

MPH and PSI options when applying XtendiMax, FeXapan, and Engenia^a

This document includes charts for 03, 04, 05, and 06 orifice sizes on 20-inch spacings.

All results are suggestions to help improve efficacy and mitigate drift.

Chart 1: Calculations are for a 20-inch nozzle spacing and 03 orifice sizes (Not PWM)

Prepared by Robert E. Wolf, Nov. 2017

Below are the speed and pressure options/limitations when using the recommended GPA and MPH options with an 03 orifice maintaining a PSI range of 40-65 ¹ – Not using PWM				
GPA ²	MPH ³	Calculated GPM ⁴	Calculated PSI ⁵	Use – Yes or NO ⁶
10	5	.17	12.8	NO
There are no options for using this orifice size below this MPH and GPA				
10	7	.24	25.6	NO
10	8	.27	32.4	NO
10	9	.30	40.0	YES
10	10	.34	51.4	YES
10	11	.37	60.8	YES
10	12	.40	71.1	NO
11	5	.19	16.0	NO
11	6	.22	21.5	NO
11	7	.26	30.4	NO
11	8	.30	40.0	YES
11	9	.33	48.4	YES
11	10	.37	60.8	YES
11	11	.41	74.7	NO
12	7	.28	34.8	NO
12	8	.32	45.5	YES
12	9	.36	57.6	YES
12	10	.40	71.1	NO
13	6	.26	30.0	NO
13	7	.31	42.7	YES
13	8	.35	54.4	YES
13	9	.39	67.6	NO
13	10	.44	86.0	NO
14	6	.28	34.8	NO
14	7	.33	48.4	YES
14	8	.38	64.2	YES (Engenia)
14	9	.42	78.4	NO
15	6	.30	40.0	YES
15	7	.35	54.4	YES
15	8	.40	71.1	NO
16	6	.32	45.5	YES
16	7	.38	64.2	YES (Engenia)
16	8	.43	82.2	NO
17	5	.29	37.4	NO
17	6	.34	51.4	YES
17	7	.40	71.1	NO
18	5	.30	40.0	YES
18	6	.36	57.6	YES
18	7	.42	78.4	NO
19	6	.38	64.2	YES (Engenia)
20	4	.27	32.4	NO
20	5	.34	51.4	YES
20	6	.40	71.1	NO
There are no options for using this orifice size above this MPH and GPA				

^aAll footnotes appear at the end of this document. Please read to better understand how the charts were prepared and the intention of these calculations.

Chart 2: Calculations are for a 20-inch nozzle spacing and 04 orifice sizes – Not PWM

Prepared by Robert E. Wolf, Nov. 2017

Below are the speed and pressure options/limitations when using the recommended GPA and MPH options with an 04 orifice maintaining a PSI range of 40-65 ¹ – Not using PWM				
GPA ²	MPH ³	Calculated GPM ⁴	Calculated PSI ⁵	Use – Yes or NO ⁶
10	5	.17	7.2	NO
There are no options for using this orifice size below this MPH and GPA				
10	10	.34	28.9	NO
10	11	.37	34.2	NO
10	12	.40	40.0	YES
10	13	.44	48.4	YES
10	14	.47	55.2	YES
10	15	.51	65.0	YES (Engenia)
11	10	.37	34.2	NO
11	11	.41	42.0	YES
11	12	.44	48.4	YES
11	13	.48	57.6	YES
11	14	.52	67.6	NO
11	15	.56	78.4	NO
12	10	.40	40.0	YES
12	11	.44	48.4	YES
12	12	.48	57.6	YES
12	13	.53	70.2	NO
13	10	.44	48.4	YES
13	11	.48	57.6	YES
13	12	.53	70.2	NO
14	10	.47	55.2	YES
14	11	.52	67.6	NO
14	12	.57	81.2	NO
15	10	.51	65.0	YES (Engenia)
15	11	.56	78.4	NO
16	10	.54	72.9	NO
There are no options for using this orifice size above this MPH and GPA				

^aAll footnotes appear at the end of this document. Please read to better understand how the charts were prepared and the intention of these calculations.

