North American Aspirator Air/Gas Mixers

Sheet 3065-1_sizing data

TABLE 1. Capacities* scfh air of 3065 Mixers with North American burner nozzles.
(for Btu/h, multiply by 100)‡

Complete 3065 Mixer Designation		North American Premix Burner Size #	Required Air Pressure in osi for Natural Gas							
			2	4	6	8	10	12	14	16
			Required Air Pressure in osi ^ for Manufactured or Coke Oven Gas							
			2.3	4.6	6.8	9.1	11.4	13.7	16	18.3
			Mixture Pressure in inches of Water Column**							
Manufactured or Coke Oven Gas	Natural Gas		1	2	3	4	5	6	7	8
3065-0-10	3065-0-9	-01-A	130	180	230	260	290	320	340	370
3065-0-9	3065-0-8	-0-A	200	280	350	400	450	490	530	570
3065-0-8	3065-0-6	-0-B	250	350	430	500	560	610	660	710
3065-0-7	3065-0-5	-0-C	280	400	480	560	630	690	740	790
3065-1-9	3065-1-7	-1-A	350	490	610	700	780	860	930	990
3065-1-8	3065-1-5	-1-B	440	620	760	880	980	1 080	1 160	1 240
3065-2-13	3065-2-12	-2-A	560	790	970	1 120	1 250	1 370	1 480	1 580
3065-2-12	3065-2-10	-2-B	650	920	1 130	1 300	1 450	1 590	1 720	1 840
3065-2-10	3065-2-6	-2-C	780	1 100	1 350	1 560	1 740	1 910	2 060	2 210
3065-2-6	3065-2-0	-2-D	880	1 240	1 520	1 760	1 970	2 160	2 330	2 490
3065-3-14	3065-3-11	-3-A	980	1 390	1 700	1 960	2 190	2 400	2 590	2 770
3065-3-11	3065-3-6	-3-B	1 200	1 700	2 080	2 400	2 680	2 940	3 170	3 390
3065-4-18	3065-4-16	-4-A	1 500	2 120	2 600	3 000	3 350	3 670	3 970	4 240
3065-4-14	3065-4-10	-4-B	1 900	2 690	3 290	3 800	4 250	4 650	5 030	5 370
3065-4-12	3065-4-8	-4-C	2 050	2 900	3 550	4 100	4 580	5 020	5 420	5 800
3065-5-18	3065-5-14	-5-A	2 450	3 460	4 240	4 900	5 480	6 000	6 480	6 930
3065-5-13	3065-5-10	-5-B	2 900	4 100	5 000	5 800	6 500	7 100	7 700	8 200
3065-6-24	3065-6-20	-6-A	3 200	4 500	5 500	6 400	7 200	7 800	8 500	9 100
3065-6-18	3065-6-10	-6-B	3 850	5 400	6 700	7 700	8 600	9 400	10 200	10 900
3065-6-16	3065-6-0	-6-C	4 250	6 000	7 400	8 500	9 500	10 400	11 200	12 000
3065-7-38	3065-7-34	-7-A	4 750	6 700	8 200	9 500	10 600	11 600	12 600	13 400
3065-7-32	3065-7-26	-7-B	6 000	8 500	10 400	12 000	13 400	14 700	15 900	17 000
3065-7-26	3065-7-18	-7-C	7 050	10 000	12 200	14 100	15 800	17 300	18 700	19 900
3065-8-68	3065-8-64	-8-A	10 500	14 800	18 200	21 000	23 500	25 700	27 800	29 700
3065-8-60	3065-8-56	-8-B	13 000	18 400	22 500	26 000	29 100	31 800	34 400	36 800
3065-8-52	3065-8-36	-8-C	18 000	25 500	31 200	36 000	40 200	44 100	47 600	51 000
3065-8-28	3065-8-0	-8-D	21 500	30 400	37 200	43 000	48 100	52 500	57 000	60 800
3065-9-64	3065-9-56	-9	37 700	53 500	65 000	75 500	84 500	92 000	99 500	107 000

Table 1 is used to size a single 3065 for any North American 4651, 4659, or 4682 premix burner, which all share the same capacity rating system. Mixer/burner recommendations in Table 1 maintain the required relationship between the mixer orifice size and burner port size for use with zero governor ratio control. To use this table, find burner size in the third column from the left, then read across to the mixer designation that appears to the left that matches the fuel being used.

