APPLICATION FOR HCAI SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

APPLICATION #: OSP-0393

HCAI Special Seismic Certification Preapproval (OSP)

Type: ☐ New ☒ Renewal

Manufacturer Information

Manufacturer: Powerex, Inc.

Manufacturer's Technical Representative: Joe Abt

Mailing Address: 150 Production Drive, Harrison, OH 45030

Telephone: (513) 367-3273 Email: jabt@powerexinc.com

Product Information

Product Name: Medical Gas and Vacuum Systems

Product Type: Medical Air and Vacuum Systems

Product Model Number: See attachment

General Description: Medical vacuum and laboratory vacuum units contain pumps, a receiver tank, controller and filters.

Mounting Description: Rigid base mounted and neoprene pad mounted., See Certified Product Tables

Tested Seismic Enhancements: Seismic enhancements made to the test units and/or modifications required to address anomalies during the tests shall be incorporated into the production units.

Applicant Information

Applicant Company Name: Dynamic Certification Laboratories

Contact Person: Kelly Laplace

Mailing Address: 1315 Greg Parkway #109, Sparks, NV 89431

Telephone: (775) 358-5085 Email: Kelly@shaketest.com

Title: Business Manager

California Licensed Structural Engineer Responsible for the Engineering and Test Report(s)

Company Name: THE VMC GROUP

Name: Kenneth Tarlow California License Number: S2851

Mailing Address: 980 9th Street, 16th Floor, Sacramento, CA 95814

Telephone: (832) 627-2214 Email: ken.tarlow@thevmcgroup.com

Certification Method

☐ GR-63-Core ☒ ICC-ES AC156 ☐ IEEE 344 ☐ IEEE 693 ☐ NEBS 3

☐ Other (Please Specify):

Testing Laboratory

Company Name: DYNAMIC CERTIFICATION LABORATORY (DCL)

Contact Person: Kelly Laplace

Mailing Address: 1315 Greg St., Ste 109, Sparks NV 89431

Telephone: (775) 358-5085 Email: kelly@shaketest.com

Seismic Parameters

Design Basis of Equipment or Components (F_p/W_p) = 1.40 (Rigid); 4.39 (Internally isolated), 3.51 (externally isolated with neoprene elements)

S_{DS} (Design spectral response acceleration at short period, g) = 1.95

a_p (Amplification factor) = 1.0 (Rigid), 2.5 (internally isolated system), 2.5 (externally isolated with neoprene elements)

R_p (Response modification factor) = 2.5 (Rigid), 2.0 (internally isolated system), 2.5 (externally isolated with neoprene elements)

Ω_0 (System overstrength factor) = 2.0

I_p (Importance factor) = 1.5

z/h (Height ratio factor) = 1

Natural frequencies (Hz) = See Attachment

Overall dimensions and weight = See Attachment

HCAI Approval (For Office Use Only) - Approval Expires on 01/24/2030

Date: 1/24/2024

Name: Timothy Piland Title: Senior Structural Engineer

Special Seismic Certification Valid Up to: S_{DS} (g) = 1.95 z/h = 1

Condition of Approval (if applicable):

Special Seismic Certification

Table 1 - Certified Components - Stacked Systems, Lubricated Rotary Vane Pumps, Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Flexible Base Mount

Medical System Model	Laboratory System Model	HP	Tank Size [1] (gallons)	Total Number of Pumps	Vertically Stacked Pumps or Layers	Horizontally Arrayed Pumps	Max. Dimensions (in)			Max. Operating Weight (lb)	Mounting	Unit
							Length	Width [2]	Height			
Stacked Systems												
Duplex												
VPD0404	LVPD0404	5 (2)	120 V	2	2	1	55	64	76	1,340	Flexible base (neoprene) w/ internal isolation	UUT1
VPD0405	LVPD0405	5 (2)	200 V	2	2	1	55	64	83	1,600		Interpolated
VPD0504	LVPD0504	5 (2)	120 V	2	2	1	55	64	76	1,685		Interpolated
VPD0XXX	LVPD0XXX	5 (2)	200 V	2	2	1	70	45	80	1,940		UUT5 [3]
VPD0754	LVPD0754	7.5 (2)	120 V	2	2	1	55	64	76	1,760		Interpolated
VPD0755	LVPD0755	7.5 (2)	200 V	2	2	1	55	64	83	1,960		Interpolated
VPD1004	LVPD1004	10 (2)	120 V	2	2	1	55	64	76	2,050		Interpolated
VPD1005	LVPD1005	10 (2)	200 V	2	2	1	55	64	83	2,250		Interpolated
VPD1505	LVPD1505	15 (2)	200 V	2	2	1	70	90	87	4,280		Interpolated
VPD2005	LVPD2005	20 (2)	200 V	2	2	1	70	90	87	4,610		Interpolated
VPD2505	LVPD2505	25 (2)	200 V	2	2	1	70	90	87	5,130		UUT2
Triplex (based on 2-stack plus 1)												
VPT0504	LVPT0504	5 (3)	120 V	3	2,1	2	55	96	76	1,950	Flexible base (neoprene) w/ internal isolation	Extrapolated [4]
VPT0505	LVPT0505	5 (3)	200 V	3	2,1	2	55	96	83	2,350		Extrapolated [4]
VPT0754	LVPT0754	7.5 (3)	120 V	3	2,1	2	55	96	76	2,400		Extrapolated [4]
VPT0755	LVPT0755	7.5 (3)	200 V	3	2,1	2	55	96	83	2,600		Extrapolated [4]
VPT1004	LVPT1004	10 (3)	120 V	3	2,1	2	55	96	76	3,000		Extrapolated [4]
VPT1005	LVPT1005	10 (3)	200 V	3	2,1	2	55	96	83	3,200		Extrapolated [4]
VPT1505	LVPT1505	15 (3)	200 V	3	2,1	2	70	135	87	5,850		Extrapolated [4]
VPT2005	LVPT2005	20 (3)	200 V	3	2,1	2	70	135	87	6,250		Extrapolated [4]
VPT2505	LVPT2505	25 (3)	200 V	3	2,1	2	71	135	87	6,800		Extrapolated [4]
Triplex (3-stack)												
VPT0304	LVPT0304	3 (3)	120 V	3	3	1	55	66	84	1,635	Flexible base (neoprene) w/ internal isolation	Extrapolated [4]
VPT0404	LVPT0404	5 (3)	120 V	3	3	1	55	66	84	1,710		Extrapolated [4]
VPT0504	LVPT0504	5 (3)	120 V	3	3	1	55	66	87	1,850		Extrapolated [4]
VPT0XXX	LVPT0XXX	7.5 (2), 3 (1)	N/A	3	3	1	55	32	85	1,680		UUT8 [5]
VPT0505	LVPT0505	5 (3)	200 V	3	3	1	55	66	87	1,975		Extrapolated [4]
VPT0754	LVPT0754	7.5 (3)	120 V	3	3	1	55	66	87	2,425		Extrapolated [4]
VPT0755	LVPT0755	7.5 (3)	200 V	3	3	1	55	66	87	2,550		Extrapolated [4]

(Continued on Next Page)

1. V in tank listing indicates vertical orientation.
2. When touchscreen controls are used, an additional 2 inch space is required between skids.
3. UUT5 as tested was a pump skid only to certify alternate pumps. Skids are structurally independent and flexibly connected.
4. See Justification Matrix for explanation of extrapolated units.
5. UUT8 tested with a 7.5 HP claw pump (upper position), 7.5 HP lubricated pump (middle position), and 3 HP lubricated pump (lower position). Units are modular in nature; UUT8 was tested without a receiver tank and control panel skid. Receiver tanks and control panels are bookended by UUT1 and UUT2.

Special Seismic Certification

Table 1 - Certified Components (Continued) - Stacked Systems, Lubricated Rotary Vane Pumps, Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Flexible Base Mount

Medical System Model	Laboratory System Model	HP	Tank Size [1] (gallons)	Total Number of Pumps	Vertically Stacked Pumps or Layers	Horizontally Arrayed Pumps	Max. Dimensions (in)			Max. Operating Weight (lb)	Mounting	Unit
							Length	Width [2]	Height			
Stacked Systems (Continued)												
Quadruplex												
VPQ0505	LVPQ0505	5 (4)	200 V	4	2,2	2	55	96	83	2,850	Flexible base (neoprene) w/ internal isolation	Extrapolated [4]
VPQ0755	LVPQ0755	7.5 (4)	200 V	4	2,2	2	55	96	83	3,150		Extrapolated [4]
VPQ1005	LVPQ1005	10 (4)	200 V	4	2,2	2	55	96	83	3,900		Extrapolated [4]
VPQ1505	LVPQ1505	15 (4)	200 V	4	2,2	2	70	135	87	7,150		Extrapolated [4]
VPQ2005	LVPQ2005	20 (4)	200 V	4	2,2	2	70	135	87	7,750		Extrapolated [4]
VPQ2505	LVPQ2505	25 (4)	200 V	4	2,2	2	71	135	87	8,600		Extrapolated [4]
Penta, Hexa and Octoplex Variants Using The Same Stack Construction												
VPP2506	LVPP2506	25 (5)	240 V	5	2,2,1	3	80	180	96	9,800	Flexible base (neoprene) w/ internal isolation	Extrapolated [4]
VPH2506	LVPH2506	25 (6)	240 V	6	2,2,2	3	80	225	96	10,200		Extrapolated [4]
VPO2506	LVPO2506	25 (8)	240 V	8	2,2,2,2	4	80	225	96	11,900		UUT2, UUT13 [3]
Expandable												
VPD0504-EX3	LVPD0504-EX3	5 (2)	120 V	2 (3)	2	1 (2)	55	64	76	1,685	Flexible base (neoprene) w/ internal isolation	Extrapolated [4]
VPD0505-EX3	LVPD0505-EX3	5 (2)	200 V	2 (3)	2	1 (2)	55	64	83	1,905		Extrapolated [4]
VPD0754-EX3	LVPD0754-EX3	7.5 (2)	120 V	2 (3)	2	1 (2)	55	64	76	1,760		Extrapolated [4]
VPD0755-EX3	LVPD0755-EX3	7.5 (2)	200 V	2 (3)	2	1 (2)	55	64	83	1,960		Extrapolated [4]
VPD1004-EX3	LVPD1004-EX3	10 (2)	120 V	2 (3)	2	1 (2)	55	64	76	2,050		Extrapolated [4]
VPD1005-EX3	LVPD1005-EX3	10 (2)	200 V	2 (3)	2	1 (2)	55	64	83	2,250		Extrapolated [4]
VPD1505-EX3	LVPD1505-EX3	15 (2)	200 V	2 (3)	2	1 (2)	70	90	87	4,280		Extrapolated [4]
VPD2005-EX3	LVPD2005-EX3	20 (2)	200 V	2 (3)	2	1 (2)	70	90	87	4,610		Extrapolated [4]
VPD2505-EX3	LVPD2505-EX3	25 (2)	200 V	2 (3)	2	1 (2)	71	90	87	5,030		Extrapolated [4]
VPT0505-EX4	LVPT0505-EX4	5 (3)	200 V	3 (4)	2	2	55	96	83	2,350		Extrapolated [4]
VPT0755-EX4	LVPT0755-EX4	7.5 (3)	200 V	3 (4)	2	2	55	96	83	2,600		Extrapolated [4]
VPT1005-EX4	LVPT1005-EX4	10 (3)	200 V	3 (4)	2	2	55	96	83	3,200		Extrapolated [4]
VPT1505-EX4	LVPT1505-EX4	15 (3)	200 V	3 (4)	2	2	70	135	87	5,850		Extrapolated [4]
VPT2005-EX4	LVPT2005-EX4	20 (3)	200 V	3 (4)	2	2	70	135	87	6,250		Extrapolated [4]
VPT2505-EX4	LVPT2505-EX4	25 (3)	200 V	3 (4)	2	2	71	135	87	6,800		Extrapolated [4]

1. V in tank listing indicates vertical orientation.
2. When touchscreen controls are used, an additional 2 inch space is required between skids.
3. Two-high 25 HP vacuum pump skid tested in UUT2. Octoplex controller tested in UUT13. 240 gallon tank tested in UUT4b. Dimensions and weight shown here for the VPO2506 are calculated, assuming octoplex system contains of four of the duplex pump stacks as tested in UUT2.
4. See Justification Matrix for explanation of extrapolated units.