Chart 3: Calculations are for a 20-inch nozzle spacing and 05 orifice sizes – Not PWM

Prepared by Robert E. Wolf, Nov. 2017

What are the speed and pressure options/limitations when using the recommended GPA and MPH options with an 05 orifice maintaining a PSI range of 40-65 ¹ – Not using PWM				
GPA ²	MPH ³	Calculated GPM ⁴	Calculated PSI ⁵	Use – Yes or NO ⁶
10	5	.17	4.6	NO
There are no options for using this orifice size below this MPH and GPA				
10	13	.44	31.0	NO
10	14	.47	35.3	NO
10	15	.51	41.6	YES
11	12	.44	31.0	NO
11	13	.48	36.9	NO
11	14	.52	43.3	YES
11	15	.56	50.2	YES
12	10	.40	25.6	NO
12	11	.44	31.0	NO
12	12	.48	36.9	NO
12	13	.53	44.9	YES
12	14	.57	52.0	YES
12	15	.61	59.4	YES
13	10	.44	31.0	NO
13	11	.48	36.9	NO
13	12	.53	44.9	YES
13	13	.57	52.0	YES

13	14	.61	59.4	YES
13	15	.66	69.7	NO
14	10	.47	35.3	NO
14	11	.52	43.3	YES
14	12	.57	52.0	YES
14	13	.61	59.4	YES
14	14	.66	69.7	NO
14	15	.71	80.7	NO
15	10	.51	41.6	YES
15	11	.56	50.2	YES
15	12	.61	59.4	YES
15	13	.66	69.7	NO
15	14	.71	80.7	NO
16	10	.54	46.7	YES
16	11	.59	55.7	YES
16	12	.65	67.6	NO
16	13	.70	78.4	NO
17	10	.57	52.0	YES
17	11	.63	63.5	YES
17	12	.69	76.2	NO
18	10	.61	59.4	YES
18	11	.67	71.8	NO
19	10	.64	65.5	NO
19	11	.70	78.4	NO
20	10	.67	71.8	NO
20	11	.74	87.6	NO
There are no options for using this orifice size above this MPH and GPA				

^aAll footnotes appear at the end of this document. Please read to better understand how the charts were prepared and the intention of these calculations.

Chart 4: Calculations are for a 20-inch nozzle spacing and 06 orifice sizes – Not PWM

Prepared by Robert E. Wolf, Nov. 2017

What are the speed and pressure options/limitations when using the recommended GPA and MPH options with an 06 orifice maintaining a PSI range of 40-65 ¹ – Not using PWM				
GPA ²	MPH ³	Calculated GPM ⁴	Calculated PSI ⁵	Use – Yes or NO ⁶
10	5	.17	3.21	NO
There are no options for using this orifice size below this MPH and GPA				
12	14	.57	36.1	NO
12	15	.61	41.3	YES
13	10	.44	21.5	NO
13	13	.57	36.1	NO
13	14	.61	41.3	YES
13	15	.66	48.4	YES
14	11	.52	30.4	NO
14	12	.57	36.1	NO
14	13	.61	41.3	YES
14	14	.66	48.4	YES
14	15	.71	56.0	YES
15	11	.56	34.8	NO
15	12	.61	41.3	YES
15	13	.66	48.4	YES
15	14	.71	56.0	YES
15	15	.76	64.2	YES (Engenia)
16	10	.54	32.4	NO
16	11	.59	38.7	NO
16	12	.65	46.9	YES
16	13	.70	54.4	YES
16	14	.75	62.5	YES
16	15	.81	72.9	NO
17	10	.57	36.1	NO
17	11	.63	44.1	YES
17	12	.69	52.9	YES
17	13	.74	60.8	YES
17	14	.80	71.1	NO

17	15	.86	82.2	NO
18	10	.61	41.3	YES
18	11	.67	49.9	YES
18	12	.73	59.2	YES
18	13	.79	69.3	NO
18	14	.85	80.3	NO
19	10	.64	45.5	YES
19	11	.70	54.4	YES
19	12	.77	65.9	NO
19	13	.83	76.5	NO
20	10	.67	49.9	YES
20	11	.74	60.8	YES
20	12	.81	72.9	NO
There are no options for using this orifice size above this MPH and GPA				

