



PERFORMANCE TEST REPORTS

CLIENT	:	Air Products Manufacturing LLC
PROJECT NAME/NO.	:	WEP Renewables
CLIENT PO NO	:	4505605360
HMD DOCUMENT NO	:	HMD-4505605360-K01-07
CLIENT DOCUMENT NO	:	EN207122-SNDYN-9V3-00119
HMD PUMP NO	:	840055 & 840056
EQUIPMENT TAG NO	:	18-P-257/18-P-257S

1	16/05/2023	ISSUE FOR REVIEW	AFS	AFS	NW
0	20/02/2023	ISSUE FOR REVIEW	GC	AFS	NW
REV	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY

NOTE:

 RESOLUTION SHEET				
Comment Number	Document Name: Performance Test Reports		Revision from which comment first appeared	Comment Status: Open\Closed - (Date Closed:)
	CLIENT COMMENT	HMD RESPONSE	Current Rev:	
1	Curve is dropping. Pump will deliver unstable flow in this area. Refer email dated 03 March 2022 & provide continuous rising curve (without any dropping).	Pumps have been retested with orifice plates as per request from Air Products. Results were sent by email on 15/05 for review and accepted on 16/05.	0	Closed (16/05/2023)

HMD SEAL/LESS PUMP H/Q/P PERFORMANCE TEST SHEET

HMD SEAL/LESS PUMPS LTD.
HAMPDEN PARK INDUSTRIAL ESTATE
EASTBOURNE,
EAST SUSSEX
BN22 9AN
ENGLAND

TELEPHONE : (01323) 452000
FAX : (01323) 503369
EMAIL : pumps@hmdpumps.com

CLIENT:	Air Products Manufacturing LLC	ORDER N°:	4505605360
HMD JOB N°:	840055- 11mm orifice plate	PUMP SPEED:	1765 RPM
PUMP MODEL:	LMV-801S DA1 ZL (40 Bar)	IMPELLER DIA:	6.14 Inches
ORIFICE PLATE:	Inches	ITEM NUMBER:	18-P-257
BALANCE KEYS:		BALANCE HOLES:	
DUTY REQUIREMENTS:-		LIQUID DETAILS:-	
DUTY FLOW:	6.60 (US)GPM	LIQUID PUMPED:	Slop Oil
DUTY HEAD:	48.88 FT	SG:	0.893
HYD TEST PRESSURE:	870 PSI	TEMPERATURE:	150 ° F
JACKET TEST PRESS:	PSI	VISCOSITY:	0.67 cSt
NPSHA:	9.84 FT		
MOTOR DETAILS:-		SERIAL N°:	XF2204295822
MANUFACTURER:	Baldor	RATED PWR:	7.50 HP
SUPPLIED BY:	HMD	FRAME SIZE:	215 T
RATED SPEED:	1765 RPM	QUOTED ABS PWR:	0.87 HP
SUPPLY:	460 V / 3~ / 60 Hz		

PERFORMANCE TESTED TO :

API 685

READING	1	2	3	4	5	6	7	8
FLOW in (GPM)	3.61	5.11	6.27	6.60	6.93	7.59		
DIFFERENTIAL HEAD in FT	50.53	48.89	46.59	45.61	44.30	42.00		
POWER (hp)	0.76	0.78	0.80	0.81	0.82	0.83		
PUMP EFFICIENCY	6.06	8.04	9.27	9.41	9.45	9.67		
Discharge readings M H2O	15.10	14.60	13.90	13.60	13.20	12.50		
Correction gauge FLC	49.54	47.90	45.60	44.62	43.31	41.01		
Suction Head M H2O	0.00	0.00	0.00	0.00	0.00	0.00		
Correction gauge FLC	0.00	0.00	0.00	0.00	0.00	0.00		
Wattmetre reading (hp)	0.84	0.87	0.89	0.90	0.91	0.93		
Motor Efficiency (%)	90.0	90.0	90.0	90.0	90.0	90.0		
Motor speed rpm	1765	1765	1765	1765	1765	1765		
Impeller speed rpm	1765	1765	1765	1765	1765	1765		
Slip rpm	0	0	0	0	0	0		
Thrust (lbs)								
Datum correction (FT)	0.98	0.98	0.98	0.98	0.98	0.98		
Suction Bore (INCHES)	2.95	2.95	2.95	2.95	2.95	2.95		
Discharge Bore (INCHES)	1.97	1.97	1.97	1.97	1.97	1.97		
vel suc ² /2 x g (FLC)	0.000	0.001	0.001	0.001	0.002	0.002		
vel dis ² /2 x g (FLC)	0.002	0.005	0.007	0.008	0.008	0.010		

TESTED BY : n jessop

SIGNATURE 

FOR : Air Products Manufacturing LLC

DATE OF TEST : 15-May-23

WITNESSED BY : _____

SIGNATURE

Pump Model: LMV-801S DA1 ZL (40 Bar)

Speed: 1765

RPM

Impeller Dia: 6.14

Inches

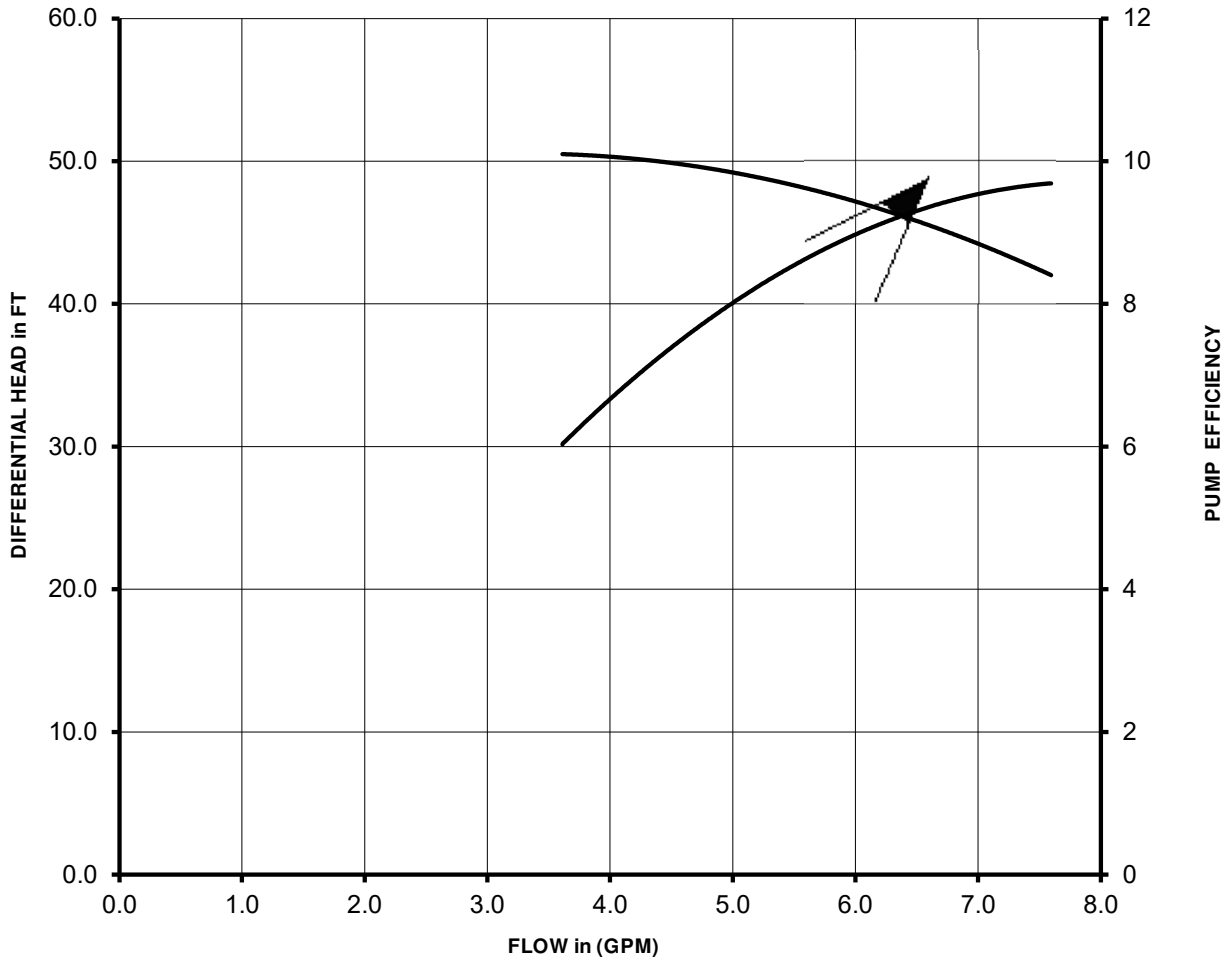
Orifice Plate:

Inches

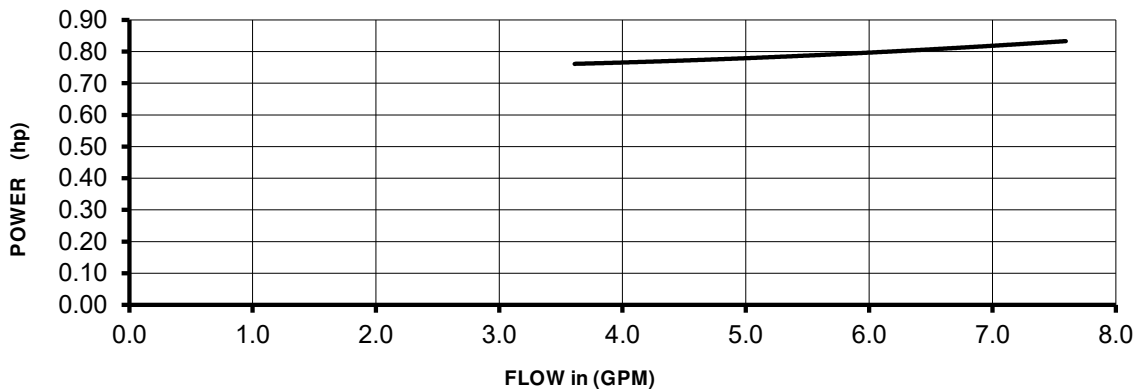
HMD Serial No: 840055- 11mm orifice pla

Item No: 18-P-257

HQ PERFORMANCE CURVE



POWER CURVE



HMD SEAL/LESS PUMP H/Q/P SG CORR PERFORMANCE TEST SHEET

HMD SEAL/LESS PUMPS LTD.
HAMPDEN PARK INDUSTRIAL ESTATE
EASTBOURNE,
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BN22 9AN
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TELEPHONE : (01323) 452000
FAX : (01323) 503369
EMAIL : pumps@hmdpumps.com

CLIENT:	Air Products Manufacturing LLC	ORDER N°:	4505605360
HMD JOB N°:	840055- 11mm orifice plate	PUMP SPEED:	1765 RPM
PUMP MODEL:	LMV-801S DA1 ZL (40 Bar)	IMPELLER DIA:	6.14 Inches
ORIFICE PLATE:	Inches	ITEM NUMBER:	18-P-257
BALANCE KEYS:		BALANCE HOLES:	
DUTY REQUIREMENTS:-		LIQUID DETAILS:-	
DUTY FLOW:	6.60 (US)GPM	LIQUID PUMPED:	Slop Oil
DUTY HEAD:	48.88 FT	SG:	0.893
HYD TEST PRESSURE:	870 PSI	TEMPERATURE:	150 ° F
JACKET TEST PRESS:	PSI	VISCOSITY:	0.67 cSt
NPSHA:	9.84 FT		
MOTOR DETAILS:-		SERIAL N°:	XF2204295822
MANUFACTURER:	Baldor	RATED PWR:	7.50 HP
SUPPLIED BY:	HMD	FRAME SIZE:	215 T
RATED SPEED:	1765 RPM	QUOTED ABS PWR:	0.87
SUPPLY:	460 V / 3~ / 60 Hz		

PERFORMANCE TESTED TO : API 685

READING	PUMP PERFORMANCE ON SITE SG (Slop Oil) - NOT VISC CORRECTED							
	1	2	3	4	5	6	7	8
FLOW in (GPM)	3.61	5.11	6.27	6.60	6.93	7.59		
DIFFERENTIAL HEAD in FT	50.53	48.89	46.59	45.61	44.30	42.00		
POWER (hp)	0.68	0.70	0.71	0.72	0.73	0.74		
PUMP EFFICIENCY	6.06	8.04	9.27	9.41	9.45	9.67		

READING	PUMP PERFORMANCE ON SITE SG AND VISCOSITY (Slop Oil)							
	1	2	3	4	5	6	7	8
FLOW in (GPM)	3.61	5.11	6.27	6.60	6.93	7.59		
DIFFERENTIAL HEAD in FT	50.53	48.89	46.59	45.61	44.30	42.00		
POWER (hp)	0.68	0.70	0.71	0.72	0.73	0.74		
PUMP EFFICIENCY	6.06	8.04	9.27	9.41	9.45	9.67		

Note:

All pump efficiency figures stated are OVERALL and include magnetic coupling loss.

Viscosity Correction Factors	
Cq =	1.00
Ch =	1.00
Ce =	1.00

TESTED BY : n jessop

SIGNATURE 

FOR : Air Products Manufacturing LLC

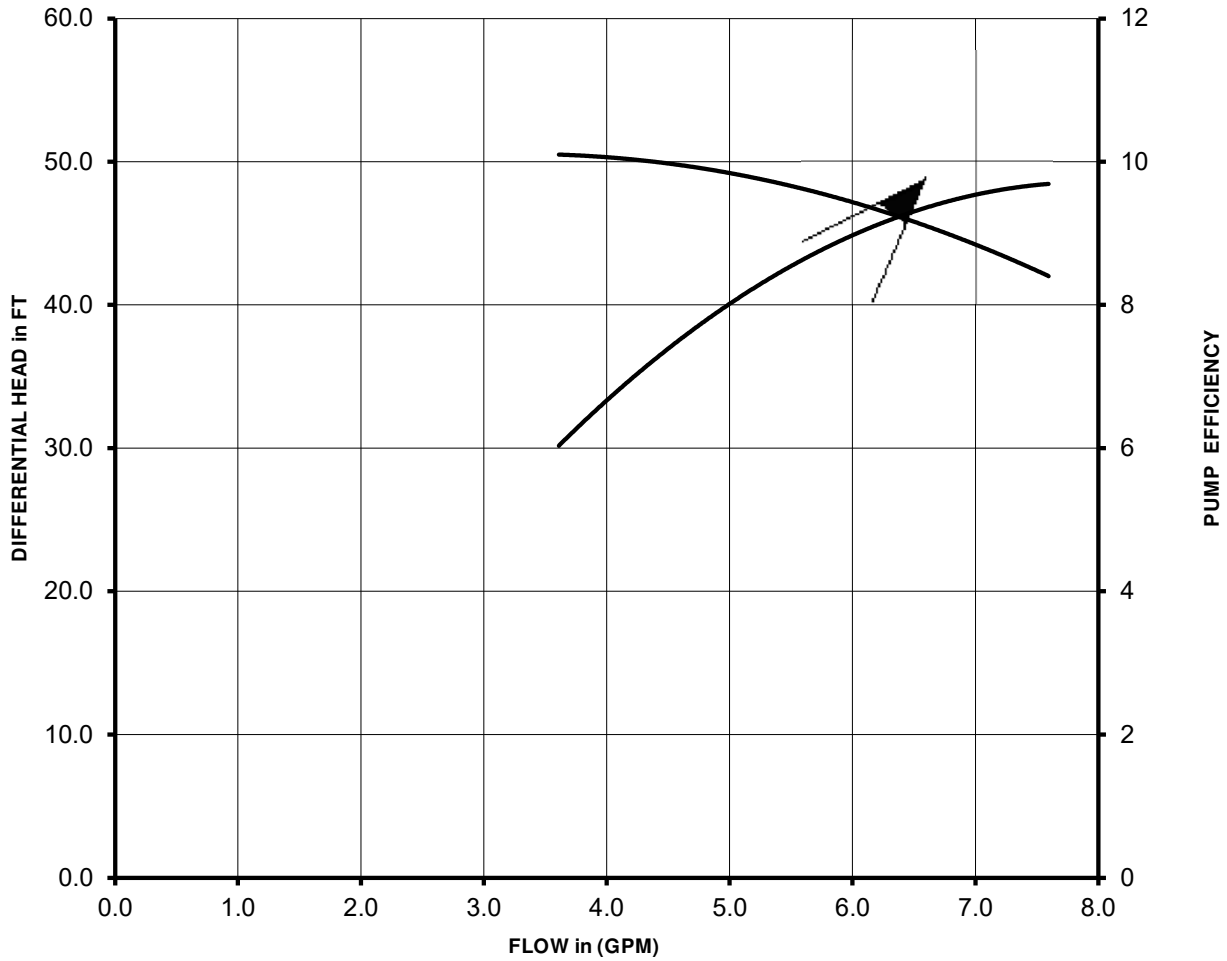
DATE OF TEST : 15-May-23

WITNESSED BY :