Special Seismic Certification

Table 2 - Justification Matrix for Extrapolation - Stacked Systems, Lubricated Rotary Vane Pumps, Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Flexible Base Mount

Unit	Units Used For Extrapolation	Difference From Units Used For Extrapolation
VPT0504	UUT1 (VPD0404)	The duplex units tested in UUT1 and UUT2 consist of (2) pumps mounted on one side of the vertical tank. The extrapolated triplex systems consist of (1) two-high pump skid mounted on one side of the vertical tank and (1) one-high pump skid mounted on the other side of the vertical tank. Each skid is structurally independent and flexibly connected.
VPT0505	↕	
VPT0754		
VPT0755		
VPT1004		
VPT1005		
VPT1505		
VPT2005		
VPT2505	UUT2 (VPD2505)	
VPQ0505	UUT1 (VPD0404)	The duplex units tested in UUT1 and UUT2 consist of (1) two-high pump skid mounted on one side of the vertical tank. The extrapolated quadraplex systems consist of (2) two-high pump skids mounted on opposing sides of the vertical tank. Each skid is structurally independent and flexibly connected.
VPQ0755	↕	
VPQ1005		
VPQ1505		
VPQ2005		
VPQ2505	UUT2 (VPD2505)	
VPP2505	UUT2 (VPD2505)	The duplex unit tested in UUT2 consists of (2) 25 HP pumps mounted on one side of the vertical tank. The extrapolated pentaplex system has (1) two-high and (1) one-high pump skids mounted on one side of the vertical tank and (1) two-high pump skid mounted on the other side of the vertical tank. Extrapolated hexaplex and octoplex systems consist of (1) or (2) two-pump stacks mounted on one side of the vertical tank and (2) two-pump stacks mounted on the other side of the vertical tank. The pumps are mounted to independent skids. The octoplex controller was tested in UUT13.
VPH2505	UUT2 (VPD2505)	
VPO2505	UUT2 (VPD2505)	
VPD0504-EX3	UUT1 (VPD0404)	The extrapolated expandable units consist of an independent receiver tank/control panel skid and an independent pump skid. The tested units UUT1 and UUT2 consisted of independent receiver tank/control panel skid and an independent pump skid.
VPD0505-EX3	↕	
VPD0754-EX3		
VPD0755-EX3		
VPD1004-EX3		
VPD1005-EX3		
VPD1505-EX3		
VPD2005-EX3		
VPD2505-EX3		
VPT0505-EX4		
VPT0755-EX4		
VPT1005-EX4		
VPT1505-EX4		
VPT2005-EX4		
VPT2505-EX4	UUT2 (VPD2505)	

Special Seismic Certification

Table 2 - Justification Matrix for Extrapolation (Cont.) - Stacked Systems, Lubricated Rotary Vane Pumps, Flexible Base Mount

DCL Project Number: 43160-2301

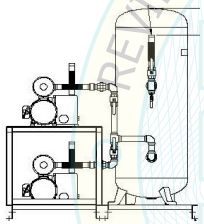
Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

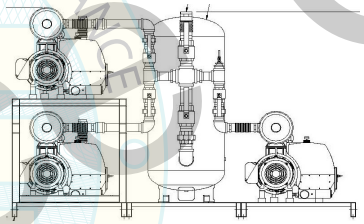
Mounting: Flexible Base Mount

Unit	Units Used For Extrapolation	Difference From Units Used For Extrapolation
VPD0504	UUT5 (VPD0XXX)	UUT5 consists of a representative frame and base platform with a pump (RA0155A 5 HP) similar to that of UUT1 in the lower position and a larger claw pump in the upper position.
VPD0505		
VPT0304	UUT8 (VPT0XXX)	UUT8 consists of a representative base and frame structure. The top position is occupied by a claw pump heavier than the certified lubricated rotary vane models, with the lowest position occupied by the lightest of the certified lube models and the mid position by the largest pump in the certified list. Control and tank skids for certified units are the same as was tested in UUT1 and UUT2.
VPT0404		
VPT0504		
VPT0505		
VPT0754		
VPT0755		

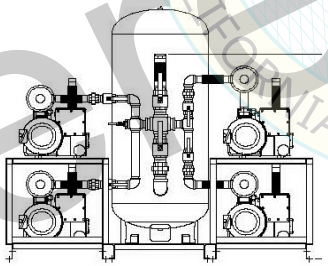
Duplex System



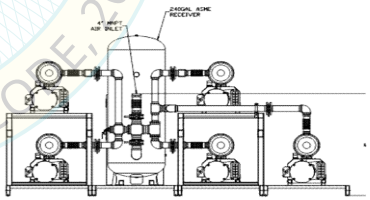
Triplex System



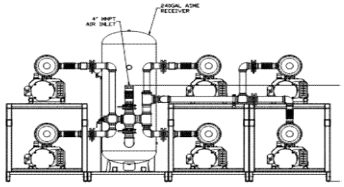
Quadruplex System



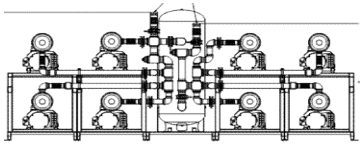
Pentaplex System



Hexaplex System



Octoplex System



Special Seismic Certification

Table 3 - Certified Components - Stacked Units, Oilless Claw Pumps, Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Flexible Base Mount

Medical System Model	Laboratory System Model	HP	Tank Size [1]	Total Number of Pumps	Vertically Stacked Pumps or Layers	Horizontally Arrayed Pumps	Max. Dimensions (in)			Maximum Operating Weight (lb)	Mounting	Unit
							Length	Width [2]	Height			
Stacked Systems												
Duplex												
CVPD0504A	LCPD0504	5 (2)	120 V	2	2	1	55	64	76	1,690	Flexible base (neoprene) w/ internal isolation	UUT3
CVPD0504B	LCPD0604	6.4 (2)	120 V	2	2	1	55	64	76	1,925		Interpolated
CVPD0754A	LCPD0704	7.0 (2)	120 V	2	2	1	55	64	76	2,175		Interpolated
CVPD0754B	LCPD0904	9.1 (2)	120 V	2	2	1	55	64	76	2,400		Interpolated
CVPD1005	LCPD1005	10 (2)	200 V	2	2	1	55	64	83	2,875		Interpolated
CVPDXXXX	LCPDXXXX	15 (1), 5 (1)	N/A	2	2	1	70	45	80	1,940		UUT5 [3]
CVPD1505	LCPD1505	15 (2)	200 V	2	2	1	74	90	88	3,800		UUT4 [4]
Triplex (based on 2-stack plus 1 layout)												
CVPT0504A	LCPT0504	5 (3)	120 V	3	2, 1	2	55	96	76	2,150	Flexible base (neoprene) w/ internal isolation	Extrapolated [5]
CVPT0505A	LCPT0505	5 (3)	200 V	3	2, 1	2	55	96	83	2,275		Extrapolated [5]
CVPT0504B	LCPT0604	6.4 (3)	120 V	3	2, 1	2	55	96	76	2,000		Extrapolated [5]
CVPT0505B	LCPT0605	6.4 (3)	200 V	3	2, 1	2	55	96	83	2,150		Extrapolated [5]
CVPT0755A	LCPT0705	7.0 (3)	200 V	3	2, 1	2	55	96	83	3,200		Extrapolated [5]
CVPT0755B	LCPT0905	9.1 (3)	200 V	3	2, 1	2	55	96	83	3,500		Extrapolated [5]
CVPT1005	LCPT1005	10 (3)	200 V	3	2, 1	2	55	96	83	4,200		Extrapolated [5]
CVPT1505	LCPT1505	15 (3)	200 V	3	2, 1	2	71	135	88	4,800		Extrapolated [5]
Triplex (3-stack)												
CVPT0XXXX	LCVPT0XXXX	7.5 (2), 3 (1)	N/A	3	3	1	55	32	85	1,680	Flexible base (neoprene) w/ internal isolation	UUT8 [6]
CVPT0304	LCVPT0304	3 (3)	120 V	3	3	1	55	66	84	2,200		Extrapolated [5]
CVPT0504A	LCVPT0504	4-5 (3)	120 V	3	3	1	55	66	84	2,235		Extrapolated [5]
CVPT0504B	LCVPT0604	5-6.4 (3)	120 V	3	3	1	55	66	87	2,360		Extrapolated [5]
CVPT0505A	LCVPT0505	4-5 (3)	200 V	3	3	1	55	66	87	2,275		Extrapolated [5]
CVPT0505B	LCVPT0605	5-6.4 (3)	200 V	3	3	1	55	66	87	2,400		Extrapolated [5]
CVPT0754A	LCVPT0754A	6.4-7.5 (2)	120 V	3	3	1	55	66	87	2,565		Extrapolated [5]
CVPT0755A	LCVPT0755A	6.4-7.5 (2)	200 V	3	3	1	55	66	87	2,690		Extrapolated [5]
CVPT0754B	LCVPT0754B	7.5-9.1 (2)	120 V	3	3	1	55	66	87	2,600		Extrapolated [5]
CVPT0755B	LCVPT0755B	7.5-9.1 (2)	200 V	3	3	1	55	66	87	2,725		Extrapolated [5]

Continued on Next Page

1. V in tank listing indicates vertical or horizontal orientation.
2. When touchscreen controls are used, an additional 2 inch space is required between skids.
3. UUT5 was tested as a pump skid only to certify alternate pumps.
4. Two-high 15 HP vacuum pump skid tested in UUT4. Dimensions and weight shown here for the CVPO1506 are calculated, assuming octoplex system consists of four of the duplex pump stacks as tested in UUT4.
5. See Justification Matrix for explanation of extrapolated units.
6. UUT8 was tested as a pump skid only to certify alternate pumps. UUT8 tested with a 7.5 HP claw pump (upper position), 7.5 HP lubricated pump (middle position), and 3 HP lubricated pump (lower position). Receiver tanks and control panels bookended by UUT3 and UUT4.

Special Seismic Certification

Table 3 - Certified Components (Continued) - Stacked Units, Oilless Claw Pumps, Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Flexible Base Mount

Medical System Model	Laboratory System Model	HP	Tank Size [1]	Total Number of Pumps	Vertically Stacked Pumps or Layers	Horizontally Arrayed Pumps	Max. Dimensions (in)			Maximum Operating Weight (lb)	Mounting	Unit
							Length	Width [2]	Height			
Stacked Systems												
Quadruplex												
CVPQ0505A	LCPQ0505	5 (4)	200 V	4	2,2	2	55	96	83	2,500	Flexible base (neoprene) w/ internal isolation	Extrapolated [3]
CVPQ0505B	LCPQ0605	6.4 (4)	200 V	4	2,2	2	55	96	83	2,700		Extrapolated [3]
CVPQ0755A	LCPQ0705	7.0 (4)	200 V	4	2,2	2	55	96	83	3,600		Extrapolated [3]
CVPQ0755B	LCPQ0905	9.1 (4)	200 V	4	2,2	2	55	96	83	4,000		Extrapolated [3]
CVPQ1005	LCPQ1005	10 (4)	200 V	4	2,2	2	55	96	83	4,900		Extrapolated [3]
CVPQ1505	LCPQ1505	15 (4)	200 V	4	2,2	2	71	135	88	5,600		Extrapolated [3]
Penta, Hexa and Octoplex Variants Using the Same Stack Construction												
CVPP1506	LCPP1506	15 (5)	240 V	5	2,2,1	2	180	80	96	6,200	Flexible base (neoprene) w/ internal isolation	Extrapolated [3]
CVPH1506	LCPH1506	15 (6)	240 V	6	2,2,2	2	225	80	96	6,800		Extrapolated [3]
CVPO1506	LCPO1506	15 (7)	240 V	8	2,2,2,2	2	225	80	96	9,850		UUT4, UUT13 [4]

1. V in tank listing indicates vertical or horizontal orientation

2. When touchscreen controls are used, an additional 2 inch space is required between skids.

3. See Justification Matrix for explanation of extrapolated units.

4. Octoplex controller tested in UUT13; two-high 15 HP vacuum pump skid tested in UUT4. Dimensions and weight shown here for the CVPO1506 are calculated, assuming octoplex system consists of four of the duplex pump stacks as tested in UUT4.

Special Seismic Certification

Table 4 - Justification Matrix for Extrapolation - Stacked Systems, Oilless Claw Pumps, Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Flexible Base Mount

Unit	Units Used For Extrapolation	Difference From Units Used For Extrapolation
CVPT0504A	UUT3 (CVPD0504A)	The duplex units tested in UUT3 and UUT4 consist of (1) two-high pump skid mounted on one side of the vertical tank. The extrapolated triplex systems consist of (1) two-high pump skid mounted on one side of the vertical tank and (1) one-high pump skid mounted on the other side of the vertical tank. Each skid is structurally independent and flexibly connected.
CVPT0505A	↕	
CVPT0504B		
CVPT0505B		
CVPT0755A		
CVPT0755B		
CVPT1005		
CVPT1505	UUT4 (CVPD1505)	
CVPQ0505A	UUT3 (CVPD0504A)	The duplex units tested in UUT3 and UUT4 consist of (1) two-high pump skid mounted on one side of the vertical tank. The extrapolated quadraplex systems consist of (2) two-high pump skids mounted on opposing sides of the vertical tank. Each skid is structurally independent and flexibly connected.
CVPQ0505B	↕	
CVPQ0755A		
CVPQ0755B		
CVPQ1005		
CVPQ1505	UUT4 (CVPD1505)	
CVPP1506	UUT4 (CVPD1505)	The duplex unit tested in UUT4 consists of (2) 15 HP pumps mounted on one side of the vertical tank. The extrapolated pentaplex system has (1) two-high and (1) one-high pump skids mounted on one side of the vertical tank and (1) two-high pump skid mounted on the other side of the vertical tank. Extrapolated hexaplex and octoplex systems consist of (1) or (2) two-high pump skids mounted on one side of the vertical tank and (2) two-high pump skids mounted on the other side of the vertical tank. Each skid is structurally independent and flexibly connected. The octoplex controller was tested in UUT13.
CVPH1506	UUT4 (CVPD1505)	
CVPO1506	UUT4 (CVPD1505)	

Special Seismic Certification

Table 4 - Justification Matrix for Extrapolation (Cont.) - Stacked Systems, Claw Oilless, Flexible Base Mount

DCL Project Number: 43160-2301

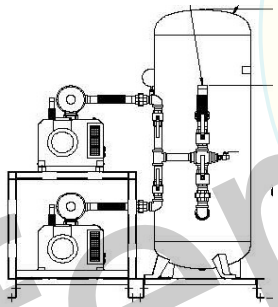
Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

