HY-PRO FILTRATION

VAC-U-DRY

VACUUM DEHYDRATION SKIDS

- Remove Free & Dissolved Water down to 20 PPM (0.002%)
- Remove Free & Dissolved gasses
- Standard Flow range 5~60 gpm,19~225 lpm (larger units available)
- Visually Monitor Fluid and Process through Clear Chamber Covers
- High Water Removal Efficiency
- Adjustable vacuum setting valve
- High Efficiency Particulate Filtration
- Low Watt Density Heaters
- Dimensional and Arrangement Design Flexibility
- Condensate Water Holding Tank with Automatic Drain Standard for 24 x 7 unattended operation
- Electrical Phase Reversal Standard
- Available PLC or VFD Control

FLUXA

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VAC-U-DRY optimizes the balance between heat, vacuum and process design to rapidly remove dissolved water and gas. Keep your oil clean, dry and reliable!

V10 Model

Large air cooled condenser

Air inlet breather. (particulate or desiccant)

Dual stainless steel condensate tanks standard with clear covers for visual process inspection

Several High output vacuum pump options available (lubricated vane dry seal shown)

Clear vacuum chamber and condensate tank covers for visual monitoring of dehydration process.

Top loading particle filter assembly with coreless filter element and true Δp gauge

Auto water drain circuit allows for 24 x 7 continuous unattended operation

Flexibility of design dimensions & process arrangement is an available option. We'll listen then customize a VAC-U-DRY for your specific application.

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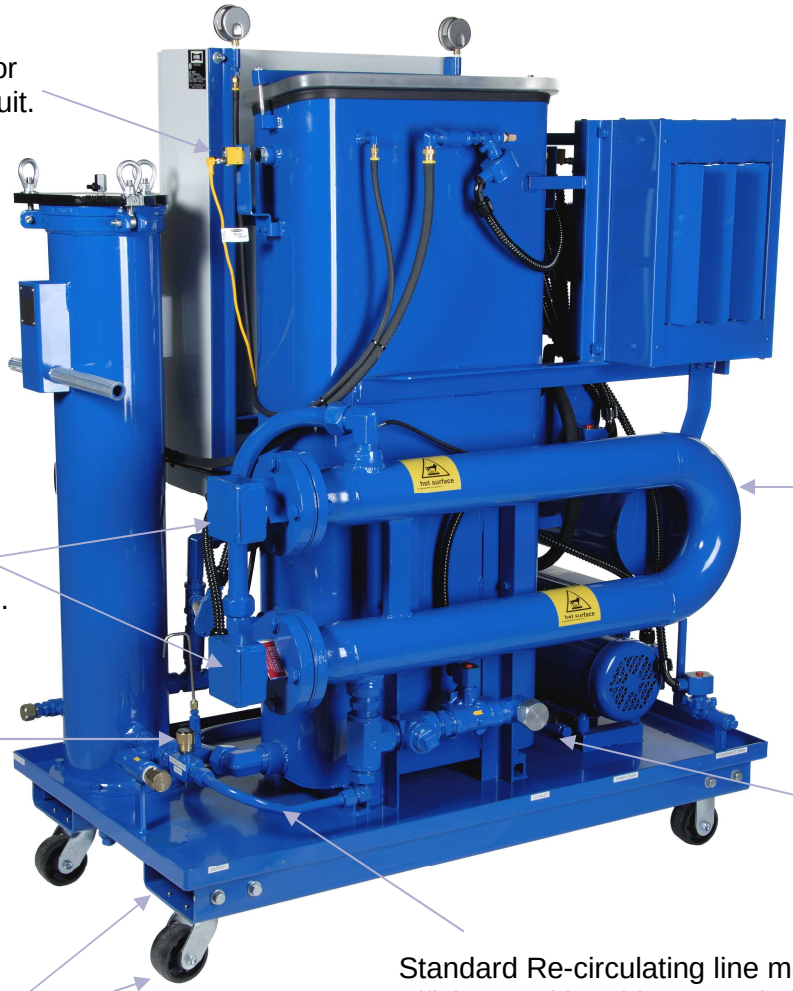
User friendly . . . Clear vacuum chamber and condensate tank covers allow you to see the performance (condensation and collected water).



Optional foam sensor and knockdown circuit.

All condensate wetted parts are 304 stainless steel (standard)

Low watt density fin tube heaters prevent coking with no direct contact between heating element & fluid.