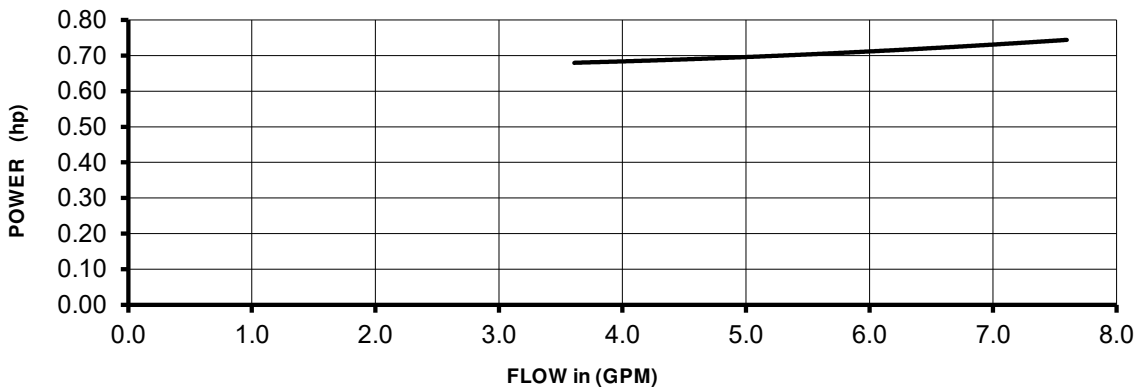
SIGNATURE

te	Pump Model: LMV-801S DA1 ZL (40 Bar)	HMD Serial No: 840055- 11mm orifice pla
	Speed: 1765 RPM	Item No: 18-P-257
	Impeller Dia: 6.14 Inches	
	Orifice Plate: Inches	

HQ PERFORMANCE CURVE CORRECTED FOR SITE CONDITIONS



POWER CURVE CORRECTED FOR SITE CONDITIONS



HMD SEAL/LESS PUMP NOISE TEST SHEET									
HMD SEAL/LESS PUMPS LTD. HAMPDEN PARK INDUSTRIAL ESTATE EASTBOURNE, EAST SUSSEX BN22 9AN ENGLAND					TELEPHONE : (01323) 452 000 FAX : (01323) 503369 EMAIL : pumps@hmdpumps.com				
CLIENT :		Air Products Manufacturing LLC							
CLIENT ORDER N° :		4505605360							
CLIENT ITEM N° :		840055							
HMD JOB N° :		18-P-257							
PUMP UNIT TESTED :-		DESCRIPTION :-							
		PUMP MODEL :			LMV-801S DA1 ZL (40 Bar)				
		DUTY FLOW :			6.60 GPM				
		DUTY HEAD :			48.88 FT				
MOTOR DETAILS :-		DESCRIPTION :-							
		RATED SPEED :			1765 RPM				
		RATED POWER :			7.50 HP				
		SUPPLY :			460 V / 3~ / 60 Hz				
		SERIAL N° :			XF2204295822				
		MANUFACTURER :			Baldor				
ACOUSTIC CONTROL DEVICES :-		DESCRIPTION :-							
MEASURING EQUIPMENT :-		DESCRIPTION :-							
		SOUND METER :			Bruel&Kjaer				
		SERIAL N° :			1824865				
TEST RESULTS :- (dBA VALUES)									
(AT DUTY POINT)									
MICROPHONE POSITION	OVERALL	62.5	125	250	500	1k	2k	4k	8k
1	63.20	27.00	37.70	45.40	55.10	58.50	54.40	57.80	51.20
2	63.40	27.50	37.30	47.30	54.40	57.40	54.80	59.20	52.40
3	62.60	27.50	37.70	48.40	54.90	57.10	53.00	57.80	49.40
4	63.00	27.30	37.80	48.50	53.10	58.80	53.70	57.90	50.30
5	63.30	26.50	37.90	46.10	53.40	58.90	53.50	58.70	50.00
BACKGROUND NOISE, POST TEST	55.80	29.50	34.50	42.90	52.20	50.90	46.60	43.80	32.40
MEASURED SOUND PRESSURE LEVEL AVERAGED OVER SURFACE MEASURED									63.10
BACKGROUND SOUND PRESSURE LEVEL AVERAGED OVER MEASURED SURFACE									55.80
BACKGROUND NOISE CORRECTION									-0.90
TEST ENVIRONMENT NOISE CORRECTION - BASED ON ISO 3744									-7.20
CORRECTION FOR SET-UP (EG. TEST PIPING, VALVES, BASEPLATE ETC)									
CORRECTED SOUND PRESSURE LEVEL AVERAGED OVER MEASURED SURFACE									55.00
COMMENTS :-									
TESTED BY : M Wheeler					SIGNATURE				
FOR : Air Products Manufacturing LLC					DATE OF TEST : 12-Jan-23				
WITNESSED BY :					SIGNATURE				

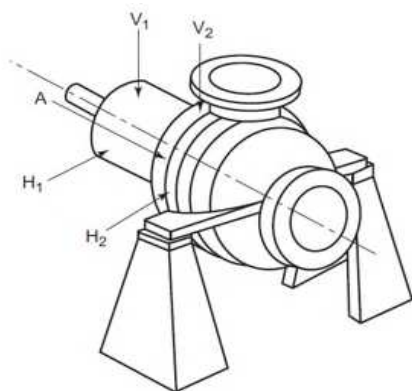


Vibration Fast Fourier Transform (FFT) API 685 6.8.3.2 Table 6

Pump No. 840055
Model No. LMV-801S DA1 ZL(40 Bar)

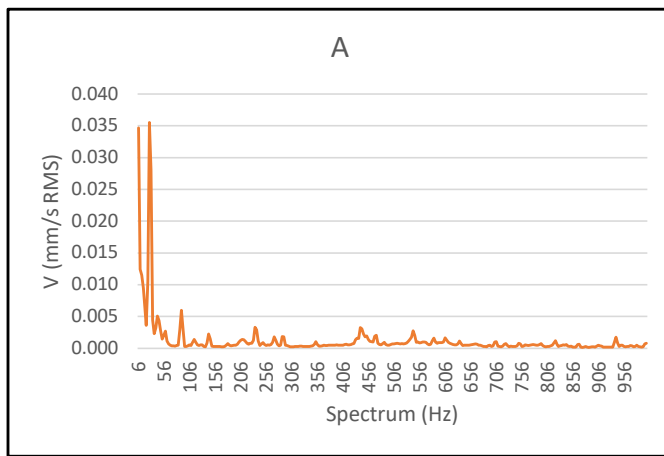
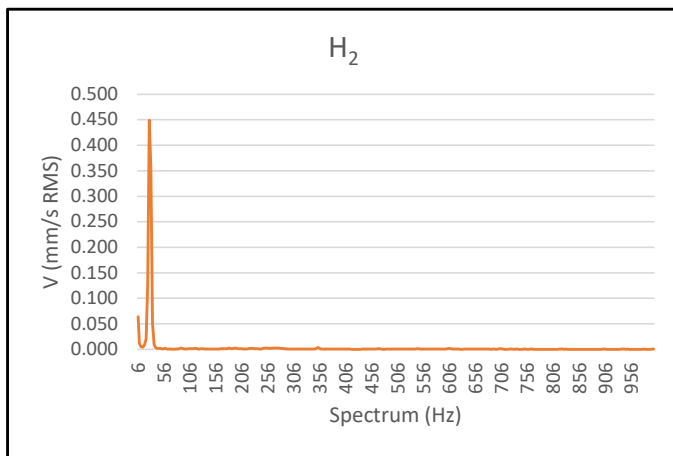
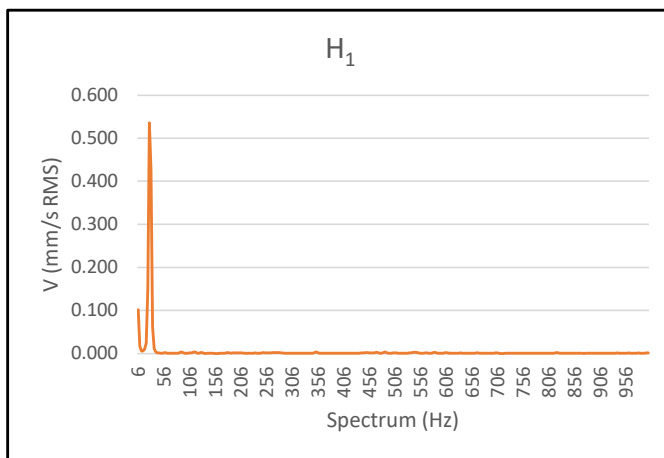
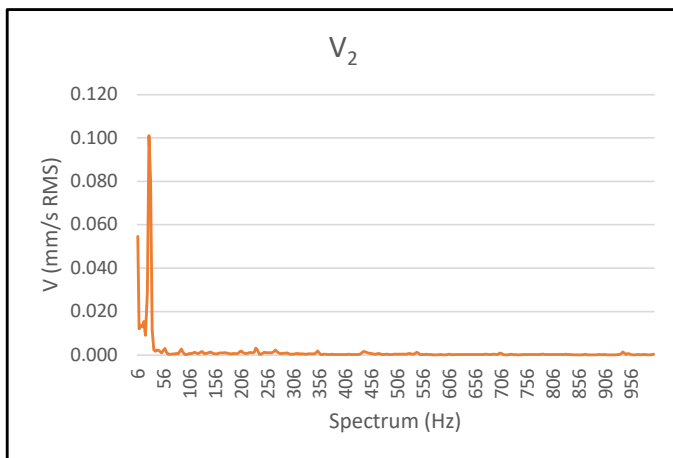
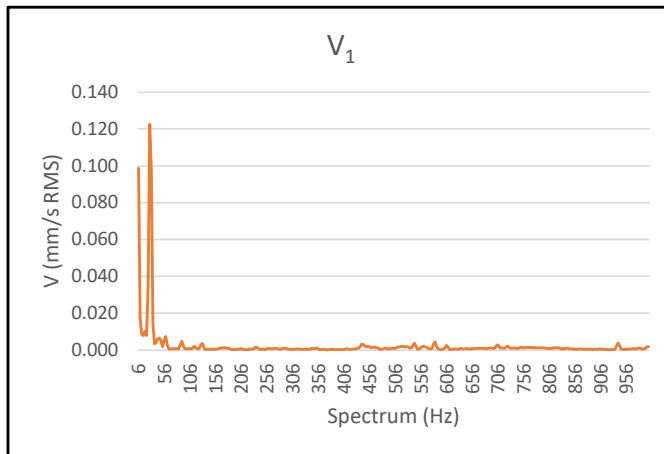
Order No. 4505605360
Item No. 18-P-257

3.61 **GPM** **29.660** **Hz**
1780 **RPM**



V₁ Rear bearing
V₂ Back bearing
H₁ Rear bearing
H₂ Back bearing
A Axial

Location of vibration reading API 685 6.8.3.2 Figure 6



Overall velocity (v_u), Discrete frequency velocity (v_f), units (mm/sec RMS), Velocity (V)

V1	0.123 v_u	H1	0.536 v_u	A	0.036 v_u	Operator: M Wheeler
V2	0.101 v_u	H2	0.449 v_u	Overall	0.96 v_f	Date: 12/01/2023

We certify that the vibration limits at any flowrate within the preferred operating region are within the limits shown in API 685 Table 6

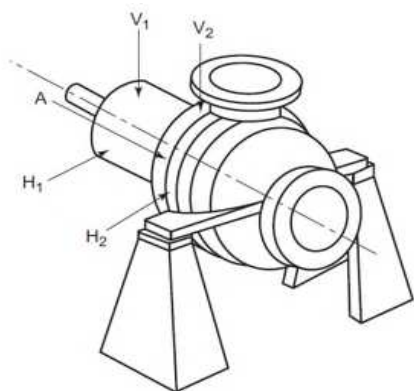


Vibration Fast Fourier Transform (FFT) API 685 6.8.3.2 Table 6

Pump No. 840055
Model No. LMV-801S DA1 ZL(40 Bar)