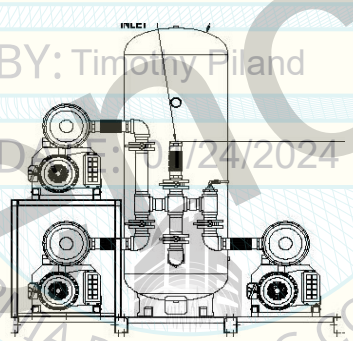
Mounting: Flexible Base Mount

Unit	Units Used For Extrapolation	Difference From Units Used For Extrapolation
CVPD1505	UUT5	UUT5 demonstrates an alternate 15HP claw pump as the pump used in UUT4 is replaced by a similar, but structurally different pump designated MM1502. The MM1502 pump was tested in the upper position of the frame set.
CVPT0303	UUT8	UUT8 consists of a triplex stack utilizing a base and frame as tested in previously certified models. UUT8 had the 7.5 Oilless Claw pump featured in the highest (top) position and alternate pumps in the lower positions. Tank and control skids are the same as tested in UUT3, UUT4.
CVPT0503A		
CVPT0504A		
CVPT0505A		
CVPT0504B		
CVPT0505B		
CVPT0754A		
CVPT0754B		
CVPT0755A		
CVPT0755B		

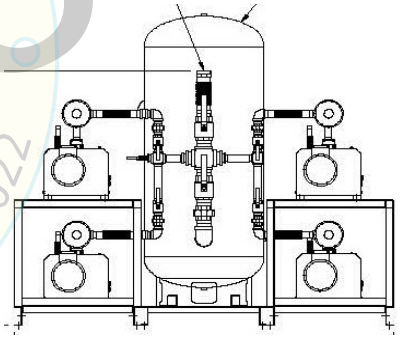
Duplex System



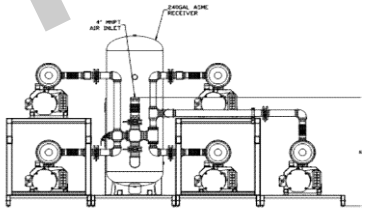
Triplex System



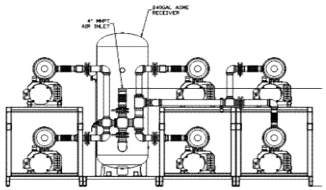
Quadruplex System



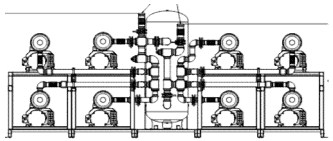
Pentaplex System



Hexaplex System



Octoplex System



Special Seismic Certification

Table 5 - Certified Components - Tank-Over Systems, Lubricated Rotary Vane Pumps, Rigid or Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Rigid or Flexible Base Mount

Medical System Model	Laboratory System Model	HP	Tank Size [1] (gallons)	Total Number of Pumps	Vertically Stacked Pumps or Layers	Horizontally Arrayed Pumps	Max. Dimensions (in)			Max. Operating Weight (lb)	Mounting	Unit
							Length	Width	Height			
Tank Over Systems												
VPDT0302	LVPT0302	3 (2)	60 H	2	2	1	74	39	89	1,440	Rigid or flexible base mount (neoprene) w/ internal isolation	Extrapolated [2]
VPDT0402	LVPDT0402	5 (2)	60 H	2	2	1	74	39	89	1,590		Extrapolated [2]
VPDT0502	LVPDT0502	5 (2)	60 H	2	2	1	74	39	89	1,815		Extrapolated [2]
VPDT0XXX	LVPDT0XXX	7.5 (1), 3 (1)	60 H	2	2	1	74	39	89	1,450	Rigid base w/ internal isolation	UUT6 [3,4]
VPDT0752	LVPDT0752	7.5 (2)	60 H	2	2	1	74	39	89	2,295	Rigid or flexible base mount (neoprene) w/ internal isolation	Extrapolated [2]

1. H in tank listing indicates horizontal orientation
2. See Justification Matrix for explanation of extrapolated units.
3. UUT6 tested with a 7.5 HP lubricated rotary vane pump in the middle tier and a 3 HP lubricated rotary vane pump in the bottom tier of the system.
4. See UUT7, tested in flexible base mounted condition for bookending of tank-over systems.

Special Seismic Certification

Table 6 - Justification Matrix for Extrapolation - Tank-Over Systems, Lubricated Rotary Vane Pumps, Rigid or Flexible Base Mount

DCL Project Number: 43160-2301

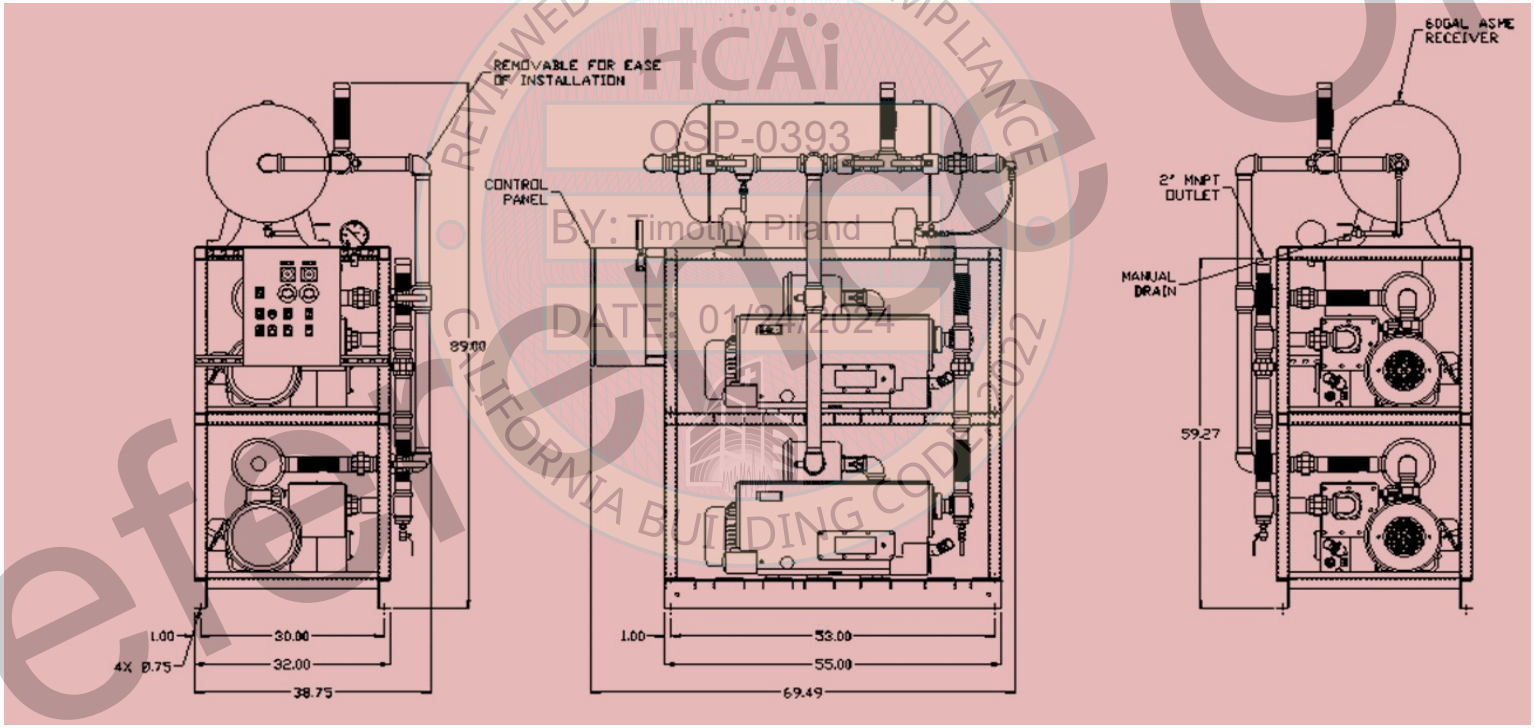
Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Rigid or Flexible Base Mount

Unit	Units Used For Extrapolation	Difference From Units Used For Extrapolation
VPDT0302	UUT6 (VPDT0XXX)	UUT6 consisted of a frame and base structure with (1) 3 HP vacuum pump in the lower tier, (1) 7.5 HP vacuum pump in the middle tier, and a 60 gallon horizontal tank rigidly bolted at the top level. The system is plumbed and has an electrical control panel mounted to the frame. The tested lubricated rotary vane pumps encompass the range for the tank-over systems. Also see UUT7 for bookending of tank-over systems.
VPDT0402		
VPDT0502		
VPDT0752		

Tank-Over Construction
Duplex:



Special Seismic Certification

Table 7 - Certified Components - Tank-Over Units, Oilless Claw Pumps, Rigid or Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Rigid or Flexible Base Mount

Medical System Model	Laboratory System Model	HP	Tank Size [1]	Total Number of Pumps	Vertically Stacked Pumps or Layers	Horizontally Arrayed Pumps	Max. Dimensions (in)			Maximum Operating Weight (lb)	Mounting	Unit
							Length	Width	Height			
Tank Over Systems												
CVPDT0302	LCVPT0302	3 (2)	60 H	2	2	1	74	39	89	1,600	Rigid or flexible base (neoprene) w/ internal isolation	Extrapolated [2]
CVPDT0XXX	LCVPT0XXXX	7.5 (1), 3 (1)	60 H	2	2	1	74	39	89	1,910	Flexible base (neoprene) w/ internal isolation	UUT7 [3,4]
CVPDT0502A	LCVPDT0502	4-5 (2)	60 H	2	2	1	74	39	89	1,860	Rigid or flexible base (neoprene) w/ internal isolation	Extrapolated [2]
CVPDT0502B	LCVPDT0602	5-6.4 (2)	60 H	2	2	1	74	39	89	1,910		Extrapolated [2]
CVPDT0752A	LCVPDT0702	6.4-7.5 (2)	60 H	2	2	1	74	39	89	2,030		Extrapolated [2]
CVPDT0752B	LCVPDT0752	7.5-9.1 (2)	60 H	2	2	2	74	39	89	2,145		Extrapolated [2]

1. H in tank listing indicates vertical or horizontal orientation
2. See Justification Matrix for explanation of extrapolated units.
3. UUT7 was tested with a 7.5 HP oilless claw pump in the top position and a 3 HP oilless claw pump in the bottom position.
4. See UUT6 for bookending of tank-over systems.

Special Seismic Certification

Table 8 - Justification Matrix for Extrapolation - Tank-Over Systems, Oilless Claw Pumps, Rigid or Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

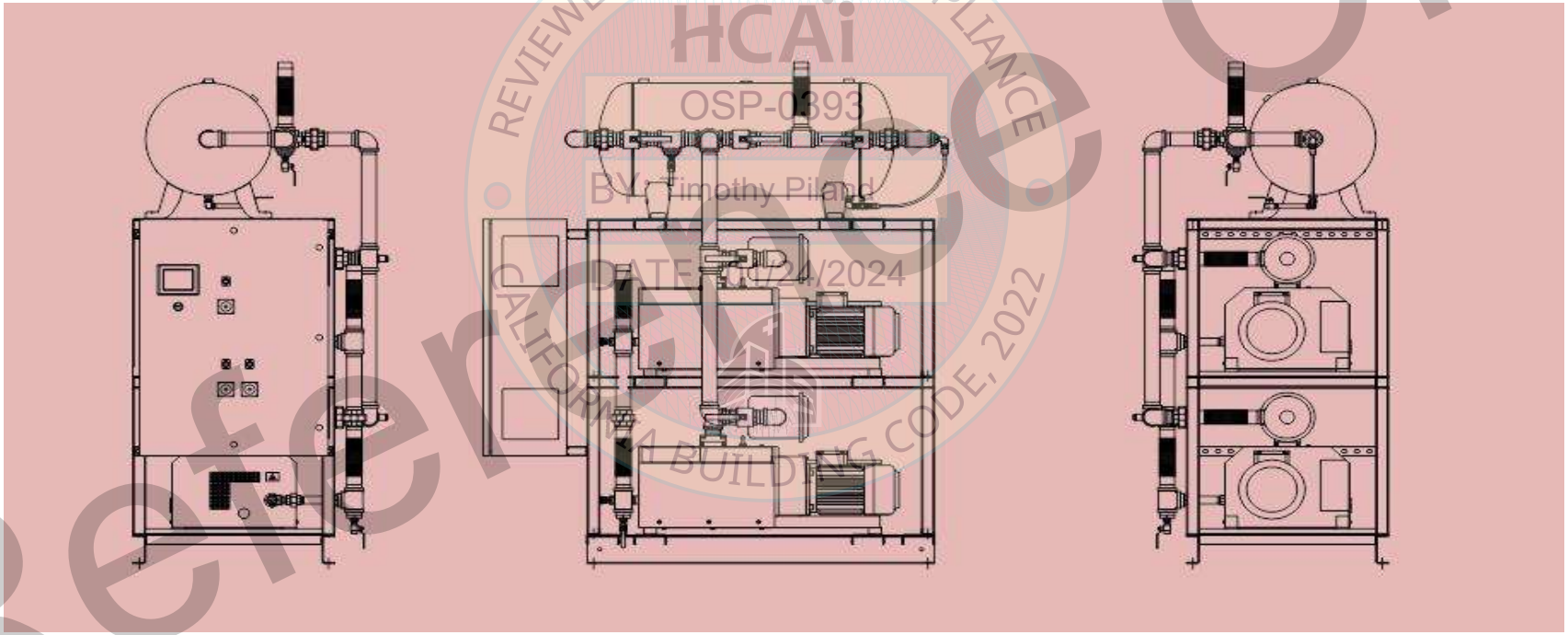
Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Rigid or Flexible Base Mount

