.25	22.19
20.0	1,200			12.12	32.36	12.42	34.35	10.79	24.40
22.0	1,320			13.33	38.61	13.66	40.98	11.87	29.11
24.0	1,440			14.55	45.36	14.91	48.15	12.95	34.20
26.0	1,560			15.76	52.61	16.15	55.84	14.03	39.67
28.0	1,680			16.97	60.35			15.11	45.51
30.0	1,800							16.19	51.71
32.0	1,920							17.27	58.27

Friction losses are calculated using Hazen-Williams equation ($C = 140$) and minimum inside diameters.

Note: ■ Shaded areas of chart indicate velocities over 5 feet per second (FPS). **Use with caution.**

Velocity of flow values are computed from the general equation $V = .408 \frac{Q}{d^2}$

Friction pressure loss values are computed from the equation $hf = 0.2083 \left(\frac{100}{C} \right) 1.852 \frac{Q^{1.852}}{d^{4.866}}$ x .433 for psi loss per 100' of pipe

Friction Loss Characteristics

PVC Class 200 IPS Plastic Pipe

PVC Class 200 IPS Plastic Pipe														
Sizes: 1/4" thru 6"														
Flow: 1 thru 600 GPM														
SIZE	3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"			
OD	1.050		1.315		1.660		1.900		2.375		2.875			
ID	.930		1.189		1.502		1.720		2.149		3.166			
WALL THK.	.060		0.063		0.079		0.090		0.113		0.117			
Flow GPM	Velocity FPS	psi Loss												
1	0.47	0.06	0.28	0.02	0.18	0.01	0.13	0.00	0.17	0.00				
2	0.94	0.22	0.57	0.07	0.36	0.02	0.27	0.01						
3	1.42	0.46	0.86	0.14	0.54	0.04	0.41	0.02	0.26	0.01				
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		
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		
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		
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		
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		
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		
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		
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		
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		
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		
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		
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		
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		
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		
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		
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		
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		
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		
45			12.98	21.14	8.13	6.78	6.20	3.51	3.97	1.19	2.71	0.47		
50			14.42	25.70	9.04	8.24	6.89	4.26	4.41	1.44	3.01	0.57		
55			15.87	30.66	9.94	9.83	7.58	5.09	4.85	1.72	3.31	0.68		
60			17.31	36.02	10.85	11.55	8.27	5.97	5.30	2.02	3.61	0.80		
65			18.75	41.77	11.75	13.40	8.96	6.93	5.74	2.35	3.92	0.93		
70					12.65	15.37	9.65	7.95	6.18	2.69	4.22	1.06		
75					13.56	17.47	10.34	9.03	6.62	3.06	4.52	1.21		
80					14.46	19.68	11.03	10.18	7.06	3.44	4.82	1.36		
85					15.37	22.02	11.72	11.39	7.50	3.85	5.12	1.52		
90					16.27	24.48	12.41	12.66	7.95	4.28	5.42	1.69		
95					17.18	27.06	13.10	13.99	8.39	4.74	5.72	1.87		
100					18.08	29.76	13.79	15.39	8.83	5.21	6.03	2.06		
110					19.89	35.50	15.17	18.36	9.71	6.21	6.63	2.45		
120						16.54	21.57	10.60	7.30	7.23	2.88	4.88	1.11	
130						17.92	25.02	11.48	8.47	7.84	3.34	5.29	1.29	
140							19.30	28.70	12.36	9.71	8.44	3.84	5.69	1.47
150									13.25	11.04	9.04	4.36	6.10	1.68
160									14.13	12.44	9.64	4.91	6.51	1.89
170									15.01	13.91	10.25	5.50	6.91	2.11
180									15.90	15.47	10.85	6.11	7.32	2.35
190									16.78	17.10	11.45	6.75	7.73	2.60
200									17.66	18.80	12.06	7.43	8.14	2.85
225									19.87	23.38	13.56	9.24	9.15	3.55
250											15.07	11.23	10.17	4.31
275											16.58	13.39	11.19	5.15
300											18.09	15.74	12.21	6.05
325											19.60	18.25	13.22	7.01
350												14.24	8.05	8.61
375												15.26	9.14	9.22
400												16.28	10.30	9.84
425												17.29	11.53	10.45
450												18.31	12.81	11.07
475												19.33	14.16	11.68
500													12.30	4.58
550													13.53	5.46
600													14.76	6.42
													6.81	0.98

Note: Shaded areas of chart indicate velocities over 5 feet per second (FPS). **Use with caution.**

Velocity of flow values are computed from the general equation $V = .408 \frac{Q}{d^2}$

Friction pressure loss values are computed from the equation
$$hf = 0.2083 \left(\frac{100}{C} \right) 1.852 Q^{\frac{1.852}{d^{4.866}}} \quad d$$
 x .433 for psi loss per 100' of pipe