NOTES:

* Air flow capacity data assumes stoichiometric ratio with natural gas, air flow increases with excess air and decreases with excess fuel.

‡ Capacities with 100% combustion air through mixer and nozzle. Burners can be operated with "rich" mixture if secondary air is available in vicinity of nozzle, which increases Btu/h capacities.

^Multiply air pressure in osi by 1.73 to convert pressure in osi to pressure in inches wc (16 osi = 27.7" wc)

**Note: Not every size premix burner capacity is available for every burner type, or stable at every pressure on this table. Consult the individual burner bulletin and sheets for details and operating stability range.

TABLE 2. Recommended Mixer Selections for Multiple Burners Using Natural Gas

Burner Size desig.	Number of Burners per 3065 Aspirator Mixer									
	1	2	3	4	5	6	7	8	9	10
-01-A	3065-0-9	3065-0-5	3065-1-6	3065-2-13	3065-2-11	3065-2-8	3065-2-6	3065-2-0	3065-3-11	3065-3-6
-0-A	3065-0-8	3065-1-8	3065-1-5	3065-2-8	3065-3-13	3065-3-9	3065-3-5	3065-4-16	3065-4-14	3065-4-12
-0-B	3065-0-6	3065-1-4	3065-2-8	3065-3-12	3065-3-7	3065-4-16	3065-4-14	3065-4-10	3065-5-18	3065-5-16
-0-C	3065-0-5	3065-2-12	3065-3-13	3065-3-6	3065-4-15	3065-4-11	3065-5-18	3065-5-15	3065-5-10	3065-6-24
-1-A	3065-1-7	3065-2-9	3065-3-10	3065-4-17	3065-4-13	3065-4-5	3065-5-15	3065-5-10	3065-6-22	3065-6-20
-1-B	3065-1-5	3065-2-4	3065-3-4	3065-4-13	3065-5-18	3065-5-13	3065-6-24	3065-6-20	3065-6-15	3065-6-10
-2-A	3065-2-12	3065-3-9	3065-4-14	3065-5-17	3065-5-9	3065-6-20	3065-6-15	3065-6-6	3065-7-36	3065-7-34
-2-B	3065-2-10	3065-4-18	3065-4-8	3065-5-12	3065-6-22	3065-6-14	3065-7-38	3065-7-34	3065-7-32	3065-7-28
-2-C	3065-2-6	3065-4-15	3065-5-15	3065-6-24	3065-6-13	3065-7-36	3065-7-32	3065-7-28	3065-7-24	3065-7-18
-2-D	3065-2-0	3065-4-11	3065-5-9	3065-6-18	3065-7-38	3065-7-32	3065-7-28	3065-7-20	3065-7-12	–
-3-A	3065-3-11	3065-4-8	3065-6-24	3065-6-13	3065-7-36	3065-7-30	3065-7-24	3065-7-15	–	–
-3-B	3065-3-6	3065-5-15	3065-6-18	3065-7-36	3065-7-30	3065-7-20	3065-7-4	–	–	–
-4-A	3065-4-16	3065-6-22	3065-7-38	3065-7-28	3065-7-18	–	–	–	–	–
-4-B	3065-4-10	3065-6-14	3065-7-30	3065-7-16	–	–	–	–	–	–
-4-C	3065-4-8	3065-6-9	3065-7-28	3065-7-4	–	–	–	–	–	–
-5-A	3065-5-14	3065-7-34	3065-7-16	–	–	–	–	–	–	–

