

FOR PWM SPRAYERS

COMBO-JET® 80° 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									ER80-XX TIP SERIES <small>Recommended Pressure: 25-70 PSI</small>			SR80-XX TIP SERIES <small>Recommended Pressure: 30-100 PSI</small>				MR80-XX TIP SERIES <small>Recommended Pressure: 30-100 PSI</small>				DR80-XX TIP SERIES <small>Recommended Pressure: 35-100 PSI</small>				SPRAY TIP PART #s		
Tip Cap No.	Flow Rate IGPM	PSI	Sprayer Speed Range - MPH (Rounded)					VMD (Droplet Size in µ; %<141µ (Drift %); %<200µ (Drift %); %<600µ (Small Droplets))												Tip-Cap & Part No.						
			@ Application Rate - Imperial Gal/Acre @ 20"					80° ER Series			80° SR Series			80° MR Series			80° DR Series			Tip-Cap	Part #					
			5	7.5	10	12.5	15	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	0-2	0-1	0-1	176	28%	64%	100%	293	8%	22%	97%	-	-	-	-	-	-	-	-	-	ER80-01	40270-01
	0.07	30	1-4	1-3	1-2	0-2	0-1	156	41%	74%	100%	234	20%	39%	97%	219	23%	43%	97%	312	10%	21%	94%	SR80-01	40288-01	
	0.08	40	1-5	1-3	1-2	0-2	0-2	144	49%	81%	100%	199	29%	51%	97%	192	30%	53%	97%	275	14%	29%	96%	MR80-01	40290-01	
	0.09	50	1-6	1-4	1-3	1-2	0-2	135	56%	86%	100%	176	36%	60%	98%	173	36%	61%	97%	249	17%	34%	98%	DR80-01	40280-01	
	0.10	60	2-6	1-4	1-3	1-2	1-2	128	61%	91%	100%	159	41%	68%	98%	159	40%	67%	97%	230	19%	39%	99%	100 Mesh - Green		
015	0.11	70	2-7	1-4	1-3	1-3	1-2	122	66%	95%	100%	146	46%	75%	98%	148	44%	73%	97%	214	21%	43%	100%	40251-00		
	0.09	20	1-5	1-3	1-3	1-2	0-2	200	21%	50%	100%	318	8%	19%	93%	-	-	-	-	-	-	-	-	ER80-015	40270-015	
	0.11	30	2-6	1-4	1-3	1-3	1-2	180	29%	59%	100%	264	16%	31%	95%	324	10%	21%	94%	419	4%	9%	87%	SR80-015	40288-015	
	0.12	40	2-7	1-5	1-4	1-3	1-2	167	34%	65%	100%	231	22%	40%	96%	285	14%	28%	96%	381	6%	12%	90%	MR80-015	40290-015	
	0.14	50	2-8	1-6	1-4	1-3	1-3	158	39%	70%	100%	208	26%	48%	97%	257	17%	33%	97%	354	7%	15%	92%	DR80-015	40280-015	
02	0.15	60	2-9	2-6	1-5	1-4	1-3	151	42%	73%	100%	191	30%	53%	97%	237	19%	38%	98%	333	8%	17%	94%	100 Mesh - Green		