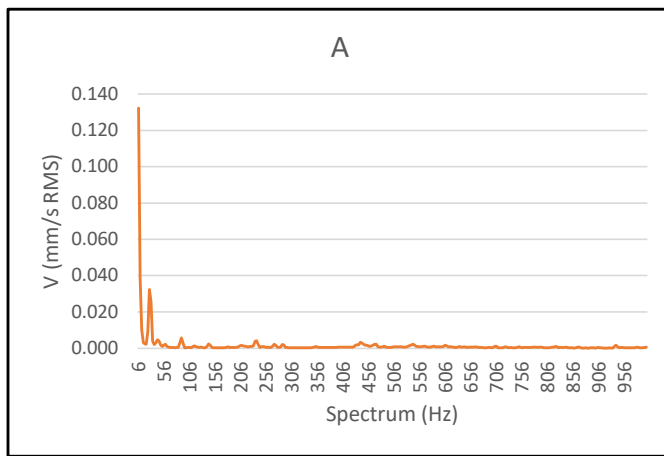
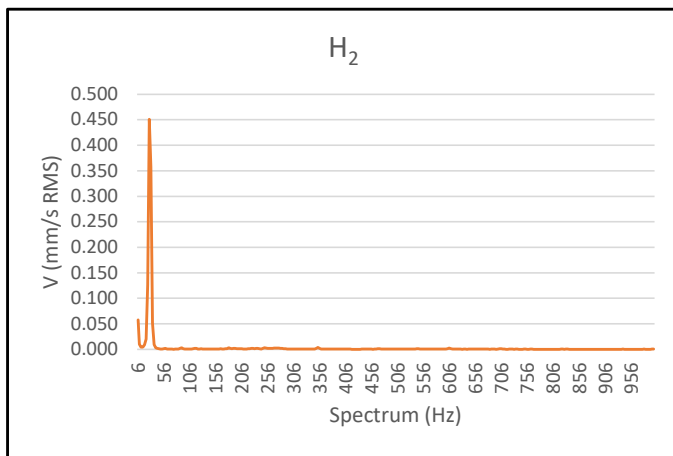
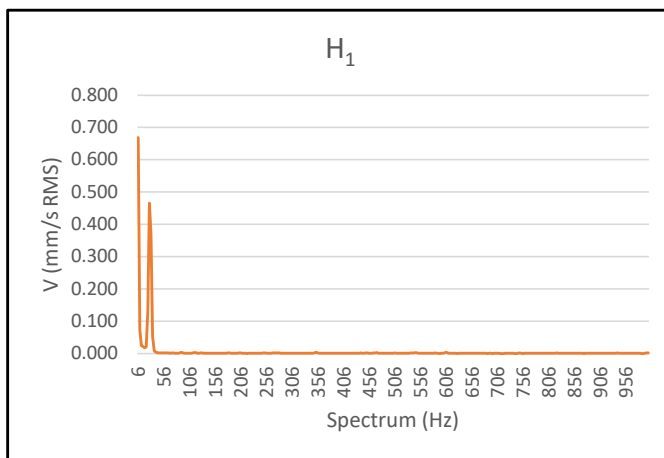
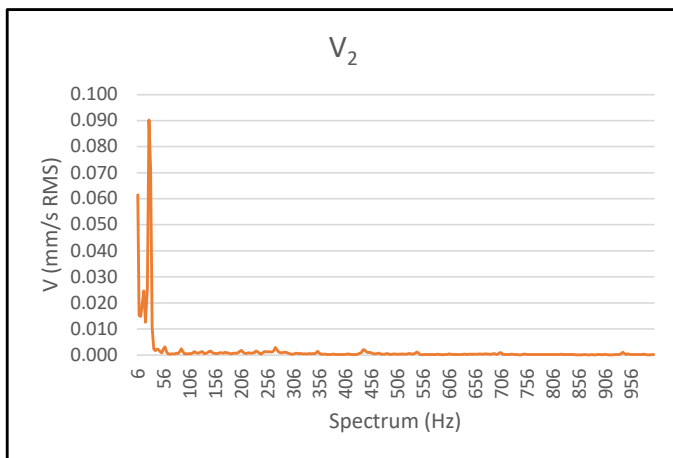
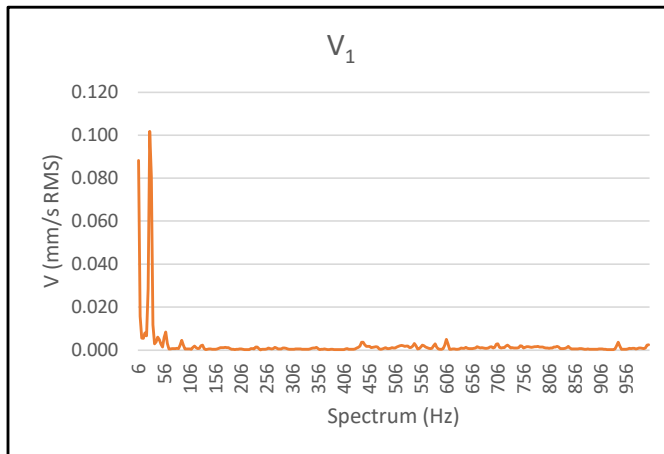
Order No. 4505605360
Item No. 18-P-257

5.11 **GPM** 29.660 **Hz**
1780 **RPM**



V₁ Rear bearing
V₂ Back bearing
H₁ Rear bearing
H₂ Back bearing
A Axial

Location of vibration reading API 685 6.8.3.2 Figure 6



Overall velocity (v_u), Discrete frequency velocity (v_f), units ($mm/sec RMS$), Velocity (V)

V1	0.069 v_u	H1	0.669 v_u	A	0.132 v_u	Operator: M Wheeler
V2	0.090 v_u	H2	0.451 v_u	Overall	1.12 v_f	Date: 12/01/2023

We certify that the vibration limits at any flowrate within the preferred operating region are within the limits shown in API 685 Table 6

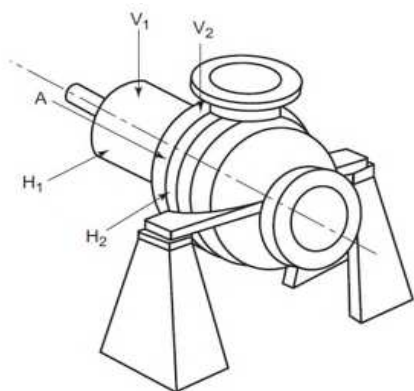


Vibration Fast Fourier Transform (FFT) API 685 6.8.3.2 Table 6

Pump No. 840055
Model No. LMV-801S DA1 ZL(40 Bar)

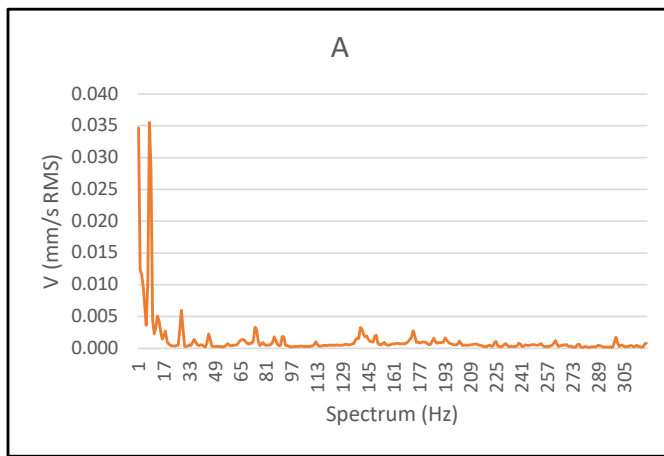
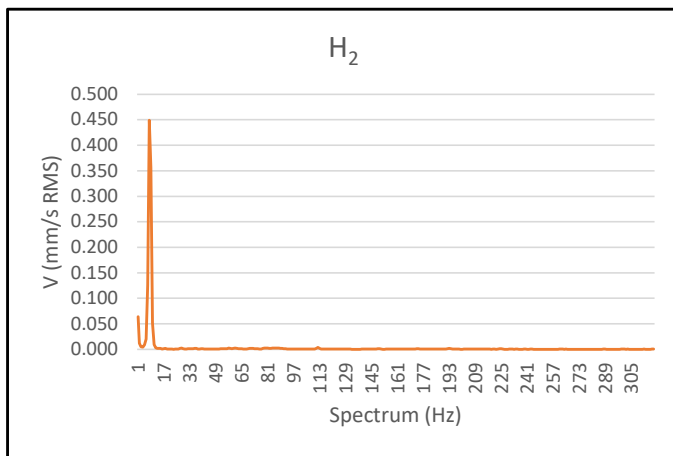
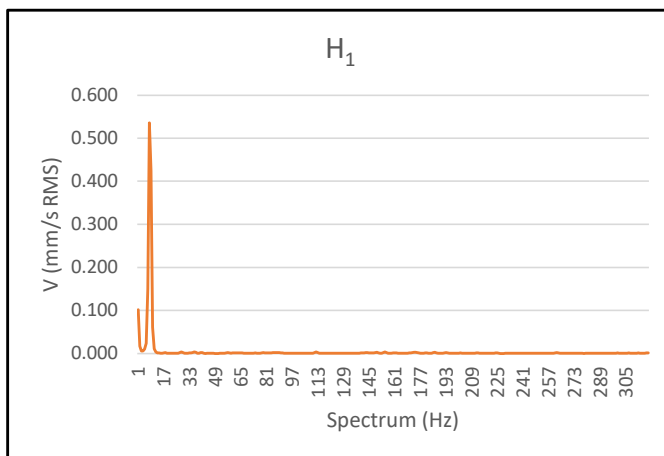
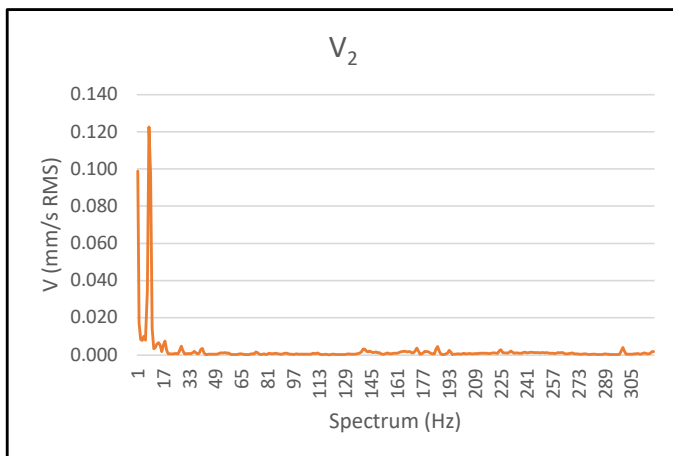
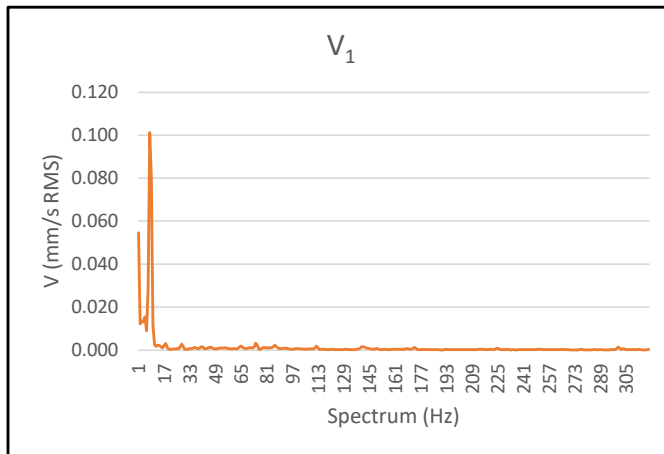
Order No. 4505605360
Item No. 18-P-257

6.27 **GPM** 29.660 **Hz**
1780 **RPM**



V₁ Rear bearing
V₂ Back bearing
H₁ Rear bearing
H₂ Back bearing
A Axial

Location of vibration reading API 685 6.8.3.2 Figure 6



Overall velocity (v_u), Discrete frequency velocity (v_f), units ($mm/sec RMS$), Velocity (V)

V1	0.094 v_u	H1	0.542 v_u	A	0.039 v_u	Operator: M Wheeler
V2	0.092 v_u	H2	0.671 v_u	Overall	1.15 v_f	Date: 12/01/2023

We certify that the vibration limits at any flowrate within the preferred operating region are within the limits shown in API 685 Table 6

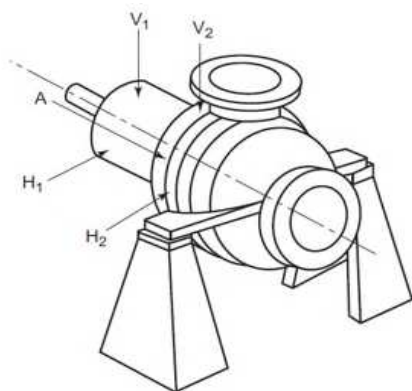


Vibration Fast Fourier Transform (FFT) API 685 6.8.3.2 Table 6

Pump No. 840055
Model No. LMV-801S DA1 ZL(40 Bar)

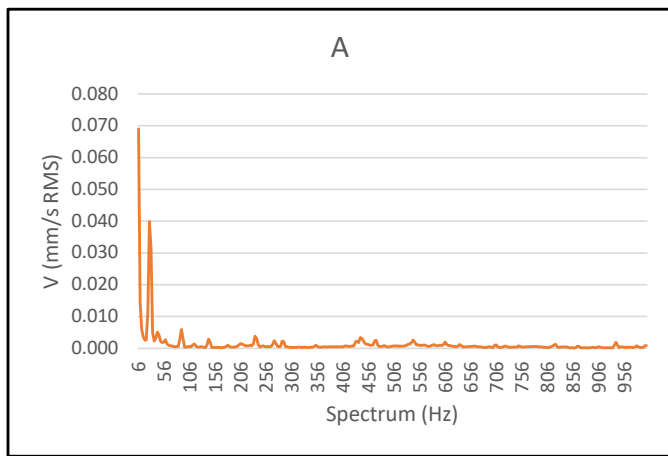
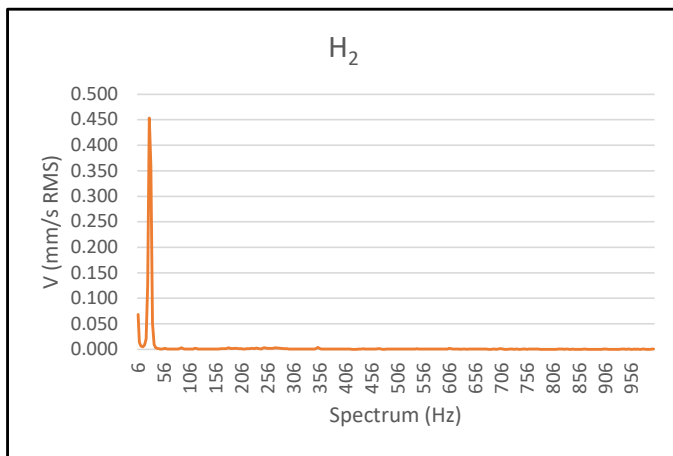
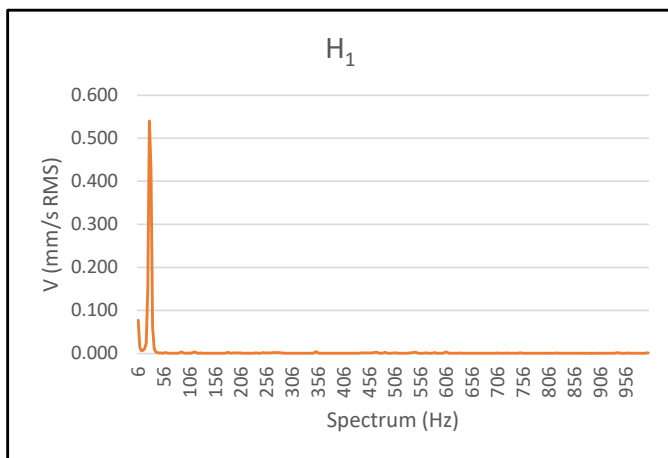
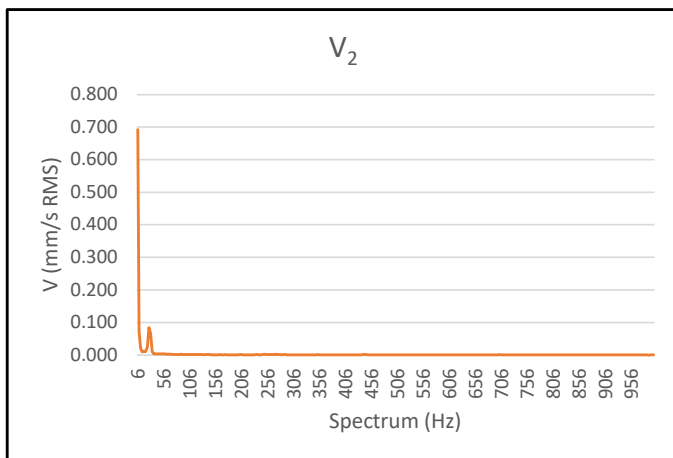
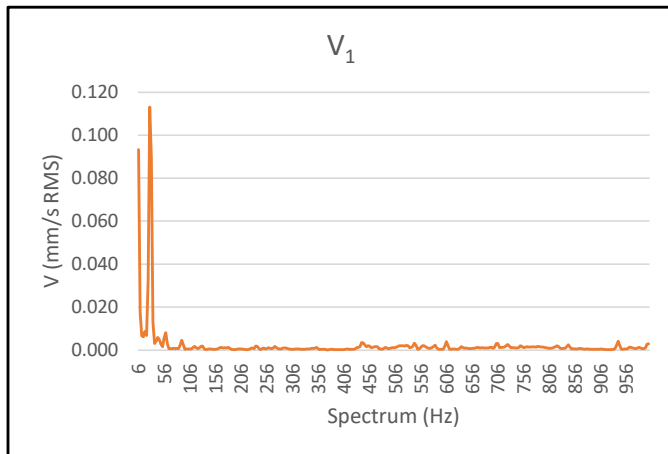
Order No. 4505605360
Item No. 18-P-257