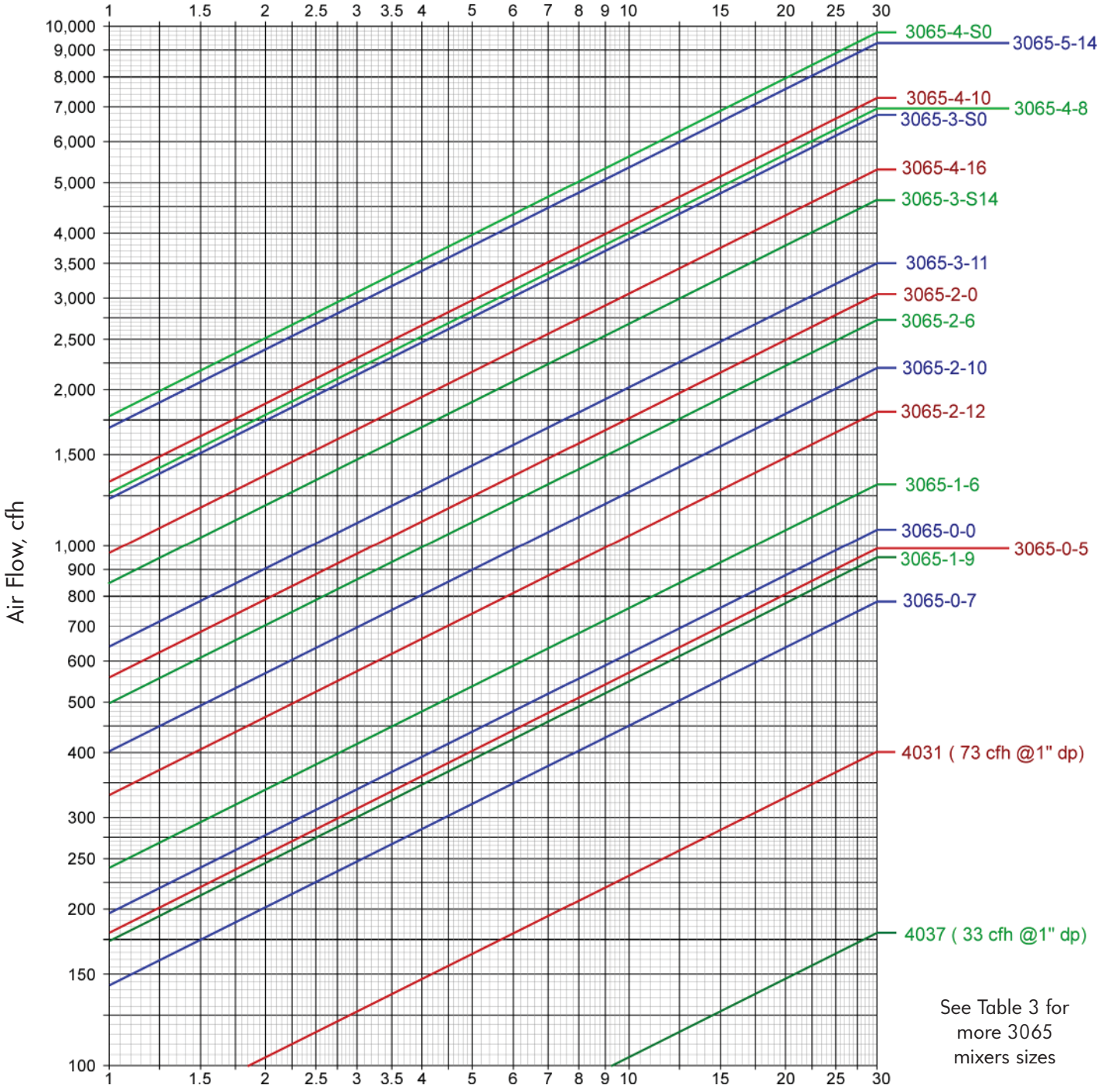
Table 2 lists proper selection if several burners are fed from a single 3065 mixer. Burner capacity and number of premix burners (4651, 4659, or 4682) determine mixer selection. Mixer/burner recommendations in Table 2 maintain the required relationship between the mixer orifice size and burner port size for use with zero governor ratio control. Flow distribution and pressure drops should be considered carefully when designing the mixture manifold.