Unit	Units Used For Extrapolation	Difference From Units Used For Extrapolation
CVPDT0302	UUT7	UUT7 consists of a frame and base structure with (1) 3 HP oilless claw vacuum pump in the lower tier, (1) 7.5 HP oilless claw vacuum pump in the middle tier, and a 60 gallon horizontal tank rigidly bolted at the top level. The system is plumbed and has an electrical control panel mounted to the frame. The tested oilless claw pumps encompass the range for tank-over construction.
CVPDT0502A		
CVPDT0502B		
CVPDT0752A		
CVPDT0752B		

Tank-Over Construction

Duplex:



Special Seismic Certification

Table 9 - Certified Components - Tank Mounted Vertical Systems, Oilless Rotary Vane Pumps, Rigid or Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Rigid or Flexible Base Mount

Medical System Model	Laboratory System Model [1]	HP	Tank Size (gallons)	Total Number of Pumps	Vertically Stacked Pumps or Layers	Horizontally Arrayed Pumps	Max. Dimensions (in)			Maximum Operating Weight (lb)	Tested Mounting	Certified Mounting	Unit
							Length	Width	Height				
Tank Mounted Vertical Systems with Oilless Rotary Vane Pumps													
VVOTD0153	LVVOD0153	1.5	80	2	1	2	43	30	74	710	Rigid base	Rigid or flexible base (neoprene) w/ internal isolation	UUT21 [2,4]
VVOTD0203	LVVOD0203	2	80	2	1	2	53	34	80	930	N/A		Interpolated
VVOTD0303	LVVOD0303	3	80	2	1	2	53	34	80	1,100	N/A		Interpolated
VVOTD0304	LVVOD0304	3	120	2	1	2	53	34	89	1,180	N/A		Interpolated
VVOTD0403	LVVOD0403	4	80	2	1	2	53	34	80	1,125	N/A		Interpolated
VVOTD0404	LVVOD0404	4	120	2	1	2	53	34	89	1,200	N/A		Interpolated
VVOTD0503	LVVOD0503	5	80	2	1	2	53	34	90	1,320	N/A		Interpolated
VVOTD0504	LVVOD0504	5	120	2	1	2	53	34	90	1,170	Flexible base (neoprene)		UUT23 [3,4]

1. Lab systems identical to medical systems (software change only).
2. UUT21 tested with 80 gal tank, one 1.5 HP lubricated rotary vane pump and one 1.5HP oilless rotary vane pump.
3. UUT23 tested with 120 gal tank and two 5 HP oilless rotary vane pumps.
4. UUT21 was tested in rigid base configuration and serves as the lower bookend, UUT23 was tested in flexible base configuration and serves as the upper bookend.

Special Seismic Certification

Table 10 - Certified Components - Tank Mounted Vertical Systems, Lubricated Rotary Vane or Oilless Claw Pumps, Rigid Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Rigid Base Mount

Medical System Model	Laboratory System Model [1]	HP	Tank Size (gallons)	Total Number of Pumps	Vertically Stacked Pumps or Layers	Horizontally Arrayed Pumps	Max. Dimensions (in)			Maximum Operating Weight (lb)	Tested Mounting	Certified Mounting	Unit
							Length	Width	Height				
Tank Mounted Vertical Systems with Lubricated Rotary Vane Pumps													
VVTD0153	LVVD0153	1.5	80	2	1	2	43	30	74	710	Rigid base	Rigid base w/ internal isolation	UUT21 [2]
VVTD0203	LVVD0203	2	80	2	1	2	42	30	75	835	N/A		Interpolated
VVTD0204	LVVD0204	2	120	2	1	2	44	50	75.5	880	N/A		Interpolated
VVTD0303	LVVD0303	3	80	2	1	2	55	30	85	1,260	Rigid base		UUT22 [3]
VVTD0304	LVVD0304	3	120	2	1	2	54	37	84	1,475	N/A		Interpolated
VVTD0403	LVVD0403	4	80	2	1	2	54	37	84.5	1,350	N/A		Interpolated
VVTD0404	LVVD0404	4	120	2	1	2	54	37	84.5	1,500	N/A		Interpolated
VVTD0503	LVVD0503	5	80	2	1	2	58	37	87	1,260	N/A		Interpolated
VVTD0504	LVVD0504	5	120	2	1	2	59	35	85	1,670	Rigid base		UUT24 [4]
Tank Mounted Vertical Systems with Oilless Claw pumps													
CVTD0203V	LCVD0203	2	80	2	1	2	55	30	85	1,260	Rigid base	Rigid base w/ internal isolation	UUT22 [3]
CVTD0303V	LCVD0303	3	80	2	1	2	35	56	82	1,500	N/A		Interpolated
CVTD0504AV	LCVD0504AV	4	120	2	1	2	59	35	84	1,650	N/A		Interpolated
CVTD0504BV	LCVD0604	5	120	2	1	2	59	35	85	1,670	Rigid base		UUT24 [4]

1. Lab systems identical to medical systems (software change only).
2. UUT21 tested with 80 gal tank, one 1.5 HP lubricated rotary vane pump and one 1.5HP oilless claw pump.
3. UUT22 tested with 80 gal tank, one 3 HP lubricated rotary vane pump and one 2 HP oilless claw pump.
4. UUT24 tested with 120 gal tank, one 5 HP lubricated rotary vane pump and one 5 HP oilless claw pump.

Special Seismic Certification

Table 11 - Certified Components - Enclosed Medical/Laboratory Vacuum Systems, Lubricated Rotary Vane and Oilless Claw Pumps, Rigid Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Rigid Base Mount

Medical Air Model Number [1]	Lab Air Model Number [1]	HP Per Pump	Total HP	Number of Vacuum Enclosures	Vertically Stacked Pumps Per Enclosure	Horizontally Arrayed Pumps Per Enclosure	Tank Size (gallons) [2]	Maximum Dimensions (in) of Individual Enclosed Vacuum Unit [3]			Max. Operating Weight (lb) of Individual Enclosed Vacuum Unit [3]	Mounting	Unit
								Length	Width	Height			
Duplex Systems (2-stack individually enclosed vacuum units with structurally independent and flexibly connected tanks)													
MVEVD0404 - TEST	LVEVD0404 - TEST	4.6	9	1	2	1	N/A	65	34	66	1,340	Rigid base w/ internal isolation	UUT37 [4]
MVEVD0404	LVEVD0404	4.6	9	1	2	1	120 V	65	34	66	1,340		Interpolated
MVEVD0504	LVEVD0504	5	10	1	2	1	120 V	82	34	77	1,650		Interpolated
MVECD0203	LVECD0203	2	4	1	2	1	80 V	65	34	66	1,905		Interpolated
MVECD0303	LVECD0303	3	6	1	2	1	80 V	65	34	66	1,925		Interpolated
MVECD0404	LVECD0404	4	8	1	2	1	120 V	65	34	66	1,925		Interpolated
MVECD0504	LVECD0504	5	10	1	2	1	120 V	65	34	66	1,925		Interpolated
MVEVD0754	LVEVD0754	7.5	15	1	2	1	120 V	82	34	77	2,000		Interpolated
MVECD0604	LVECD0604	6	12	1	2	1	120 V	65	34	66	2,295		Interpolated
MVECD0754	LVECD0754	7.5	15	1	2	1	120 V	82	34	77	2,295		Interpolated
MVEVCDXXX	LVEVCDXXX	7.5, 15	22.5	1	2	1	N/A	82	34	77	2,540		UUT38 [5]
MVECD1005	LVECD1005	10	20	1	2	1	200 V	82	34	77	2,730		Interpolated [6]
MVECD1505	LVECD1505	15	30	1	2	1	200 V	82	34	77	2,750		Interpolated [6]
Triplex Systems (3-stack individually enclosed vacuum units with structurally independent and flexibly connected tanks)													
MVECT0404	LVECT0405	4	12	1	3	1	120 V	82	34	77	2,725	Rigid base w/ internal isolation	Interpolated [6]
MVECT0504	LVECT0505	5	15	1	3	1	120 V	82	34	77	2,725		Interpolated [6]
MVECT0605	LVECT0605	6	18	1	3	1	200 V	82	34	77	3,080		Interpolated [6]
MVECT0755	LVECT0755	7.5	22.5	1	3	1	200 V	82	34	77	3,080		Interpolated [6]
MVECT0755 - TEST	LVECT0755 - TEST	7.5	22.5	1	3	1	N/A	82	34	77	3,080		UUT39 [7]
Triplex (2-stack plus 1 layout, structurally independent and flexibly connected individually enclosed vacuum units and tanks)													
MVEVT0405	LVEVT0405	4.6	13.8	2	2, 1 partial fill	1	200 V	65	34	66	1,340	Rigid base w/ internal isolation	Extrapolated [8]
MVEVT0505	LVEVT0505	5	15	2	2, 1 partial fill	1	200 V	65	34	77	1,650		Extrapolated [8]
MVECTS0404	LVECTS0404	4	12	2	2, 1 partial fill	1	120 V	65	34	66	1,925		Extrapolated [8]
MVECTS0504	LVECTS0504	5	15	2	2, 1 partial fill	1	120 V	65	34	66	1,925		Extrapolated [8]
MVEVT0755	LVEVT0755	7.5	22.5	2	2, 1 partial fill	1	200 V	65	34	77	2,000		Extrapolated [8]
MVECTS0605	LVECTS0605	6	18	2	2, 1 partial fill	1	200 V	65	34	66	2,295		Extrapolated [8]
MVECTS0755	LVECTS0755	7.5	22.5	2	2, 1 partial fill	1	200 V	65	34	66	2,295		Extrapolated [8]
MVECT1005	LVECT1005	10	30	2	2, 1 partial fill	1	200 V	82	34	77	2,730		Extrapolated [6,8]
MVECT1505	LVECT1505	15	45	2	2, 1 partial fill	1	200 V	82	34	77	2,750		Extrapolated [6,8]
Quadruplex (2-stack individually enclosed vacuum units with structurally independent and flexibly connected tanks)													
MVEVQ0405	LVEVQ0405	4.6	18.4	2	2	1	200 V	65	34	66	1,350	Rigid base w/ internal isolation	Extrapolated [8]
MVEVQ0505	LVEVQ0505	5	20	2	2	1	200 V	82	34	77	1,650		Extrapolated [8]
MVECQ0405	LVECQ0405	4	16	2	2	1	200 V	65	34	66	1,925		Extrapolated [8]
MVECQ0505	LVECQ0505	5	20	2	2	1	200 V	65	34	66	1,925		Extrapolated [8]

Continued on Next Page

Notes:

1. Lab units are physically identical to medical air units (software change only). The fourth character of the model number can have "V" for lubricated vane pumps, "C" for oilless claw pumps. Systems more than 10 HP or 3-stack systems only feature oilless claw pumps.
2. Systems use structurally independent and flexibly connected tanks, tested in or interpolated by UUT30a, rigidly mounted to the structure. Tank dimensions and weights are listed in Table 13. V stands for vertical orientation.
3. Max weights and dimensions represent the maximum dimensions and weights of a single enclosed system. Systems with multiple enclosed vacuum units have structurally independent and flexibly connected enclosed vacuum units with internally isolated pumps.
4. UUT37 was tested with (2) 5 HP lubricated vane pumps. UUT37 was not tested with a structurally independent tank.
5. UUT38 was a hybrid model tested with (1) 15 HP oilless claw pump in the top position and (1) 7.5 HP lubricated vane pump in the bottom position to certify subcomponents. UUT38 was not tested with a structurally independent tank.
6. Applicable models require the enclosure panel retrofits described in the Unit Mounting Description of the UUT39 Unit Under Test (UUT) Summary Sheet.
7. UUT39 was tested with (3) 7.5 HP oilless claw pumps. UUT39 is the heaviest possible vacuum enclosure. UUT39 was not tested with a structurally independent tank.
8. An extrapolation justification matrix is provided in Table 12.