6.60 **GPM** 29.660 **Hz**
1780 **RPM**



V₁ Rear bearing
V₂ Back bearing
H₁ Rear bearing
H₂ Back bearing
A Axial

Location of vibration reading API 685 6.8.3.2 Figure 6



Overall velocity (v_u), Discrete frequency velocity (v_f), units ($mm/sec RMS$), Velocity (V)

V1	0.113 v_u	H1	0.536 v_u	A	0.069 v_u	Operator: M Wheeler
V2	0.693 v_u	H2	0.453 v_u	Overall	1.19 v_f	Date: 12/01/2023

We certify that the vibration limits at any flowrate within the preferred operating region are within the limits shown in API 685 Table 6

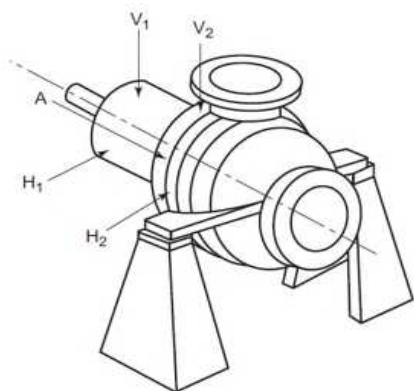


Vibration Fast Fourier Transform (FFT) API 685 6.8.3.2 Table 6

Pump No. 840055
Model No. LMV-801S DA1 ZL(40 Bar)

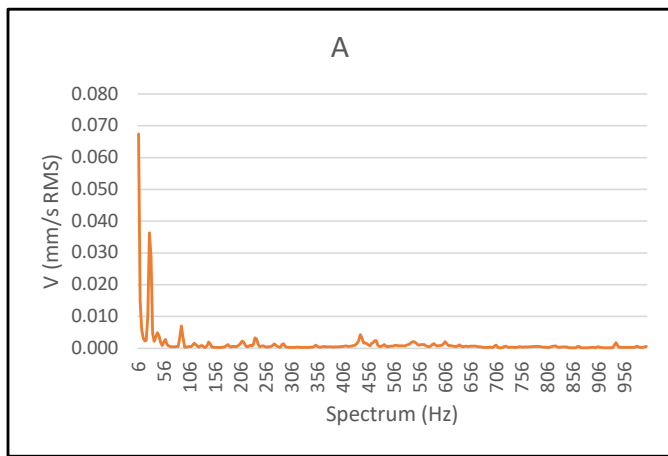
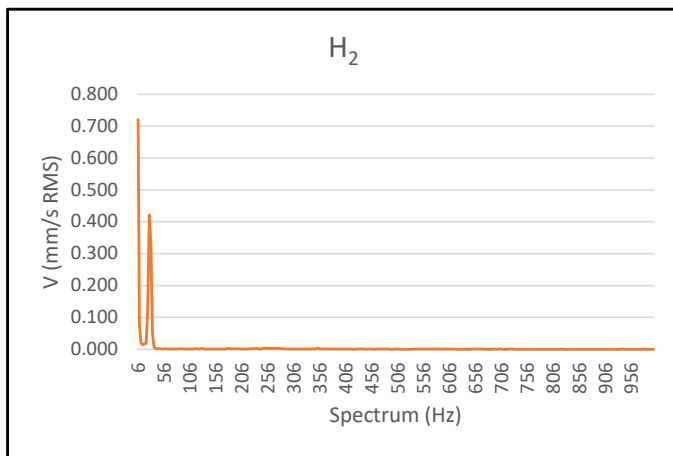
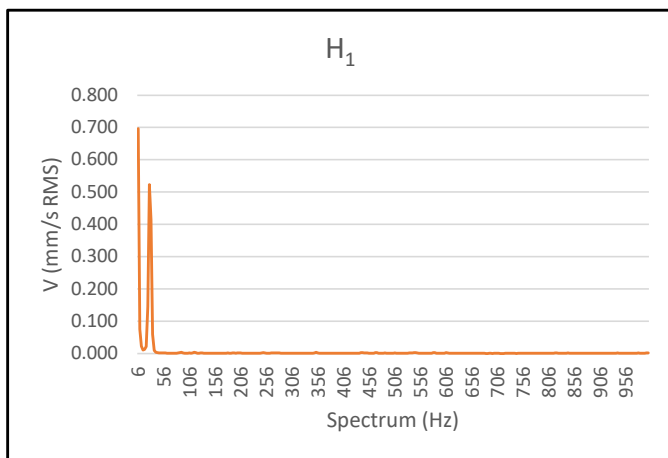
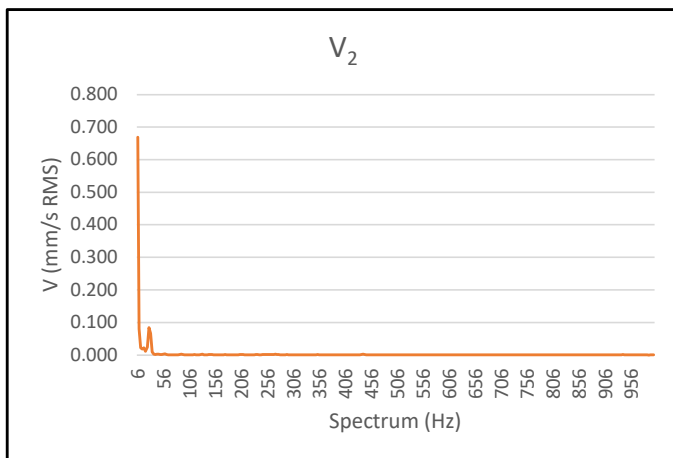
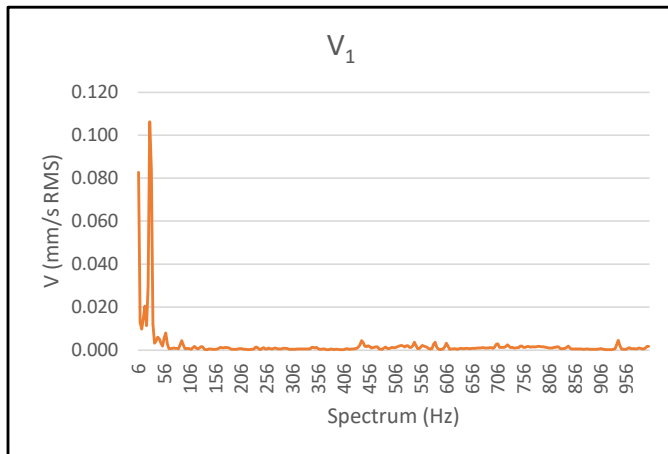
Order No. 4505605360
Item No. 18-P-257

6.93 **GPM** 29.660 **Hz**
1780 **RPM**



V₁ Rear bearing
V₂ Back bearing
H₁ Rear bearing
H₂ Back bearing
A Axial

Location of vibration reading API 685 6.8.3.2 Figure 6



Overall velocity (v_u), Discrete frequency velocity (v_f), units ($mm/sec RMS$), Velocity (V)

V1	0.106 v_u	H1	0.697 v_u	A	0.067 v_u	Operator: M Wheeler
V2	0.669 v_u	H2	0.720 v_u	Overall	1.52 v_f	Date: 12/01/2023

We certify that the vibration limits at any flowrate within the preferred operating region are within the limits shown in API 685 Table 6

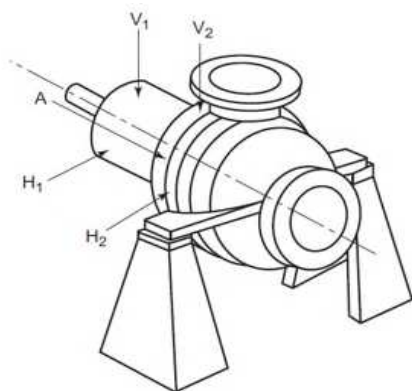


Vibration Fast Fourier Transform (FFT) API 685 6.8.3.2 Table 6

Pump No. 840055
Model No. LMV-801S DA1 ZL(40 Bar)

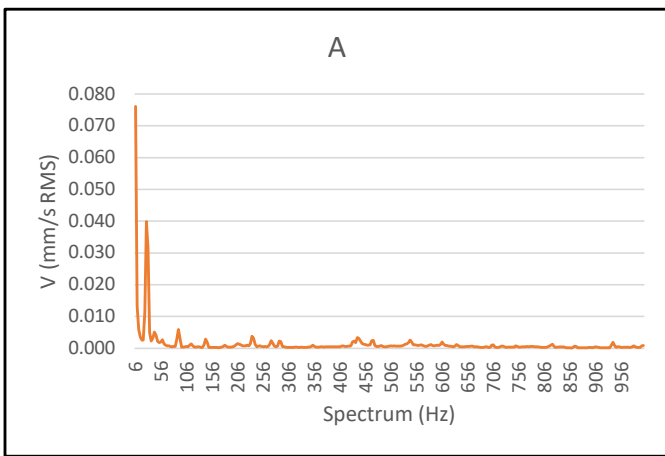
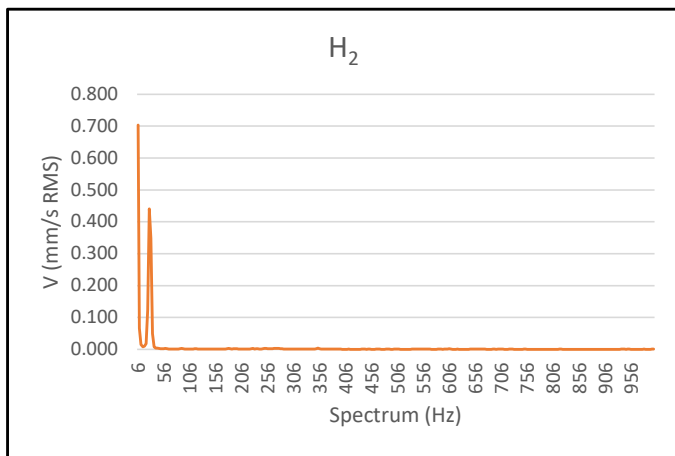
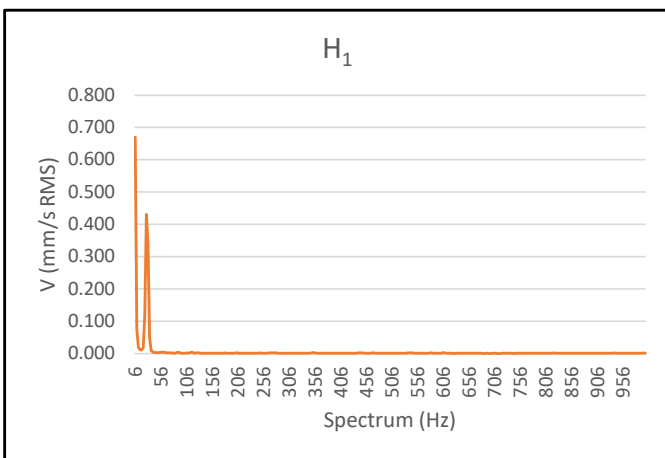
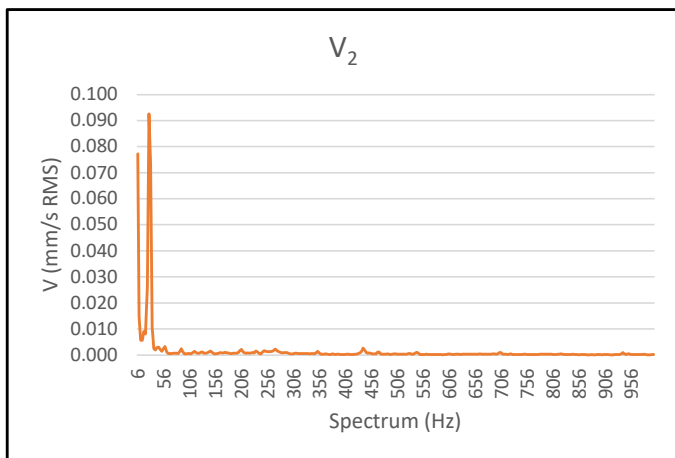
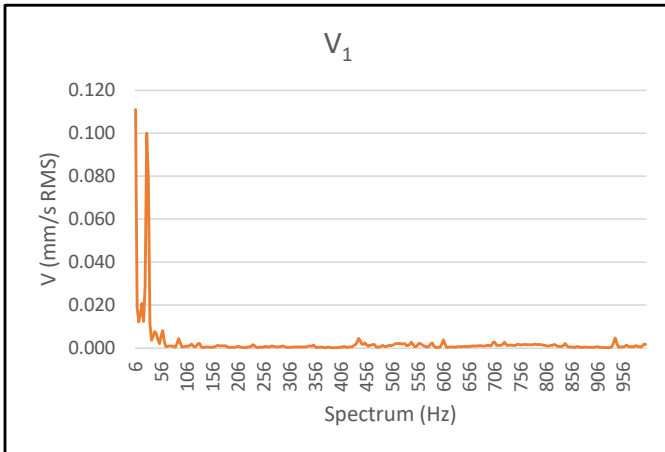
Order No. 4505605360
Item No. 18-P-257

7.59 **GPM** 29.660 **Hz**
1780 **RPM**



V₁ Rear bearing
V₂ Back bearing
H₁ Rear bearing
H₂ Back bearing
A Axial

Location of vibration reading API 685 6.8.3.2 Figure 6



Overall velocity (v_u), Discrete frequency velocity (v_f), units ($mm/sec RMS$), Velocity (V)

V1	0.111 v_u	H1	0.670 v_u	A	0.076 v_u	Operator: M Wheeler
V2	0.093 v_u	H2	0.704 v_u	Overall	1.29 v_f	Date: 12/01/2023

We certify that the vibration limits at any flowrate within the preferred operating region are within the limits shown in API 685 Table 6



MECHANICAL RUN (2hrs) TEST RESULTS & 15 MIN RUN AT DUTY 1.5

CLIENT: Air Products Manufacturing LLC

CLIENT ORDER NO: 4505605360

CLIENT ITEM NO: 18-P-257

HMD REF: 840055

Machinery Under Test	Description	HMD Pump				
	a] Pump Model	LMV-801S DA1 ZL (40 Bar)				
	b] Impeller Dia					
Driving Motor	Description					
	a] Type/Speed	1765 RPM				
	b] Power	7.5 HP				
	c] Supply Volts, Phases, etc	460 V, 34.6 A, 60 Hz				
	d] Serial Number					
	e] Motor Manufacturer	ABB Baldor				
Measuring Equipment	Accelerometer Type	VIB 2				
	Serial No	1542				
Overall Vibration Test Results (mm/sec-RMS)	Position					
	Flow (m ³ /hr)	07:45	08:00	08:15	08:30	08:45
	Vertical- V ₁	0.2	0.2	0.2	0.2	0.1
	Horizontal (Transverse)- H ₁	0.5	0.4	0.5	0.6	0.6
	Axial- A	0.1	0.1	0.1	0.1	0.1
	Vertical- V ₂	0.2	0.2	0.2	0.2	0.2
	Horizontal (Transverse)- H ₂	0.4	0.4	0.4	0.5	0.5
Tested By	Neil Jessop 					
Position	Test Engineer					
Date	5 January 2023					



MECHANICAL RUN (2hrs) TEST RESULTS & 15 MIN RUN AT DUTY 1.5

CLIENT: Air Products Manufacturing LLC

CLIENT ORDER NO: 4505605360

CLIENT ITEM NO: 18-P-257

HMD REF: 840055

Machinery	Description					
Under Test	a] Pump Model	LMV-801S DA1 ZL (40 Bar)				
	b] Impeller Dia					
Driving Motor	Description					
	a] Type/Speed	1765 RPM				
	b] Power	7.5 HP				
	c] Supply Volts, Phases, etc	460 V, 34.6 A, 60 Hz				
	d] Serial Number					
	e] Motor Manufacturer	ABB Baldor				
Measuring Equipment	Accelerometer Type	VIB 2				
	Serial No	1542				
Overall Vibration Test Results (mm/sec-RMS)	Position					
	Flow (m ³ /hr)	09:00	09:15	09:30	09:45	
	Vertical- V ₁	0.1	0.1	0.2	0.1	
	Horizontal (Transverse)- H ₁	0.6	0.6	0.6	0.6	
	Axial- A	0.1	0.1	0.1	0.1	
	Vertical- V ₂	0.2	0.1	0.1	0.2	
	Horizontal (Transverse)- H ₂	0.5	0.4	0.5	0.5	
Tested By	Neil Jessop					
Position	Test Engineer					
Date	5 January 2023					