To use this table, find burner size in left-hand column, then read across to the mixer designation that appears under the number of burners to be fed. The table is limited to 4" pipe size and smaller mixers, larger mixture lines are prone to flashback. Multiple burners above size -5-A are not recommended for use with a single mixer. If size and number of burners require a mixer outside the range of the table, divide the burners among two or more mixers, and select the mixers from Table 2.

For additional information on premix systems and premix system design, see the following sheets:

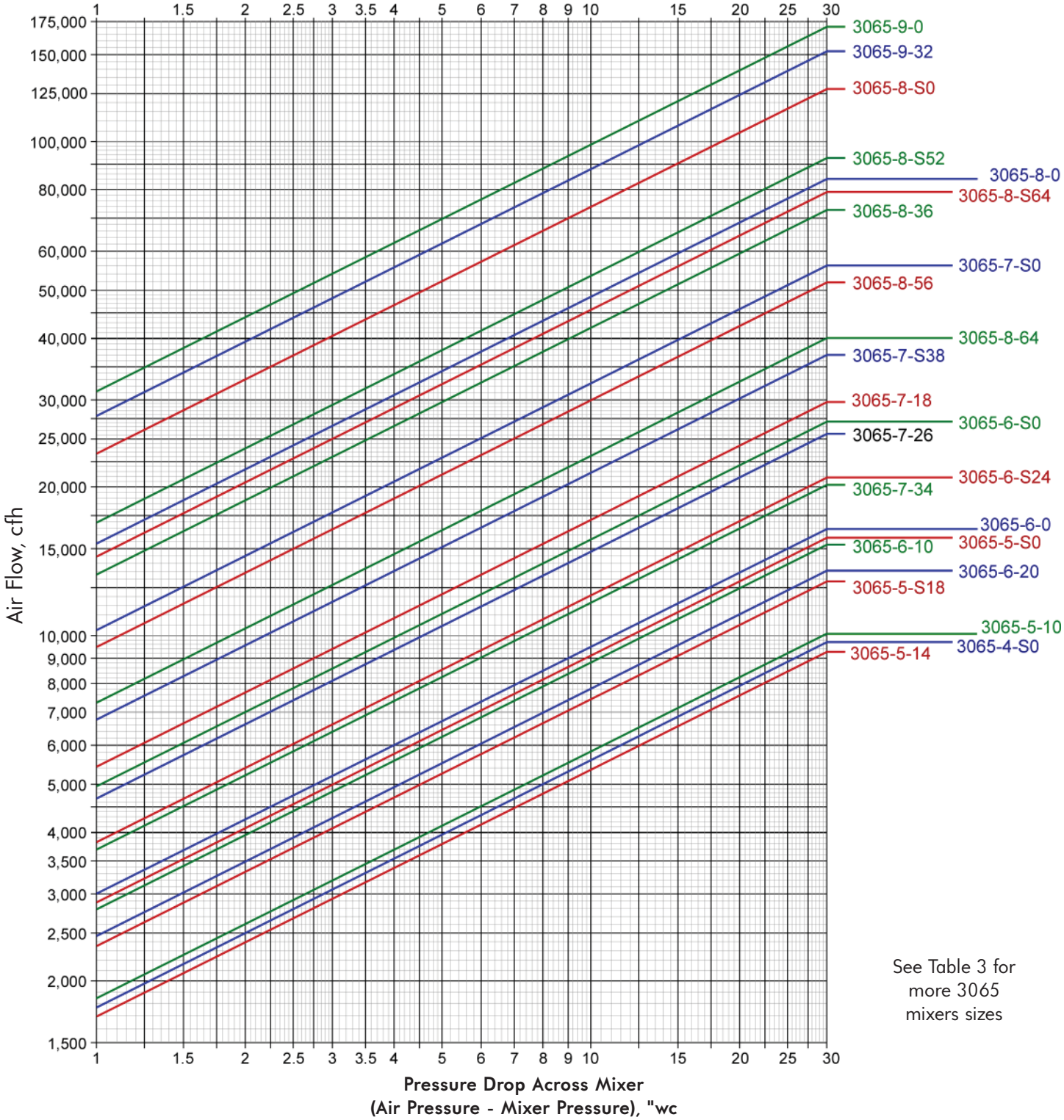
- Series 4651, 4659, and 4682 Burner Nozzles, Sheet 4600-1
- North American Air/Gas Ratio Regulators, Bulletin 7218/7219A
- Air/Gas Ratio Regulators, Instructions 7218-2
- Premix Burners, Handbook Supplement 288
- Straight pipe run requirements, Handbook Supplement 14
- Jiffy Sheet, Handbook Supplement 288
- Piping Practice for Industrial Burner Systems, Handbook Supplement 46
- Prevent "Pooped" Pilots, Handbook Supplement 289
- Practical Pointers (Industrial Burner Control Systems)