Special Seismic Certification

Table 11 - Certified Components (Continued) - Enclosed Medical/Laboratory Vacuum Systems, Lubricated Rotary Vane or Oilless Claw Pumps, Rigid Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Rigid Base Mount

Medical Air Model Number [1]	Lab Air Model Number [1]	HP Per Pump	Total HP	Number of Vacuum Enclosures	Vertically Stacked Pumps Per Enclosure	Horizontally Arrayed Pumps Per Enclosure	Tank Size (gallons) [2]	Maximum Dimensions (in) of Individual Enclosed Vacuum Unit [3]			Max. Operating Weight (lb) of Individual Enclosed Vacuum Unit [3]	Mounting	Unit
								Length	Width	Height			
Quadruplex (2-stack individually enclosed vacuum units with structurally independent and flexibly connected tanks)													
MVEVQ0755	LVEVQ0755	7.5	30	2	2	1	200 V	65	34	77	2,000	Rigid base w/ internal isolation	Extrapolated [4]
MVECQ0605	LVECQ0605	6	24	2	2	1	200 V	65	34	66	2,295		Extrapolated [4]
MVECQ0755	LVECQ0755	7.5	30	2	2	1	200 V	65	34	66	2,295		Extrapolated [4]
MVECQ1005	LVECQ1005	10	40	2	2	1	200 V	82	34	77	2,730		Extrapolated [4,5]
MVECQ1505	LVECQ1505	15	60	2	2	1	200 V	82	34	77	2,750		Extrapolated [4,5]
Pentaplex (1-stack and 2-stack individually enclosed vacuum units with structurally independent and flexibly connected tanks)													
MVECPS0505	LVECPS0505	5	25	3	2,2,1 partial fill	1	200 V	65	34	66	1,925	Rigid base w/ internal isolation	Extrapolated [4]
MVECPS0755	LVECPS0755	7.5	37.5	3	2,2,1 partial fill	1	200 V	65	34	66	2,295		Extrapolated [4]
MVECP1505	LVECP1505	15	75	3	2,2,1 partial fill	1	200 V	82	34	77	2,750		Extrapolated [4,5]
Pentaplex (2-stack and 3-stack individually enclosed vacuum units with structurally independent and flexibly connected tanks)													
MVECP0505	LVECP0505	5	25	2	2, 3	1	200 V	82	34	77	2,725	Rigid base w/ internal isolation	Extrapolated [4,5]
MVECP0755	LVECP0755	7.5	37.5	2	2, 3	1	200 V	82	34	77	3,080		Extrapolated [4,5]
Hexaplex (2-stack individually enclosed vacuum units with structurally independent and flexibly connected tanks)													
MVECHS0505	LVECHS0505	5	30	3	2,2,2	1	200 V	82	34	77	1,925	Rigid base w/ internal isolation	Extrapolated [4]
MVECHS0755	LVECHS0755	7.5	45	3	2,2,2	1	200 V	82	34	77	2,295		Extrapolated [4]
MVECH1505	LVECH1505	15	90	3	2,2,2	1	200 V	82	34	77	2,750		Extrapolated [4,5]
Hexaplex (3-stack individually enclosed vacuum units with structurally independent and flexibly connected tanks)													
MVECH0505	LVECH0505	5	30	2	3,3	1	200 V	82	34	77	2,725	Rigid base w/ internal isolation	Extrapolated [4,5]
MVECH0755	LVECH0755	7.5	45	2	3,3	1	200 V	82	34	77	3,080		Extrapolated [4,5]
Expandable Duplex to Triplex (depopulated 3-stack individually enclosed vacuum units with structurally independent and flexibly connected tanks, expandable to 3-stack system)													
MVECD0404-EX3	LVECD0404-EX3	4	8 exp to 12	1	2 exp to 3	1	120 V	82	34	77	2,725	Rigid base w/ internal isolation	Extrapolated [4,5]
MVECD0504-EX3	LVECD0504-EX3	5	10 exp to 15	1	2 exp to 3	1	120 V	82	34	77	2,725		Extrapolated [4,5]
MVECD0605-EX3	LVECD0605-EX3	6	12 exp to 18	1	2 exp to 3	1	200 V	82	34	77	3,080		Extrapolated [4,5]
MVECD0755-EX3	LVECD0755-EX3	7.5	15 exp to 22.5	1	2 exp to 3	1	200 V	82	34	77	3,080		Extrapolated [4,5]
Expandable Triplex to Quadruplex (1-stack and 2-stack individually enclosed vacuum units with structurally independent and flexibly connected tanks, expandable to 2-stack only system)													
MVECT0405-EX4	LVECT0404-EX4	4	8 exp to 12	2	2, 1 exp to 2	1	200 V	65	34	66	1,925	Rigid base w/ internal isolation	Extrapolated [4]
MVECT0504-EX4	LVECT0504-EX4	5	10 exp to 15	2	2, 1 exp to 2	1	200 V	65	34	66	1,925		Extrapolated [4]
MVECT0605-EX4	LVECT0605-EX4	6	12 exp to 18	2	2, 1 exp to 2	1	200 V	65	34	66	2,295		Extrapolated [4]
MVECT0755-EX4	LVECT0755-EX4	7.5	15 exp to 22.5	2	2, 1 exp to 2	1	200 V	65	34	66	2,295		Extrapolated [4]
MVECT1005-EX4	LVECT1005-EX4	10	30 exp to 40	2	2, 1 exp to 2	1	200 V	82	34	77	2,730		Extrapolated [4,5]
MVECT1505-EX4	LVECT1505-EX4	15	45 exp to 60	2	2, 1 exp to 2	1	200 V	82	34	77	2,750		Extrapolated [4,5]

Notes:

1. Lab units are physically identical to medical air units (software change only). The fourth character of the model number can have "V" for lubricated vane pumps, "C" for oilless claw pumps. Systems more than 10 HP or 3-stack systems only feature oilless claw pumps.
2. Systems use structurally independent and flexibly connected tanks, tested in or interpolated by UUT30a, rigidly mounted to the structure. Tank dimensions and weights are listed in Table 13. V stands for vertical orientation.
3. Max weights and dimensions represent the maximum dimensions and weights of a single enclosed system. Systems with multiple enclosed vacuum units have structurally independent and flexibly connected enclosed vacuum units with internally isolated pumps.
4. An extrapolation justification matrix is provided in Table 12.
5. Applicable models require the enclosure panel retrofits described in the Unit Mounting Description of the UUT39 Unit Under Test (UUT) Summary Sheet.

Special Seismic Certification

Table 12 - Justification Matrix for Extrapolation - Enclosed Medical/Laboratory Vacuum systems
Lubricated Rotary Vane or Oilless Claw Pumps, Rigid Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Mounting: Rigid Base Mount

Extrapolated Unit (Medical)	Extrapolated Unit (Laboratory)	Units Used for Extrapolation	Difference From Units Used for Extrapolation
MVEVT0404	LVEVT0404	UUT37 (MVEVD0404 - TEST)	Extrapolated triplex systems include (1) one-high partial fill enclosed vacuum system in addition to (1) two-high enclosed system. Both enclosed systems are structurally independent and flexibly attached. UUT37 is the smallest enclosed system, UUT38 tested the heaviest pumps of each technology, and UUT39 is the heaviest single enclosed vacuum system. Structurally independent and flexibly connected tanks are directly mounted to the structure and were bookended by the tanks tested in UUT30a on a rigid base platform.
MVEVT0504	LVEVT0504		
MVECTS0404	LVECTS0404		
MVECTS0504	LVECTS0504		
MVEVT0754	LVEVT0754		
MVECTS0605	LVECTS0605		
MVECTS0755	LVECTS0755		
MVECT1005	LVECT1005		
MVECT1505	LVECT1505	UUT38 (MVEVCDXXX), UUT39 (MVECT0755 - TEST)	
MVEVQ0405	LVEVQ0405	UUT37 (MVEVD0404)	Extrapolated quadplex systems include (2) separate, structurally independent and flexibly connected enclosed systems. UT37 is the smallest enclosed system, UUT38 tested the heaviest pumps of each technology, and UUT39 is the heaviest single enclosed vacuum system. Structurally independent and flexibly connected tanks are directly mounted to the structure and were bookended by the tanks tested in UUT30a on a rigid base platform.
MVEVQ0505	LVEVQ0505		
MVECQ0405	LVECQ0405		
MVECQ0505	LVECQ0505		
MVECQ0605	LVECQ0605		
MVEVQ0755	LVEVQ0755		
MVECQ0755	LVECQ0755		
MVECQ1005	LVECQ1005		
MVECQ1505	LVECQ1505	UUT38 (MVEVCDXXX), UUT39 (MVECT0755 - TEST)	
MVECPS0505	LVECPS0505	UUT37 (MVEVD0404 - TEST)	Extrapolated pentaplex systems include a combination of either (1) two-high and (1) three-high enclosed systems or (2) two-high and (1) one-high enclosed systems with all seperate enclosed systems being structurally independent and flexibly attached. UT37 is the smallest enclosed system, UUT38 tested the heaviest pumps of each technology, and UUT39 is the heaviest single enclosed vacuum system. Structurally independent and flexibly connected tanks are directly mounted to the structure and were bookended by the tanks tested in UUT30a on a rigid base platform.
MVECPS0755	LVECPS0755		
MVECP1505	LVECP1505		
MVECP0505	LVECP0505		
MVECP0755	LVECP0755	UUT38 (MVEVCDXXX), UUT39 (MVECT0755 - TEST)	
MVECHS0505	LVECHS0505	UUT37 (MVEVD0404 - TEST)	Extrapolated hexaplex systems include a combination of either (3) two-high or (2) three-high enclosed systems with all separate enclosed systems being structurally independent and flexibly attached. UT37 is the smallest enclosed system, UUT38 tested the heaviest pumps of each technology, and UUT39 is the heaviest single enclosed vacuum system. Structurally independent and flexibly connected tanks are directly mounted to the structure and were bookended by the tanks tested in UUT30a on a rigid base platform.
MVECHS0755	LVECHS0755		
MVECH1505	LVECH1505		
MVECH0505	LVECH0505		
MVECH0755	LVECH0755	UUT38 (MVEVCDXXX), UUT39 (MVECT0755 - TEST)	
MVECD0404-EX3	LVECD0404-EX3	UUT37 (MVEVD0404 - TEST)	Extrapolated expandable systems are initially built with (1) partially filled three-high system with two pumps and can be populated by one pump to create (1) three-high enclosed system. UUT37 is the smallest enclosed system, UUT38 tested the heaviest pumps of each technology, and UUT39 is the heaviest single enclosed vacuum system. Structurally independent and flexibly connected tanks are directly mounted to the structure and were bookended by the tanks tested in UUT30a on a rigid base platform.
MVECD0504-EX3	LVECD0504-EX3		
MVECD0605-EX3	LVECD0605-EX3		
MVECD0755-EX3	LVECD0755-EX3	UUT38 (MVEVCDXXX), UUT39 (MVECT0755 - TEST)	
MVECT0405-EX4	LVECT0404-EX4	UUT37 (MVEVD0404 - TEST)	Extrapolated expandable systems are initially built with (1) two-high enclosed system and (1) partially filled two-high enclosed system that can be populated with one pump to create a system with (2) two-high enclosed systems. UUT37 is the smallest enclosed system, UUT38 tested the heaviest pumps of each technology, and UUT39 is the heaviest single enclosed vacuum system. Each enclosed system is structurally independent and flexibly connected. Structurally independent and flexibly connected tanks are directly mounted to the structure and were bookended by the tanks tested in UUT30a on a rigid base platform.
MVECT0504-EX4	LVECT0504-EX4		
MVECT0605-EX4	LVECT0605-EX4		
MVECT0755-EX4	LVECT0755-EX4		
MVECT1005-EX4	LVECT1005-EX4		
MVECT1505-EX4	LVECT1505-EX4	UUT38 (MVEVCDXXX), UUT39 (MVECT0755 - TEST)	

Special Seismic Certification

Table 13 - Certified Subcomponents - Stacked Systems, Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Lubricated Rotary Vane Vacuum Pumps

Model [1]	Manufacturer	Material	Dimensions (in) L x W x H	HP	Voltage Tested	Voltage Certified	Max Weight (lb.)	Unit
RA0063	Busch	Cast iron lubricated vane vacuum pumps with face-mounted TEFC motor, carbon steel and aluminum body. Pump has rubber isolation feet.	28 x 19 x 12	3	208V	208-230/460	172	UUT8
RC0101	Busch		29 x 19 x 12	5	208V		198	UUT1
RA0101	Busch		29 x 19 x 12	5	N/A		198	Interpolated
RA0155A	Busch		31.5 x 20 x 13.5	5	460V		243	UUT5
RC0155	Busch		38 x 22 x 16.5	5	N/A		435	Interpolated
RC0205	Busch		41 x 24 x 16.5	7.5 or 8	N/A		435	Interpolated
RA0205	Busch		41 x 24 x 16.5	7.5 or 8	208V		435	UUT8
RC0305	Busch		44 x 24 x 16.5	10	N/A		520	Interpolated
RA0255	Busch		44 x 24 x 16.5	10	N/A		520	Interpolated
RA0305	Busch		44 x 24 x 16.5	10	N/A		520	Interpolated
RC0400	Busch		54 x 38 x 26.5	15	N/A		1084	Interpolated
RC0502	Busch		65.5 x 38 x 26.5	20	N/A		1285	Interpolated
RC0630	Busch		69 x 40 x 26.5	25	460V		1527	UUT2

Oilless Claw Vacuum Pumps

Model	Manufacturer	Material	Dimensions (in) L x W x H	HP	Voltage Tested	Voltage Certified	Max Weight (lb.)	Unit
MM1102	Busch	Cast iron oilless claw vacuum pumps with face-mounted TEFC motor, carbon steel and aluminum body. Pump has rubber isolation feet.	40 x 17 x 16	4.5 to 5	230V	208-230/460	450	UUT3
MM1142	Busch		42 x 17 x 16	5 to 6.4	N/A		450	Interpolated
MM1202	Busch		43 x 20 x 18	6.4 to 7	N/A		610	Interpolated
MM1252	Busch		43 x 20 x 18	7.5 to 9.1	208V / 230V		620	UUT8
MM1322	Busch		48 x 20 x 18	9 to 10.2	N/A		655	Interpolated
MM1402	Busch		48 x 20 x 18	9 to 10.2	N/A		706	Interpolated
MM1502	Busch		54.5 x 20 x 18	15	460V		717	UUT5
MI1502	Busch		48 x 31 x 27	15	460V		860	UUT4

Special Seismic Certification

Table 13 - Certified Subcomponents (Continued) - Stacked Systems, Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Tanks

Model [1]	Manufacturer	Material	Dimensions (in)	Capacity (gal)	Orientation	Max Weight (lb.)	Unit
AR0274xxxx	Campbell Hausfeld [2]	Carbon steel, ASME construction 200 psig [3]	24" Dia x 71" H	120	Vertical	325	UUT1, UUT3
AR0512xxxx			30" Dia x 77" H	200		500	UUT4
AR05130xAJ			30" Dia x 89"H	240		580	UUT4b
VES04767	Morganton	Carbon steel, ASME construction 200 psig [3]	24" Dia x 70" H	120	Vertical	325	UUT31b
VES07303			30" Dia x 80" H	200		500	Interpolated
VES07072			30" Dia x 92"H	240		580	UUT30b

1. xxxx in model number is for variations in paint color and threaded port sizes, not affecting structural elements.
2. Campbell Hausfeld is alternately branded as Twin Lakes Manufacturing.
3. Construction in accordance with ASME BPVC Section VIII. Tanks have an allowable working pressure rating of 200 psig.

