

Document Title	Pulsations Compressor Flange
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Client	Airpack Nederland BV
Project	API 618 Design Approach 2 for 17811-00-0701

**DYNAFLOW
RESEARCH
GROUP.**

Appendix E

Pulsations Compressor Flange

0	Issued for comments	For Comments	TK	MPB	FMB	18/02/2022
Rev.	Description	Status	Prep'd	Chk'd	App'd	Date

Pulsations at compressor flange exceed allowable



Goal of criteria to ensure compressor valve life time and compressor efficiency. Valve dynamics in combination with pulsations will determine reduced efficiency.

N₂ compressor 17811-03A

1st Stage Suction Side

1st Stage Discharge Side

Maximum allowable peak-to-peak pulsation at the compressor cylinder flange:

Node : 240
Average pressure : 6.642 to 6.720 barg

Harmonic (variation)	Frequency [Hz]	Peak-to-Peak Pulsation [bar]	Allowable Pulsation [bar]	Percentage [%]
1 (20)	6.660	0.0230	0.541	4.24
2 (1)	13.320	0.0423	0.536	7.90
3 (1)	19.980	0.0137	0.536	2.55
4 (1)	26.640	0.0363	0.536	6.78
5 (1)	33.300	9.122e-03	0.536	1.70
6 (16)	39.960	0.0357	0.540	6.62
7 (1)	46.620	0.0172	0.536	3.21
8 (1)	53.280	0.148	0.536	27.71
9 (20)	59.940	0.0263	0.541	4.85
10 (2)	66.600	0.0834	0.536	15.54
11 (20)	73.260	0.0130	0.541	2.40
12 (2)	79.920	0.0338	0.536	6.30

All (1)		0.291	0.536	54.30

Node : 250
Average pressure : 19.63 barg

Harmonic (variation)	Frequency [Hz]	Peak-to-Peak Pulsation [bar]	Allowable Pulsation [bar]	Percentage [%]
1 (1)	6.660	0.0315	1.433	2.20
2 (1)	13.320	0.548	1.433	38.21
3 (1)	19.980	0.170	1.433	11.84
4 (1)	26.640	0.389	1.433	27.15
5 (1)	33.300	0.198	1.433	13.79
6 (1)	39.960	0.221	1.433	15.44
7 (1)	46.620	0.218	1.433	15.18
8 (1)	53.280	0.256	1.433	17.86
9 (1)	59.940	0.286	1.433	19.98
10 (1)	66.600	0.134	1.433	9.35
11 (1)	73.260	0.293	1.433	20.42
12 (1)	79.920	0.146	1.433	10.18

All (1)		1.481	1.433	103.33

** EXCEEDS **

Pulsations at compressor flange within allowable

Goal of criteria to ensure compressor valve life time and compressor efficiency. Valve dynamics in combination with pulsations will determine reduced efficiency.

N₂ compressor 17811-03A

2nd Stage Suction Side

Maximum allowable peak-to-peak pulsation at the compressor cylinder flange:

Node : 730
Average pressure : 19.20 to 19.42 barg

Harmonic (variation)	Frequency [Hz]	Peak-to-Peak Pulsation [bar]	Allowable Pulsation [bar]	Percentage [%]
1 (1)	6.660	0.0958	0.739	12.96
2 (20)	13.320	0.113	0.735	15.41
3 (1)	19.980	0.0269	0.739	3.64
4 (1)	26.640	0.0293	0.739	3.97
5 (1)	33.300	0.0100	0.739	1.36
6 (1)	39.960	0.0397	0.739	5.38
7 (1)	46.620	0.0115	0.739	1.56
8 (1)	53.280	0.0510	0.739	6.90
9 (1)	59.940	0.0204	0.739	2.76
10 (1)	66.600	0.123	0.739	16.68
11 (10)	73.260	0.0194	0.737	2.63
12 (1)	79.920	0.0963	0.739	13.02

All (1)		0.373	0.739	50.41

2nd Stage Discharge Side

Node : 740
Average pressure : 23.63 barg

Harmonic (variation)	Frequency [Hz]	Peak-to-Peak Pulsation [bar]	Allowable Pulsation [bar]	Percentage [%]
1 (20)	6.660	0.0734	0.883	8.31
2 (1)	13.320	0.191	0.900	21.19
3 (1)	19.980	0.0434	0.900	4.82
4 (1)	26.640	0.0755	0.900	8.38
5 (1)	33.300	0.0374	0.900	4.16
6 (1)	39.960	0.0948	0.900	10.53
7 (1)	46.620	0.0655	0.900	7.28
8 (1)	53.280	0.180	0.900	20.04
9 (1)	59.940	0.149	0.900	16.60
10 (1)	66.600	0.230	0.900	25.55
11 (1)	73.260	0.224	0.900	24.93
12 (17)	79.920	0.166	0.884	18.83

All (1)		0.775	0.900	86.03

Pulsations at compressor flange within allowable

Goal of criteria to ensure compressor valve life time and compressor efficiency. Valve dynamics in combination with pulsations will determine reduced efficiency.

Air compressor 17811-03B

Suction Side

Maximum allowable peak-to-peak pulsation at the compressor cylinder flange:

Node : 250
Average pressure : 6.848 barg

Harmonic (variation)	Frequency [Hz]	Peak-to-Peak Pulsation [bar]	Allowable Pulsation [bar]	Percentage [%]
1 (36)	6.667	8.547e-05	0.550	0.02
2 (1)	13.334	0.201	0.549	36.54
3 (36)	20.001	7.649e-05	0.550	0.01
4 (1)	26.668	0.0512	0.549	9.34
5 (36)	33.335	8.826e-05	0.550	0.02
6 (1)	40.002	0.0322	0.549	5.87
7 (36)	46.669	1.208e-04	0.550	0.02
8 (1)	53.336	0.0239	0.549	4.35
9 (36)	60.003	1.396e-04	0.550	0.03
10 (50)	66.670	0.0161	0.550	2.92
11 (36)	73.337	1.238e-04	0.550	0.02
12 (50)	80.004	9.814e-03	0.550	1.78

All (1)		0.245	0.549	44.73

Discharge Side

Node : 265
Average pressure : 20.73 barg

Harmonic (variation)	Frequency [Hz]	Peak-to-Peak Pulsation [bar]	Allowable Pulsation [bar]	Percentage [%]
1 (19)	6.667	6.240e-05	1.519	0.00
2 (1)	13.334	0.392	1.522	25.78
3 (19)	20.001	7.294e-05	1.519	0.00
4 (1)	26.668	0.226	1.522	14.85
5 (19)	33.335	1.286e-04	1.519	0.01
6 (1)	40.002	0.225	1.522	14.78
7 (19)	46.669	2.804e-04	1.519	0.02
8 (1)	53.336	0.415	1.522	27.26
9 (36)	60.003	3.286e-04	1.517	0.02
10 (50)	66.670	0.175	1.515	11.55
11 (36)	73.337	1.874e-04	1.517	0.01
12 (50)	80.004	0.108	1.515	7.12

All (1)		1.020	1.522	67.04