FOR PWM SPRAYERS

COMBO-JET® 110° Tip-Cap Performance Specifications for PWM Systems

Please Note:
1. Flow and application rates shown are for water only, applied on 20" spacing.
2. For applications where a uniform pattern is required, recommended pressures are higher than in standard spray systems.
3. Cap color determined by flow rate, as per ISO standard.
4. In order to make this chart easier to use, not all available tip-cap sizes are shown. For specifications for 005, 0067, 20, 25, 30, 40, 50 & 60 size Tip-Caps, visit our website.
5. Standard PWM systems have inherent flow capacity up to 1.5 US Gallons/Min

ER110-XX TIP SERIES — Recommended Pressure: 25-70 PSI

SR110-XX TIP SERIES — Recommended Pressure: 30-100 PSI

MR110-XX TIP SERIES — Recommended Pressure: 30-100 PSI

DR110-XX TIP SERIES — Recommended Pressure: 35-100 PSI

SPRAY TIP PART #s

Tip Cap No.	Flow Rate IGPM	PSI	Sprayer Speed Range - MPH (Rounded) @ Application Rate - Imperial Gal/Acre @ 20"					VMD (Droplet Size in µ); %<141µ (Drift %); %<200µ (Drift %); %<600µ (Small Droplets)														Tip-Cap & Part No.	
								110° ER Series				110° SR Series				110° MR Series				110° DR Series				Tip-Cap	Part #
			50	75	100	125	150	VMD	<141	<200	<600	VMD	<141	<200	<600	VMD	<141	<200	<600	VMD	<141	<200	<600	Strainer	
01	0.06	20	1-3	1-2	1-2	0-2	0-1	**149**	45%	84%	100%	-	-	-	-	-	-	-	-	-	-	-	-	ER110-01	40281-01
	0.07	30	1-4	1-3	1-3	1-2	0-2	**140**	51%	87%	100%	-	-	-	-	-	-	-	-	-	-	-	-	SR110-01	40287-01
	0.08	40	1-5	1-3	1-3	1-2	0-2	**133**	56%	89%	100%	-	-	-	-	-	-	-	-	-	-	-	-	MR110-01	40291-01
	0.09	50	1-6	1-4	1-4	1-3	1-2	**128**	59%	91%	100%	-	-	-	-	-	-	-	-	-	-	-	-	DR110-01	40286-01
	0.10	60	2-6	1-4	1-4	1-3	1-2	**124**	62%	93%	100%	-	-	-	-	-	-	-	-	-	-	-	-	100 Mesh - Green	
	0.11	70	2-7	1-4	1-4	1-3	1-3	**121**	65%	94%	100%	-	-	-	-	-	-	-	-	-	-	-	-	40251-00	
015	0.09	20	1-5	1-3	1-3	1-3	1-2	**153**	40%	77%	100%	-	-	-	-	-	-	-	-	-	-	-	-	ER110-015	40281-015
	0.11	30	2-6	1-4	1-4	1-3	1-3	**145**	47%	81%	100%	**216**	24%	45%	98%	**323**	11%	22%	94%	**368**	7%	15%	92%	SR110-015	40287-015
	0.12	40	2-7	1-5	1-5	1-4	1-3	**139**	51%	83%	100%	**200**	28%	50%	98%	**279**	16%	30%	97%	**329**	10%	20%	94%	MR110-015	40291-015
	0.14	50	2-8	1-6	1-6	1-4	1-3	**135**	55%	86%	100%	**188**	32%	55%	98%	**248**	20%	36%	98%	**302**	12%	24%	95%	DR110-015	40286-015