Ample plumbing makes Vac-U-Dry suitable for fluid viscosity to 460 cSt. Ideal for high viscosity lubricating fluids

Re-circulation line control valve

Vac-U-Dry inlet

Standard Re-circulating line maximizes efficiency with cold start and allows adjustment system return flow rate.

Solid non-shedding wheels and forklift guides standard

Model	Length Inch (mm)	Width Inch (mm)	Height Inch (mm)	Crated Weight Lbs (Kg)	Dispersal Element Qty.
V3	56 (1422)	32 (813)	48 (1219)	1300 (590)	2
V5	56 (1422)	32 (813)	60 (1524)	1900 (863)	2
V10	56 (1422)	32 (813)	60 (1524)	1900 (863)	3
V15	56 (1422)	32 (813)	60 (1524)	1990 (904)	3
V20	72 (1829)	36 (914)	60 (1524)	2100 (954)	4
V30	84 (2134)	40 (1016)	60 (1524)	2500 (1136)	4 (ext. length)
V45	84 (2134)	48 (1219)	60 (1524)	2840 (1290)	8 (ext. length)
V60	84 (2134)	60 (1524)	60 (1524)	3210 (900)	8 (ext. length)

*Dimensions and weights are for standard models. Additional options may increase Vac-U-Dry size.

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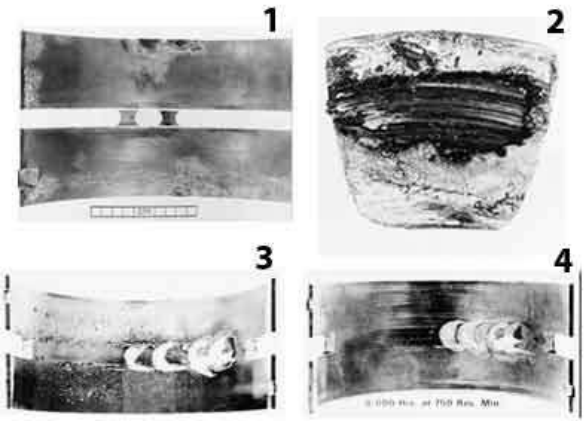

The Harmful Affects of Water in Oil

Water is one of the most common and most damaging contaminants found in a lube or hydraulic system. Continuous or periodic high water levels can result in damage such as:

- Metal Etching (corrosion)
- Abrasive wear in hydraulic components
- Dielectric Strength Loss
- Fluid Breakdown
- Additive precipitation and oil oxidation
- Reduction in lubricating properties

75% of All Hydraulic Component failures are Caused by Fluid Contamination

The effects of moisture in your oil systems can drastically reduce on stream plant availability. Bearing life and critical component life is greatly reduced by moisture levels above and within the saturation point. Many systems run constantly above this point due to inefficient dehydration technologies and high ingression. This develops acidity and loss of lubrication properties. Free water occurs when oil becomes saturated and cannot dissolve any additional water. This water makes the oil appear cloudy and can even be seen in puddle form at the bottom of a reservoir. Water which is absorbed into the oil is called dissolved water. At elevated temperatures, oil has the ability to hold more water in the dissolved state due to the expansion of the oil molecules. As the oil cools, it loses its capacity to hold water and free water will appear where previously not visible. Fluid type also determines saturation point in addition to temperature changes.

Fluid	Saturation PPM	Saturation %
Hydraulic	300	0.03%
Lubrication	400	0.04%
Transformer	50	0.005%

New Moisture Level PPM (%)

Current Moisture Level (PPM)	1000 (0.1%)		500 (0.05%)		250 (0.025%)		100 (0.01%)		50 (0.005%)	
	Rolling Element	Journal Bearing	Rolling Element	Journal Bearing	Rolling Element	Journal Bearing	Rolling Element	Journal Bearing	Rolling Element	Journal Bearing
5000	2.3	1.6	3.3	1.9	4.8	2.3	7.8	2.9	11.2	3.5
2500	1.6	1.3	2.3	1.6	3.3	1.9	5.4	2.4	7.8	2.9
1000			1.4	1.2	2	1.5	3.3	1.9	4.8	2.3
500					1.4	1.2	2.3	1.6	3.3	1.9
250							1.5	1.3	2.3	1.6
100									1.4	1.2