Friction Loss Characteristics

PVC Class 315 IPS Plastic Pipe

PVC Class 315 IPS Plastic Pipe																								
Sizes: 1/2" thru 6"																								
Flow: 1 thru 600 GPM																								
SIZE	1/2"		3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		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	0.716		0.894		1.121		1.414		1.618		2.023		2.449		2.982		3.834		5.643					
WALL THK.	0.062		0.078		0.097		0.123		0.141		0.176		0.213		0.259		0.333		0.491					
Flow GPM	Velocity FPS	psi Loss																						
1	0.79	0.22	0.51	0.07	0.32	0.02	0.20	0.01	0.15	0.00	0.19	0.00												
2	1.59	0.78	1.02	0.27	0.64	0.09	0.40	0.03	0.31	0.01														
3	2.38	1.65	1.53	0.56	0.97	0.19	0.61	0.06	0.46	0.03	0.29	0.01	0.20	0.00										
4	3.18	2.82	2.04	0.96	1.29	0.32	0.81	0.10	0.62	0.05	0.39	0.02	0.27	0.01										
5	3.97	4.26	2.55	1.45	1.62	0.48	1.02	0.16	0.77	0.08	0.49	0.03	0.34	0.01	0.22	0.00								
6	4.77	5.97	3.06	2.03	1.94	0.67	1.22	0.22	0.93	0.11	0.59	0.04	0.40	0.02	0.27	0.01								
7	5.57	7.95	3.57	2.70	2.27	0.90	1.42	0.29	1.09	0.15	0.69	0.05	0.47	0.02	0.32	0.01								
8	6.36	10.18	4.08	3.45	2.59	1.15	1.63	0.37	1.24	0.19	0.79	0.06	0.54	0.03	0.36	0.01								
9	7.16	12.66	4.59	4.30	2.92	1.43	1.83	0.46	1.40	0.24	0.89	0.08	0.61	0.03	0.41	0.01								
10	7.95	15.38	5.10	5.22	3.24	1.74	2.04	0.56	1.55	0.29	0.99	0.10	0.68	0.04	0.45	0.01	0.27	0.00						
11	8.75	18.35	5.61	6.23	3.57	2.07	2.24	0.67	1.71	0.35	1.09	0.12	0.74	0.05	0.50	0.02	0.30	0.01						
12	9.55	21.56	6.12	7.32	3.89	2.43	2.44	0.79	1.87	0.41	1.19	0.14	0.81	0.05	0.55	0.02	0.33	0.01						
14	11.14	28.69	7.14	9.74	4.54	3.24	2.85	1.05	2.18	0.54	1.39	0.18	0.95	0.07	0.64	0.03	0.38	0.01						
16	12.73	36.74	8.16	12.47	5.19	4.15	3.26	1.34	2.49	0.70	1.59	0.23	1.08	0.09	0.73	0.04	0.44	0.01						
18	14.32	45.69	9.18	15.51	5.84	5.16	3.67	1.67	2.80	0.87	1.79	0.29	1.22	0.12	0.82	0.04	0.49	0.01						
20	15.91	55.54	10.20	18.86	6.49	6.27	4.08	2.03	3.11	1.05	1.99	0.35	1.36	0.14	0.91	0.05	0.55	0.02						
22	17.50	66.26	11.23	22.50	7.14	7.48	4.48	2.42	3.42	1.25	2.19	0.42	1.49	0.17	1.00	0.06	0.61	0.02						
24	19.10	77.84	12.25	26.43	7.79	8.79	4.89	2.84	3.74	1.47	2.39	0.50	1.63	0.20	1.10	0.08	0.66	0.02						
26			13.27	30.65	8.44	10.19	5.30	3.29	4.05	1.71	2.59	0.58	1.76	0.23	1.19	0.09	0.72	0.03						
28			14.29	35.16	9.09	11.69	5.71	3.78	4.36	1.96	2.79	0.66	1.90	0.26	1.28	0.10	0.77	0.03	0.35	0.00				
30				15.31	39.95	9.74	13.29	6.12	4.29	4.67	2.23	2.99	0.75	2.04	0.30	1.37	0.11	0.83	0.03	0.38	0.01			
35				17.86	53.15	11.36	17.68	7.14	5.71	5.45	2.96	3.48	1.00	2.38	0.39	1.60	0.15	0.97	0.04	0.44	0.01			
40					12.98	22.64	8.16	7.31	6.23	3.80	3.98	1.28	2.72	0.51	1.83	0.19	1.11	0.06	0.51	0.01				
45					14.61	28.15	9.18	9.10	7.01	4.72	4.48	1.59	3.06	0.63	2.06	0.24	1.24	0.07	0.57	0.01				
50						16.23	34.22	10.20	11.06	7.79	5.74	4.98	1.94	3.40	0.76	2.29	0.29	1.38	0.09	0.64	0.01			
55						17.85	40.83	11.22	13.19	8.57	6.85	5.48	2.31	3.74	0.91	2.52	0.35	1.52	0.10	0.70	0.02			
60						19.48	47.97	12.24	15.50	9.35	8.04	5.98	2.71	4.08	1.07	2.75	0.41	1.66	0.12	0.76	0.02			
65							13.26	17.97	10.13	9.33	6.48	3.15	4.42	1.24	2.98	0.48	1.80	0.14	0.83	0.02				
70								14.28	20.62	10.90	10.70	6.97	3.61	4.76	14.2	3.21	0.55	1.94	0.16	0.89	0.02			
75								15.30	23.43	11.68	12.16	7.47	4.10	5.10	1.62	3.44	0.62	2.08	0.18	0.96	0.03			
80									16.32	26.40	12.46	13.71	7.97	4.62	5.44	1.82	3.67	0.70	2.22	0.21	1.02	0.03		
85									17.34	29.54	13.24	15.33	8.47	5.17	5.78	2.04	3.89	0.78	2.35	0.23	1.08	0.04		
90									18.36	32.84	14.02	17.05	8.97	5.75	6.12	2.27	4.12	0.87	2.49	0.26	1.15	0.04		
95									19.38	36.30	14.80	18.84	9.47	6.35	6.46	2.51	4.35	0.96	2.63	0.28	1.21	0.04		
100										15.58	20.72	9.96	6.99	6.80	2.76	4.58	1.06	2.77	0.31	1.28	0.05			
110										17.14	24.72	10.96	8.34	7.48	3.29	5.04	1.26	3.05	0.37	1.40	0.06			
120											18.70	29.04	11.96	9.79	8.16	3.87	5.50	1.48	3.33	0.44	1.53	0.07		
130												12.70	11.36	8.84	4.48	5.96	1.72	3.60	0.51	1.66	0.08			
140													13.95	13.03	9.52	5.14	6.42	1.97	3.88	0.58	1.79	0.09		
150													14.95	14.81	10.20	5.84	6.88	2.24	4.16	0.66	1.92	0.10		
160													15.95	16.69	10.88	6.59	7.34	2.53	4.44	0.74	2.04	0.11		
170													16.94	18.67	11.56	7.37	7.79	2.83	4.71	0.83	2.17	0.13		
180													17.94	20.75	12.24	8.19	8.25	3.14	4.99	0.93	2.30	0.14		
190													18.94	22.94	12.92	9.05	8.71	3.47	5.27	1.02	2.43	0.16		
200														19.93	25.23	13.60	9.95	9.17	3.82	5.55	1.12	2.56	0.17	
225															15.30	12.38	10.32	4.75	6.24	1.40	2.88	0.21		
250																17.00	15.05	11.47	5.77	6.93	1.70	3.20	0.26	
275																	18.70	17.95	12.61	6.89	7.63	2.03	3.52	0.31
300																		13.76	8.09	8.32	2.38	3.84	0.36	
325																		14.91	9.39	9.02	2.76	4.16	0.42	
350																		16.05	10.77	9.71	3.17	4.48	0.48	
375																		17.20	12.23	10.40	3.60	4.80	0.55	
400																		18.35	13.79	11.10	4.06	5.12	0.62	
425																		19.49	15.42	11.79	4.54	5.44	0.69	
450																		12.49	5.05	5.76	0.77			
475																		13.18	5.58	6.08	0.85			
500																		13.87	6.14	6.40	0.94			
550																		15.26	7.32	7.04	1.12			
600																			16.65	8.60	7.68	1.31		