HMD SEAL/LESS PUMP H/Q/P PERFORMANCE TEST SHEET

HMD SEAL/LESS PUMPS LTD.
HAMPDEN PARK INDUSTRIAL ESTATE
EASTBOURNE,
EAST SUSSEX
BN22 9AN
ENGLAND

TELEPHONE : (01323) 452000
FAX : (01323) 503369
EMAIL : pumps@hmdpumps.com

CLIENT:	Air Products Manufacturing LLC	ORDER N°:	4505605360
HMD JOB N°:	840056- 11mm orifice plate	PUMP SPEED:	1765 RPM
PUMP MODEL:	LMV-801S DA1 ZL (40 Bar)	IMPELLER DIA:	6.14 Inches
ORIFICE PLATE:	Inches	ITEM NUMBER:	18-P-257S
BALANCE KEYS:		BALANCE HOLES:	
DUTY REQUIREMENTS:-		LIQUID DETAILS:-	
DUTY FLOW:	6.60 (US)GPM	LIQUID PUMPED:	Slop Oil
DUTY HEAD:	48.88 FT	SG:	0.893
HYD TEST PRESSURE:	870 PSI	TEMPERATURE:	150 ° F
JACKET TEST PRESS:	PSI	VISCOSITY:	0.67 cSt
NPSHA:	9.84 FT		
MOTOR DETAILS:-		SERIAL N°:	
MANUFACTURER:		RATED PWR:	7.50 HP
SUPPLIED BY:	Client	FRAME SIZE:	215 T
RATED SPEED:	RPM	QUOTED ABS PWR:	0.87 HP
SUPPLY:	460 V / 3~ / 60 Hz		

PERFORMANCE TESTED TO :

API 685

READING	1	2	3	4	5	6	7	8
FLOW in (GPM)	3.61	5.11	6.27	6.60	6.93	7.59		
DIFFERENTIAL HEAD in FT	50.20	48.56	45.94	44.95	43.97	41.35		
POWER (hp)	0.75	0.76	0.77	0.78	0.80	0.81		
PUMP EFFICIENCY	6.12	8.24	9.42	9.56	9.67	9.81		
Discharge readings M H2O	15.00	14.50	13.70	13.40	13.10	12.30		
Correction gauge FLC	49.21	47.57	44.95	43.96	42.98	40.35		
Suction Head M H2O	0.00	0.00	0.00	0.00	0.00	0.00		
Correction gauge FLC	0.00	0.00	0.00	0.00	0.00	0.00		
Wattmetre reading (hp)	0.83	0.84	0.86	0.87	0.89	0.90		
Motor Efficiency (%)	90.0	90.0	90.0	90.0	90.0	90.0		
Motor speed rpm	1765	1765	1765	1765	1765	1765		
Impeller speed rpm	1765	1765	1765	1765	1765	1765		
Slip rpm	0	0	0	0	0	0		
Thrust (lbs)								
Datum correction (FT)	0.98	0.98	0.98	0.98	0.98	0.98		
Suction Bore (INCHES)	2.95	2.95	2.95	2.95	2.95	2.95		
Discharge Bore (INCHES)	1.97	1.97	1.97	1.97	1.97	1.97		
vel suc ² /2 x g (FLC)	0.000	0.001	0.001	0.001	0.002	0.002		
vel dis ² /2 x g (FLC)	0.002	0.005	0.007	0.008	0.008	0.010		

TESTED BY : n jessop

SIGNATURE 

FOR : Air Products Manufacturing LLC

DATE OF TEST : 15-May-23

WITNESSED BY : _____

SIGNATURE

Pump Model: LMV-801S DA1 ZL (40 Bar)

Speed: **RPM**

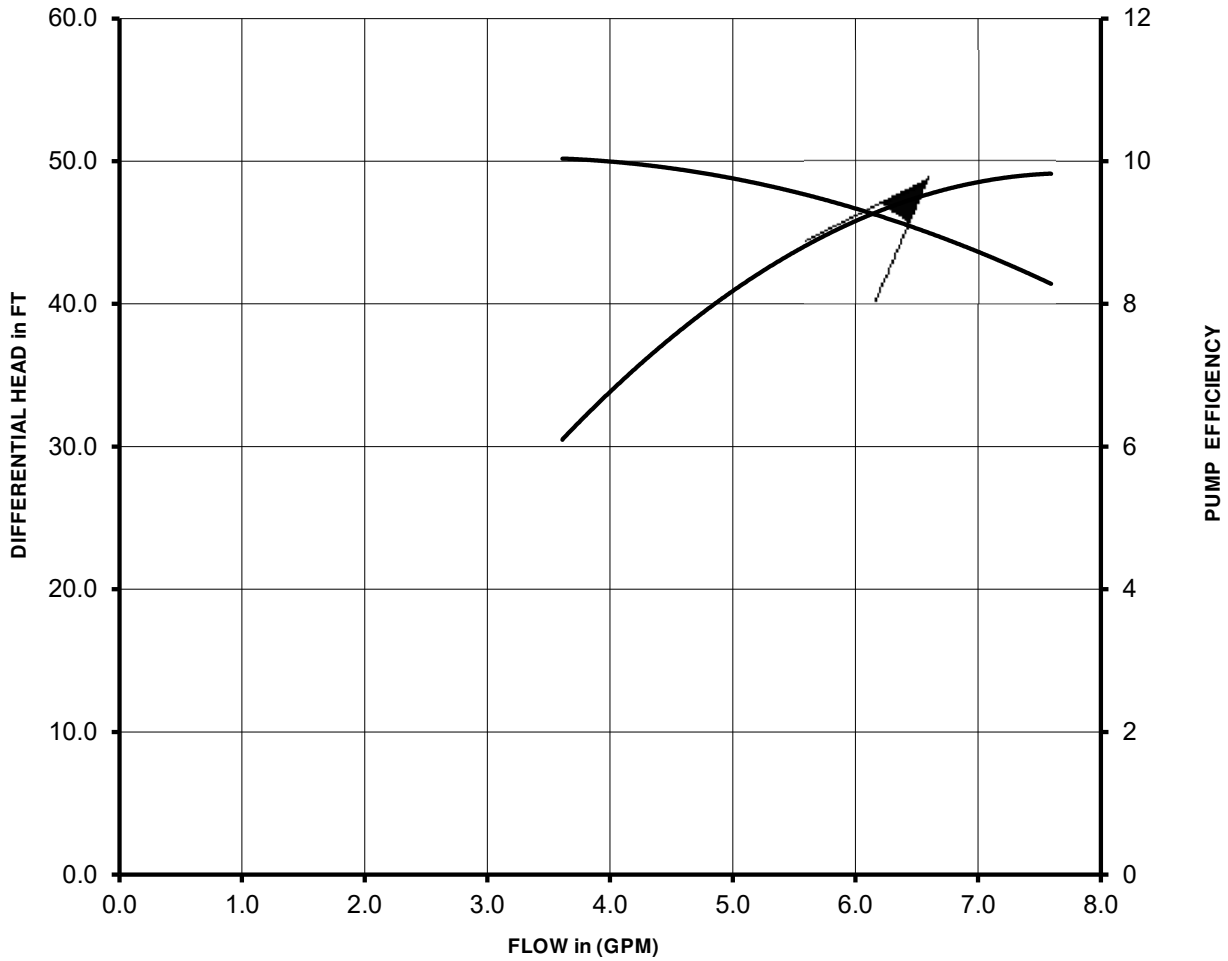
Impeller Dia: 6.14 **Inches**

Orifice Plate: **Inches**

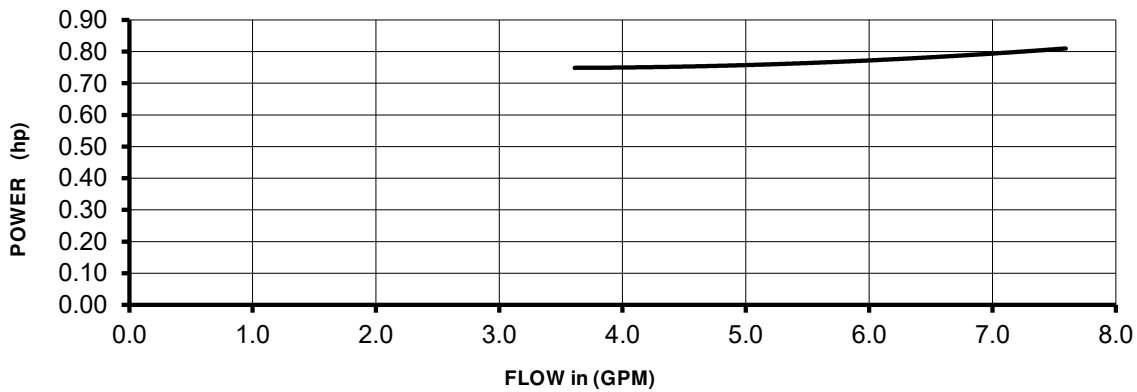
HMD Serial No: 840056- 11mm orifice pla

Item No: 18-P-257S

HQ PERFORMANCE CURVE



POWER CURVE



HMD SEAL/LESS PUMP H/Q/P SG CORR PERFORMANCE TEST SHEET

HMD SEAL/LESS PUMPS LTD.
HAMPDEN PARK INDUSTRIAL ESTATE
EASTBOURNE,
EAST SUSSEX
BN22 9AN
ENGLAND

TELEPHONE : (01323) 452000
FAX : (01323) 503369
EMAIL : pumps@hmdpumps.com

CLIENT:	Air Products Manufacturing LLC	ORDER N°:	4505605360
HMD JOB N°:	840056- 11mm orifice plate	PUMP SPEED:	1765 RPM
PUMP MODEL:	LMV-801S DA1 ZL (40 Bar)	IMPELLER DIA:	6.14 Inches
ORIFICE PLATE:	Inches	ITEM NUMBER:	18-P-257S
BALANCE KEYS:		BALANCE HOLES:	
DUTY REQUIREMENTS:-		LIQUID DETAILS:-	
DUTY FLOW:	6.60 (US)GPM	LIQUID PUMPED:	Slop Oil
DUTY HEAD:	48.88 FT		
HYD TEST PRESSURE:	870 PSI	SG:	0.893
JACKET TEST PRESS:	PSI	TEMPERATURE:	150 ° F
NPSHA:	9.84 FT	VISCOSITY:	0.67 cSt
MOTOR DETAILS:-			
MANUFACTURER:		SERIAL N°:	
SUPPLIED BY:	Client	RATED PWR:	7.50 HP
RATED SPEED:	RPM	FRAME SIZE:	215 T
SUPPLY:	460 V / 3~ / 60 Hz	QUOTED ABS PWR:	0.87

PERFORMANCE TESTED TO :

API 685

READING	PUMP PERFORMANCE ON SITE SG (Slop Oil) - NOT VISC CORRECTED							
	1	2	3	4	5	6	7	8
FLOW in (GPM)	3.61	5.11	6.27	6.60	6.93	7.59		
DIFFERENTIAL HEAD in FT	50.20	48.56	45.94	44.95	43.97	41.35		
POWER (hp)	0.67	0.68	0.69	0.70	0.71	0.72		
PUMP EFFICIENCY	6.12	8.24	9.42	9.56	9.67	9.81		

READING	PUMP PERFORMANCE ON SITE SG AND VISCOSITY (Slop Oil)							
	1	2	3	4	5	6	7	8
FLOW in (GPM)	3.61	5.11	6.27	6.60	6.93	7.59		
DIFFERENTIAL HEAD in FT	50.20	48.56	45.94	44.95	43.97	41.35		
POWER (hp)	0.67	0.68	0.69	0.70	0.71	0.72		
PUMP EFFICIENCY	6.12	8.24	9.42	9.56	9.67	9.81		

Note:

All pump efficiency figures stated are OVERALL and include magnetic coupling loss.

Viscosity Correction Factors	
Cq =	1.00
Ch =	1.00
Ce =	1.00

TESTED BY : n jessop

SIGNATURE 

FOR : Air Products Manufacturing LLC

DATE OF TEST : 15-May-23

WITNESSED BY :

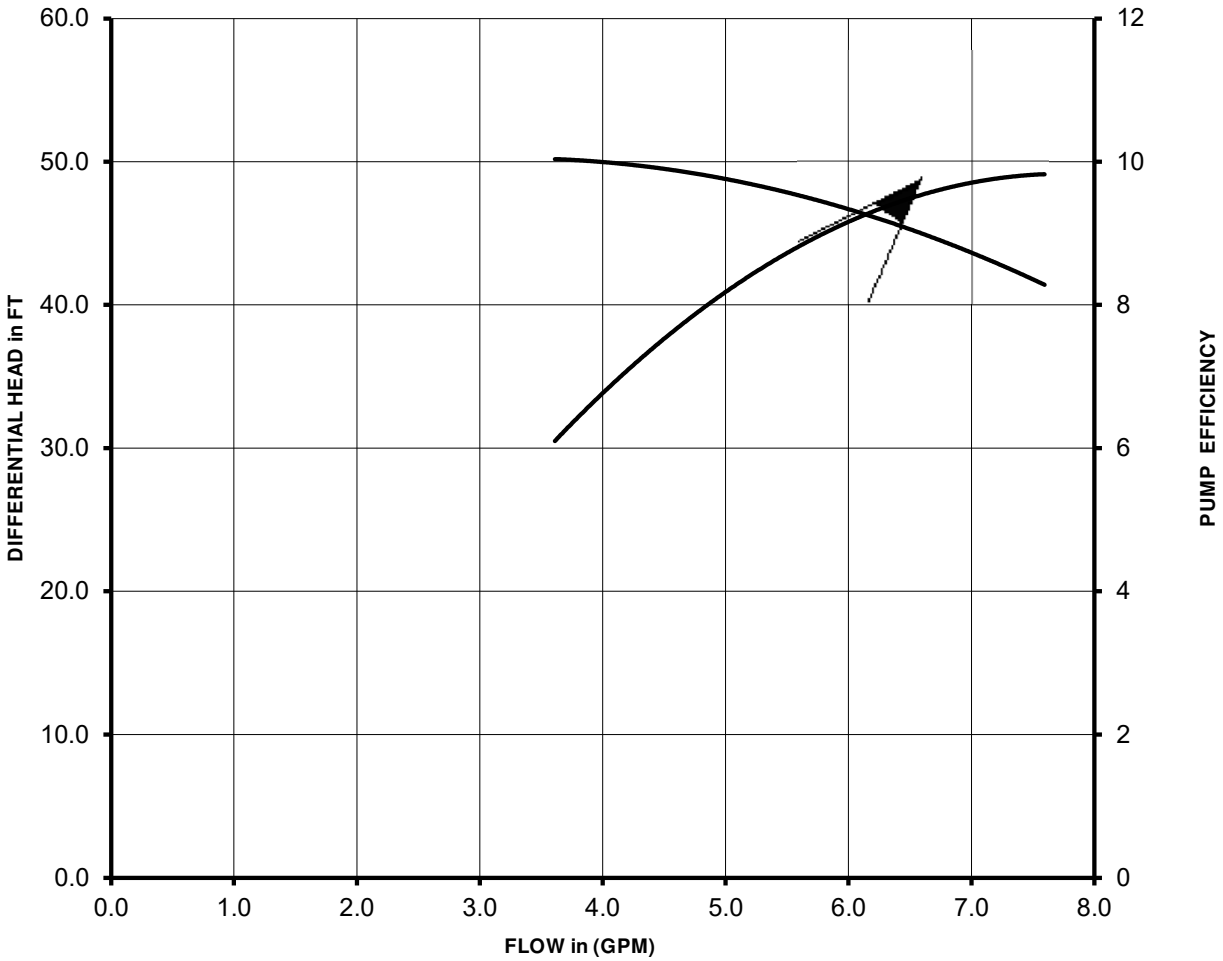
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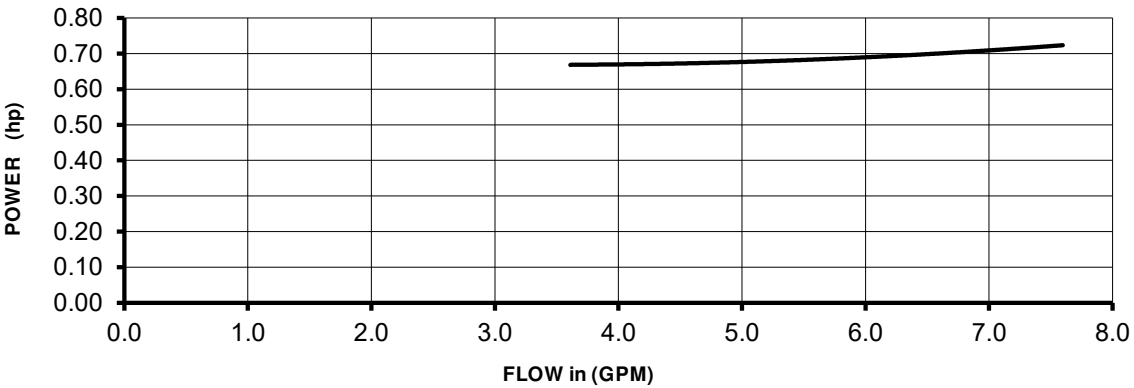
Pump Model: LMV-801S DA1 ZL (40 Bar)
Speed: 1765 **RPM**
Impeller Dia: 6.14 **Inches**
Orifice Plate: **Inches**