	0.15	60	2-9	2-6	2-6	1-5	1-4	**131**	58%	87%	100%	**178**	34%	59%	98%	**226**	23%	41%	99%	**282**	14%	27%	96%	100 Mesh - Green	
	0.16	70	2-10	2-7	2-7	1-5	1-4	**128**	61%	89%	100%	**169**	37%	62%	98%	**209**	25%	46%	99%	**265**	15%	30%	97%	40251-00	
02	0.12	20	2-7	1-5	1-5	1-3	1-3	**173**	32%	62%	100%	-	-	-	-	-	-	-	-	-	-	-	-	ER110-02	40281-02
	0.14	30	2-9	1-6	1-6	1-4	1-3	**160**	39%	69%	100%	**220**	22%	43%	99%	**317**	11%	23%	95%	**433**	5%	10%	82%	SR110-02	40287-02
	0.17	40	2-10	2-7	2-7	1-5	1-4	**151**	45%	73%	100%	**207**	26%	48%	99%	**281**	15%	29%	97%	**394**	6%	13%	87%	MR110-02	40291-02
	0.18	50	3-11	2-7	2-7	1-5	1-4	**144**	49%	77%	100%	**197**	28%	52%	99%	**256**	18%	34%	97%	**364**	8%	16%	90%	DR110-02	40286-02
	0.20	60	3-12	2-8	2-8	2-6	1-5	**138**	52%	80%	100%	**189**	31%	55%	99%	**237**	21%	38%	98%	**339**	9%	19%	91%	50 Mesh - Red	
	0.22	70	3-13	2-9	2-9	2-6	1-5	**133**	55%	82%	100%	**182**	32%	57%	99%	**222**	23%	42%	98%	**318**	10%	20%	93%	40250-00	
025	0.15	20	2-9	1-6	1-6	1-4	1-3	**194**	28%	54%	100%	-	-	-	-	-	-	-	-	-	-	-	-	ER110-025	40281-025
	0.18	30	3-11	2-7	2-7	1-5	1-4	**187**	29%	56%	100%	**237**	19%	38%	98%	**353**	8%	17%	90%	**437**	5%	10%	79%	SR110-025	40287-025
	0.21	40	3-12	2-8	2-8	2-6	1-5	**181**	30%	57%	100%	**223**	22%	43%	98%	**322**	11%	22%	93%	**401**	6%	13%	86%	MR110-025	40291-025
	0.23	50	3-14	2-9	2-9	2-7	1-5	**177**	30%	59%	100%	**213**	25%	46%	98%	**299**	13%	25%	95%	**373**	8%	16%	89%	DR110-025	40286-025
	0.25	60	4-15	2-10	2-10	2-7	1-6	**173**	31%	60%	100%	**204**	27%	49%	98%	**280**	15%	28%	96%	**350**	9%	18%	91%	50 Mesh - Red	
	0.27	70	4-16	3-11	3-11	2-8	2-6	**170**	31%	60%	100%	**196**	28%	51%	98%	**263**	16%	31%	96%	**331**	10%	20%	93%	40250-00	
03	0.17	20	3-10	2-7	2-7	1-5	1-4	**199**	26%	51%	99%	-	-	-	-	-	-	-	-	-	-	-	-	ER110-03	40281-03
	0.21	30	3-13	2-8	2-8	2-6	1-5	**185**	31%	56%	99%	**307**	11%	23%	95%	**399**	6%	13%	86%	**484**	3%	7%	73%	SR110-03	40287-03
	0.25	40	4-15	2-10	2-10	2-7	1-6	**175**	34%	59%	98%	**282**	14%	28%	96%	**364**	8%	17%	90%	**447**	5%	10%	79%	MR110-03	40291-03
	0.27	50	4-16	3-11	3-11	2-8	2-7	**167**	37%	62%	98%	**263**	17%	33%	97%	**337**	10%	20%	93%	**419**	6%	12%	83%	DR110-03	40286-03
	0.30	60	4-18	3-12	3-12	2-9	2-7	**160**	39%	65%	97%	**247**	19%	36%	97%	**315**	11%	22%	94%	**396**	6%	13%	86%	50 Mesh - Red	