Controllers

Model	Manufacturer	Description	Material	NEMA Rating	Dimensions (in)	Max Weight (lb.)	Unit
BASIC_PVM (24x20x8)	Powerex	No Touchscreen	Powder coated carbon steel	12	24"H x 20"W x 8"D	235	Extrapolated [1]
BASIC_PVM (30x24x8)	Powerex	No Touchscreen	Powder coated carbon steel	12	30"H x 24"W x 8"D	245	Extrapolated [1]
BASIC_PVM (36x30x8)	Powerex	No Touchscreen	Powder coated carbon steel	12	36"H x 30"W x 8"D	280	Extrapolated [1]
HMI_PXMI (30x24x8)	Powerex	Human Machine Interface: Touchscreen	Powder coated carbon steel	12	30"H x 24"W x 8"D	250	UUT1
HMI_PXMI (36x30x8)	Powerex				36"H x 30"W x 8"D	295	Interpolated
PBMI_PXMI (30x24x8)	Powerex	Powerex Building Management Integrator: HMI panel with additional communications card	Powder coated carbon steel	12	30"H x 24"W x 8"D	250	Interpolated
PBMI_PXMI (36x30x8)	Powerex				36"H x 30"W x 8"D	295	UUT2
PBMI_VFD (42x30x12)	Powerex	Same as PMXI, but with lead pump VFD	Powder coated carbon steel	12	42"H x 30"W x 12"D	315	UUT3, UUT4
PBMI_PXMI (42 x 30 x12)	Powerex	Powerex Building Management Integrator: HMI panel with additional communications card. Control configured for up to 8 pumps.	Powder coated carbon steel	12	42"H x 30"W x 12"D	315	UUT13

1. BASIC_PVM controller can be extrapolated because it is a depopulated version of the controllers tested in UUT 1, 2, 3 and 4.

Special Seismic Certification

Table 14 - Certified Subcomponents - Tank-Over Systems, Rigid or Flexible Base Mount

DCL Project Number: 43160-2301
Manufacturer: Powerex
Product Line: Medical Vacuum and Laboratory Vacuum

Vacuum Pumps

Model	Manufacturer	Material	Dimensions (in) L x W x H	HP	Voltage Tested	Voltage Certified	Max Weight (lb.)	Unit
RA0063	Busch	Cast iron lubricated vane vacuum pumps with face-mounted TEFC motor, carbon steel and aluminum body with rubber isolation feet attached to the pump	28 x 19 x 12	3	208V	208-230/460	172	UUT6
RC0101	Busch		29 x 19 x 12	5	208V		198	Interpolated
RA0101	Busch		29 x 19 x 12	5	N/A		198	Interpolated
RA0155A	Busch		31.5 x 20 x 13.5	5	460V		243	Interpolated
RC0155	Busch		38 x 22 x 16.5	5	N/A		362	Interpolated
RC0205	Busch		41 x 24 x 16.5	7.5 or 8	N/A		435	Interpolated
RA0205	Busch		41 x 24 x 16.5	7.5 or 8	208V		435	UUT6
MM1144	Busch	Oilless claw pumps with integrated lubricated cast iron drive gearbox, exhaust box, C-face motor with aluminum finned shell with rubber isolation feet attached to the pump	41 x 17 x 16	3	208V	208-230/460	407	UUT7
MM1102	Busch		40 x 17 x 16	4.5 to 5	230V		450	Interpolated
MM1142	Busch		42 x 17 x 16	5 to 6.4	N/A		450	Interpolated
MM1202	Busch		43 x 20 x 18	6.4 to 7	N/A		610	Interpolated
MM1252	Busch		43 x 20 x 18	7.5 to 9.1	208V / 230V		620	UUT7

Tank

Model [1]	Manufacturer	Material	Dimensions (in)	Capacity (gal)	Orientation	Max Weight (lb.)	Unit
AR8029xxx	Campbell Hausfeld [2]	Carbon steel, ASME construction 200 psig [3]	20" Dia x 47" L	60	Horizontal	130	UUT6, UUT7

1. xxxx in model number is for variations in paint color and threaded port sizes, not affecting structural elements.
2. Campbell Hausfeld is alternately branded as Twin Lakes Manufacturing.
3. Constructed in accordance with ASME BPVC Section VIII. Tanks have an allowable working pressure rating of 200 psig.

Controllers

Model	Manufacturer	Description	Material	NEMA rating	Dimensions (in)	Max Weight (lb.)	Unit
BASIC_PVM (24x20x8)	Powerex	No Touchscreen	Powder coated carbon steel	12	24"H x 20"W x 8"D	235	UUT6
BASIC_PVM (30x24x8)					30"H x 24"W x 8"D	245	Interpolated
BASIC_PVM (36x30x8)					36"H x 30"W x 8"D	280	Interpolated
HMI_PXMI (30x24x8)	Powerex	Human Machine Interface: Touchscreen	Powder coated carbon steel	12	30"H x 24"W x 8"D	250	Interpolated
HMI_PXMI (36x30x8)					36"H x 30"W x 8"D	295	Interpolated
PBMI_PXMI (30x24x8)	Powerex	Powerex Building Management Integrator: HMI panel with additional communications card	Powder coated carbon steel	12	30"H x 24"W x 8"D	250	Interpolated
PBMI_PXMI (36x30x8)					36"H x 30"W x 8"D	295	Interpolated
PBMI_VFD (42x30x12)	Powerex	Same as PXMI, but with lead pump VFD	Powder coated carbon steel	12	42"H x 30"W x 12"D	315	UUT7

Special Seismic Certification

Table 15 - Certified Subcomponents - Tank Mounted Vertical Systems, Rigid or Flexible Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Oilless Rotary Vane Pumps								
Model	Manufacturer	Material	Dimensions (L x W x H, in)	HP	Voltage tested	Voltage available	Max Weight (lb.)	Unit
SV1025	Busch	Oilless vane type vacuum pumps with flange mounted motor assembly and rubber isolation feet on pump/motor	20 x 10 x 11	1.5	208V	208-230/460	64	UUT21
SV1040	Busch		22 x 10 x 11	2	N/A		91	Interpolated
SV1063	Busch		30 x 17 x 14	3	N/A		181	Interpolated
SV1080	Busch		31 x 17 x 14	4	N/A		198	Interpolated
SV1100	Busch		33 x 17 x 14	5	460V		265	UUT23

Tanks							
Model [1]	Manufacturer	Material	Dimensions (in)	Capacity (gal)	Type	Max Weight (lb.)	Unit
AR0630xxx	Campbell Hausfeld [2]	Carbon steel, ASME construction 200 psig [3]	24" Dia x 53" H	80	Conventional	176	UUT21
AR0568xxx			30" Dia x 53" H	120	Conventional	325	UUT23

1. xxx in model number is for variations in paint color and threaded port sizes, not affecting structural elements.
2. Campbell Hausfeld is alternately branded as Twin Lakes Manufacturing.
3. Construction is in accordance with ASME BPVC Section VIII. Tanks have an allowable working pressure rating of 200 psig.

Controllers								
Type	Model	Manufacturer	Description	Material	NEMA Rating	Dimensions (W x H x D, in)	Max Weight (lb.)	Unit
Basic Duplex controller	PVM239xxAB or CB [1]	Powerex	NEMA 12 enclosure integrated to enclosure frame, containing PLC, transformers, relays, motor contactor and motor protector circuit breaker for up to 2 motors, optional HMI and optional VFD.	Powder coated carbon steel	12	20 x 24 x 8	235	UUT21
						24 x 24 x 8	240	Interpolated
Premium Duplex controller includes HMI	PBMIV269xxAB or CB [1]					30 x 30 x 8	265	Interpolated
						24 x 36 x 8	275	UUT23

1. Where first x = 1,2,3,5,7,A for HP, Second x = 2, 3, 4 for voltage (208, 230, 460V), and A or C relates to the value of the temperature switch. The panel size is determined by the amperage draw of the system.

Special Seismic Certification

Table 16 - Certified Subcomponents - Tank Mounted Vertical Systems, Rigid Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model	Manufacturer	Material	Dimensions (L x W x H, in)	HP	Voltage Tested	Voltage Available	Max Weight (lb.)	Unit
Lubricated Rotary Vane Pumps								
RA0025	Busch	Cast iron lubricated rotary vane pumps with face-mounted TEFC motor, carbon steel and aluminum body with rubber isolation feet on pump/motor	25 x 14 x 10.5	1.5	208V	208-230/460	80	UUT21
RA0040	Busch		26 x 14 x 10.5	2	N/A		95	Interpolated
RA0063	Busch		28 x 19 x 12	3	460V		172	UUT22
RA0101	Busch		29 x 19 x 12	5	N/A		198	Interpolated
RA0155A	Busch		31.5 x 20 x 13.5	5	460V		243	UUT24
Oilless Claw Pumps								
MM1104	Busch	Oilless claw pumps with integrated lubricated cast iron drive gearbox, exhaust box, C-face motor with aluminum finned shell with rubber isolation feet on pump/motor	40 x 17 x 16	2	460V	208-230/460	407	UUT22
MM1144	Busch		41 x 17 x 16	3	N/A		407	Interpolated
MM1102	Busch		40 x 17 x 16	4.5 to 5	N/A		450	Interpolated
MM1142	Busch		42 x 17 x 16	5 to 6.4	460V		450	UUT24

Model [1]	Manufacturer	Material	Dimensions (in)	Capacity (gal)	Type	Max Weight (lb.)	Unit
Tanks							
AR0630xxx	Campbell Hausfeld [2]	Carbon steel, ASME construction 200 psig [3]	24" Dia x 53" H	80	Conventional	176	UUT21
AR0568xxx			30" Dia x 53" H	120		325	UUT23 [4]
AR0273xxx	Campbell Hausfeld [2]	Carbon steel, ASME construction 200 psig [3]	24" Dia x 50.5" H	80	Frame	170	UUT22
AR0614xxx			30" Dia x 52" H	120		310	UUT24
VES07285	Morganton	Carbon steel, ASME construction 200 psig [3]	24" Dia x 49" H	80	Frame	170	UUT31a
VES04865			30" Dia x 52" H	120		325	Interpolated
VES07072			30" Dia x 92"H	240		580	UUT30a

1. xxx in model number is for variations in paint color and threaded port sizes, not affecting structural elements.
2. Campbell Hausfeld is alternately branded as Twin Lakes Manufacturing.
3. Construction is in accordance with ASME BPVC Section VIII. Tanks have an allowable working pressure rating of 200 psig.
4. UUT23, which serves as an upper bookend, was tested on neoprene pads.

Type	Model	Manufacturer	Description	Material	NEMA Rating	Dimensions (W x H x D, in)	Max Weight (lb.)	Unit
Controllers								
Basic Duplex controller	PVM239xxAB or CB [1]	Powerex	NEMA 12 enclosure integrated to enclosure frame, containing PLC, transformers, relays, motor contactor and motor protector circuit breaker for up to 2 motors, optional HMI and optional VFD.	Powder coated carbon steel	12	20 x 24 x 8	235	UUT21
						24 x 24 x 8	240	Interpolated
Premium Duplex controller includes HMI	PBMIV269xxAB or CB [1]					30 x 30 x 8	265	Interpolated
						24 x 36 x 8	275	Interpolated
						30 x 36 x 8	295	Interpolated
Premium with VFD	PBMIV269xxCV [2]					30 x 40 x 12	305	UUT24

1. Where first x = 1,2,3,5,7,A for HP, Second x = 2, 3, 4 for voltage (208, 230, 460V), and A or C relates to the value of the temperature switch. The panel size is determined by the amperage draw of the system.
2. Where first x = 1,2,3,5,7,A for HP, Second x = 2, 3, 4 for voltage (208, 230, 460V).