Chart 1A. Air Capacities for Selected Small North American 3065 Aspirator Mixers vs. Pressure Drop Across Mixer ("wc) (Differential Pressure) (see Table 3 for Data on all 3065 sizes)
(for Btu/h, multiply by 100)



See Table 3 for more 3065 mixers sizes

Chart 1B. Air Capacities for Selected Large North American 3065 Aspirator Mixers vs. Pressure Drop Across Mixer ("wc) (Differential Pressure) (see Table 3 for Data on all 3065 sizes)
(for Btu/h multiply by 100)



See Table 3 for more 3065 mixers sizes

Table 3A. 3065 Mixer Throat Areas & Capacities, scfh air @ 1" and 30" wc Differential Pressure
(Pressure Drop Across Mixer = Air Pressure - Mixture Pressure)
(for Btu/h, multiply by 100)

3065(S) Mixers

3065(S) Mixer Size	Mixer Throat Area in²	Air Flow @1"wc	Air Flow @30"wc
-0-0	0.100	216	1 180
-0-5	0.091	179	980
-0-6	0.083	162	890
-0-7	0.073	143	780
-0-8	0.061	120	660
-0-9	0.048	95	520
-1-0	0.151	295	1 620
-1-4	0.138	271	1 480
-1-5	0.131	258	1 410
-1-6	0.123	241	1 320
-1-7	0.113	222	1 210
-1-8	0.102	199	1 090
-1-9	0.089	173	950
-1-10	0.074	145	790
-1-11	0.058	113	620
-2-0	0.277	552	3 020
-2-4	0.265	528	2 890
-2-5	0.258	514	2 810
-2-6	0.250	497	2 720
-2-7	0.240	477	2 610
-2-8	0.228	454	2 490
-2-9	0.215	428	2 350
-2-10	0.200	399	2 190
-2-11	0.184	367	2 010
-2-12	0.167	332	1 820
-2-13	0.147	294	1 610
-2-14*	0.127	253	1 380
-3-0	0.406	836	4 580
-3-4	0.394	810	4 440
-3-5	0.387	796	4 360
-3-6	0.378	779	4 270
-3-7	0.368	758	4 150
-3-8	0.357	735	4 020
-3-9	0.344	702	3 850
-3-10	0.329	678	3 710
-3-11	0.313	645	3 530
-3-12	0.296	608	3 330
-3-13	0.276	569	3 120
-3-14	0.256	531	2 910
-3-S0	0.559	1 235	6 770
-3-S4	0.547	1 208	6 620
-3-S5	0.540	1 193	6 530
-3-S6	0.532	1 165	6 380
-3-S7	0.522	1 135	6 220
-3-S8	0.510	1 101	6 030
-3-S9	0.497	1 065	5 830
-3-S10	0.483	1 026	5 620
-3-S11	0.467	984	5 390
-3-S12	0.449	939	5 140
-3-S13	0.430	892	4 890
-3-S14	0.409	842	4 610
-4-0	0.645	1445	7 910
-4-5	0.626	1391	7 620
-4-6	0.617	1373	7 520
-4-7	0.607	1 350	7 400
-4-8	0.596	1 325	7 260
-4-9	0.583	1 296	7 100
-4-10	0.568	1 273	6 970
-4-11	0.552	1 228	6 720
-4-12	0.534	1 188	6 510