	0.32	70	5-19	3-13	3-13	2-10	2-8	**155**	41%	67%	97%	**234**	20%	39%	97%	**297**	13%	25%	95%	**376**	7%	15%	88%	40250-00	
04	0.23	20	3-14	2-9	2-9	2-7	1-5	**243**	18%	35%	97%	-	-	-	-	-	-	-	-	-	-	-	-	ER110-04	40281-04
	0.28	30	4-17	3-11	3-11	2-8	2-7	**228**	21%	41%	97%	**319**	10%	21%	93%	**425**	4%	10%	83%	**519**	3%	6%	67%	SR110-04	40287-04
	0.32	40	5-19	3-13	3-13	2-10	2-8	**217**	24%	44%	97%	**294**	13%	26%	95%	**386**	6%	14%	88%	**478**	4%	9%	74%	MR110-04	40291-04
	0.36	50	5-21	4-14	4-14	3-11	2-9	**209**	26%	47%	96%	**275**	15%	30%	96%	**355**	8%	17%	91%	**447**	5%	10%	79%	DR110-04	40286-04
	0.40	60	6-23	4-16	4-16	3-12	2-9	**202**	27%	50%	96%	**259**	17%	33%	96%	**330**	9%	19%	93%	**421**	6%	12%	82%	50 Mesh - Red	
	0.43	70	6-25	4-17	4-17	3-13	3-10	**196**	29%	52%	96%	**245**	18%	35%	97%	**309**	10%	21%	95%	**400**	6%	13%	84%	40250-00	
05	0.28	20	4-17	3-11	3-11	2-8	2-7	**253**	17%	34%	95%	-	-	-	-	-	-	-	-	-	-	-	-	ER110-05	40281-05
	0.34	30	5-20	3-14	3-14	3-10	2-8	**231**	21%	40%	95%	**367**	7%	16%	90%	**501**	3%	7%	69%	**539**	2%	5%	61%	SR110-05	40287-05
	0.40	40	6-24	4-16	4-16	3-12	2-9	**217**	25%	44%	95%	**334**	10%	21%	93%	**459**	4%	9%	76%	**513**	3%	6%	66%	MR110-05	40291-05
	0.44	50	7-26	4-18	4-18	3-13	3-11	**207**	27%	47%	95%	**308**	12%	24%	94%	**427**	5%	12%	80%	**492**	3%	7%	70%	DR110-05	40286-05
	0.49	60	7-29	5-19	5-19	4-14	3-12	**198**	29%	50%	95%	**287**	14%	27%	95%	**400**	6%	13%	83%	**475**	3%	8%	73%	50 Mesh - Red	
	0.52	70	8-31	5-21	5-21	4-16	3-12	**192**	31%	52%	95%	**269**	15%	30%	96%	**378**	7%	15%	85%	**460**	4%	8%	75%	40250-00	
06	0.33	20	5-20	3-13	3-13	2-10	2-8	**289**	13%	26%	94%	-	-	-	-	-	-	-	-	-	-	-	-	ER110-06	40281-06
	0.40	30	6-24	4-16	4-16	3-12	2-10	**268**	16%	32%	94%	**438**	5%	10%	81%	**524**	3%	6%	64%	**583**	2%	4%	54%	SR110-06	40287-06
	0.47	40	7-28	5-18	5-18	3-14	3-11	**253**	19%	36%	94%	**393**	7%	15%	87%	**490**	3%	8%	71%	**547**	2%	5%	61%	MR110-06	40291-06
	0.52	50	8-31	5-21	5-21	4-15	3-12	**242**	21%	39%	95%	**358**	9%	19%	90%	**465**	4%	9%	76%	**519**	3%	6%	65%	DR110-06	40286-06
	0.57	60	8-34	6-23	6-23	4-17	3-14	**233**	23%	41%	95%	**330**	11%	22%	92%	**443**	5%	10%	79%	**496**	3%	7%	69%	50 Mesh - Red	
	0.62	70	9-37	6-24	6-24	5-18	4-15	**225**	24%	43%	95%	**306**	12%	24%	93%	**426**	5%	11%	81%	**476**	3%	7%	71%	40250-00	