Component Life Extension by Removing Water*

*courtesy of Noria

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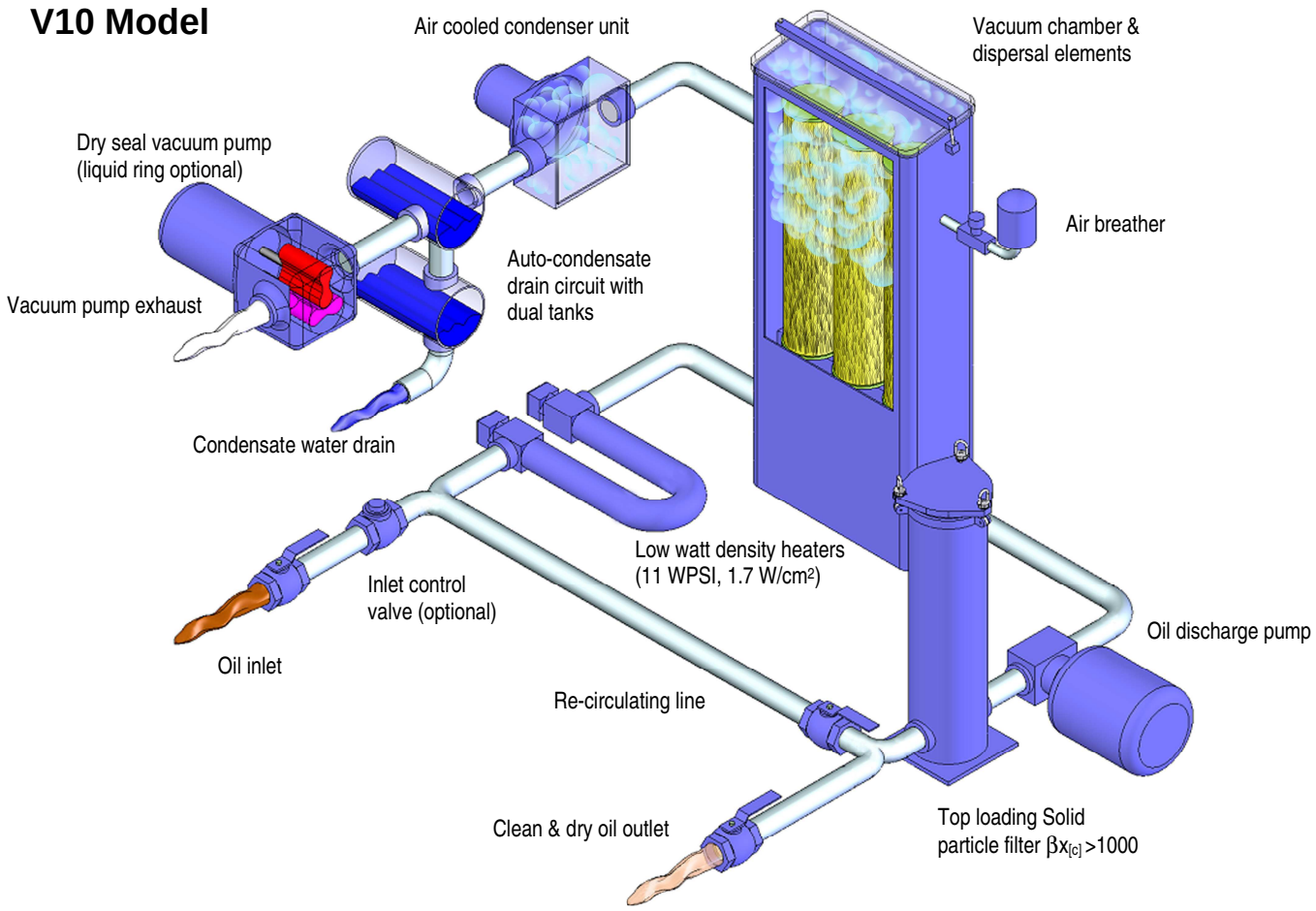
Increase "Must Have" Plant Reliability

Centrifuges only remove free water that is well above the saturation point leaving harmful quantities of free and dissolved water in the oil. Desorbers and coalescing filters can achieve water levels of 150 ppm, but the process can be much slower or impossible with the presence of surfactants and additives. VAC-U-DRY rapidly removes water (below 20 ppm (0.0020% with desiccant breather) with efficiency to control water levels under normal ingression and regain control of high ingression conditions in hours instead of weeks or months.