HMD Serial No: 840056- 11mm orifice pla
Item No: 18-P-257S

HQ PERFORMANCE CURVE CORRECTED FOR SITE CONDITIONS



POWER CURVE CORRECTED FOR SITE CONDITIONS



HMD SEAL/LESS PUMP NOISE TEST SHEET									
HMD SEAL/LESS PUMPS LTD. HAMPDEN PARK INDUSTRIAL ESTATE EASTBOURNE, EAST SUSSEX BN22 9AN ENGLAND					TELEPHONE : (01323) 452 000 FAX : (01323) 503369 EMAIL : pumps@hmdpumps.com				
CLIENT :		Air Products Manufacturing LLC							
CLIENT ORDER N° :		4505605360							
CLIENT ITEM N° :		840056							
HMD JOB N° :		18-P-257S							
PUMP UNIT TESTED :-		DESCRIPTION :-							
		PUMP MODEL :			LMV-801S DA1 ZL (40 Bar)				
		DUTY FLOW :			6.60 GPM				
		DUTY HEAD :			48.88 FT				
MOTOR DETAILS :-		DESCRIPTION :-							
		RATED SPEED :			RPM				
		RATED POWER :			7.50 HP				
		SUPPLY :			460 V / 3~ / 60 Hz				
		SERIAL N° :							
		MANUFACTURER :							
ACOUSTIC CONTROL DEVICES :-		DESCRIPTION :-							
MEASURING EQUIPMENT :-		DESCRIPTION :-							
		SOUND METER :			Bruel&Kjaer				
		SERIAL N° :			1824865				
TEST RESULTS :- (dBA VALUES) (AT DUTY POINT)									
MICROPHONE POSITION	OVERALL	62.5	125	250	500	1k	2k	4k	8k
1	64.00	29.50	37.90	46.00	53.20	61.45	54.30	57.10	49.50
2	62.60	25.50	35.70	46.10	54.30	56.30	53.80	58.40	42.40
3	63.50	28.40	37.90	46.30	54.50	59.10	54.10	58.50	50.60
4	63.30	26.10	37.60	49.40	52.50	57.70	55.00	59.10	51.10
5	62.90	28.60	37.50	48.00	55.60	58.40	53.20	57.40	49.20
BACKGROUND NOISE, POST TEST	56.60	27.80	36.70	45.30	51.10	53.30	47.40	42.60	31.90
MEASURED SOUND PRESSURE LEVEL AVERAGED OVER SURFACE MEASURED									63.26
BACKGROUND SOUND PRESSURE LEVEL AVERAGED OVER MEASURED SURFACE									56.60
BACKGROUND NOISE CORRECTION									-1.10
TEST ENVIRONMENT NOISE CORRECTION - BASED ON ISO 3744									-7.20
CORRECTION FOR SET-UP (EG. TEST PIPING, VALVES, BASEPLATE ETC)									
CORRECTED SOUND PRESSURE LEVEL AVERAGED OVER MEASURED SURFACE									54.96
COMMENTS :-									
TESTED BY : M Wheeler					SIGNATURE				
FOR : Air Products Manufacturing LLC					DATE OF TEST : 13-Jan-23				
WITNESSED BY :					SIGNATURE				

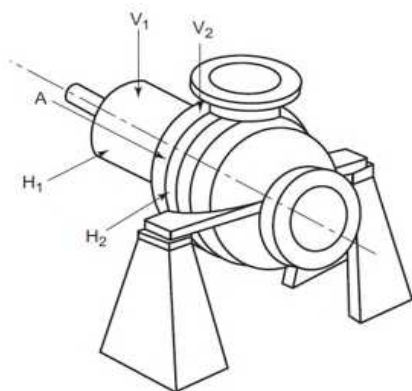


Vibration Fast Fourier Transform (FFT) API 685 6.8.3.2 Table 6

Pump No. 840056
Model No. LMV-801S DA1 ZL(40 Bar)

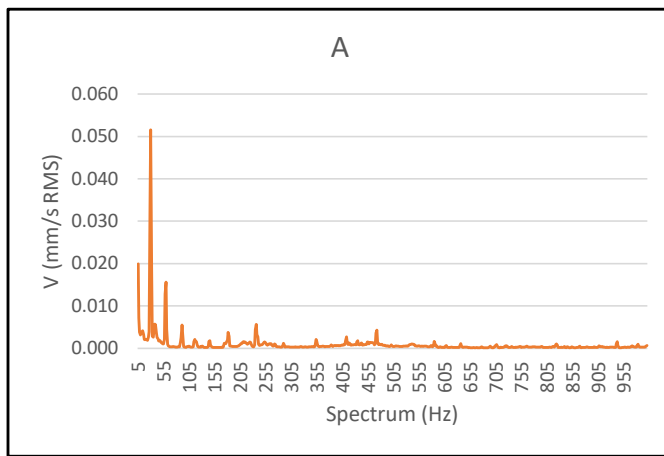
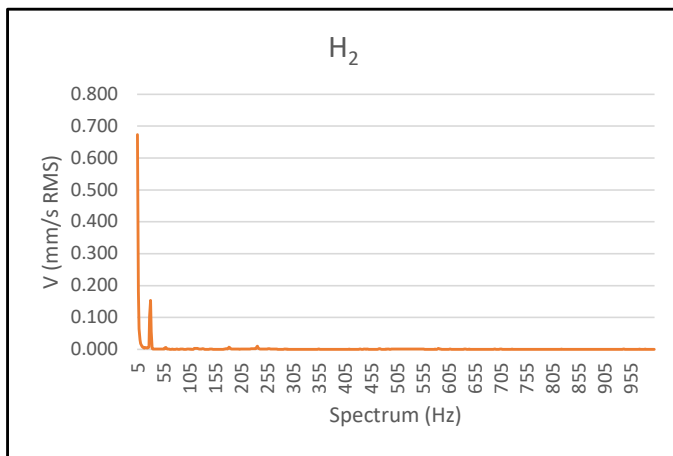
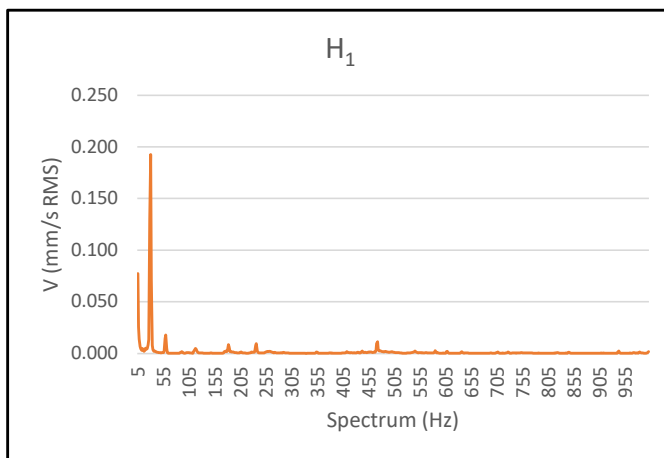
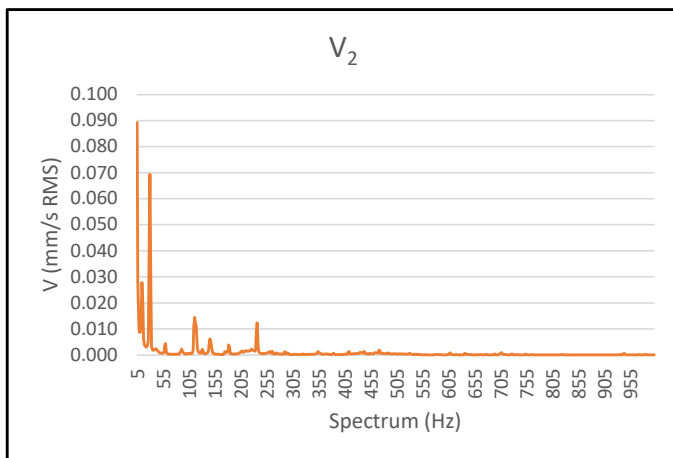
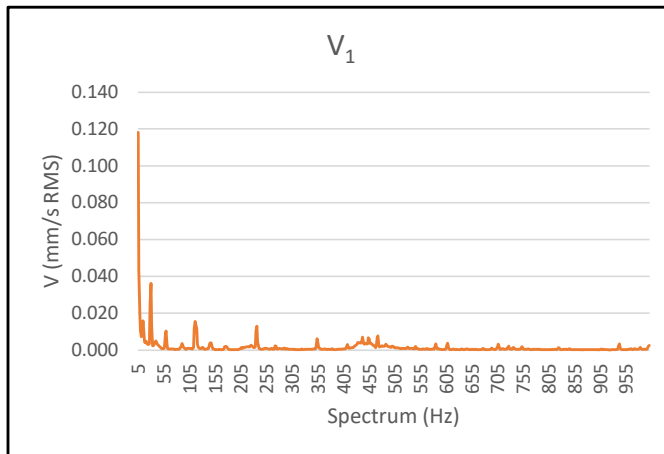
Order No. 4505605360
Item No. 18-P-257

3.61 **GPM** 29.660 **Hz**
1780 **RPM**



V₁ Rear bearing
V₂ Back bearing
H₁ Rear bearing
H₂ Back bearing
A Axial

Location of vibration reading API 685 6.8.3.2 Figure 6



Overall velocity (v_u), Discrete frequency velocity (v_f), units ($mm/sec RMS$), Velocity (V)

V1	0.118 v_u	H1	0.193 v_u	A	0.052 v_u	Operator: M Wheeler
V2	0.089 v_u	H2	0.673 v_u	Overall	0.80 v_f	Date: 12/01/2023

We certify that the vibration limits at any flowrate within the preferred operating region are within the limits shown in API 685 Table 6

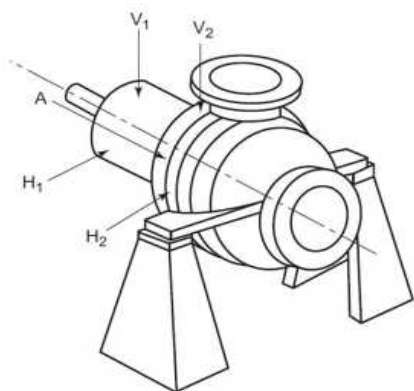


Vibration Fast Fourier Transform (FFT) API 685 6.8.3.2 Table 6

Pump No. 840056
Model No. LMV-801S DA1 ZL(40 Bar)

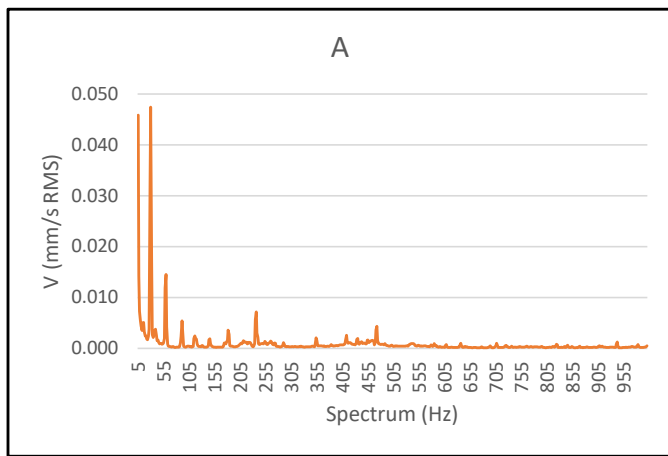
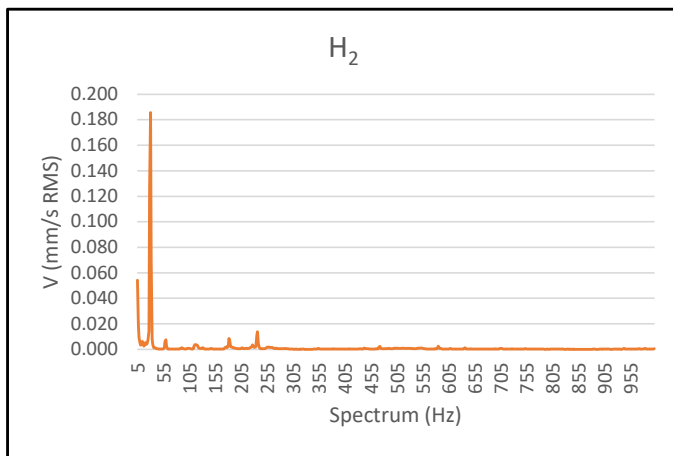
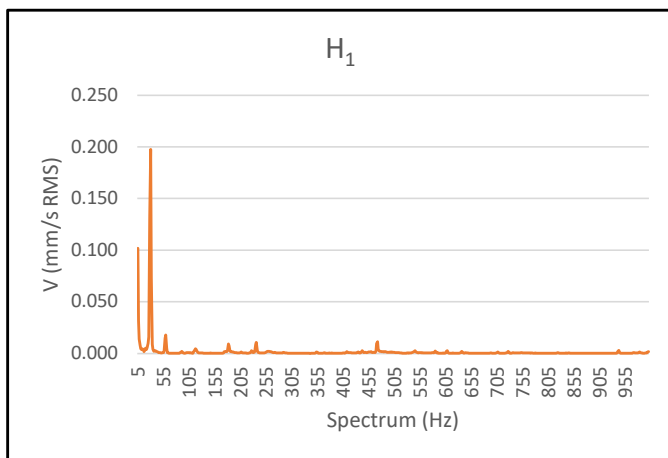
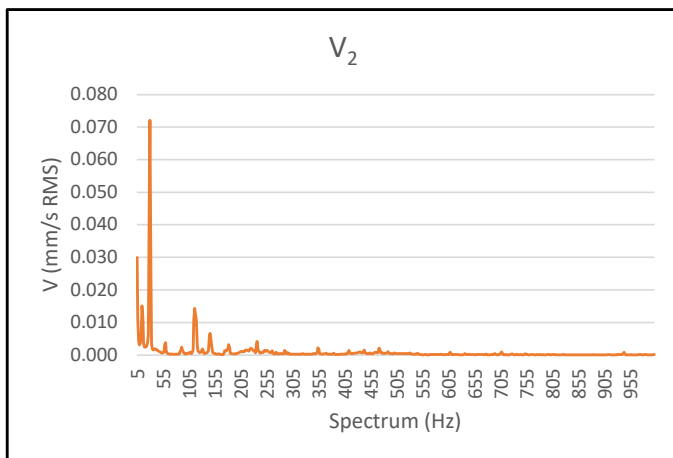
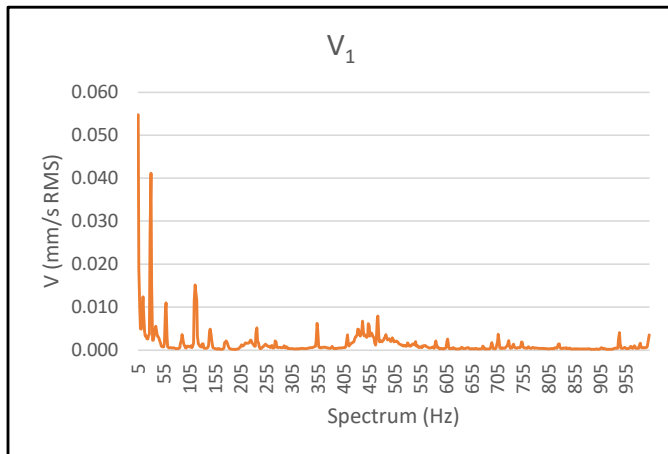
Order No. 4505605360
Item No. 18-P-257