	0.16	70	2-10	2-7	1-5	1-4	1-3	145	45%	77%	100%	178	33%	58%	98%	221	22%	42%	99%	317	9%	19%	95%	40251-00		
	0.12	20	2-7	1-5	1-3	1-3	1-2	185	28%	56%	100%	296	9%	21%	93%	-	-	-	-	-	-	-	-	ER80-02	40270-02	
	0.14	30	2-9	1-6	1-4	1-3	1-3	171	34%	62%	100%	258	15%	31%	95%	328	8%	18%	94%	456	3%	7%	80%	SR80-02	40288-02	
	0.17	40	2-10	2-7	1-5	1-4	1-3	162	38%	66%	100%	235	20%	38%	96%	299	11%	23%	94%	421	4%	10%	84%	MR80-02	40290-02	
025	0.18	50	3-11	2-7	1-5	1-4	1-4	155	42%	69%	100%	217	24%	43%	97%	279	13%	27%	95%	396	5%	12%	86%	DR80-02	40280-02	
	0.20	60	3-12	2-8	2-6	1-5	1-4	150	44%	72%	100%	204	27%	48%	98%	263	15%	31%	95%	376	6%	13%	88%	50 Mesh - Red		
	0.22	70	3-13	2-9	2-6	1-5	1-4	146	47%	74%	99%	194	29%	52%	98%	251	17%	34%	95%	361	7%	15%	89%	40250-00		
	0.15	20	2-9	1-6	1-4	1-3	1-3	234	17%	37%	100%	344	6%	14%	89%	-	-	-	-	-	-	-	-	ER80-025	40270-025	
	0.18	30	3-11	2-7	1-5	1-4	1-4	210	23%	45%	100%	299	11%	23%	92%	429	4%	10%	80%	463	3%	7%	77%	SR80-025	40288-025	
03	0.21	40	3-12	2-8	2-6	1-5	1-4	195	28%	51%	100%	270	15%	29%	94%	386	6%	14%	84%	432	4%	10%	80%	MR80-025	40290-025	
	0.23	50	3-14	2-9	2-7	1-5	1-5	184	31%	55%	100%	250	18%	34%	95%	356	8%	17%	87%	410	5%	12%	83%	DR80-025	40280-025	
	0.25	60	4-15	2-10	2-7	1-6	1-5	175	34%	59%	100%	235	20%	38%	96%	333	9%	19%	88%	393	6%	13%	84%	50 Mesh - Red		
	0.27	70	4-16	3-11	2-8	2-6	1-5	168	36%	62%	100%	223	22%	42%	97%	315	10%	21%	90%	379	7%	14%	86%	40250-00		
	0.17	20	3-10	2-7	1-5	1-4	1-3	251	17%	38%	99%	406	4%	9%	86%	-	-	-	-	-	-	-	-	ER80-03	40270-03	
04	0.21	30	3-13	2-8	2-6	1-5	1-4	230	22%	44%	99%	349	9%	17%	89%	437	4%	10%	80%	485	3%	7%	71%	SR80-03	40288-03	
	0.25	40	4-15	2-10	2-7	1-6	1-5	217	26%	49%	99%	314	12%	22%	91%	395	6%	13%	85%	451	4%	9%	76%	MR80-03	40290-03	
	0.27	50	4-16	3-11	2-8	2-7	1-5	207	29%	52%	99%	289	14%	27%	92%	364	8%	16%	87%	426	5%	11%	80%	DR80-03	40280-03	
	0.30	60	4-18	3-12	2-9	2-7	1-6	199	31%	55%	99%	270	16%	30%	93%	341	9%	18%	89%	406	6%	13%	82%	50 Mesh - Red		
	0.32	70	5-19	3-13	2-10	2-8	2-6	192	33%	57%	99%	255	18%	33%	93%	323	10%	20%	90%	391	7%	14%	84%	40250-00		