Contaminant Type	VAC-U-DRY Capability
Water	Remove 100% free water 90% + dissolved water
Particulate	ISO Cleanliness Code 13/11/8 per ISO4406:1999
Gases	Remove 100% free gases 90% + dissolved gases
Air	Remove 100% free air 90% + dissolved air

The VAC-U-DRY Purification Process and Flow Diagram

Contaminated oil is drawn into the VAC-U-DRY purifier by a high output vacuum pump. The oil passes through the low watt density heater where heated to optimum temperature for the dehydration process (150°F, 66°C). The oil enters the vacuum chamber passing through specially designed dispersal elements which create a thin film of oil that is exposed to the vacuum. The water is vaporized and then drawn into the condenser where it becomes liquid and drains into the condensate tank.



The dehydrated oil flows to the bottom of the vacuum chamber and is removed by the discharge pump. The oil is pumped through the high efficiency particulate filter assembly ($\beta x_{[c]} > 1000$) and returned to the system. The re-circulating line helps the VAC-U-DRY reach optimum temperature in cold start situations and can be used to throttle machine inlet and outlet flow.

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Feature	Description
Condensate wet parts stainless	Better fluid compatibility with no price adder (304 stainless standard)
Flexible design & dimensions	Flexible dimensions, process setup to suit your application (others won't)
Programmable thermostat	Precise temperature control, prevents overheating, unattended operation
Vacuum process	27" max Hg vacuum yields rapid water and gas removal. Operational up to 20 meter (60 ft) negative head
Visual access	Clear covers on vacuum chamber and condensate tank allow visual inspection of oil condition and process

Feature	Description
Re-circulation line	Achieve optimum temp faster. Reduce flow rate for smaller systems. Maintain several systems with one VAC-U-DRY
Condensate collection	All water removed does not go through vacuum pump extends vac pump life.
Heater system	Low watt density heaters prevent coking No direct heat element contact with oil Heat applied only when necessary
Auto condensate drain	Automatic condensate drain standard Maximizes uptime (24/7 operation)
Electrical phase reversal standard	Electrical phase reversal automatically controlled in the control panel No guess work or switch to throw

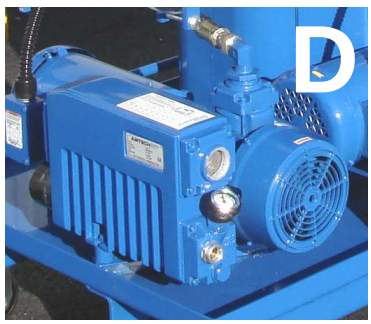
Operator Friendly Smart Relay - Smart relay enabled control panel performs controlled start-up & shut-down routines for ease of operation and keeps operators out of the control box. Includes machine drain sequence & automatic phase reversal (internally controlled, no guess work or switch to

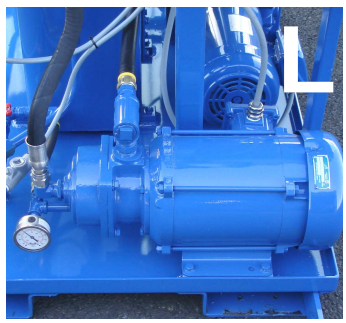
Programmable Thermostat - Programmable temperature controller for ease of operation and variable temp control with high limit safety setting.

Heater Selector Switch (keyed) - Optional keyed selector switch for all units above 12KW. Suitable with mobile unit when AMP circuit does not allow for AMP draw with heat > 12KW (Multiple heaters can be deselected)

Vacuum Pump Option Selection

Code	Description	Maintenance	Requirements
C	Dry seal (dry rotary claw)	20,000 hour maintenance oil change	Long maintenance interval plus excellent portability
D	Dry seal (lubricated rotary vane)	500~750 hour maintenance oil / filter change	Excellent portability
L	Liquid ring (external process water line ~ 3 gpm required)	Monitor water supply line filter, vacuum pump compound gauge (positive pressure)	Ideal for hot, humid ambient conditions, limited portability
S	Liquid ring (self-contained water supply on-board)	1200 hour check vacuum pump in-line filter, check vacuum pump water level often	Benefit of liquid ring vacuum pump plus excellent portability