¹The XtendiMax and FeXapan labels specify that applicators must use an approved nozzle found on each of their respective websites (www.extendimaxapplicationrequirements.com and www.fexapanapplicationrequirement.dupont.com - Appendix A & B), and to use the nozzle within a specified pressure range. The Engenia label also advises applicators to refer to the following website (www.engeniatankmix.com - Appendix C) to select an approved nozzle and do not exceed the nozzle manufacturer's specified pressures. Some of the nozzles approved suggest a maximum pressure near 60 PSI while others are limited to a maximum of 40 PSI. **Warning!** Most all nozzles are listed with extremely low pressures as acceptable. However, based on research, and through years of experience working with venturi nozzle types, the author is suggesting a lower pressure cut-off at 40 psi for some of the nozzles listed. That stated, those with a maximum at 40 PSI would be acceptable at 30 PSI on the lower end. In any setting, 20 PSI or lower would not be advisable. Using a lower pressure with some venturi nozzles may result in a poor pattern, with larger than needed droplet sizes, with the possibility of reduced coverage and weed control. **For the purpose of the charts provided in this document, a 40 PSI lower pressure cut-off is advised (except as noted above)....strictly to protect against a poor pattern and coverage with reduced weed control.** Thus, the suggested acceptable MPH and GPA combinations shown in these charts are based on a pressure range of **40 – 65 PSI. If you are using a nozzle with a 30 PSI minimum, you will need to calculate (see footnote 4 and 5 below) your own parameters. None of these charts reflect the nozzles approved for PWM. All calculations are based on a conventional spray system with a rate controller.**

²The Engenia label specifies a minimum of 10 GPA. XtendiMax and FeXapan now specify a minimum of 15 GPA. For more options at 15 GPA, a larger nozzle size is recommended. The charts included are based on calculations to determine the speed and pressure combinations with a variety of GPA's that will deliver an acceptable pattern while mitigating drift.

³The label specifies a maximum driving speed of 15 MPH. Speeds below 10 MPH would be acceptable provided the minimum pressures are maintained. An 03-sized orifice will allow for slower speeds. Please note that the Engenia label suggests dropping the speed to 5 MPH along the edge of the treatment area. This would not be acceptable, as the pressure would be so low that the spray pattern would likely collapse (boom could shut off). **Remember – the pressure gauge should be used as your speedometer!**

⁴The following formula was used to determine GPM: $GPM = GPA * MPH * 20 / 5940$

⁵The usable pressure is determined with the following formula: $GPM_1 / GPM_2 = \sqrt{PSI_1} / \sqrt{PSI_2}$. This calculation is based on the relationship of liquid flow through a given orifice size at a specific PSI. The University of Illinois app – **Sprayer Calibration Calculator**, can also be used to determine the GPM and then the PSI for the various GPA and MPH combinations.

⁶As shown by the calculations in this table, there are a limited number of options when adhering to the GPA, MPH, and PSI parameters specified for applying these products. **The YES-options are identified in green** in each of the tables. **The NO-options are in red.** If a MPH and GPA combination is not shown, that is an indication the calculation did not meet the pressure range guidelines set forth in this document.

Appendix A: ExtendiMax approved nozzle chart: (last updated 4/27/17)