-4-13	0.515	1 146	6 280
-4-14	0.494	1 100	6 020
-4-15	0.472	1 050	5 750
-4-16	0.448	968	5 300
-4-17	0.423	941	5 150
-4-18	0.396	875	4 790
-4-22*	0.273	604	3 310
-4-S0	0.785	1 786	9 780
-4-S5	0.766	1 743	9 540
-4-S6	0.758	1 723	9440
-4-S7	0.748	1 701	9 320
-4-S8	0.736	1 675	9 170
-4-S10	0.709	1 612	8 830
-4-S11	0.693	1 575	8 630
-4-S12	0.675	1 535	8 410
-4-S13	0.656	1 491	8 170
-4-S14	0.635	1 444	7 910
-4-S15	0.613	1 394	7 630
-4-S16	0.589	1 340	7 340
-4-S17	0.564	1 282	7 020
-4-S18	0.537	1 221	6 690
-5-0	0.887	2 004	10 970
-5-6	0.860	1 941	10 630
-5-8	0.838	1 893	10 370
-5-9	0.825	1 863	10 210
-5-10	0.811	1 830	10 030
-5-12	0.777	1 767	9 680
-5-13	0.758	1 724	9 440
-5-14	0.737	1 689	9 250
-5-15	0.715	1 638	8 970
-5-16	0.691	1 583	8 670
-5-17	0.666	1 525	8 350
-5-18	0.639	1 464	8 020
-5-S0	1.227	2 893	15 800
-5-S6	1.200	2 828	15 500
-5-S8	1.178	2 777	15 200
-5-S9	1.165	2 746	15 000
-5-S10	1.150	2 712	14 900
-5-S12	1.117	2 651	14 500
-5-S13	1.098	2 605	14 300
-5-S14	1.077	2 556	14 000
-5-S15	1.055	2 503	13 700
-5-S16	1.031	2 464	13 500
-5-S17	1.006	2 404	13 200
-5-S18	0.979	2 339	12 800
-6-0	1.289	2 995	16 400
-6-6	1.261	2 931	16 100
-6-7	1.251	2 908	15 900
-6-9	1.227	2 851	15 600
-6-10	1.212	2 837	15 500
-6-12	1.178	2 758	15 100
-6-13	1.159	2 713	14 900
-6-14	1.138	2 684	14 700
-6-15	1.116	2 650	14 500
-6-16	1.092	2 611	14 300
-6-18	1.040	2 504	13 700
-6-20	0.982	2 380	13 000
-6-22	0.918	2 193	12 000
-6-24	0.847	2 011	11 000
-6-S0	1.996	4 936	27 000
-6-S6	1.968	4 868	26 700
-6-S7	1.958	4 843	26 500
-6-S9	1.933	4 782	26 200
-6-S10	1.919	4 746	26 000
-6-S12	1.885	4 663	25 500
-6-S13	1.866	4 615	25 300
-6-S14	1.845	4 564	25 000
-6-S15	1.823	4 509	24 700
-6-S16	1.799	4 450	24 400
-6-S18	1.747	4 292	23 500
-6-S20	1.689	4 149	22 700
-6-S22	1.624	3 991	21 900
-6-S24	1.554	3 817	20 900

Note: Some 3065 mixers are available with additional special rod sizes.

Table 3B. 3065 Mixer Throat Areas & Capacities, scfh air @ 1" and 30" wc Differential Pressure
(Pressure Drop Across Mixer = Air Pressure - Mixture Pressure)
(for Btu/h, multiply by 100)