Note: Shaded areas of chart indicate velocities over 5 feet per second (FPS). **Use with caution.**

Velocity of flow values are computed from the general equation $V = .408 \frac{Q}{d^2}$

Friction pressure loss values are computed from the equation $hf = 0.2083 \left(\frac{100}{C} \right) 1.852 Q \frac{1.852}{d^4.866}$ x .433 for psi loss per 100' of pipe.

Friction Loss Characteristics

PVC Schedule 40 IPS Plastic Pipe

PVC Schedule 40 IPS Plastic Pipe

Sizes: $\frac{1}{2}$ " thru 6"

Flow: 1 thru 600 GPM

(1120, 1220) C=150 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

SIZE	1/2"		3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		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 THK.	0.109		0.113		0.133		0.140		0.145		0.154		0.203		0.216		0.237		0.280							
Flow GPM	Velocity FPS	psi Loss																								
1	1.05	0.43	0.60	0.11	0.37	0.03	0.21	0.01	0.15	0.00	0.19	0.00														
2	2.11	1.55	1.20	0.39	0.74	0.12	0.42	0.03	0.31	0.02	0.57	0.03	0.40	0.01	0.21	0.00	0.26	0.01								
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	0.55	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	4.45	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			

Note: Shaded areas of chart indicate velocities over 5 feet per second (FPS). **Use with caution.**

Velocity of flow values are computed from the general equation $V = .408 \frac{Q}{d^2}$

Friction pressure loss values are computed from the equation

$$hf = 0.2083 \left(\frac{100}{C} \right)^{1.852} \frac{Q^{1.852}}{d^{4.866}} \quad x .433 \text{ for psi loss per 100' of pipe}$$

Friction Loss Characteristics

PVC Schedule 80 IPS Plastic Pipe

PVC Schedule 80 IPS Plastic Pipe

Sizes: $\frac{1}{2}$ " thru 6"