05	0.23	20	3-14	2-9	2-7	1-5	1-5	254	16%	33%	99%	409	3%	10%	83%	-	-	-	-	-	-	-	-	ER80-04	40270-04	
	0.28	30	4-17	3-11	2-8	2-7	1-6	233	20%	39%	99%	352	6%	18%	86%	428	5%	11%	79%	551	2%	4%	60%	SR80-04	40288-04	
	0.32	40	5-19	3-13	2-10	2-8	2-6	219	23%	44%	99%	317	9%	23%	89%	393	7%	14%	83%	515	3%	6%	67%	MR80-04	40290-04	
	0.36	50	5-21	4-14	3-11	2-9	2-7	209	25%	47%	99%	292	11%	27%	90%	367	8%	17%	86%	488	3%	8%	71%	DR80-04	40280-04	
	0.40	60	6-23	4-16	3-12	2-9	2-8	201	27%	50%	99%	274	13%	30%	91%	348	10%	19%	87%	467	4%	9%	74%	50 Mesh - Red		
06	0.43	70	6-25	4-17	3-13	3-10	2-8	195	29%	52%	99%	259	14%	33%	92%	332	11%	21%	89%	450	5%	10%	76%	40250-00		
	0.28	20	4-17	3-11	2-8	2-7	1-6	303	10%	22%	95%	462	2%	6%	77%	-	-	-	-	-	-	-	-	ER80-05	40270-05	
	0.34	30	5-20	3-14	3-10	2-8	2-7	274	15%	29%	95%	396	6%	13%	82%	517	3%	6%	65%	587	1%	3%	53%	SR80-05	40288-05	
	0.40	40	6-24	4-16	3-12	2-9	2-8	255	19%	34%	95%	355	9%	18%	85%	478	4%	8%	71%	551	2%	5%	60%	MR80-05	40290-05	
	0.44	50	7-26	4-18	3-13	3-11	2-9	241	21%	38%	95%	326	11%	22%	87%	450	5%	10%	75%	524	3%	6%	65%	DR80-05	40280-05	
07	0.49	60	7-29	5-19	4-14	3-12	2-10	230	23%	41%	95%	305	13%	25%	88%	428	5%	12%	78%	503	3%	7%	68%	50 Mesh - Red		
	0.52	70	8-31	5-21	4-16	3-12	3-10	221	25%	44%	95%	287	14%	28%	89%	410	6%	13%	80%	486	4%	8%	71%	40250-00		
	0.33	20	5-20	3-13	2-10	2-8	2-7	331	11%	18%	92%	483	2%	6%	72%	-	-	-	-	-	-	-	-	ER80-06	40270-06	
	0.40	30	6-24	4-16	3-12	2-10	2-8	305	15%	24%	91%	435	4%	10%	79%	544	2%	5%	61%	613	1%	3%	48%	SR80-06	40288-06	
	0.47	40	7-28	5-18	3-14	3-11	2-9	287	18%	27%	91%	404	6%	13%	82%	509	3%	7%	67%	579	2%	5%	54%	MR80-06	40290-06	
08	0.52	50	8-31	5-21	4-15	3-12	3-10	275	21%	30%	91%	382	7%	15%	85%	483	4%	8%	71%	555	2%	6%	58%	DR80-06	40280-06	
	0.57	60	8-34	6-23	4-17	3-14	3-11	265	23%	33%	90%	364	8%	17%	87%	463	4%	9%	74%	535	3%	7%	61%	50 Mesh - Red		
0.62	70	9-37	6-24	5-18	4-15	3-12	256	24%	35%	90%	350	9%	19%	88%	447	5%	10%	76%	519	3%	8%	64%	40250-00			