5.11 **GPM** 29.660 **Hz**
1780 **RPM**



V₁ Rear bearing
V₂ Back bearing
H₁ Rear bearing
H₂ Back bearing
A Axial

Location of vibration reading API 685 6.8.3.2 Figure 6



Overall velocity (v_u), Discrete frequency velocity (v_f), units ($mm/sec RMS$), Velocity (V)

V1	0.055 v_u	H1	0.197 v_u	A	0.047 v_u	Operator: M Wheeler
V2	0.072 v_u	H2	0.186 v_u	Overall	0.40 v_f	Date: 12/01/2023

We certify that the vibration limits at any flowrate within the preferred operating region are within the limits shown in API 685 Table 6

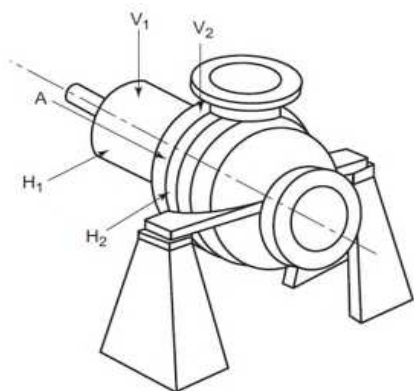


Vibration Fast Fourier Transform (FFT) API 685 6.8.3.2 Table 6

Pump No. 840056
Model No. LMV-801S DA1 ZL(40 Bar)

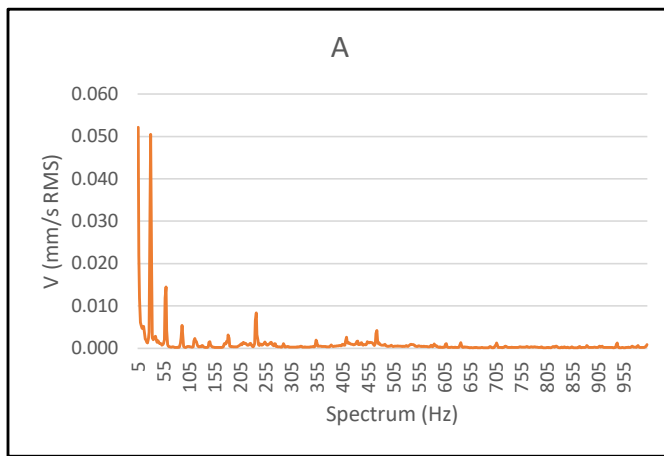
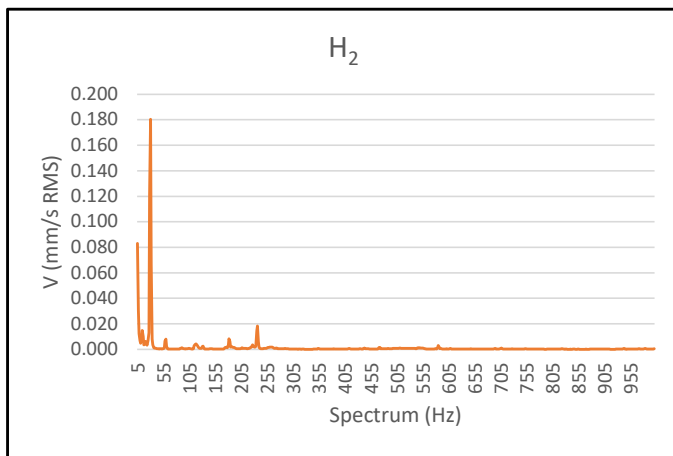
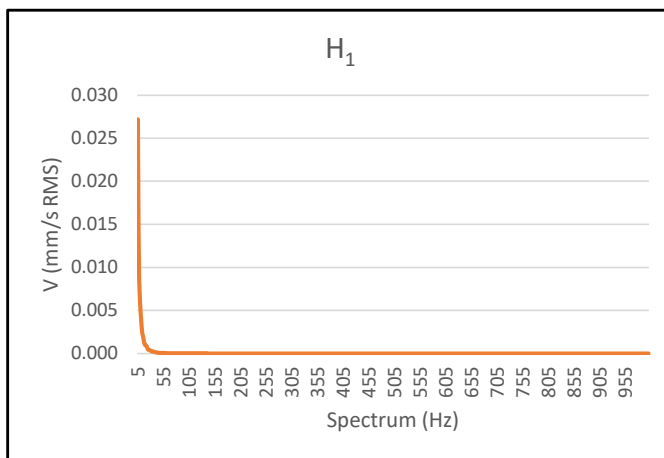
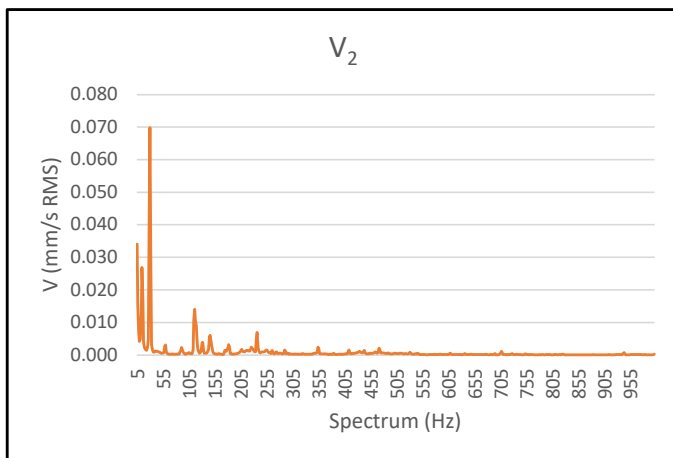
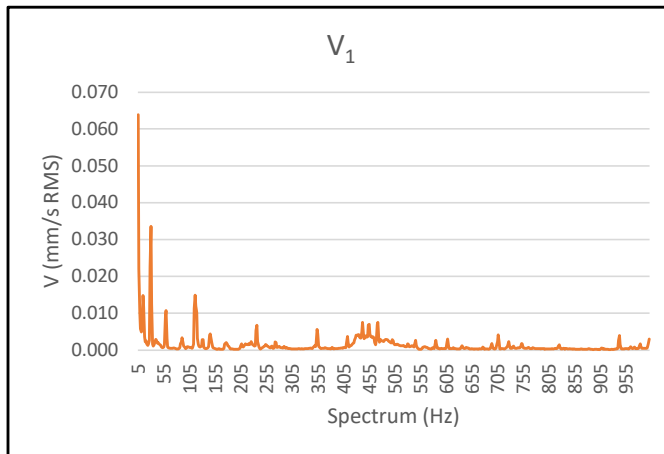
Order No. 4505605360
Item No. 18-P-257

6.27 **GPM** 29.660 **Hz**
1780 **RPM**



V₁ Rear bearing
V₂ Back bearing
H₁ Rear bearing
H₂ Back bearing
A Axial

Location of vibration reading API 685 6.8.3.2 Figure 6



Overall velocity (v_u), Discrete frequency velocity (v_f), units ($mm/sec RMS$), Velocity (V)

V1	0.064 v_u	H1	0.027 v_u	A	0.052 v_u	Operator: M Wheeler
V2	0.070 v_u	H2	0.180 v_u	Overall	0.30 v_f	Date: 12/01/2023

We certify that the vibration limits at any flowrate within the preferred operating region are within the limits shown in API 685 Table 6

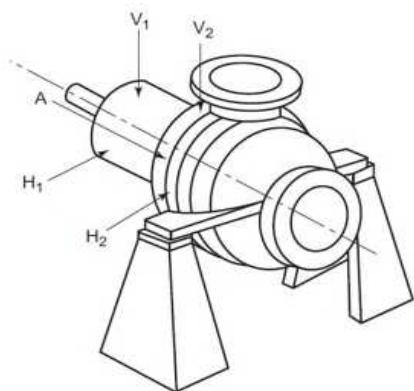


Vibration Fast Fourier Transform (FFT) API 685 6.8.3.2 Table 6

Pump No. 840056
Model No. LMV-801S DA1 ZL(40 Bar)

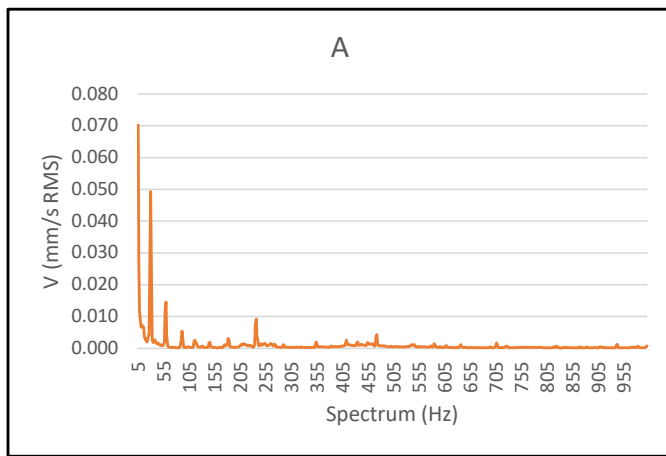
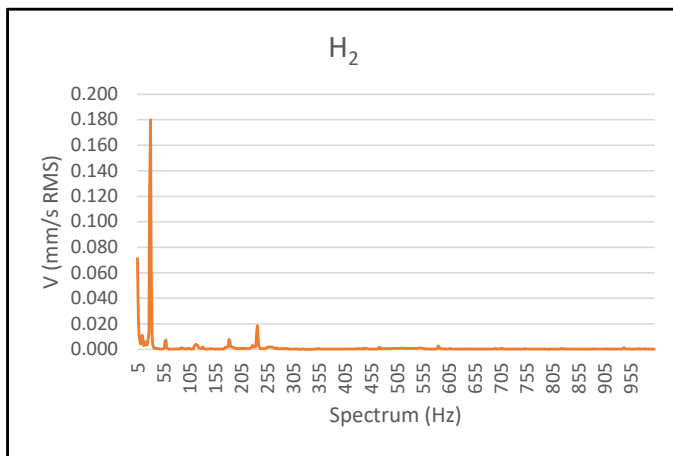
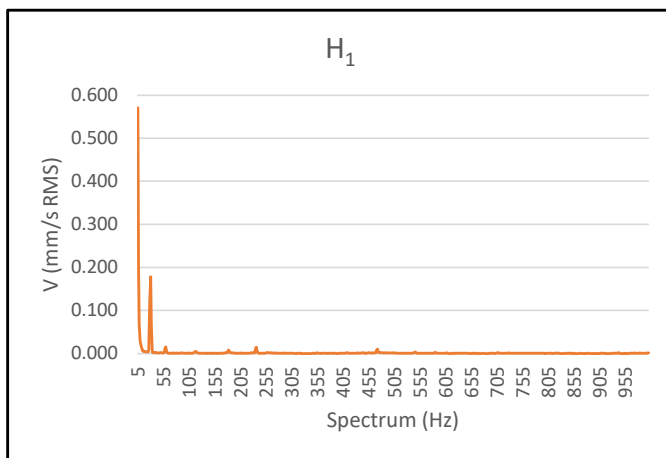
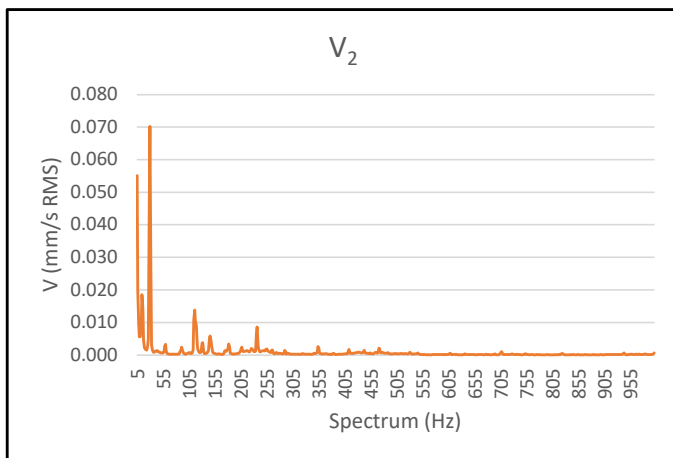
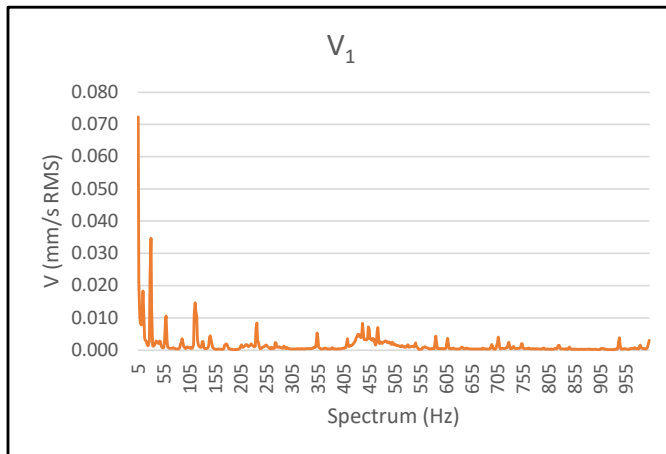
Order No. 4505605360
Item No. 18-P-257

6.60 **GPM** 29.660 **Hz**
1780 **RPM**



V₁ Rear bearing
V₂ Back bearing
H₁ Rear bearing
H₂ Back bearing
A Axial

Location of vibration reading API 685 6.8.3.2 Figure 6



Overall velocity (v_u), Discrete frequency velocity (v_f), units ($mm/sec RMS$), Velocity (V)

V1	0.072 v_u	H1	0.571 v_u	A	0.070 v_u	Operator: M Wheeler
V2	0.070 v_u	H2	0.180 v_u	Overall	0.59 v_f	Date: 12/01/2023

We certify that the vibration limits at any flowrate within the preferred operating region are within the limits shown in API 685 Table 6