Flow: 1 thru 600 GPM

(1120, 1220) C=150 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

SIZE	$\frac{1}{2}$ "		$\frac{3}{4}$ "		1"		$\frac{1}{4}$ "		$\frac{1}{2}$ "		2"		$\frac{1}{2}$ "		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	0.546		0.742		0.957		1.278		1.500		1.939		2.323		2.900		3.826		5.761															
WALL THK.	0.147		0.154		0.179		0.191		0.200		0.218		0.276		0.300		0.337		0.432															
Flow GPM	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss														
1	1.36	0.81	0.74	0.18	0.44	0.05	0.24	0.01	0.18	0.01	0.10	0.00	0.15	0.00																				
2	2.73	2.92	1.48	0.66	0.89	0.19	0.49	0.05	0.36	0.02	0.21	0.01																						
3	4.10	6.19	2.22	1.39	1.33	0.40	0.74	0.10	0.54	0.05	0.32	0.01	0.22	0.01																				
4	5.47	10.54	2.96	2.37	1.78	0.69	0.99	0.17	0.72	0.08	0.43	0.02	0.30	0.01																				
5	6.84	15.93	3.70	3.58	2.22	1.04	1.24	0.25	0.90	0.12	0.54	0.03	0.37	0.01	0.24	0.00																		
6	8.21	22.33	4.44	5.02	2.67	1.46	1.49	0.36	1.08	0.16	0.65	0.05	0.45	0.02	0.29	0.01																		
7	9.58	29.71	5.18	6.68	3.11	1.94	1.74	0.47	1.26	0.22	0.75	0.06	0.52	0.03	0.33	0.01																		
8	10.94	38.05	5.92	8.56	3.56	2.48	1.99	0.61	1.45	0.28	0.86	0.08	0.60	0.03	0.38	0.01																		
9	12.31	47.33	6.66	10.64	4.00	3.09	2.24	0.76	1.63	0.35	0.97	0.10	0.68	0.04	0.43	0.01																		
10	13.68	57.52	7.41	12.93	4.45	3.75	2.49	0.92	1.81	0.42	1.08	0.12	0.75	0.05	0.48	0.02	0.27	0.00																
11	15.05	68.63	8.15	15.43	4.90	4.47	2.74	1.10	1.99	0.50	1.19	0.14	0.83	0.06	0.53	0.02	0.30	0.01																
12	16.42	80.63	8.89	18.13	5.34	5.26	2.99	1.29	2.17	0.59	1.30	0.17	0.90	0.07	0.58	0.02	0.33	0.01																
14			10.37	24.12	6.23	6.99	3.49	1.71	2.53	0.79	1.51	0.23	1.05	0.09	0.67	0.03	0.39	0.01																
16			11.85	30.88	7.12	8.95	3.99	2.19	2.90	0.01	1.73	0.29	1.20	1.12	0.77	0.04	0.44	0.01																
18			13.33	38.41	8.01	11.14	4.49	2.73	3.26	1.26	1.95	0.36	1.36	0.15	0.87	0.05	0.50	0.01																
20			14.82	46.69	8.90	13.54	4.99	3.31	3.62	1.52	2.17	0.44	1.51	0.18	0.97	0.06	0.55	0.02																
22			16.30	55.70	9.80	16.15	5.49	3.95	3.98	1.81	2.38	0.52	1.66	0.22	1.06	0.07	0.61	0.02																
24			17.78	65.44	10.69	18.97	5.99	4.64	4.35	2.13	2.60	0.61	1.81	0.25	1.16	0.09	0.66	0.02																
26			19.26	75.90	11.58	22.01	6.49	5.39	4.71	2.47	2.82	0.71	1.96	0.29	1.26	0.10	0.72	0.03																
28					12.47	25.24	6.99	6.18	5.07	2.83	3.03	0.81	2.11	0.34	1.35	0.11	0.78	0.03																
30					13.36	28.69	7.49	7.02	5.43	3.22	3.25	0.92	2.26	0.38	1.45	0.13	0.83	0.03	0.36	0.00														
35					15.59	38.16	8.74	9.34	6.34	4.29	3.79	1.23	2.64	0.51	1.69	0.17	0.97	0.05	0.43	0.01														
40					17.81	48.87	9.99	11.96	7.25	5.49	4.34	1.57	3.02	0.65	1.94	0.22	1.11	0.06	0.49	0.01														
45						11.24	14.88	8.16	6.83	4.88	1.96	3.40	0.81	2.18	0.28	1.25	0.07	0.55	0.01															
50						12.49	18.09	9.06	8.30	5.42	2.38	3.78	0.99	2.42	0.34	1.39	0.09	0.61	0.01															
55						13.73	21.58	9.97	9.90	5.96	2.84	4.15	1.18	2.66	0.40	1.53	0.10	0.67	0.01															
60						14.98	25.35	10.87	11.63	6.51	3.33	4.53	1.38	2.91	0.47	1.67	0.12	0.73	0.02															
65						16.23	29.40	11.78	13.49	7.05	3.87	4.91	1.61	3.15	0.55	1.81	0.14	0.79	0.02															
70						17.48	33.72	12.69	15.47	7.59	4.44	5.29	1.84	3.39	0.63	1.95	0.16	0.86	0.02															
75						18.73	38.32	13.59	17.58	8.13	5.04	5.67	2.09	3.63	0.71	2.09	0.18	0.92	0.03															
80						19.98	43.19	14.50	19.81	8.68	5.68	6.04	2.36	3.88	0.80	2.22	0.21	0.98	0.03															
85							15.41	22.16	9.22	6.36	6.42	2.63	4.12	0.90	2.36	0.23	1.04	0.03																
90							16.32	24.64	9.76	7.07	6.80	2.93	4.36	1.00	2.50	0.26	1.10	0.04																
95							17.22	27.23	10.30	7.81	7.18	3.24	4.60	1.10	2.64	0.29	1.16	0.04																
100							18.13	29.95	10.85	8.59	7.56	3.57	4.85	1.21	2.78	0.31	1.22	0.04																
110							19.94	35.73	11.93	10.25	8.31	4.25	5.33	1.45	3.06	0.38	1.35	0.05																