Special Seismic Certification

Table 17 - Certified Subcomponents - Enclosed Medical/Laboratory Vacuum Systems, Rigid Base Mount

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Lubricated Rotary Vane Vacuum Pumps

Model	Manufacturer	Material	Dimensions (in) L x W x H	HP	Voltage Tested	Voltage Certified [1]	Max Weight (lb.)	Unit
RC0101	Busch	Cast iron lubricated vane vacuum pump with face-mounted TEFC motor, carbon steel and aluminum body. Pump has rubber isolation feet.	29 x 19 x 12	5	460V	208-230/460	198	UUT37
RA0101	Busch		29 x 19 x 12	5	N/A		198	Interpolated
RA0155A	Busch		31.5 x 20 x 13.5	5	N/A		243	Interpolated
RC0155	Busch		38 x 22 x 16.5	5	N/A		362	Interpolated
RC0205	Busch		41 x 24 x 16.5	7.5 or 8	N/A		435	Interpolated
RA0205	Busch		41 x 24 x 16.5	7.5 or 8	460V		435	UUT38

1. Pumps with different voltages are physically identical and only differ in wiring.

Oilless Claw Vacuum Pumps

Model	Manufacturer	Material	Dimensions (in) L x W x H	HP	Voltage Tested	Voltage Certified [1]	Max Weight (lb.)	Unit
MM1102	Busch	Cast iron oilless claw vacuum pump with face-mounted TEFC motor, carbon steel and aluminum body. Pump has rubber isolation feet.	40 x 17 x 16	4.5 to 5	N/A	208-230/460	450	Extrapolated
MM1142	Busch		42 x 17 x 16	5 to 6.4	N/A		450	Extrapolated
MM1202	Busch		43 x 20 x 18	6.4 to 7	N/A		610	Extrapolated
MM1252	Busch		43 x 20 x 18	7.5 to 9.1	460V		620	UUT39
MM1322	Busch		48 x 20 x 18	9 to 10.2	N/A		655	Interpolated
MM1402	Busch		48 x 20 x 18	9 to 10.2	N/A		706	Interpolated
MM1502	Busch		54.5 x 20 x 18	15	460V		717	UUT38

1. Pumps with different voltages are physically identical and only differ in wiring.

Controllers

Model	Manufacturer	Description	Material	Dimensions (in)	Max Weight (lb.)	Unit
BASIC_PVM	Powerex	No Touchscreen	Powder coated carbon steel	24"H x 20"W x 8"D	240	UUT37
HMI_PXMI	Powerex	Human Machine Interface: Touchscreen	Powder coated carbon steel	30"H x 24"W x 8"D	245	UUT39
PBMI_VFD	Powerex	Same HMI_PXMI with lead pump VFD	Powder coated carbon steel	42"H x 30"W x 12"D	246	UUT38

Enclosures

Model	Manufacturer	Material	Dimensions (in) (L x W x H)	Max Weight (lb.)	Unit
Small	Powerex	Powder coated carbon steel	65 x 34 x 66	540	UUT37
Large	Powerex	Powder coated carbon steel	82 x 34 x 77	750	UUT38, UUT39

Tanks [1]

Model	Manufacturer	Material	Dimensions (in)	Capacity (gal)	Max Weight (lb.)	Unit
VES07285	Morganton	Carbon steel, ASME construction 200 psig [2]	24" Dia x 49" H	80	177	UUT30a [3]
VES04865			30" Dia x 52" H	120	325	Interpolated
VES07303			30" Dia x 80" H	200	500	Interpolated
VES07072			30" Dia x 92"H	240	580	UUT30a [3]

1. Tanks are structurally independent and flexibly attached to enclosed vacuum systems. Tanks are rigidly base mounted to the structure or a rigid frame base.
2. Construction in accordance with ASME BPVC Section VIII. Tanks have an allowable working pressure rating of 200 psig.
3. Tanks tested in UUT30a were rigidly mounted to a rigid frame base.

Special Seismic Certification

Table 18 - Tested Units

DCL Project Number: 43160-2301

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number	Type	Pump HP	Tank Size (gal)		Vertically Stacked Pumps	Horizontally Arrayed Pumps	Dimensions (inches)			Weight (lb)	Mounting	Unit
							Length	Width	Height			
Stacked Systems												
VPD04042L1	Duplex	(2) 5HP	120		2	1	55.0	64.0	76.0	1,340	Flexible base (neoprene) w/ internal isolation	UUT1
VPQ2505S5588940	Duplex	(2) 25HP	200		2	1	70.0	90.0	87.0	5,130		UUT2
CVPD0504A3F1	Duplex	(2) 5HP	120		2	1	55.0	64.0	76.0	1,690		UUT3
CVPQ1505S5588940	Duplex	(2) 15HP	200		2	1	74.0	90.0	88.0	3,800		UUT4
VPD0xxx/CVPD0xxx	Duplex	(1) 15HP, (1) 5HP	N/A		2	1	70.0	45.0	80.0	1,940		UUT5
VPT0xxx/CVPT0xxx	Triplex	(2) 7.5HP, (1) 3HP	N/A		3	1	55.0	32.0	85.0	1,680		UUT8
VPO150x/CVPO150x controller	Octoplex controller	N/A	N/A		N/A	N/A	55.0	32.0	65.0	410		UUT13
Tank Over Systems												
VPDT0xxx	Duplex	(1) 7.5HP, (1) 3HP	60		2	1	74.0	39.0	89.0	1,450	Rigid base w/ internal isolation	UUT6
CVPDT0xxx	Duplex	(1) 7.5HP, (1) 3HP	60		2	1	74.0	39.0	89.0	1,910	Flexible base (neoprene) w/ internal isolation	UUT7
Medical Air Stacked Scroll Systems [1]												
MSD15064L5 (receiver/dryer skid)	Duplex	15	240		2	3	84.0	32.0	96.0	1,510	Flexible base (neoprene) w/ internal isolation	UUT4a
MSD15064L5 (receiver/dryer skid)	N/A	N/A	240		N/A	N/A	84.0	32.0	96.0	1,310	Flexible base (neoprene)	UUT4b
Vertical Tank Mounted Systems												
VVTD0153 / VVOTD0153	Duplex	(1) 1.5 HP lube vane, (1) 1. 5 HP oilless vane	80	Conventional	1	2	43.0	30.0	74.0	710	Rigid base w/ internal isolation	UUT21
VVTD0303 / CVTD0203V	Duplex	(1) 3 HP lube vane, (1) 2 HP oilless claw	80	Frame	1	2	55.0	30.0	85.0	1,260	Rigid base w/ internal isolation	UUT22
VVOTD0504	Duplex	(2) 5 HP oilless vane	120	Conventional	1	2	53.0	34.0	90.0	1,170	Flexible base (neoprene) w/ internal isolation	UUT23
VVTD0504 / CVTD0504BV	Duplex	(1) 5 HP lube vane, (1) 5 HP oilless claw	120	Frame	1	2	59.0	35.0	85.0	1,670	Rigid base w/ internal isolation	UUT24
Enclosed Vacuum Systems												
MVEVD0404 - TEST	Duplex	(2) 5 HP Lube Vane	N/A	N/A	2	1	65.0	34.0	66.0	1,340	Rigid base w/ internal isolation	UUT37
MVEVCDXXX	Duplex	(1) 15 HP Oilless Claw, (1) 7.5 HP Lube Vane	N/A	N/A	2	1	82.0	34.0	77.0	2,540	Rigid base w/ internal isolation	UUT38
MVECT0755 - TEST	Triplex	(3) 7.5 HP Oilless Claw	N/A	N/A	3	1	82.0	34.0	77.0	3,080	Rigid base w/ internal isolation	UUT39
Morganton Tanks												
VES07285 (80 Gal); VES07072 (240 Gal)	Tank Skid	80 gallon and 240 gallon vertical tank on a platform frame base [2]	80, 240	Frame	N/A	N/A	33.5	60.0	94.0	1,010	Rigid base	UUT30a
		80 gallon and 240 gallon vertical tank on a platform frame base [2]	80, 240	Frame	N/A	N/A	33.5	60.0	94.0	1,010	Flexible base (neoprene)	UUT30b
VES07285 (80 Gal); VES04767 (120 Gal)	Tank Skid	80 gallon, 120 gallon vertical tank on a ladder frame base [2]	80, 120	Frame	N/A	N/A	32.0	55.0	75.0	630	Rigid base	UUT31a
		80 gallon, 120 gallon vertical tank on a ladder frame base [2]	80, 120	Frame	N/A	N/A	32.0	55.0	75.0	630	Flexible base (neoprene)	UUT31b

1. Medical Air Stacked Scroll System included here for bookending of Campbell Hausfeld 240 gallon vertical tank.

2. The frame bases tested are rigid frame bases.

UUT1 - DCL Test Report 34796-1401a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VPD0404(2L1)

Product Construction Summary: Powder coated carbon steel skid and frame

Options / Component Summary: Duplex system. 5 HP 208V lubricated vane vacuum pumps, 120 gallon vertical receiver tank, HMI_PXMI controller in NEMA 12 enclosure.

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT1	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	1,340	55	64	76	7.0	6.5	21.3

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.50	1.0	1.5	4.00	3.00	1.68	0.68

Unit Mounting Description:

Base mounted using Airloc model 32 neoprene vibration isolation pads. Both skids were anchored to the shake table interface plate with (4) 1/2"-diameter Grade 5 bolts and washers spaced approximately 30'' widthwise and 53'' lengthwise on-center for each skid (eight total).

UUT1, view from front right

UUT1, view from left

UUT2 - DCL Test Report 34796-2301a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VPQ2505(S5588940)

Product Construction Summary: Powder coated carbon steel skid and frame

Options / Component Summary: Duplex system. 25 HP 460V lubricated rotary vane vacuum pumps, 200 gallon vertical receiver tank, PBMI_PXMI controller in NEMA 12 enclosure

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT2	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	5,130	70	90	87	4.50	3.80	10.25

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	1.95	1.0	1.5	3.12	2.34	1.31	0.53

Unit Mounting Description:

Base mounted using Airloc model 32 neoprene vibration isolation pads. Both skids were anchored to the shake table interface plate with (4) 1/2"-diameter Grade 5 bolts and washers spaced approximately 88'' widthwise and 34'' lengthwise on-center for each skid (eight total).

UUT2, view from front

UUT2, view from left

UUT3 - DCL Report 34796-1401a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: CVPD0504(A3F1)

Product Construction Summary: Powder coated carbon steel skid and frame

Options / Component Summary: Duplex system. 5HP 230V oilless claw pumps, 120 gallon vertical receiver tank, PBMI_VFD controller in NEMA 12 enclosure

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT3	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	1,690	55	64	76	6.25	6.25	13.00

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.50	1.0	1.5	4.00	3.00	1.68	0.68

Unit Mounting Description:

Base mounted using Airloc model 32 neoprene vibration isolation pads. Both skids were anchored to the shake table interface plate with (4) 1/2"-diameter Grade 5 bolts and washers spaced approximately 30'' widthwise and 48'' lengthwise for each skid (eight total). The control panel was braced to the skid with one piece of B-Line B45 14 gage galvanized carbon steel channel attached with B-Line B230 brackets (one bracket per channel end) and (2) 1/2" Grade 2 bolts and nuts with flat washers per bracket.

UUT3, view from front

UUT3, view from left

UUT4 - DCL Test Report 34796-1401a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: CVPQ150S5588940 (CVPD1505, since 2-high vacuum pump stack was tested; also, S was substituted for 5 in the test specimen model number because this was a "special" build for the test)

Product Construction Summary: Powder coated carbon steel skid and frame

Options / Component Summary: Duplex system. 15 HP 460V oilless claw pumps, 200 gallon vertical receiver tank, PBMI_VFD controller in NEMA 12 enclosure.

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT4	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	3,800	74	90	88	4.50	4.75	11.75

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.06	1.0	1.5	3.30	2.47	1.38	0.56

Unit Mounting Description:

Base mounted using Airloc model 32 neoprene vibration isolation pads. Both skids were anchored to the shake table interface plate with (4) 1/2"-diameter Grade 5 bolts and washers (eight total).

UUT4, view from front right

UUT4, view from left

UUT4a - DCL Test Report 33299-1301

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Air and Laboratory Air

Model Number: MSD15064L5 (controller/pump skid)

Product Construction Summary: Powder coated structural steel skid and frame. Unit is internally isolated.

Options / Component Summary:

5HP scroll pump with WEG motor, PBMI_PXMI controller in NEMA 12 enclosure.

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT4a	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	1,510	84*	34	96*	6.8	5.5	12.0

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

*Note: Length and height are combined dimensions for UUT4a and UUT4b.

Unit Mounting Description:

The unit was base mounted to the shake table interface frame through the skid using four Airloc model 32 neoprene pads and (4) 1/2"-diameter, Grade 5 bolts and washers spaced approximately 32'' widthwise and 74'' lengthwise on-center.

UUT4a Overall View

UUT4b - DCL Test Report 33299-1301

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Air and Laboratory Air

Model Number: MSD15064L5 (receiver/dryer skid)

Product Construction Summary: Powder coated structural steel skid and frame

Options / Component Summary: 240 gallon vertical receiver tank and PMD111 desiccant air dryer.

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT4b	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	1,310	84*	32	96*	5.5	5.0	22.5

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.42	1.0	1.5	3.87	2.90	1.61	0.65

*Note: Length and height are combined dimensions for UUT4a and UUT4b.

Unit Mounting Description:

Base mounted using Airloc model 32 neoprene vibration isolation pads. The skid was mounted to the shake table interface frame using (4) 1/2"-diameter, Grade 5 bolts and washers spaced approximately 30'' widthwise and 82'' lengthwise on-center.