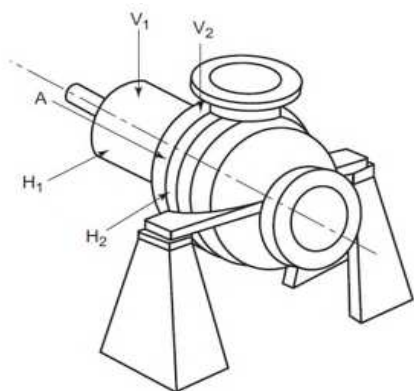


Vibration Fast Fourier Transform (FFT) API 685 6.8.3.2 Table 6

Pump No. 840056
Model No. LMV-801S DA1 ZL(40 Bar)

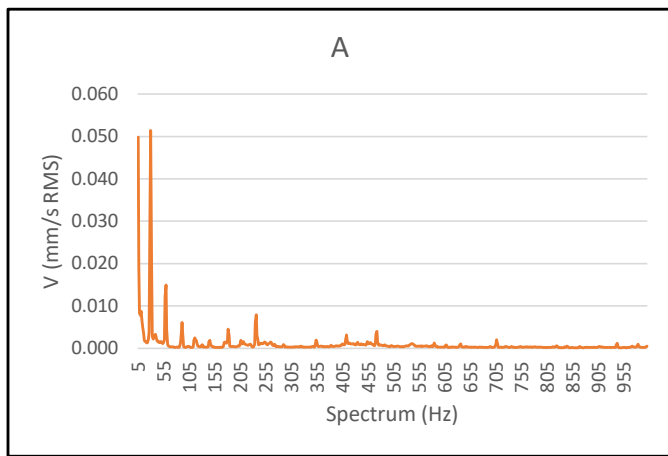
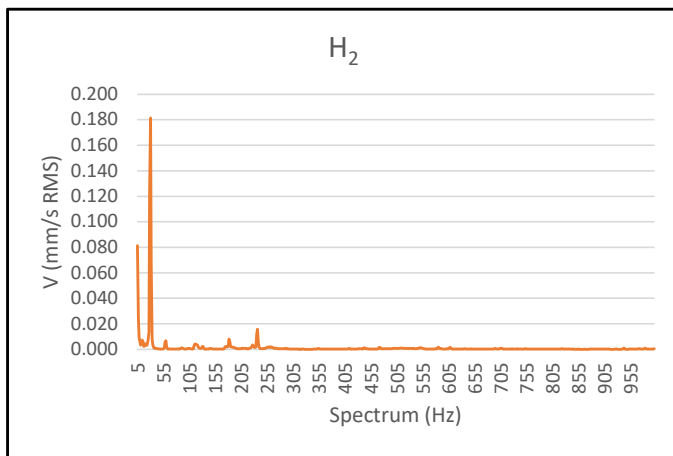
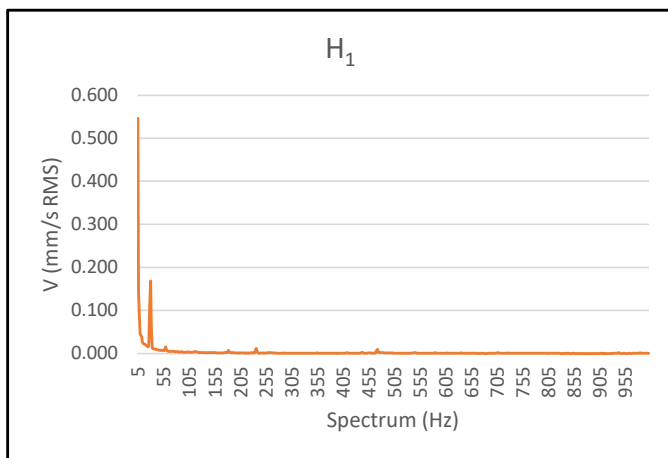
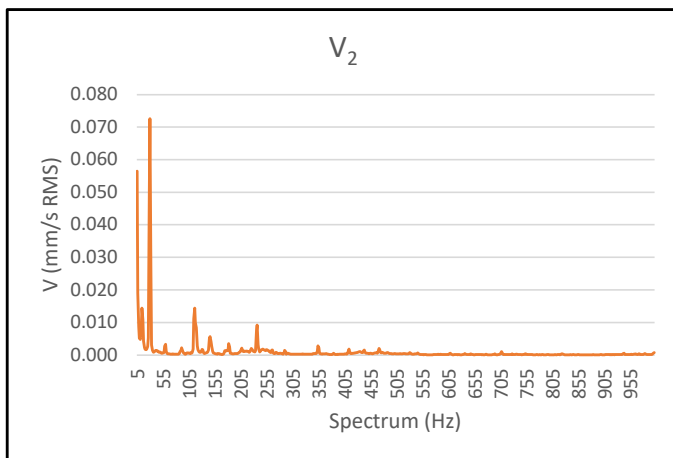
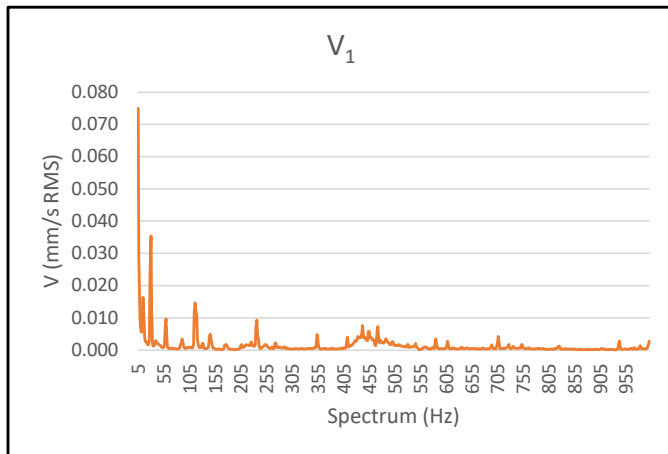
Order No. 4505605360
Item No. 18-P-257

6.93 **GPM** 29.660 **Hz**
1780 **RPM**



V₁ Rear bearing
V₂ Back bearing
H₁ Rear bearing
H₂ Back bearing
A Axial

Location of vibration reading API 685 6.8.3.2 Figure 6



Overall velocity (v_u), Discrete frequency velocity (v_f), units ($mm/sec RMS$), Velocity (V)

V1	0.075 v_u	H1	0.546 v_u	A	0.051 v_u	Operator: M Wheeler
V2	0.073 v_u	H2	0.181 v_u	Overall	0.69 v_f	Date: 12/01/2023

We certify that the vibration limits at any flowrate within the preferred operating region are within the limits shown in API 685 Table 6

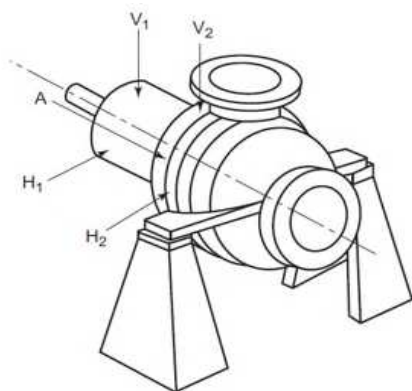


Vibration Fast Fourier Transform (FFT) API 685 6.8.3.2 Table 6

Pump No. 840056
Model No. LMV-801S DA1 ZL(40 Bar)

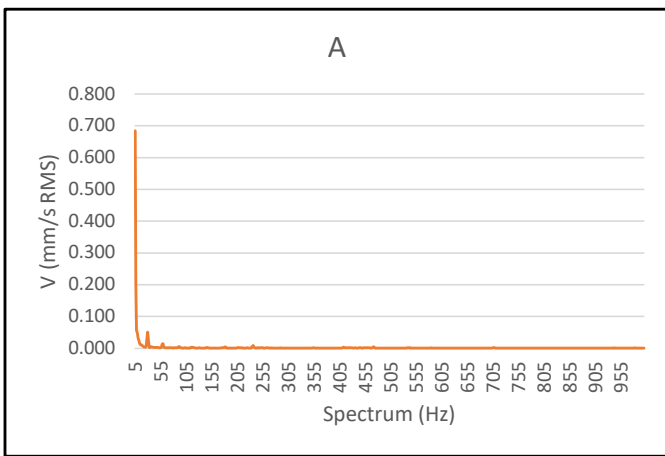
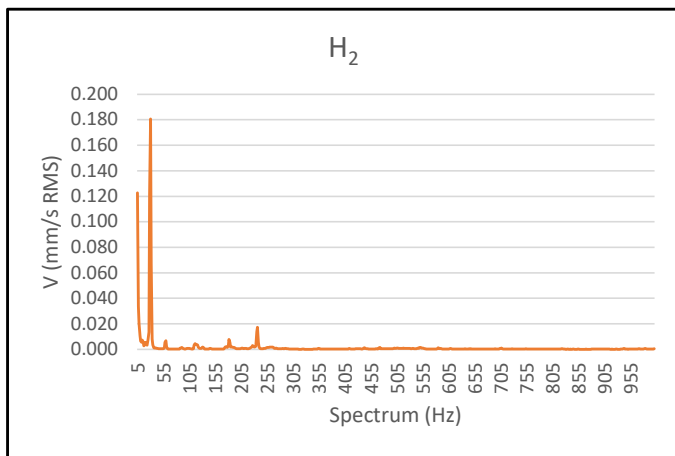
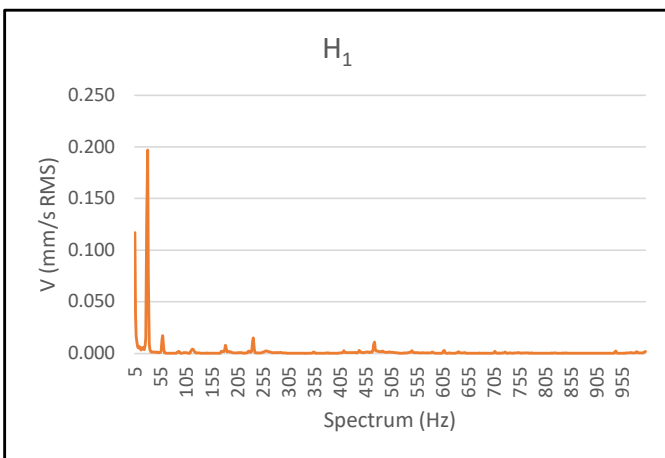
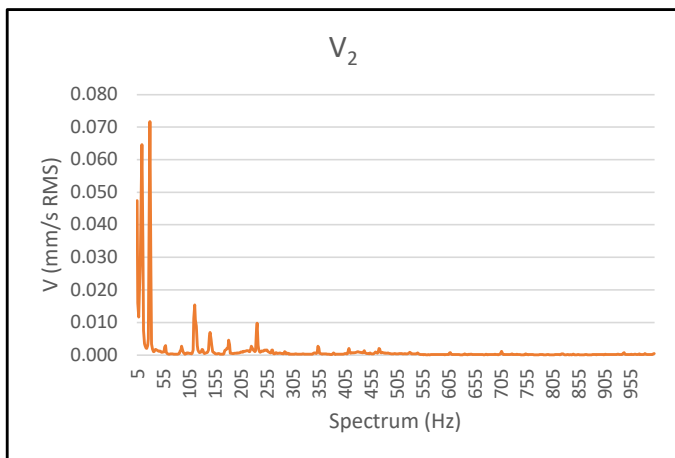
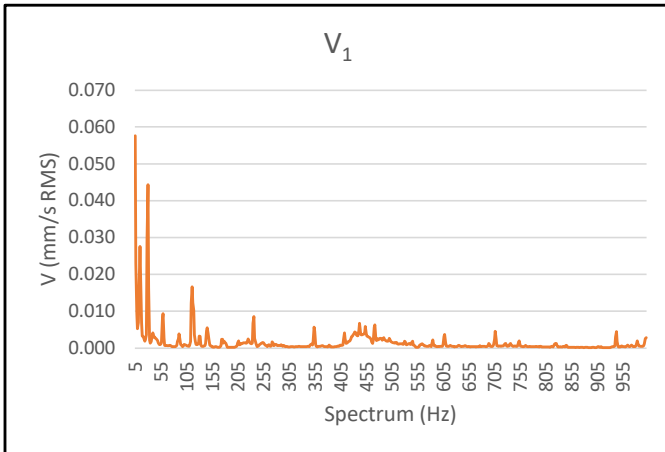
Order No. 4505605360
Item No. 18-P-257

7.59 GPM **29.660 Hz**
1780 RPM



V₁ Rear bearing
V₂ Back bearing
H₁ Rear bearing
H₂ Back bearing
A Axial

Location of vibration reading API 685 6.8.3.2 Figure 6



Overall velocity (v_u), Discrete frequency velocity (v_f), units ($mm/sec RMS$), Velocity (V)

V1	0.058 v_u	H1	0.197 v_u	A	0.685 v_u	Operator: M Wheeler
V2	0.072 v_u	H2	0.181 v_u	Overall	0.84 v_f	Date: 12/01/2023

We certify that the vibration limits at any flowrate within the preferred operating region are within the limits shown in API 685 Table 6



MECHANICAL RUN (2hrs) TEST RESULTS & 15 MIN RUN AT DUTY 1.5

CLIENT: Air Products Manufacturing LLC

CLIENT ORDER NO: 4505605360

CLIENT ITEM NO: 18-P-257

HMD REF: 840055

Machinery	Description					
Under Test	a] Pump Model	LMV-801S DA1 ZL (40 Bar)				
	b] Impeller Dia					
Driving Motor	Description					
	a] Type/Speed	1765 RPM				
	b] Power	7.5 HP				
	c] Supply Volts, Phases, etc	460 V, 34.6 A, 60 Hz				
	d] Serial Number					
	e] Motor Manufacturer	ABB Baldor				
Measuring Equipment	Accelerometer Type	VIB 2				
	Serial No	1542				
Overall Vibration Test Results (mm/sec-RMS)	Position					
	Flow (m ³ /hr)	7:30	7:45	08:00	08:15	08:30
	Vertical- V ₁	0.1	0.1	0.1	0.2	0.2
	Horizontal (Transverse)- H ₁	0.3	0.3	0.4	0.3	0.3
	Axial- A	0.1	0.1	0.2	0.1	0.1
	Vertical- V ₂	0.1	0.1	0.2	0.2	0.2
	Horizontal (Transverse)- H ₂	0.2	0.2	0.3	0.2	0.2
Tested By	Neil Jessop 					
Position	Test Engineer					
Date	6 January 2023					



MECHANICAL RUN (2hrs) TEST RESULTS & 15 MIN RUN AT DUTY 1.5

CLIENT: Air Products Manufacturing LLC

CLIENT ORDER NO: 4505605360

CLIENT ITEM NO: 18-P-257

HMD REF: 840055

Machinery	Description					
Under Test	a] Pump Model	LMV-801S DA1 ZL (40 Bar)				
	b] Impeller Dia					
Driving Motor	Description					
	a] Type/Speed	1765 RPM				
	b] Power	7.5 HP				
	c] Supply Volts, Phases, etc	460 V, 34.6 A, 60 Hz				
	d] Serial Number					
	e] Motor Manufacturer	ABB Baldor				
Measuring Equipment	Accelerometer Type	VIB 2				
	Serial No	1542				
Overall Vibration Test Results (mm/sec-RMS)	Position					
	Flow (m ³ /hr)	09:00	09:15	09:30	09:45	
	Vertical- V ₁	0.1	0.1	0.2	0.1	
	Horizontal (Transverse)- H ₁	0.6	0.6	0.6	0.6	
	Axial- A	0.1	0.1	0.1	0.1	
	Vertical- V ₂	0.2	0.1	0.1	0.2	
	Horizontal (Transverse)- H ₂	0.5	0.4	0.5	0.5	
Tested By	Neil Jessop					
Position	Test Engineer					
Date	6 January 2023					