120								13.02	12.04	9.07	5.00	5.82	1.70	3.34	0.44	1.47	0.06																	
130								14.10	13.96	9.82	5.60	6.30	1.97	3.62	0.51	1.59	0.07																	
140								15.19	16.02	10.58	6.65	6.79	2.27	3.90	0.59	1.72	0.08																	
150								16.27	18.20	11.34	7.56	7.27	2.57	4.18	0.67	1.84	0.09																	
160								17.36	20.51	12.09	8.51	7.76	2.89	4.45	0.75	1.96	0.10																	
170								18.44	22.95	12.85	9.53	8.24	3.24	4.73	0.84	2.08	0.11																	
180								19.53	25.51	13.60	10.59	8.73	3.60	5.01	0.93	2.21	0.13																	
190									14.36	11.71	9.21	3.98	5.29	1.03	2.33	0.14																		
200									15.12	12.87	9.70	4.37	5.57	1.14	2.45	0.16																		
225									17.01	16.01	10.91	5.44	6.27	1.41	2.76	0.19																		
250									18.90	19.46	12.12	6.61	6.96	1.72	3.07	0.23																		
275											13.34	7.89	7.66	2.05	3.38	0.28																		
300											14.55	9.27	8.36	2.41	3.68	0.33																		
325											15.76	10.75	9.05	2.79	3.99	0.38																		
350											16.97	12.33	9.75	3.20	4.30	0.44																		
375											18.19	14.01	10.45	3.64	4.60	0.50																		
400											19.40	15.79	11.14	4.10	4.91	0.56																		
425													11.84	4.59	5.22	0.63																		
450													12.54	5.10	5.53	0.70																		
475													13.23	5.64	5.83	0.77																		
500														13.93	6.20	6.14	0.85																	
550														15.32	7.40	6.76	1.01																	
600															16.72	8.69	7.37	1.19																

Friction Loss Characteristics

Polyethylene (PE)

SDR—Pressure-rated Tube

Sizes: $\frac{1}{2}$ " thru 6"

Flow: 1 thru 600 GPM

(2306, 3206, 3306) SDR 7, 9, 11.5, 15 C=150 PSI LOSS PER 100 FEET OF TUBE (PSI/100 FT)

SIZE	$\frac{1}{2}"$		$\frac{3}{4}"$		1"		$1\frac{1}{4}"$		$1\frac{1}{2}"$		2"		$2\frac{1}{2}"$		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 GPM	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	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								
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								
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								
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								
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								
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								
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								
10	10.54	34.67	6.00	8.82	3.70	2.14	0.72	1.57	0.34	0.95	0.10	0.66	0.04							
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								
12	12.66	48.60	7.21	12.37	4.44	3.82	2.57	1.01	1.88	0.48	1.14	0.14								
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								
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								
18	18.98	92.97	10.81	26.21	6.67	8.10	3.85	2.13	2.83	1.01	1.71	0.30								
20			12.01	31.86	7.41	9.84	4.28	2.59	3.14	1.22	1.90	0.36								
22					13.21	38.01	8.15	11.74	4.71	3.09	3.46	1.46								
24					14.42	44.65	8.89	13.79	5.14	3.63	3.77	1.72								
26					15.62	41.79	9.64	16.00	5.57	4.21	4.09	1.99								
28					16.82	59.41	10.38	18.35	5.99	4.83	4.40	2.28								
30					18.02	67.50	11.12	20.85	6.42	5.49	4.72	2.59								
35							12.97	27.74	7.49	7.31	5.50	3.45								
40									14.83	35.53	8.56	9.36								
45									16.68	44.19	9.64	11.64								
50									18.53	53.71	10.71	14.14								
55											11.78	16.87								
60											12.85	19.82								
65											13.92	22.99								
70											14.99	26.37								
75											16.06	29.97								
80											17.13	33.77								
85											18.21	37.79								
90											19.28	42.01								
95																				
100																				
110																				
120																				
130																				
140																				
150																				
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375																				
400																				
425																				
450																				
475																				
500																				
550																				
600																				