UUT4b Overall View

UUT5 - DCL Test Report 39372-1601a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VPD0XXX/CVPD0XXX

Product Construction Summary: Powder coated carbon steel skid and frame

Options / Component Summary: Duplex system. 5 HP 460V lubricated vane vacuum pump in bottom position, 5 HP 460V oilless claw pump in top position

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

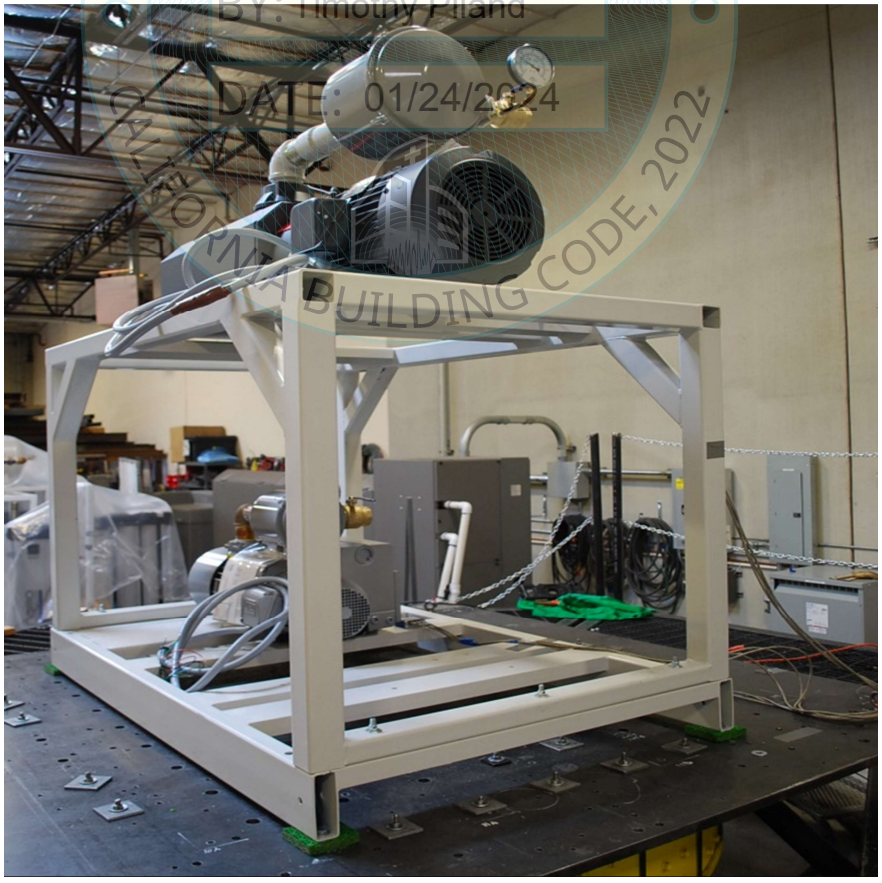
UUT5	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	1,940	70	45	80	6.0	4.0	10.0

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

Base mounted using Airloc model 32 neoprene vibration isolation pads. The skid was anchored to the shake table interface plate with (4) 1/2"-diameter Grade 5 bolts and washers spaced at approximately 43'' widthwise and 68'' lengthwise on-center.



UUT5 Overall View

UUT6 - DCL Test Report 39372-1601a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VPDT0XXX

Product Construction Summary: Powder coated carbon steel skid and frame

Options / Component Summary: Duplex tank-over system. 3 HP 208V lubricated rotary vane vacuum pump in the bottom position, 7.5 HP 208V lubricated rotary vane pump in the middle position, 60 gallon horizontal tank in the top position, 24" BASIC_PVM controller.

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
UUT 6	1,450	70 (74 to outside of pipe)	32 (39 to outside of pipe)	89	6.5	6.0	13.0

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

The skid was anchored to the shake table interface plate with (4) 1/2"-diameter Grade 5 bolts and washers spaced at approximately 30'' widthwise and 54'' lengthwise on-center.

UUT6 Overall View

UUT7 - DCL Test Report 39372-1601a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: CVPDT0XXX

Product Construction Summary: Powder coated carbon steel skid and frame

Options / Component Summary: Duplex tank-over system. 3 HP 208V oilless claw vacuum pump in the bottom position, 7.5 HP 208V oilless claw pump in the middle position, 60 gallon horizontal tank in the top position, 42" PBMI_VFD controller.

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
UUT7	1,910	70 (74 to outside of pipe)	32 (39 to outside of pipe)	89	4.5	4.5	11.0

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

Base mounted using Airloc model 32 neoprene vibration isolation pads. The skid was anchored to the shake table interface plate with (4) 1/2"-diameter Grade 5 bolts and washers spaced at approximately 30'' widthwise and 54'' lengthwise on-center.

UUT7 Overall View

UUT8 - DCL Test Report 39372-1601a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VPT0XXX/CVPT0XXX

Product Construction Summary: Powder coated carbon steel skid and frame

Options / Component Summary: Triplex system. 3HP 208V lubricated vane vacuum pump in the bottom position, 7.5 HP 208V lubricated rotary vane pump in the middle position, 7.5 HP 208V oilless claw pump in the top position.

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT8	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	1,680	55	32	85	4.0	3.5	11.5

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

Base mounted using Airloc model 32 neoprene vibration isolation pads. The skid was anchored to the shake table interface plate with (4) 1/2"-diameter Grade 5 bolts and washers spaced at approximately 30'' widthwise and 53'' lengthwise on-center.

UUT8 Overall View

UUT13 - DCL Test Report 41182-1701a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VPO150x/CVPO150x controller

Product Construction Summary: Powder coated structural steel skid

Options / Component Summary: PBMI_PXMI octoplex controller

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT13	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	410	55	32	65	9.0	9.0	>33.3

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

Base mounted using Airloc model 32 neoprene vibration isolation pads. The skid was attached to the shake table interface plate with (4) 1/2"-diameter Grade 5 bolts, washers, and 1 1/4"x1 1/4" x 3/8" malleable iron plain finish bevel washers spaced at 30'' widthwise and 53'' lengthwise on-center . The control panel was braced to the skid with one piece of B-Line B45 14 gage galvanized carbon steel channel attached with B-Line B230 brackets (one bracket per channel end) and (2) Grade 2, 1/2"-diameter bolts and nuts with flat washers per bracket.

UUT13 Overall View

UUT21 - DCL Test Report 41182-1701b

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VVTD0153 / VVOTD0153

Product Construction Summary: Powder coated structural steel skid

Options / Component Summary: 1.5 HP 208V lubricated rotary vane pump, 1.5 HP 208V oilless rotary vane pump, 80 gallon conventional tank and duplex PVM controller

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT21	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	710	43	30	74	15.0	13.5	15.0

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

The unit was base mounted with (3) 1/2"-diameter Grade 5 bolts and washers spaced approximately 27'' on-center from each other in a triangular pattern.

UUT21 Overall View

UUT22 - DCL Test Report 41182-1701b

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VVTD0303 / CVTD0203V

Product Construction Summary: Powder coated structural steel skid

Options / Component Summary: 3 HP 460V lubricated rotary vane pump, 2 HP 460V oilless claw pump, 80 gallon frame tank and duplex PBM controller with HMI

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT22	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	1,260	55	30	85	4.5	4.5	7.5

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

The unit was base mounted with (4) 1/2"-diameter Grade 5 bolts, washers, and 1 1/4"x1 1/4" x 3/8" plain finish malleable iron bevel washers spaced approximately 38'' widthwise and 30'' lengthwise on-center.

UUT22 Overall View

UUT23 - DCL Test Report 41182-1701b

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VVOTD0504

Product Construction Summary: Powder coated structural steel skid

Options / Component Summary: 5 HP 460V oilless rotary vane pumps, 80 gallon conventional tank and duplex PBM controller with HMI

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT23	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	1,170	53	34	90	7.5	7.5	28.4

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

The unit was base mounted with (4) Airloc model 32 neoprene pads, (4) 1/2"-diameter Grade 5 bolts, washers, and 2"x2"x3/16" low carbon steel black oxide finish plate washers spaced approximately 19'' widthwise and 19'' lengthwise on-center.

UUT23 Overall View

UUT24 - DCL Test Report 41182-1701b

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VVTD0504 / CVTD0504BV

Product Construction Summary: Powder coated structural steel skid

Options / Component Summary: 5 HP 460V lubricated rotary vane pump, 5 HP 460V oilless claw oilless rotary vane pump, 120 gallon frame tank and premium PBM controller with VFD

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT24	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	1,670	59	35	85	4.5	19.5	>33.3

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

The unit was base mounted with (4) 1/2"-diameter Grade 5 bolts, washers, and 1 1/4"x1 1/4" x 3/8" plain finish malleable iron bevel washers spaced approximately 38'' widthwise and 31'' lengthwise on-center. The right and left sides were braced with (1) 2.5" wide, 1/4" thick structural steel angle, with each end of the angle attached to the vertical members of the UUT frame with (1) 1/2"-diameter Grade 5 bolt and (4) 4"x4"x1/4" galvanized finish low carbon steel washers at each attachment location.

Brace attachment detail

UUT24 Overall View

UUT30a - DCL Test Report 42747-1801

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VES07285 (80gal tank) , VES07072 (240gal tank)

Product Construction Summary: Powder coated structural steel skid

Options / Component Summary: Platform frame mounted tanks

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT30a	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	1,010	34	60	94	4.0	5.5	31.5

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

UUT30a was rigidly base mounted with (4) 1/2'' diameter Grade 5 bolts and washers spaced approximately 50'' widthwise and 31'' lengthwise on-center.

UUT30a Overall View

UUT30b - DCL Test Report 42747-1801

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VES07285 (80gal tank) , VES07072 (240gal tank)

Product Construction Summary: Powder coated structural steel skid

Options / Component Summary: Platform frame mounted tanks

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT30b	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	1,010	34	60	94	3.0	3.5	10.5

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

UUT30b was flexibly base mounted with (4) 1/2'' diameter Grade 5 bolts and washers spaced approximately 50'' widthwise and 31'' lengthwise on-center through an Airloc model 32 neprene pad.

UUT30a Overall View

UUT31a - DCL Test Report 42747-1801

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VES07285 (80gal tank) , VES04767 (120gal tank)

Product Construction Summary: Powder coated structural steel skid

Options / Component Summary: Ladder frame mounted tanks

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT31a	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	630.0	32	55	75	8.5	11.5	>33.3

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

UUT31a was rigidly base mounted with (4) 1/2'' diameter Grade 5 bolts and washers spaced approximately 53'' widthwise and 30'' lengthwise on-center and (4) 1 1/4"x1 1/4" x 3/8" malleable iron bevel washers.

UUT31a Overall View

UUT31b - DCL Test Report 42747-1801

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: VES07285 (80gal tank) , VES04767 (120gal tank)

Product Construction Summary: Powder coated structural steel skid

Options / Component Summary: Ladder frame mounted tanks

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT31b	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	630	32	55	75	8.0	9.5	16.0

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

UUT 31b was flexibly base mounted with (4) 1/2'' diameter Grade 5 bolts and washers spaced approximately 53'' widthwise and 30'' lengthwise on-center and (4) 1 1/4"x1 1/4" x 3/8" malleable iron bevel washers through an Airloc model 32 neprene pad.

UUT31b Overall View

UUT37 - DCL Test Report 43160-2301a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: MVEVD0404 - TEST

Product Construction Summary: Powder-Coated Carbon Steel

Options / Component Summary: 5 HP 460V lubricated vane pumps, BASIC_PVM controller and small enclosure

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT37	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	1,340	65.0	34.0	66.0	12.0	15.0	20.5

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

UUT37 was attached to the steel shake table interface plate with (4) 1/2" Grade 5 bolts and flat washers 36" widthwise and 59.8" lengthwise on-center through (4) 2.8" x 2.0" x 0.2" manufacturer-provided carbon steel brackets attached to the unit. The brackets are attached to the unit with (2) 5/16" Grade 5 bolts and flat washers spaced 1.6" apart.

UUT37 Overall View

UUT38 - DCL Test Report 43160-2301a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: MVEVCDXXX

Product Construction Summary: Powder-Coated Carbon Steel

Options / Component Summary: 15 HP 460V lubricated vane pump in the bottom position, 15 HP 460V oilless claw pump in the top position, PBMI_VFD controller and large enclosure

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT38	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	2,540	82.0	34.0	77.0	5.5	8.0	11.0

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

UUT38 was attached to the steel shake table interface plate with (4) 1/2" Grade 5 bolts and flat washers spaced 36" widthwise and 76.8" lengthwise on-center through (4) 2.8" x 2.0" x 0.2" manufacturer-provided carbon steel brackets attached to the unit. The brackets are attached to the unit with (2) 5/16" Grade 5 bolts and flat washers spaced 1.6" apart.

UUT38 Overall View

UUT39 - DCL Test Report 43160-2301a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Powerex

Product Line: Medical Vacuum and Laboratory Vacuum

Model Number: MVECT0755 - TEST

Product Construction Summary: Powder-Coated Carbon Steel

Options / Component Summary: 7.5 HP 460V oilless claw pumps, HMI_PXMI controller and large enclosure

Note: The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

UUT Properties

UUT39	Operating Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
	3,080	82.0	34.0	77.0	4.0	8.0	13.0

Seismic Test Parameters

Building Code	Test Criteria	Sds (g)	z/h	Ip	Aflx-H (g)	Arig-H (g)	Aflx-V (g)	Arig-V (g)
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

UUT39 was attached to the steel shake table interface plate with (4) 1/2" Grade 5 bolts and flat washers spaced 36" widthwise and 76.8" lengthwise on-center through (4) 2.8" x 2.0" x 0.2" manufacturer-provided carbon steel brackets attached to the unit. The brackets are attached to the unit with (2) 5/16" Grade 5 bolts and flat washers spaced 1.6" apart. Retrofits: all side panels were fastened with (8) 1/4" Grade 5 bolts and (16) flat washers spaced 32.4" lengthwise and 20.0" vertically on-center each. The front control panel was fastened with (4) 1/4" Grade 5 bolts and (8) flat washers spaced 29.1" widthwise and 17.9" vertically.

Panel Retrofit Detail

UUT39 Overall View