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

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

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Tip Cap No.	Flow Rate IGPM	PSI	Sprayer Speed Range - MPH (Rounded)					VMD (Droplet Size in µ); %<141µ (Drift %); %<200µ (Drift %); %<600µ (Small Droplets)															Tip-Cap & Part No.		
			@ Application Rate - Imperial Gal/Acre @ 20"					80° ER Series			80° SR Series			80° MR Series			80° DR Series			Tip-Cap	Part #				
			5	7.5	10	12.5	15	VMD	<141	<200	<600	VMD	<141	<200	<600	VMD	<141	<200	<600			VMD	<141	<200	<600
08	0.51	30	8-30	5-20	4-15	3-12	3-10	345	14%	26%	88%	524	6%	10%	52%	575	5%	8%	58%	649	2%	3%	46%	ER80-08	40270-08
	0.59	40	9-35	6-23	4-18	4-14	3-12	311	18%	30%	91%	482	8%	13%	60%	532	7%	11%	65%	613	3%	5%	53%	SR80-08	40288-08
	0.66	50	10-39	7-26	5-20	4-16	3-13	287	20%	34%	92%	450	9%	15%	66%	501	8%	14%	69%	586	4%	7%	57%	MR80-08	40290-08
	0.73	60	11-43	7-29	5-22	4-17	4-14	269	23%	37%	94%	424	10%	16%	70%	477	9%	16%	72%	565	4%	8%	61%	DR80-08	40280-08
	0.78	70	12-47	8-31	6-23	5-19	4-16	254	25%	39%	94%	402	11%	17%	73%	458	10%	17%	75%	548	5%	9%	63%		
10	0.61	30	9-36	6-24	5-18	4-14	3-12	450	9%	16%	78%	560	5%	8%	44%	589	4%	6%	56%	648	3%	4%	46%	ER80-10	40270-10
	0.70	40	10-42	7-28	5-21	4-17	3-14	412	11%	20%	81%	520	6%	10%	54%	553	5%	8%	61%	618	4%	6%	51%	SR80-10	40288-10
	0.78	50	12-47	8-31	6-23	5-19	4-16	385	13%	23%	83%	489	7%	12%	60%	527	6%	10%	65%	595	5%	7%	55%	MR80-10	40290-10
	0.86	60	13-51	8-34	6-25	5-20	4-17	364	15%	25%	85%	464	8%	13%	64%	507	6%	12%	68%	577	5%	8%	58%	DR80-10	40280-10
	0.93	70	14-55	9-37	7-28	6-22	5-18	348	16%	27%	86%	442	9%	15%	67%	490	7%	13%	70%	562	6%	9%	60%		
125	0.70	30	10-42	7-28	5-21	4-17	3-14	470	9%	16%	75%	569	5%	8%	43%	638	3%	5%	47%	678	3%	4%	42%	ER80-125	40270-125
	0.81	40	12-48	8-32	6-24	5-19	4-16	436	10%	19%	78%	535	6%	10%	50%	607	4%	7%	52%	647	3%	5%	47%	SR80-125	40288-125
	0.91	50	13-54	9-36	7-27	5-22	4-18	412	11%	21%	81%	508	7%	11%	55%	584	5%	9%	56%	623	4%	6%	50%	MR80-125	40290-125
	0.99	60	15-59	10-39	7-29	6-24	5-20	393	12%	22%	83%	486	8%	12%	59%	566	6%	10%	59%	605	4%	7%	53%	DR80-125	40280-125
	1.07	70	16-64	11-42	8-32	6-25	5-21	377	13%	24%	84%	467	8%	14%	62%	551	6%	11%	61%	589	5%	8%	55%		
15	0.78	30	12-46	8-31	6-23	5-18	4-15	499	5%	11%	74%	633	4%	6%	30%	596	4%	7%	55%	718	1%	1%	34%	ER80-15	40270-15
	0.90	40	13-53	9-36	7-27	5-21	4-18	459	7%	14%	76%	599	5%	7%	38%	558	5%	10%	61%	682	2%	2%	41%	SR80-15	40288-15
	1.00	50	15-60	10-40	7-30	6-24	5-20	430	9%	17%	78%	572	5%	8%	44%	530	6%	11%	64%	655	2%	3%	45%	MR80-15	40290-15
	1.10	60	16-65	11-44	8-33	7-26	5-22	408	10%	19%	79%	550	6%	9%	48%	509	7%	13%	67%	634	3%	4%	49%	DR80-15	4028-15
	1.19	70	18-71	12-47	9-35	7-28	6-24	390	12%	21%	80%	531	6%	10%	51%	491	8%	14%	69%	616	3%	5%	51%		

*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
<60

Very Fine
60-105µ

Fine
106-235µ

Medium
236-340µ

Coarse
341-403µ

Very Coarse
404-502µ

Extremely Coarse
503-665µ

Ultra Coarse
>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 separate 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 MR80-04 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.