Note: Shaded areas of chart indicate velocities over 5 feet per second (FPS). **Use with caution.**

Velocity of flow values are computed from the general equation $V = .408 \frac{Q}{d^2}$

Friction pressure loss values are computed from the equation $hf = 0.2083 \left(\frac{100}{C} \right) 1.852 \frac{Q^{1.852}}{d^{4.866}}$ x .433 for psi loss per 100' of pipe

Friction Loss Characteristics

Type K Copper Water Tube C-140

Type K Copper Water Tube C=140												PSI LOSS PER 100 FEET OF TUBE (PSI/100 FT)						
SIZE	$\frac{1}{2}$ "		$\frac{5}{8}$ "		$\frac{3}{4}$ "		1"		$1\frac{1}{4}$ "		$1\frac{1}{2}$ "		2"		$2\frac{1}{2}$ "		3"	
OD	0.625		0.750		0.875		1.125		1.375		1.625		2.125		2.625		3.125	
ID	0.527		0.652		0.745		0.995		1.245		1.481		1.959		2.435		2.907	
WALL THK.	0.049		0.049		0.065		0.065		0.065		0.072		0.083		0.095		0.109	
Flow GPM	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss	Velocity FPS	psi Loss
1	1.46	1.09	0.95	0.39	0.73	0.20	0.41	0.05	0.26	0.02	0.18	0.01	0.10	0.00				
2	2.93	3.94	1.91	1.40	1.47	0.73	0.82	0.18	0.52	0.06	0.37	0.03	0.21	0.01				
3	4.40	8.35	2.87	2.97	2.20	1.55	1.23	0.38	0.78	0.13	0.55	0.05	0.31	0.01	0.20	0.00		
4	5.87	14.23	3.83	5.05	2.94	2.64	1.64	0.65	1.05	0.22	0.74	0.09	0.42	0.02	0.27	0.01	0.19	0.00
5	7.34	21.51	4.79	7.64	3.67	3.99	2.06	0.98	1.31	0.33	0.93	0.14	0.53	0.04	0.34	0.01	0.24	0.01
6	8.81	30.15	5.75	10.70	4.41	5.60	2.47	1.37	1.57	0.46	1.11	0.20	0.63	0.05	0.41	0.02	0.28	0.01
7	10.28	40.11	6.71	14.24	5.14	7.44	2.88	1.82	1.84	0.61	1.30	0.26	0.74	0.07	0.48	0.02	0.33	0.01
8	11.75	51.37	7.67	18.24	5.88	9.53	3.29	2.33	2.10	0.78	1.48	0.34	0.85	0.09	0.55	0.03	0.38	0.01
9	13.22	63.89	8.63	22.68	6.61	11.86	3.70	2.90	2.36	0.97	1.67	0.42	0.95	0.11	0.61	0.04	0.43	0.02
10	14.69	77.66	9.59	27.57	7.35	14.41	4.12	3.53	2.63	1.18	1.86	0.51	1.06	0.13	0.68	0.05	0.48	0.02
11	16.15	92.65	10.55	32.89	8.08	17.19	4.53	4.21	2.89	1.41	2.04	0.61	1.16	0.16	0.75	0.05	0.53	0.02
12	17.62	108.85	11.51	38.64	8.82	20.20	4.94	4.94	3.15	1.60	2.23	0.71	1.27	0.18	0.82	0.06	0.57	0.03
14			13.43	51.41	10.29	26.87	5.76	6.57	3.68	2.21	2.60	0.95	1.48	0.24	0.95	0.08	0.67	0.04
16			15.35	65.83	11.76	34.41	6.59	8.42	4.21	2.83	2.97	1.22	1.70	0.31	1.10	0.11	0.77	0.05
18			17.27	81.88	13.23	42.80	7.41	10.47	4.73	3.52	3.34	1.51	1.91	0.39	1.23	0.13	0.86	0.06
20			19.19	99.53	14.70	52.02	8.24	12.73	5.26	4.28	3.72	1.84	1.12	0.47	1.37	0.16	0.96	0.07
22					16.17	62.06	9.06	15.18	5.79	5.10	4.09	2.19	2.33	0.56	1.51	0.20	1.06	0.08
24					17.64	72.92	9.89	17.84	6.31	5.99	4.46	2.58	2.55	0.66	1.65	0.23	1.15	0.10
26					19.11	84.57	10.71	10.69	6.84	6.95	4.83	2.99	2.76	0.77	1.78	0.27	1.25	0.11
28							11.53	23.73	7.37	7.98	5.20	3.43	2.97	0.88	1.92	0.30	1.35	0.13
30							12.36	26.97	7.89	9.06	5.58	3.89	3.18	1.00	2.06	0.35	1.44	0.15
35							14.42	35.88	9.21	12.06	6.51	5.18	3.72	1.33	2.40	0.46	1.68	0.19
40							16.48	45.95	10.52	15.44	7.44	6.63	4.25	1.70	2.75	0.59	1.93	0.25
45							18.54	57.15	11.84	19.20	8.37	8.25	4.78	2.12	3.00	0.73	2.17	0.31
50									13.16	23.34	9.30	10.03	5.31	2.57	3.44	0.89	2.41	0.38
55									14.47	27.85	10.23	11.97	5.84	3.07	3.78	1.06	2.65	0.45
60									15.79	32.71	11.16	14.06	6.37	3.60	4.12	1.25	2.89	0.53
65									17.10	37.94	12.09	16.31	6.91	4.18	4.47	1.45	3.13	0.61
70									18.42	43.52	13.02	18.70	7.44	4.80	4.81	1.66	3.37	0.70
75									19.74	49.46	13.95	21.25	7.97	5.45	5.16	1.89	3.62	0.80
80											14.88	23.95	8.50	6.14	5.50	2.13	3.86	0.90
85											15.81	26.80	9.03	6.87	5.84	2.38	4.10	1.01
90											16.74	29.79	9.56	7.64	6.19	2.65	4.34	1.12
95											17.67	32.93	10.09	8.44	6.53	2.93	4.58	1.24
100											18.60	36.21	10.63	9.28	6.88	3.22	4.82	1.36
110												11.69	11.08	7.56	3.84	5.31	5.61	
120													12.75	13.01	8.25	4.52	5.79	1.91
130													13.82	15.09	8.94	5.24	6.27	2.21
140													14.88	17.31	9.63	6.01	6.75	2.54
150													15.94	19.67	10.32	6.83	7.24	2.88
160													17.01	22.17	11.00	7.69	7.72	3.25
170													18.07	24.81	11.69	8.61	8.20	3.64
180													19.13	27.58	12.38	9.57	8.69	4.04
190														13.07	10.58	9.17	4.47	
200														13.76	11.63	9.65	4.91	
225														15.48	14.47	10.86	6.11	
250														17.20	17.58	12.07	7.43	
275														18.92	20.98	13.27	8.86	
300																14.48	10.41	
325																15.69	12.07	
350																16.89	13.85	
375																18.10	15.73	
400																19.31	17.73	
425																		
450																		
475																		
500																		
550																		
600																		

