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 — Recommended Pressure: 25-70 PSI

SR80-XX TIP SERIES — Recommended Pressure: 30-100 PSI

MR80-XX TIP SERIES — Recommended Pressure: 30-100 PSI

DR80-XX TIP SERIES — Recommended Pressure: 35-100 PSI

SPRAY TIP PART #s

Tip Cap No.	Flow Rate L/min	BAR	Sprayer Speed Range (Rounded) @ Application Rate (Litres/Hectare) @ 50cm					VMD (Droplet Size in µ); %<141µ (Drift %); %<200µ (Drift %); %<600µ (Small Droplets)													Tip-Cap & Part No.	
								80° ER Series				80° SR Series				80° MR Series				80° 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	0.28	1.5	2-7	1-4	1-3	1-3	1-2	171	31%	66%	100%	280	11%	25%	97%	-	-	-	-	-	-	-	-	ER80-01	40270-01
	0.32	2.0	2-8	1-5	1-4	1-3	1-3	158	40%	73%	100%	238	19%	37%	97%	222	22%	42%	97%	317	9%	20%	94%	SR80-01	40288-01
	0.39	3.0	2-9	2-6	1-5	1-4	1-3	140	52%	83%	100%	190	32%	55%	97%	184	32%	56%	97%	265	15%	31%	97%	MR80-01	40290-01
	0.45	4.0	3-11	2-7	1-5	1-4	1-4	129	60%	90%	100%	162	40%	67%	98%	162	39%	66%	97%	233	19%	38%	99%	DR80-01	40280-01
	0.51	5.0	3-12	2-8	2-6	1-5	1-4	121	67%	96%	100%	143	47%	76%	98%	146	45%	74%	97%	211	22%	44%	100%	100 Mesh - Green	
	0.56	6.0	3-13	2-9	2-7	1-5	1-4	115	73%	100%	100%	129	52%	84%	98%	134	50%	80%	96%	195	24%	49%	100%	40251-00	
015	0.42	1.5	3-10	2-7	1-5	1-4	1-3	195	22%	52%	100%	306	10%	21%	94%	-	-	-	-	-	-	-	-	ER80-015	40270-015
	0.48	2.0	3-12	2-8	1-6	1-5	1-4	182	28%	58%	100%	268	15%	30%	95%	329	10%	20%	94%	424	4%	9%	86%	SR80-015	40288-015
	0.59	3.0	4-14	2-9	2-7	1-6	1-5	164	36%	67%	100%	222	23%	43%	96%	274	15%	30%	97%	371	6%	13%	91%	MR80-015	40290-015
	0.68	4.0	4-16	3-11	2-8	2-7	1-5	152	42%	73%	100%	194	29%	52%	97%	240	19%	37%	98%	337	8%	17%	93%	DR80-015	40280-015
	0.76	5.0	5-18	3-12	2-9	2-7	2-6	144	46%	77%	100%	175	34%	59%	98%	217	22%	43%	99%	313	9%	19%	95%	100 Mesh - Green	
	0.83	6.0	5-20	3-13	3-10	2-8	2-7	137	50%	81%	100%	161	37%	65%	98%	200	24%	47%	99%	295	10%	22%	96%	40251-00	
02	0.55	1.5	3-13	2-9	2-7	1-5	1-4	182	29%	58%	100%	288	10%	23%	93%	-	-	-	-	-	-	-	-	ER80-02	40270-02