3065(S) Mixers

3065(S) Mixer Size	Mixer Throat Area in²	Air Flow @1"wc	Air Flow @30"wc
-7-0	2.405	5 949	32 600
-7-4	2.393	5 919	32 400
-7-10	2.329	5 760	31 500
-7-12	2.295	5 676	31 100
-7-14	2.255	5 577	30 500
-7-15	2.233	5 522	30 200
-7-16	2.209	5 464	29 900
-7-18	2.157	5 335	29 200
-7-20	2.098	5 190	28 400
-7-24	1.963	4 857	26 600
-7-26	1.887	4 667	25 600
-7-28	1.804	4 462	24 400
-7-30	1.715	4 213	23 100
-7-32	1.620	3 953	21 700
-7-34	1.519	3 681	20 200
-7-36	1.411	3 444	18 900
-7-38	1.298	3 188	17 500
-7-S0	3.760	10 236	56 100
-7-S4	3.748	10 203	55 900
-7-S10	3.683	10 027	54 900
-7-S12	3.650	9 935	54 400
-7-S14	3.610	9 827	53 800
-7-S15	3.587	9 766	53 500
-7-S16	3.564	9 642	52 800
-7-S18	3.511	9 443	51 700
-7-S20	3.453	9 229	50 500
-7-S24	3.318	8 813	48 300
-7-S26	3.241	8 556	46 900
-7-S28	3.159	8 285	45 400
-7-S30	3.070	8 000	43 800
-7-S32	2.975	7 703	42 200
-7-S34	2.873	7 393	40500
-7-S36	2.766	7 071	38 700
-7-S38	2.652	6 737	36 900
-8-0	5.940	15 381	84 200
-8-15	5.767	15 030	82 300
-8-16	5.743	15 063	82 500
-8-20	5.633	14 867	81 400
-8-24	5.498	14 602	80 000
-8-28	5.338	14 178	77 700
-8-32	5.154	13 689	75 000
-8-36	4.946	13 217	72 400
-8-40	4.712	12 594	69 000
-8-44	4.455	11 906	65 200
-8-48	4.172	11 151	61 100
-8-52	3.866	10 331	56 600
-8-56	3.534	9 446	51 700
-8-60	3.178	8 336	45 700
-8-64	2.798	7 292	39 900
-8-68	2.393	6 237	34 200
-8-72	1.963	5 117	28 000
-8-S0	8.621	23 325	127 800
-8-S15	8.448	22 718	124 000
-8-S16	8.424	22 514	123 300
-8-S20	8.314	22 081	120 900
-8-S24	8.179	21 587	118 200
-8-S28	8.019	21 033	115 200
-8-S32	7.835	20 420	111 800
-8-S36	7.626	19 750	108 200
-8-S40	7.393	19 146	104 900
-8-S44	7.136	18 478	101 200
-8-S48	6.853	17 747	97 200
-8-S52	6.547	16 844	92 300
-8-S56	6.215	16 095	88 200
-8-S60	5.859	15 271	83 600
-8-S64	5.479	14 461	79 200
-8-S68	5.074	13 224	72 400
-8-S72	4.644	12 027	65 900
-9-0	10.682	31 033	170 000
-9-24	10.241	29 239	160 000
-9-32	9.897	27 765	152 000
-9-40	9.455	26 526	145 000
-9-48	8.915	25 011	137 000
-9-56	8.277	23 221	127 000
-9-64	7.541	21 155	116 000
-9-72	6.706	17 812	98 000
-9-80	5.774	14 856	81 000

3065 SIZING EXAMPLES

Note: Most premix burner pressure specifications are rated in inches water column. Most North American, blower and mixer air pressure specifications, are rated in osi: 1 osi = 1.73" wc.

Example A: Select a mixer for a single 4651-2-D burner with 16 osi (27.7"wc) air and 8"wc mixture pressure, with zero governor ratio control for natural gas.

— Since this is a standard burner nozzle size with zero governor ratio control, use ***Table 1***. Find the -2-D burner and pick a **3065-2-0** mixer from the list to the left. Per ***Table 3A***, the **3065-3-13** has the same mixer throat area, and offers more sizing options if field conditions require a new displacement rod choice.

Example B: Select a mixer for feeding six (6) 4651-2-A burners, with zero governor ratio control for natural gas.

— Since these are standard size burner nozzles with zero governor ratio control, use ***Table 2***. Find the -2-A burner row move right and find the 6 burner column. Pick the **3065-6-20** Mixer from the list.

3065 SIZING EXAMPLES continued

Example C: Select a mixer for a 4682-6-C burner with 8 osi (14"wc) air and 8"wc mixture pressure. This arrangement necessitates a cross-connected regulator and high gas pressure because air pressure drop is <66% of its air pressure.