Note: ■ Shaded areas of chart indicate velocities over 5 feet per second (FPS). **Use with caution.**

Velocity of flow values are computed from the general equation $V = .408 \frac{Q}{d^2}$

Friction pressure loss values are computed from the equation $hf = 0.2083 \left(\frac{100}{C} \right)^{1.852} \frac{Q^{1.852}}{d^{4.866}}$ x .433 for psi loss per 100' of pipe

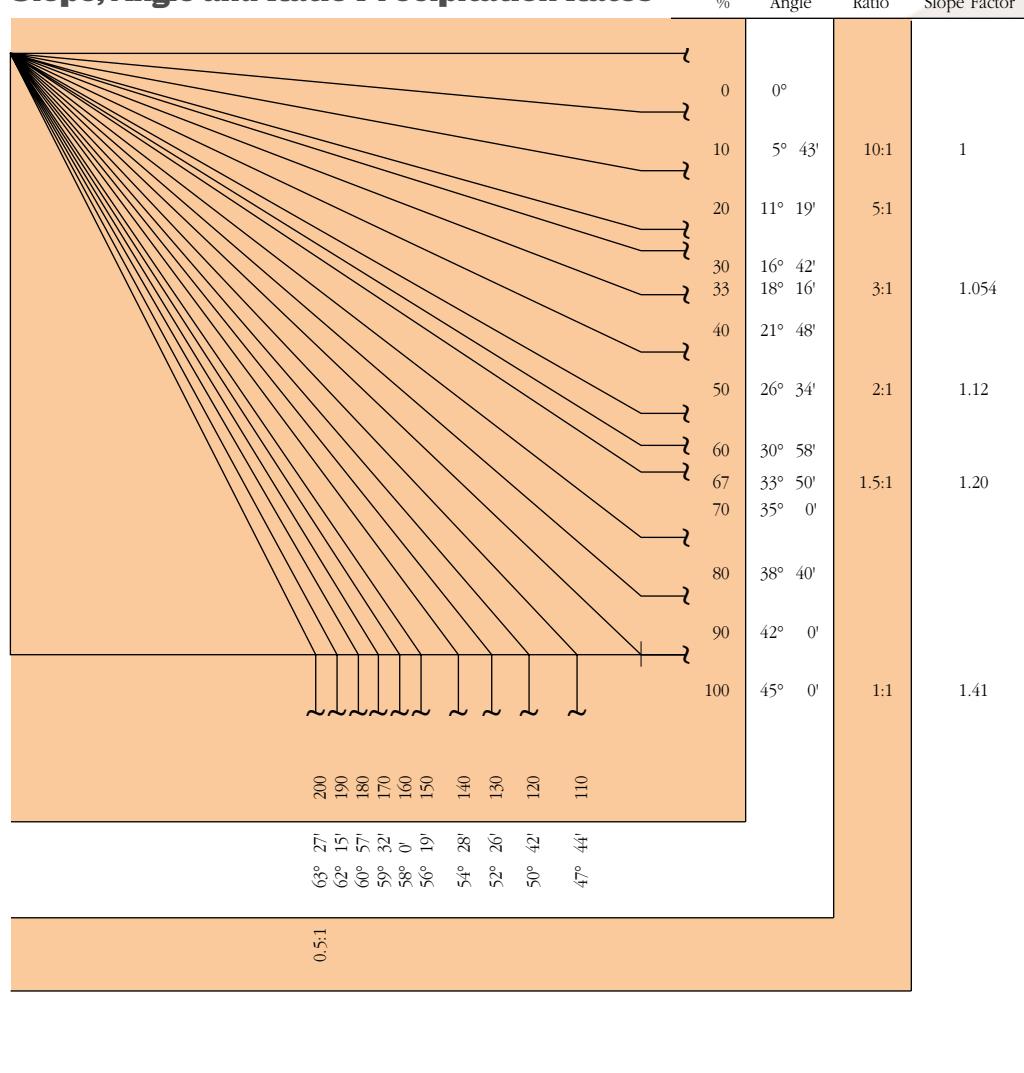
Pressure Loss Through Water Meters

Pressure Loss—psi

FLOW GPM	NOMINAL SIZE						
	5/8"	3/4"	1"	1 1/2"	2"	3"	4"
1	0.2	0.1					
2	0.3	0.2					
3	0.4	0.3					
4	0.6	0.5	0.1				
5	0.9	0.6	0.2				
6	1.3	0.7	0.3				
7	1.8	0.8	0.4				
8	2.3	1.0	0.5				
9	3.0	1.3	0.6				
10	3.7	1.6	0.7				
11	4.4	1.9	0.8				
12	5.1	2.2	0.9				
13	6.1	2.6	1.0				
14	7.2	3.1	1.1				
15	8.3	3.6	1.2				
16	9.4	4.1	1.4	0.4			
17	10.7	4.6	1.6	0.5			
18	12.0	5.2	1.8	0.6			
19	13.4	5.8	2.0	0.7			
20	15.0	6.5	2.2	0.8			
22		7.9	2.8	1.0			
24		9.5	3.4	1.2			
26		11.2	4.0	1.4			
28		13.0	4.6	1.6			
30		15.0	5.3	1.8	0.7		
32			6.0	2.1	0.8		
34			6.9	2.4	0.9		
36			7.8	2.7	1.0		
38			8.7	3.0	1.2		
40			9.6	3.3	1.3		
42			10.6	3.6	1.4		
44			11.7	3.9	1.5		
46			12.8	4.2	1.6		
48			13.9	4.5	1.7		
50			15.0	4.9	1.9	0.7	
52				5.3	2.1		
54				5.7	2.2		
56				6.2	2.3		
58				6.7	2.5		
60				7.2	2.7	1.0	
65				8.3	3.2	1.1	
70				9.8	3.7	1.3	
75				11.3	4.3	1.5	
80				12.8	4.9	1.6	0.7
90				16.1	6.2	2.0	0.8
100				20.0	7.8	2.5	0.9
110					9.5	2.9	1.0
120					11.3	3.4	1.2
130					13.0	3.9	1.4
140					15.1	4.5	1.6
150					17.3	5.1	1.8
160					20.0	5.8	2.1
170						6.5	2.4
180						7.2	2.7
190						8.0	3.0
200						9.0	3.2
220						11.0	3.9
240						13.0	4.7
260						15.0	5.5
280						17.3	6.3
300						20.0	7.2
350							10.0
400							13.0
450							16.2
500							20.0

Precipitation Rate Reference Charts

Slope, Angle and Ratio Precipitation Rates



Maximum Precipitation Rates

Soil Texture	Maximum Precipitation Rates: Inches Per Hour							
	0 to 5% slope		5 to 8% slope		8 to 12% slope		12% + slope	
	Cover	Bare	Cover	Bare	Cover	Bare	Cover	Bare
Coarse sandy soils	2.00	2.00	2.00	1.50	1.50	1.0	1.0	0.50
Coarse sandy soils over compact subsoils	1.75	1.50	1.25	1.00	1.00	0.75	0.75	0.40
Uniform light sandy loams	1.75	1.00	1.25	0.80	1.00	0.60	0.75	0.40
Light sandy loams over compact subsoils	1.25	0.75	1.00	0.50	0.75	0.40	0.50	0.30
Uniform silt loams	1.00	0.50	0.80	0.40	0.60	0.30	0.40	0.20
Silt loams over compact subsoil	0.60	0.30	0.50	0.25	0.40	0.15	0.30	0.10
Heavy clay or clay loam	0.20	0.15	0.15	0.10	0.12	0.08	0.10	0.06

The maximum PR values listed are as suggested by the United States Department of Agriculture.

The values are average and may vary with respect to actual soil condition and condition of ground cover.

Wire Sizing

Method of Wire Sizing for Electrical Components of an Automatic Irrigation System

Data Needed

- Maximum current draw of the electrical unit (valve or controller) in amperes (I)
- Distance in feet (one way) to the electrical unit (F)
- The allowable voltage drop in the wire without affecting functions of the electrical unit (Vd)

Steps

1. Calculate the maximum allowable wire resistance per 1000 feet with the following formula:

$$R = \frac{500 \times V_d}{F \times I}$$

where R = allowable wire resistance per 1000 feet.

2. Select the wire size from Chart #2 which has a resistance less than that calculated in the above formula.

Example: A valve with a minimum operating voltage of 20 volts and inrush current of .30 amps is to be located 2680 ft. from a controller. The controller minimum output voltage is 24 V ac

The allowable voltage drop (Vd) = 24 - 20 = 4 volts

The distance to valve (F) = 2680 ft.

The current draw (I) = .3 amps

$$R = \frac{500 \times 4}{2680 \times .3} = 2.49 \text{ ohm/1000 ft.}$$

From Chart #2 we find that #14 AWG wire has slightly too much resistance. Therefore, choose #12 AWG copper wire. The accompanying charts are useful for quick and easy selection of wire sizes for valves with standard and optional solenoids. Chart #3 is set up to provide maximum wire runs given a standard 24 V ac valve with a minimum operating voltage of 20 volts and a controller output of 24 V ac. Chart #4 is a multiplier factor for determining maximum wire runs for other controller output voltages and optional solenoids.

Example: Determine maximum wire run to a valve with model 24 V ac-D solenoid and controller output voltage of 26 volts and #14 control and ground wire.

From Chart #3 we find a length of 2590 ft. with #14 ground and control wire. From Chart #4 the multiplier factor at 26 V ac controller output with a model 24 V ac-D solenoid is 4.33. Therefore, the maximum wire distance to the valve is: 4.33 x 2590 feet = 11,215 feet.