	0.64	2.0	4-15	3-10	2-8	2-6	1-5	172	33%	62%	100%	261	15%	30%	95%	331	8%	17%	93%	461	3%	7%	80%	SR80-02	40288-02
	0.78	3.0	5-19	3-13	2-9	2-8	2-6	159	39%	67%	100%	228	22%	40%	97%	291	12%	25%	94%	412	5%	10%	85%	MR80-02	40290-02
	0.90	4.0	5-22	4-14	3-11	2-9	2-7	151	44%	71%	100%	207	26%	47%	97%	266	15%	30%	95%	380	6%	13%	88%	DR80-02	40280-02
	1.01	5.0	6-24	4-16	3-12	2-10	2-8	145	47%	75%	99%	192	30%	53%	98%	248	18%	35%	95%	357	7%	15%	90%	50 Mesh - Red	
	1.11	6.0	7-27	4-18	3-13	3-11	2-9	140	50%	77%	99%	180	33%	57%	98%	234	19%	38%	95%	339	8%	17%	91%	40250-00	
025	0.69	1.5	4-17	3-11	2-8	2-7	1-6	229	18%	39%	100%	334	7%	16%	90%	-	-	-	-	-	-	-	-	ER80-025	40270-025
	0.80	2.0	5-19	3-13	2-10	2-8	2-6	212	23%	45%	100%	302	11%	22%	92%	434	4%	9%	80%	466	3%	7%	76%	SR80-025	40288-025
	0.97	3.0	6-23	4-16	3-12	2-9	2-8	191	29%	52%	100%	263	16%	31%	95%	374	7%	15%	85%	424	5%	10%	81%	MR80-025	40290-025
	1.13	4.0	7-27	5-18	3-14	3-11	2-9	177	33%	58%	100%	238	20%	37%	96%	337	9%	18%	88%	396	6%	13%	84%	DR80-025	40280-025
	1.26	5.0	8-30	5-20	4-15	3-12	3-10	167	37%	62%	100%	220	22%	42%	97%	311	10%	21%	90%	376	7%	15%	86%	50 Mesh - Red	
	1.38	6.0	8-33	6-22	4-17	3-13	3-11	159	40%	66%	99%	207	25%	46%	97%	291	11%	24%	91%	360	8%	16%	87%	40250-00	
03	0.82	1.5	5-20	3-13	2-10	2-8	2-7	246	18%	39%	99%	393	5%	10%	87%	-	-	-	-	-	-	-	-	ER80-03	40270-03
	0.95	2.0	6-23	4-15	3-11	2-9	2-8	232	22%	43%	99%	353	9%	16%	89%	443	4%	9%	80%	489	3%	6%	70%	SR80-03	40288-03
	1.16	3.0	7-28	5-19	3-14	3-11	2-9	213	27%	50%	99%	304	13%	24%	91%	383	7%	14%	86%	441	4%	10%	78%	MR80-03	40290-03
	1.34	4.0	8-32	5-21	4-16	3-13	3-11	200	31%	54%	99%	273	16%	29%	92%	346	9%	18%	89%	410	6%	12%	82%	DR80-03	40280-03
	1.50	5.0	9-36	6-24	5-18	4-14	3-12	191	34%	58%	99%	251	18%	34%	93%	319	10%	21%	91%	387	7%	14%	84%	50 Mesh - Red	
	1.64	6.0	10-39	7-26	5-20	4-16	3-13	184	36%	61%	99%	235	20%	37%	94%	299	11%	23%	92%	370	8%	16%	86%	40250-00	
04	1.08	1.5	6-26	4-17	3-13	3-10	2-9	250	17%	34%	99%	396	3%	12%	83%	-	-	-	-	-	-	-	-	ER80-04	40270-04