Droplet Categories as per **ASABE S572.1** Classification (2009-current)

Extremely Fine	Very Fine	Fine	Medium	Coarse	Very Coarse	Extremely Coarse	Ultra Coarse
<60	60-105µ	106-235µ	236-340µ	341-403µ	404-502µ	503-665µ	>665µ

VMD
Volume Median Diameter
Size of the median droplet in microns (µ) for a sprayed volume. Half of the volume is made up of droplets smaller than the VMD; half is made up of droplets larger.

% <141µ
% Driftable Fines
Percentage of volume which is likely to drift. 141µ is now replacing 200µ as the new standard for driftable fines.

% <200µ
% Driftable Fines
Percentage of volume which is likely to drift. 200µ is shown for reference. 141µ is used as the new standard for driftable fines.

% <600µ
% Useful Droplets
Percentage of volume which is made up of 'useful' droplets. As the distribution of useful droplets lowers, coverage is reduced.

Strainer Mesh & Tips
Recommended Strainer mesh
Mesh of strainer determined by the size of a tip. For larger tips (08+), strainers are not required. For PWM systems, typically 80 mesh inline strainers are used as well.

COMBO-JET® 110° Tip-Cap Performance Specifications for PWM Systems

Please Note:
1. Flow and application rates shown are for water only, applied on 20" spacing.
2. For applications where a uniform pattern is required, recommended pressures are higher than in standard spray systems.
3. Cap color determined by flow rate, as per ISO standard.
4. In order to make this chart easier to use, not all available tip-cap sizes are shown. For specifications for 005, 0067, 20, 25, 30, 40, 50 & 60 size Tip-Caps, visit our website.
5. Standard PWM systems have inherent flow capacity up to 1.5 USG/Min

ER110-XX TIP SERIES — Recommended pressure varies with each size of tip

SR110-XX TIP SERIES — Recommended pressure varies with each size of tip

MR110-XX TIP SERIES — Recommended pressure varies with each size of tip

DR110-XX TIP SERIES — Recommended pressure varies with each size of tip

SPRAY TIP PART #s

Tip Cap No.	Flow Rate IGPM	PSI	Sprayer Speed Range - MPH (Rounded) @ Application Rate - Imperial Gal/Acre @ 20"					VMD (Droplet Size in µ); %<141µ (Drift %); %<200µ (Drift %); %<600µ (Small Droplets)														Tip-Cap & Part No.	
								110° ER Series				110° SR Series				110° MR Series				110° DR Series				Tip-Cap	Part #
			5.0	7.5	10.0	12.5	15.0	VMD	<141	<200	<600	VMD	<141	<200	<600	VMD	<141	<200	<600	VMD	<141	<200	<600	Strainer not req'd	
	0.51	30	8-30	5-20	5-20	4-15	3-12	312	15%	28%	92%	489	4%	11%	59%	570	3%	7%	45%	651	3%	4%	35%	ER110-08	40281-08
	0.59	40	9-35	6-23	6-23	4-18	4-14	286	18%	32%	93%	445	6%	13%	68%	522	4%	9%	54%	606	3%	5%	42%	SR110-08	40287-08
08	0.66	50	10-39	7-26	7-26	5-20	4-16	266	20%	36%	95%	410	7%	15%	74%	486	5%	10%	61%	571	4%	6%	47%	MR110-08	40291-08
	0.73	60	11-43	7-29	7-29	5-22	4-17	249	21%	38%	95%	382	8%	16%	78%	455	6%	11%	65%	543	4%	7%	50%	DR110-08	40286-08
	0.78	70	12-47	8-31	8-31	6-23	5-19	235	23%	41%	96%	359	9%	17%	80%	430	6%	12%	69%	519	4%	8%	53%		
	0.61	30	9-36	6-24	6-24	5-18	4-14	357	11%	25%	88%	527	4%	9%	50%	579	3%	6%	43%	716	2%	3%	26%	ER110-10	40281-10
	0.70	40	10-42	7-28	7-28	5-21	4-17	330	13%	28%	90%	480	6%	11%	60%	533	4%	7%	51%	679	2%	4%	31%	SR110-10	40287-10
10	0.78	50	12-47	8-31	8-31	6-23	5-19	310	16%	31%	91%	444	7%	13%	67%	497	5%	8%	57%	651	3%	5%	35%	MR110-10	40291-10
	0.86	60	13-51	8-34	8-34	6-25	5-20	293	17%	33%	92%	414	8%	14%	72%	468	5%	10%	61%	628	3%	5%	38%	DR110-10	40286-10
	0.93	70	14-55	9-37	9-37	7-28	6-22	278	19%	35%	93%	389	8%	15%	75%	444	6%	10%	64%	608	4%	6%	40%		
	0.70	30	10-42	7-28	7-28	5-21	4-17	430	8%	16%	68%	554	3%	5%	44%	699	3%	3%	24%	702	2%	4%	27%	ER110-125	40281-125
	0.81	40	12-48	8-32	8-32	6-24	5-19	403	9%	17%	73%	506	4%	8%	55%	652	3%	4%	33%	671	3%	5%	31%	SR110-125	40287-125
125	0.91	50	13-54	9-36	9-36	7-27	5-22	383	10%	18%	77%	469	5%	10%	62%	616	4%	6%	40%	646	3%	6%	35%	MR110-125	40291-128
	0.99	60	15-59	10-39	10-39	7-29	6-24	366	11%	19%	79%	439	6%	12%	67%	587	4%	7%	44%	626	4%	6%	37%	DR110-125	40286-125
	1.07	70	16-64	11-42	11-42	8-32	6-25	351	12%	20%	81%	413	6%	13%	71%	562	5%	7%	48%	609	4%	7%	40%		
	0.78	30	12-46	8-31	8-31	6-23	5-18	463	7%	14%	58%	636	3%	4%	27%	686	4%	5%	27%	740	3%	2%	23%	ER110-15	40281-15
	0.90	40	13-53	9-36	9-36	7-27	5-21	434	9%	16%	65%	594	4%	6%	38%	652	4%	6%	33%	705	3%	3%	31%	SR110-15	40287-15
15	1.00	50	15-60	10-40	10-40	7-30	6-24	413	10%	17%	69%	561	4%	7%	46%	626	4%	6%	38%	678	3%	4%	36%	MR110-15	40291-15
	1.10	60	16-65	11-44	11-44	8-33	7-26	395	11%	18%	72%	534	5%	8%	52%	604	4%	7%	41%	655	3%	5%	40%	DR110-15	40286-15
	1.19	70	18-71	12-47	12-47	9-35	7-28	380	11%	19%	74%	511	5%	9%	56%	586	4%	7%	44%	637	4%	5%	43%		