Minimum Operating Voltages at Various Static Pressures (standard 24 V ac solenoid)

Chart 1

Minimum Solenoid Operating Voltage Under Various Line Pressure

Line Pressure	Voltage (Internal Bleed Configurations)	Voltage (External Bleed Configurations)
200 psi (13.8 Bar)	21.1	
175 psi (12.1 Bar)	20.2	
150 psi (10.3 Bar)	19.1	20.0
125 psi (8.6 Bar)	18.2	19.1
100 psi (6.9 Bar)	17.1	18.2
75 psi (5.2 Bar)	16.1	17.3
50 psi (3.4 Bar)	16.0	16.4

Chart 2

Copper Wire Resistance of Various Sizes

Sizes AWG	Resistance at 20°C Ohms per 1000 ft.
4	.25
6	.40
8	.64
10	1.02
12	1.62
14	2.57
16	4.10
18	6.51

Chart 3

Maximum One-way Distance (ft.) Between Controller and Valve (standard 24 VAC solenoid) †

Ground Wire	Control Wire						
	18	16	14	12	10	8	6
18	1020	1260	1470	1640	1770	1860	1930
16	1260	1630	2000	2330	2610	2810	2960
14	1470	2000	2590	3180	3710	4150	4480
12	1640	2330	3180	4120	5050	5900	6590
10	1770	2610	3710	5050	6540	8030	9380
8	1860	2810	4150	5900	8030	10400	12770
6	1930	2960	4480	6590	9380	12770	16540

† Solenoid Model: 24 V ac Pressure: 150 psi Voltage Drop: 4 V Min. Op. Voltage: 20 V Amperage (peak): 0.3A

Multiplier Factor for Various Controller Output Voltages and Optional Low-voltage Solenoids

Chart 4

Controller Output Voltage	24-Volt Solenoids		
	24 V ac	24 V ac-D	24 VDC
28	2.00	5.77	5.45
27	1.75	5.05	4.77
26	1.50	4.33	4.09
25	1.25	3.61	3.41
24	1.00	2.88	2.73
23	.75	2.16	2.05
22	.50	1.44	1.36

Chart 5

Controller Output Voltage	12-Volt Solenoids		
	12 V.a.c.	12 V ac-D	12 VDC
16	.58	2.50	1.96
15	.50	2.08	1.63
14	.41	1.67	1.30
13	.33	1.25	.98
12	.25	.83	.65
11	.17	.42	.33

* This assumes control wire and ground wire are the same size.

Conversion Factors

To Convert	From	To	Multiply By
Area	acres	feet ²	43560
	acres	meters ²	4046.8
	meters ²	feet ²	10.764
	feet ²	inches ²	144
	inches ²	centimeters ²	6.452
	hectares	meters ²	10,000
	hectares	acres	2.471
Power	kilowatts	horsepower	1.3410
Flow	feet ³ /minutes	meters ³ /second	0.0004719
	feet ³ /second	meters ³ /second	.02832
	yards ³ /minute	meters ³ /second	.01274
	gallons/minute	meters ³ /hour	.22716
	gallons/minute	liters/minute	3.7854
	gallons/minutes	liters/second	.06309
	meters ³ /hour	liters/minute	16.645
	meters ³ /hour	liters/second	.2774
	liters/minute	liters/second	60
Length	feet	inches	12
	inches	centimeters	2.540
	feet	meters	.30481
	kilometers	miles	.6214
	miles	feet	5280
	miles	meters	1609.34
	millimeters	inch	.03937
Pressure	psi	kilopascals	6.89476
	psi	bars	.068948
	bars	kilopascals	100
	psi	feet of head	2.31
Velocity	feet/second	meters/second	.3048
Volume	feet ³	gallons	7.481
	feet ³	liters	28.32
	meters ³	feet ³	35.31
	meters ³	yard ³	1.3087
	yards ³	feet ³	27
	yards ³	gallons	202
	acres/feet	feet ³	43,560
	gallons	meters ³	.003785
	gallons	liters	3.785
	imperial gallons	gallons	1.833

Sales Warranty

The Toro Company and its affiliate, Toro Warranty Company pursuant to an agreement between them, jointly warrants to The Toro Company trade customers that The Toro Company products for micro-irrigation use will be free from original defects in materials and workmanship for the period described herein, provided they are used for irrigation purposes under manufacturer's recommended specifications.

The Toro Company price list for micro-irrigation products is F.O.B. Factory. The Toro Company is not liable for loss or damage occurring during shipment. Responsibility for safe delivery is assumed by the customer and freight carrier at the time of shipment. Claims for such damages should be filed with the freight carrier immediately upon identification.

Claims for damages that are not freight related should be filed with The Toro Company at the address below no later than five days from date of receipt.

The Toro Warranty Company

1588 N. Marshall Avenue • El Cajon, CA 92020

The Toro Company warranty does not apply to loss or damage to the product due to anything other than product defect. For example and not by way of limitation, this warranty does not apply to loss or damage to the product, vegetation or other property or personal injury due to improper installation and/or application (including non standard use of product as for example mechanical moved irrigation systems, waste water or others), abuse, alteration, mishandling, accident, insects, rodents, mechanical damage, plugging, over pressurization or if the product has been serviced by other than The Toro Company or its authorized service centers.

This warranty is not a consumer warranty and does not extend to anyone other than those trade customers who purchase The Toro Company products.

The Toro Company is not liable for failure of products not manufactured by The Toro Company even though such products may be sold or used in conjunction with The Toro Company products.

Neither The Toro Company nor Toro Warranty Company is liable for indirect, incidental, or consequential damages, including but not limited to vegetation or crop loss during periods of malfunction or resulting non-use.

Neither The Toro Company nor Toro Warranty Company is liable for any loss of damage and property damage resulting from installer's negligence.

This warranty is the only warranty made by The Toro Company or Toro Warranty Company for micro-irrigation products. It replaces all other express warranties and all implied warranties are disclaimed, including the implied warranties of merchantability and fitness for use.

Within the warranty period stated below, we agree to repair or replace, at our option and without charge, any parts which are found to have original manufacturing defects, provided the product is returned freight pre-paid. We do not warranty any labor, including but not limited to labor on installation or removal.

Warranty Period from Date of Delivery:

DL2000® Series Dripline

- Emitters2 years
- Hose.....5 years
- Rootguard®.....7 years**

Drip In® Series Dripline

- Emitters2 years
- Hose.....5 years

Blue Stripe® Hose

- Round7 years
- Micro-Distribution.....7 years

Fittings

- All1 year

Emission Devices

- All (except NGE®)1 year
- NGE Emitter2 years

Mazzei Injectors

- Airjection®1 year*

Valves

- Air Release1 year

Filters & components

- All1 year

Other accessories

- All1 year

* Warranty by Mazzei Injector Corporation

** Pro-rated warranty for root intrusion by Geoflow Inc.,





TORO®

The Toro Company

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