	1.25	2.0	7-30	5-20	4-15	3-12	2-10	235	20%	39%	99%	357	6%	17%	86%	433	5%	10%	79%	556	2%	4%	59%	SR80-04	40288-04
	1.53	3.0	9-37	6-24	5-18	4-15	3-12	215	24%	45%	99%	308	10%	25%	89%	383	7%	15%	84%	504	3%	7%	68%	MR80-04	40290-04
	1.77	4.0	11-42	7-28	5-21	4-17	4-14	202	27%	49%	99%	277	13%	30%	91%	351	9%	19%	87%	471	4%	8%	74%	DR80-04	40280-04
	1.97	5.0	12-47	8-32	6-24	5-19	4-16	193	29%	52%	99%	255	15%	34%	92%	329	11%	21%	89%	446	5%	10%	77%	50 Mesh - Red	
	2.16	6.0	13-52	9-35	6-26	5-21	4-17	186	31%	55%	99%	239	17%	37%	93%	311	12%	24%	90%	427	5%	11%	79%	40250-00	
05	1.33	1.5	8-32	5-21	4-16	3-13	3-11	297	11%	24%	95%	447	3%	8%	78%	-	-	-	-	-	-	-	-	ER80-05	40270-05
	1.53	2.0	9-37	6-25	5-18	4-15	3-12	276	15%	29%	95%	401	6%	13%	81%	522	2%	6%	65%	592	1%	3%	52%	SR80-05	40288-05
	1.88	3.0	11-45	8-30	6-23	5-18	4-15	249	20%	36%	95%	344	10%	20%	85%	467	4%	9%	73%	540	2%	5%	62%	MR80-05	40290-05
	2.17	4.0	13-52	9-35	7-26	5-21	4-17	232	23%	41%	95%	308	12%	25%	88%	432	5%	11%	78%	506	3%	7%	67%	DR80-05	40280-05
	2.43	5.0	15-58	10-39	7-29	6-23	5-19	219	26%	45%	95%	283	15%	28%	89%	407	6%	13%	81%	482	4%	8%	71%	50 Mesh - Red	
	2.66	6.0	16-64	11-43	8-32	6-26	5-21	209	28%	48%	95%	265	16%	32%	91%	387	7%	15%	83%	462	4%	9%	74%	40250-00	
06	1.56	1.5	9-37	6-25	5-19	4-15	3-12	326	12%	19%	92%	473	3%	6%	73%	-	-	-	-	-	-	-	-	ER80-06	40270-06
	1.80	2.0	11-43	7-29	5-22	4-17	4-14	307	15%	23%	91%	439	4%	9%	78%	548	2%	4%	60%	617	1%	3%	48%	SR80-06	40288-06
	2.21	3.0	13-53	9-35	7-27	5-21	4-18	283	19%	28%	91%	395	6%	14%	83%	499	3%	7%	69%	570	2%	5%	56%	MR80-06	40290-06
	2.55	4.0	15-61	10-41	8-31	6-24	5-20	266	22%	32%	90%	367	8%	17%	86%	467	4%	9%	74%	539	2%	7%	61%	DR80-06	40280-06
	2.85	5.0	17-68	11-46	9-34	7-27	6-23	254	25%	35%	90%	347	9%	19%	88%	443	5%	11%	77%	516	3%	8%	64%	50 Mesh - Red	
	3.12	6.0	19-75	12-50	9-37	7-30	6-25	245	27%	38%	90%	331	10%	21%	90%	425	6%	12%	79%	498	3%	9%	67%	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® 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 USG/Min