*Droplet categories: The above chart is based on the ASABE Standard 572.1. Refer to chemical label to verify which ASABE S572.1 categories should be followed.

Droplet Categories as per **ASABE S572.1** Classification (2009-current)

Extremely Fine	Very Fine	Fine	Medium	Coarse	Very Coarse	Extremely Coarse	Ultra Coarse
<60	60-105µ	106-235µ	236-340µ	341-403µ	404-502µ	503-665µ	>665µ

Recommended Pressure
Pressure Range for Tips
For PWM systems, the pressure loss through system components is accounted for in these charts. Specified pressure in chart is boom pressure. Additional solenoid wear may occur for pressures above 60PSI.

ASABE Droplet Categories
Color Classifications
The colors associated with the VMD is based on an ASABE standard for droplet size categorization. See categories and colors above. Refer to wilger.net for older ASABE standard S572.

Duty Cycles
Effective run time of PWM
Since PWM systems hold pressure constant, they adjust rates by the length of time the solenoids stay open (the duty cycle). Duty cycle is calculated by dividing your current speed into the max speed for that tip. Ideal operating duty cycles are 40-100%.

Pre-orifice Length & Color
Differences in tip pre-orifices
Pre-orifice color and length vary for some tips. SR-series pre-orifices will vary in color from the color of the cap. MR & DR pre-orifices will be the same color as the cap. Pre-orifices for high volume tips use a longer pre-orifice.

Using Tip Wizard
Same search, different results
PWM systems use plumbing components that cause more in pressure loss when compared to standard spray systems. Tip Wizard accounts for those pressure drops, and also provides crucial duty cycle information as well.

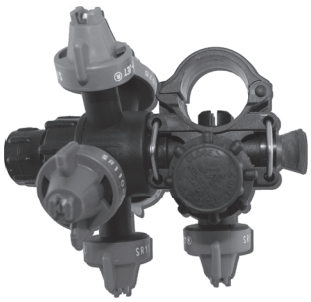
Multi-tip spraying with Pulse Width Modulation Technology

Pulse Width Modulation (PWM) provides the ability to hold tip pressure constant; therefore, holding the droplet size constant as well. This holds true with multi-tip spraying as well.

As a standard, PWM systems use one solenoid per nozzle body. For best utilization of PWM technology, a dual tip adapter [left] is used.

Spraying with two seperate outlets [right] is possible, but the outlet not controlled by a solenoid will be controlled by the auto-rate controller.

To use Tip Wizard to help select a multi-tip setup, simply split the total flow rate into two (or more) parts and ensure the tips selected can operate within the same duty cycle range and pressures.



Example Rate: 10 Imp Gal/Acre; **Speed:** 15 MPH; **Nozzle Spacing:** 20"; **Target Droplet Size:** 400 microns (Systemic Herbicide)

If the total application is 10 IGPA, the effective rates per tip must add up to 10 IGPA. For simplicity, split the flow in equal parts; for example, two tips applying 5 IGPA. While consulting the tip charts, a suitable choice might be the MR110-04 at 40 PSI with an effective volume of 5 IGPA per tip. The droplet size is right around 400µ, and travel speed at max speed (19.3MPH) is roughly at a 78% duty cycle.