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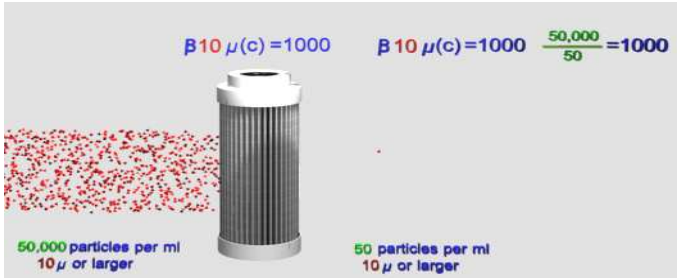
High Performance Particulate Filter Elements $\beta x_{[c]} > 1000$

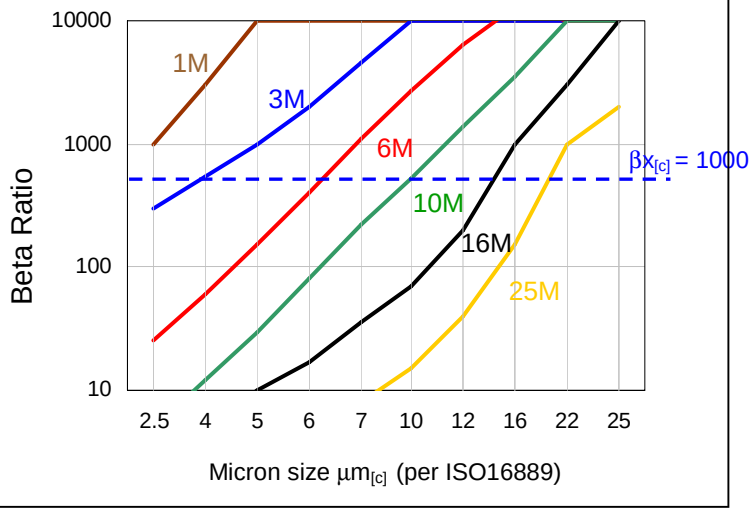
Particulate Filter - A generously sized filter with a high efficiency filter element yields lower ISO Fluid Codes and enhances overall reliability. Achieve world class turbine lube reservoir cleanliness down to 14/12/9 with Vac-U-Dry high efficiency coreless filter elements. All elements include an integral bypass valve so the bypass valve is new with each element.



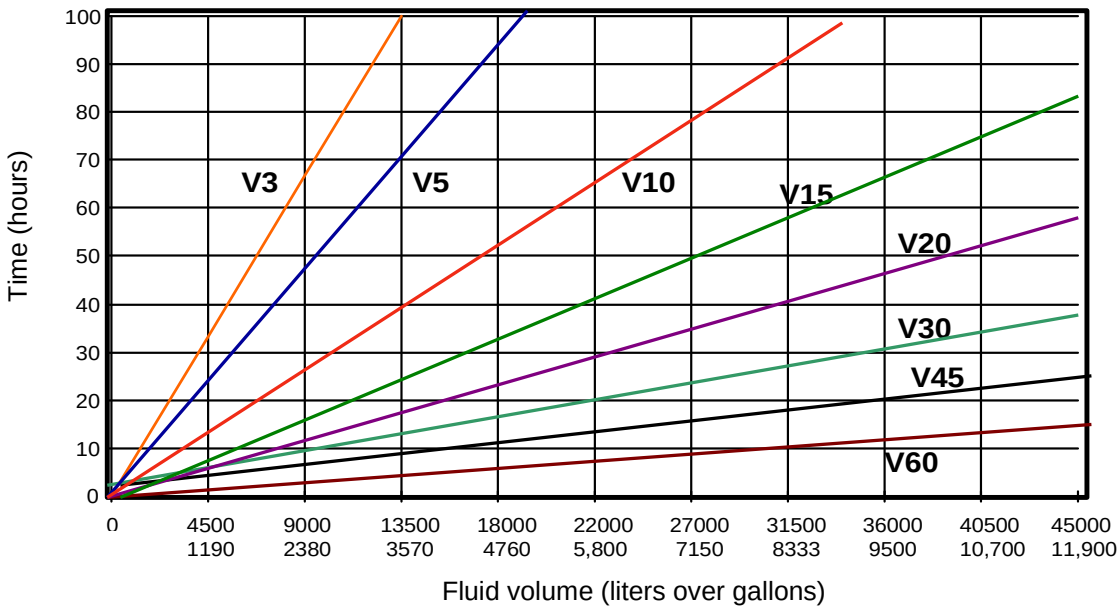
Media Selection - Vac-U-Dry is available with a wide assortment of filter element media options to fit your specific application. Whether you're running low viscosity turbine lube oil requiring super cleanliness or conditioning high viscosity steel mill lubrication systems Hy-Pro will help you make right selection.