Manufacturer	Nozzle Type	Part Number	Operating Pressure (psi)						
			10	20	30	40	50	60	70
Greenleaf Technologies	TADF03-D	TADF03-D		Min 20		Max 40			
	TADF06-D	TADF06-D		Min 20			Max 50		
	TDXL 11003-D	TDXL 11003-D		Min 20		Max 40			
	TDXL 11004-D	TDXL 11004-D		Min 20			Max 50		
	TDXL 11005-D	TDXL 11005-D		Min 20				Max 60	
	TDXL 11006-D	TDXL 11006-D		Min 20				Max 60	
Hypro	ULD120-04	ULD120-04 / FC-ULD120-04		Min 20		Max 40			
	ULD120-05	ULD120-05 / FC-ULD120-05		Min 20		Max 40			
John Deere	ULD120-04	PSULD2004 / PSULDQ2004		Min 20		Max 40			
	ULD120-05	PSULD2005 / PSULDQ2005		Min 20		Max 40			
Lechler	ID 110-03	ID 110-03 / ID 110-03C			Min 30	Max 40			
	ID 110-04	ID 110-04 / ID 110-04C			Min 30	Max 40			
	ID 110-05	ID 110-05 / ID 110-05C			Min 30	Max 40			
	ID 80-04	ID 80-04 / ID 80-04C			Min 30	Max 40			
TeeJet® Technologies	AI11003	AI11003-VS / AIC1103-VS			Min 30	Max 40			
	AI8003	AI8003-VS / AIC8003-VS			Min 30	Max 40			
	AI8005	AI8005-VS / AIC8005-VS			Min 30	Max 40			
	TTI11003	TTI11003-VP		Min 20				Max 60	
	TTI11004	TTI11004-VP		Min 20				Max 63	
	TTI11005	TTI11005-VP		Min 20				Max 60	
	TTI11006	TTI11006-VP		Min 20			Max 50		
Wilger	DR110-10	40286-10			Min 30	Max 40			
	UR110-05	40292-05			Min 30		Max 50		
	UR110-06	40292-06			Min 30			Max 60	
	UR110-08	40292-08			Min 30				Max 70
	UR110-10	40292-10			Min 30				Max 70

Appendix B: FeXapan approved nozzle chart: (last updated 5/5/17)

Manufacturer	Nozzle Type	Part Number	Operating Pressure (psi)									
			10	20	30	40	50	60	70	80	90	100
Greenleaf Technologies	TADF03-D	TADF03-D		Min 20		Max 40						
	TADF06-D	TADF06-D		Min 20			Max 50					
	TDXL 11003-D	TDXL 11003-D		Min 20		Max 40						
	TDXL 11004-D	TDXL 11004-D		Min 20			Max 50					
	TDXL 11005-D	TDXL 11005-D		Min 20				Max 60				
	TDXL 11006-D	TDXL 11006-D		Min 20				Max 60				
Hypro	ULD120-04	ULD120-04/ FC-UL_D120-04		Min 20		Max 40						
	ULD120-05	ULD120-05/ FC-ULD120-05		Min 20		Max 40						
John Deere	ULD120-04	PSULD2004/ PSULDQ2004		Min 20		Max 40						
	ULD120-05	PSULD2005/ PSULDQ2005		Min 20		Max 40						
Lechler	ID 110-03	ID 110-03/ ID 110-03C			Min 30	Max 40						
	ID 110-04	ID 110-04/ ID 110-04C			Min 30	Max 40						
	ID 110-06	ID 110-05/ ID 110-05C			Min 30	Max 40						
	ID 80-04	ID 80-04/ ID 80-04C			Min 30	Max 40						
TeeJet® Technologies	Ai11003	Ai11003-VS/ AIC1103-VS			Min 30	Max 40						
	Ai8003	Ai8003-VS/ AIC8003-VS			Min 30	Max 40						
	Ai8005	Ai8005-VS/ AIC8005-VS			Min 30	Max 40						
	TTi11003	TTi11003-VP		Min 20				Max 60				
	TTi11004	TTi11004-VP		Min 20				Max 63				
	TTi11005	TTi11005-VP		Min 20				Max 60				
	TTi11006	TTi11006-VP		Min 20			Max 50					
Wilger	DR110-10	40286-10			Min 30	Max 40						
	UR110-05	40292-05			Min 30		Max 50					
	UR110-06	40292-06			Min 30			Max 60				
	UR110-08	40292-08			Min 30				Max 70			
	UR110-10	40292-10			Min 30				Max 70			

Appendix C: Engenia approved nozzles: (Last updated 10/18/17)

- TDXL-D11003 (max psi 50)
- TTI11003
- TTI11004
- TTI11005
- ULD120-04 (max psi 40)
- ULD120-05 (max psi 40)
- DR110-10
- UR110-05
- UR110-06
- UR110-08
- UR110-10
- 1/4TTJ08 Turf Jet³
- 1/4TTJ04 Turf Jet³