ER80-XX TIP SERIES — Recommended pressure varies with each size of tip

SR80-XX TIP SERIES — Recommended pressure varies with each size of tip

MR80-XX TIP SERIES — Recommended pressure varies with each size of tip

DR80-XX TIP SERIES — Recommended pressure varies with each size of tip

SPRAY TIP PART #s

Tip Cap No.	Flow Rate L/min	BAR	Sprayer Speed Range (Rounded) @ Application Rate (Litres/Hectare) @ 50cm					VMD (Droplet Size in µ); %<141µ (Drift %); %<200µ (Drift %); %<600µ (Small Droplets)														Tip-Cap & Part No.	
								80° ER Series				80° SR Series				80° MR Series				80° DR Series				Tip-Cap	Part #
			50	100	150	200	250	VMD	<141	<200	<600	VMD	<141	<200	<600	VMD	<141	<200	<600	VMD	<141	<200	<600	Strainer	
	2.29	2.0	14-55	9-37	7-28	6-22	5-18	349	14%	25%	88%	529	6%	10%	51%	580	5%	8%	57%	654	2%	3%	45%	ER80-08	40270-08
	2.81	3.0	17-67	11-45	8-34	7-27	6-22	302	19%	31%	91%	470	8%	13%	62%	520	7%	12%	66%	603	3%	6%	55%	SR80-08	40288-08
08	3.24	4.0	19-78	13-52	10-39	8-31	6-26	272	22%	36%	93%	429	10%	16%	69%	482	9%	15%	72%	569	4%	8%	60%	MR800-08	40290-08
	3.62	5.0	22-87	14-58	11-43	9-35	7-29	251	25%	40%	95%	397	11%	17%	73%	454	10%	18%	75%	544	5%	9%	64%	DR80-08	40280-08
	3.97	6.0	24-95	16-64	12-48	10-38	8-32	235	27%	43%	95%	371	12%	19%	76%	432	11%	20%	78%	525	6%	10%	67%		
	2.71	2.0	16-65	11-43	8-33	7-26	5-22	455	9%	16%	78%	565	5%	8%	43%	593	4%	5%	55%	652	3%	4%	45%	ER80-10	40270-10
	3.32	3.0	20-80	13-53	10-40	8-32	7-27	402	12%	21%	82%	508	7%	11%	56%	543	5%	9%	63%	609	4%	6%	53%	SR80-10	40288-10
10	3.83	4.0	23-92	15-61	11-46	9-37	8-31	368	14%	24%	84%	468	8%	13%	63%	510	6%	11%	67%	580	5%	8%	57%	MR80-10	40290-10
	4.28	5.0	26-103	17-69	13-51	10-41	9-34	344	16%	27%	86%	437	9%	15%	68%	486	7%	13%	70%	559	6%	9%	61%	DR80-10	40280-10
	4.69	6.0	28-113	19-75	14-56	11-45	9-38	325	18%	29%	87%	412	10%	16%	71%	467	8%	15%	73%	542	6%	10%	63%		
	3.14	2.0	19-75	13-50	9-38	8-30	6-25	433	8%	16%	74%	573	5%	7%	42%	642	3%	5%	46%	682	3%	4%	41%	ER80-125	40270-125
	3.84	3.0	23-92	15-61	12-46	9-37	8-31	395	11%	20%	79%	525	6%	10%	52%	598	5%	8%	54%	638	4%	6%	48%	SR80-125	40288-125
125	4.44	4.0	27-106	18-71	13-53	11-43	9-35	369	12%	22%	82%	490	8%	12%	58%	569	6%	10%	58%	608	4%	7%	52%	MR80-125	40290-125
	4.96	5.0	30-119	20-79	15-60	12-48	10-40	348	13%	24%	84%	463	9%	14%	63%	547	7%	12%	62%	586	5%	8%	55%	DR80-125	40280-125
	5.43	6.0	33-130	22-87	16-65	13-52	11-43	331	14%	26%	86%	441	9%	15%	66%	530	7%	13%	64%	569	5%	9%	58%		
	3.47	2.0	21-83	14-56	10-42	8-33	7-28	504	5%	10%	74%	637	4%	5%	29%	601	4%	7%	55%	722	1%	1%	34%	ER80-15	40270-15
	4.26	3.0	26-102	17-68	13-51	10-41	9-34	448	8%	15%	77%	588	5%	7%	41%	548	6%	10%	62%	671	2%	3%	42%	SR80-15	40288-15
15	4.91	4.0	29-118	20-79	15-59	12-47	10-39	412	10%	19%	79%	554	6%	9%	47%	513	7%	13%	66%	637	3%	4%	48%	MR80-15	40290-15
	5.49	5.0	33-132	22-88	16-66	13-53	11-44	386	12%	21%	81%	527	6%	10%	52%	487	8%	14%	69%	612	3%	5%	52%	DR80-15	4028-15
	6.02	6.0	36-144	24-96	18-72	14-58	12-48	366	13%	23%	82%	505	7%	11%	56%	467	9%	16%	72%	593	4%	6%	55%		

*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.

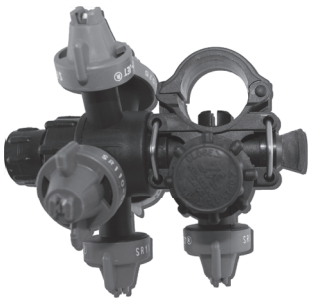
Multi-tip spraying with Pulse Width Modulation Technology

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: 100 Litres/Hectare; **Speed:** 24 KPH; **Nozzle Spacing:** 50cm; **Target Droplet Size:** 400 microns (Systemic Herbicide)

If the total application is 100L/Ha, the effective rates per tip must add up to 100L/Ha. For simplicity, split the flow in equal parts; for example, two tips applying 50L/Ha. While consulting the tip charts, a suitable choice might be the MR80-04 at ~2.8BAR with an effective volume of 50L/Ha per tip. The droplet size is right around 400µ, and travel speed at max speed (24MPH) is roughly at a 70% duty cycle.