— Capacity of a 4682-6-C at 8"wc mixture pressure is 1,200,000 Btu/h. (divide by 100= 12,000 scfh air) Pressure drop across the mixer = 8 osi (14"wc) minus 8"wc mp = 6"wc. From the capacity ***Chart 1B***, a 3065-6-S0 Mixer would serve the purpose, as would a 3065-7-20. For minimum cost and size (both mixer and burner nozzle are 3" NPT) use the **3065-6-*S0*** mixer. The gas pressure required upstream of the ratio regulator = 14" wc + 6"wc = 20" wc = 11.5 osi (use 12-16 osi)

Example D: Select a mixer for 3,000 scfh air) burner with 8 osi air and 8"wc mixture pressure. (This arrangement necessitates a cross-connected regulator and 12-16 osi gas pressure.) Pressure drop across the mixer = 8 osi (14"wc) minus 8"wc mixture pressure = 6"wc.

— From the capacity ***Chart 1A***, a **3065-3-S0** or a **3065-4-8** could be used. Which mixer to choose depends on a number of factors.

- The **3065-3-S0** uses 1½" pipe and the **3065-4-8** uses 2" pipe
- If at any time the system capacity needs to be increased, the capacity of the **3065-4-8** can be increased by using a smaller displacement rod. The **3065-0-S0** with its -0 rod is already is at the maximum capacity.
- In most cases pick the mixer with the same pipe size as the burner, but the **3065-4-8** mixer offers more sizing options if field conditions require a new displacement rod choice.

Example E1: An existing system uses a **3065-5-17** mixer to feed four (4) 4682-2-A burner nozzles, with a zero governor ratio control for natural gas. What mixer is needed if the burners are changed to four (4) 4682-2-B burner nozzles to increase the system capacity?

— Since these are standard size nozzles with zero governor ratio control, use ***Table 2***. Find the -2-B nozzle row move right and find the 4 nozzle column. Find the **3065-5-12** Mixer from the list. Since the mixers are both the 3065-5 size, only the displacement rod needs to be changed.

Example E2: An existing system uses a **3065-5-17** mixer to feed four (4) 4682-2-A burner nozzles with a zero governor ratio control for natural gas. What mixer is needed if the burners are changed to four (4) 4682-2-D burner nozzles to increase the system capacity.

— Since these are standard size burner nozzles with zero governor ratio control, use ***Table 2***. Find the -2-D burner row, move right and find the 4 burner column. Pick the **3065-6-18** mixer from the list. This is a new mixer size which requires larger pipe (but maybe a 3065-5-S_ will work) from ***Table 3B***, the orifice throat area of a **3065-6-18** is (1.040 in2). A **3065-5-S15** is (1.055 in2). So use the **3065-5-S15** because only the mixer needs to be changed and not the piping. **Note:** The other system components still need to be checked to see if they are suitable for use with the higher capacity. Because of more pressure drop through the piping it may be necessary to cross connect the ratio regulator.

Example G: Select a mixer for a 2,300,000 Btu/h (divide by 100= 23,000 scfh air) burner with 8 osi air and 4"wc mixture pressure. (zero governor ratio control for natural gas) Pressure drop across the mixer = 8 osi (14"wc) minus 4"wc mp = 10"wc.

— From the capacity ***Chart 1B***, a **3065-8** with between a **#56** and a **#64** rod or a **3065-7-S** with between no rod and a #38 rod (21,000 cfh capacity) could be used. For minimum cost and size, use a **3065-7-S**.

Effective mixer throat area = for a **3065-7-S38** = 2.652 sq. in. (from ***Table 3B***)

$$\frac{\text{(A), Throat area, unknown mixer}}{\text{Throat area, known mixer}} = \frac{\text{Capacity, unknown mixer}}{\text{Capacity, known mixer}}$$

$$\frac{(A)}{2.652} = \frac{23{,}000 \text{ scfh}}{21{,}000 \text{ scfh}}$$

$$A = 2.90 \text{ sq. in.}$$

From ***Table 3B*** use **3065-7-S34** mixer.

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