Dynamic Filter Efficiency (DFE) Testing
Revolutionary test methods assure that DFE rated elements perform true to rating even under demanding variable flow and vibration conditions. Today's industrial and mobile hydraulic circuits require elements that deliver specified cleanliness under ALL circumstances. Wire mesh supports the media to ensure against cyclical flow fatigue, temperature, and chemical resistance failures possible in filters with synthetic support mesh. Contact your distributor or Hy-Pro for more information and published articles on DFE testing and DFE rated filter elements.

Glass Media Filtration Efficiency (Beta Ratio) vs Micron Size



Estimated Water Removal Time - 5000 ppm (0.5%) to 150 ppm (0.015%)



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VAC-U-DRY PART NUMBER GUIDE

V | flow rate | pump seal | power | dispersal element | media | seal | heater | con-denser | special options

table 1 code	Flow rate gpm (lpm)
3	3 (11)
5	5 (19)
10	10 (38)
15	15 (56)
20	20 (75)
30	30 (113)
45	45 (169)
60	60 (225)

Table 2 code	Vacuum Pump type
C	Dray seal (rotary claw)
D	Dry seal (lubrificated rotary vane)
L	Liquid ring (external water supply required)
S	Liquid ring (self-contained water supply on-board)
*Consult literature for vacuum pump selection	

table 3 code	Power options
23	230 VAC, 3P, 60 Hz
38	380 VAC, 3P, 50 Hz
41	415 VAC, 3P, 50 Hz
46	460 VAC, 3P, 60 Hz
57	575 VAC, 3P, 60 Hz

table 4 code	Dispersal element
D	Pleated dispersal (viscosity < 100 cSt)
P	Metallic packed (viscosity > 100 cSt)

table 5 code	Discharge filter efficiency rating
1M	ß2.5$_{[c]}$ = 1000 (ß1 = 200)
3M	ß5$_{[c]}$ = 1000 (ß3 = 200)
6M	ß7$_{[c]}$ = 1000 (ß6 = 200)
10M	ß12$_{[c]}$ = 1000 (ß12 = 200)
16M	ß17$_{[c]}$ = 1000 (ß17 = 200)
25M 25W	ß22$_{[c]}$ = 1000 (ß25 = 200) 25µ nominal wire mesh
40W	40µ nominal wire mesh
74W	74µ nominal wire mesh
149W	149µ nominal wire mesh
250W	250µ nominal wire mesh

table 6 code	Seal material
V	Viton (standard)
E	EPR

table 7 code	Heater (KW)
12	12 KW
24*	24 KW
36*	36 KW
48*	48 KW

table 8 code	Heater (KW)
A	air cooled
L	liquid cooled
B	air & liquid cooled

* Possible high full Amp load (consider special option J)

table 9 code	Special option (add options to p/n in order they appear in table)
8	8" solid wheel upgrade
A*	Auto-condensate drain (supplied standard)
B	pre-filter Bag filter housing
C	CE mark (V5~V60) + International crating
D	dirty filter indicator alarm light
E	Carbon vacuum pump exhaust filter
F	vacuum chamber foaming sensor
G	316 stainless condensate wet parts (304 std.)
H	manual reset hour meter (in addition to std. non-reset hour meter)
J	individual heater selector switches (24 KW and higher) for applications with limited amp circuit breakers
K	sight flow indicator (wheel type)
L	lifting eye kit
M	discarge line flow meter
P	water sensor + PLC control auto start/stop
Q*+	maintenance spares and repair kit
R*	Electrical phase reversal switch (supplied std.)
T*	Hose kit (suction & return hoses + wands)
U	Electrical cord 50' without plug (13 meter)
V*	Inlet control valve (for positive head inlet)
W	Water sensor and indicator
X	Explosion proof Class 1, Div 2, Group C/D with air purge (instruments quality air required). Consult factory for other explosion proof options
Y	Variable speed control (VFD drive)
Z*	On-site start up training (1 x 10 hour shift)

* recommended options(Auto-condensate drain & phase reversal standard)
+ Q option repair & sparer kit includes several items such as fuses, common relay, vac pump oil/exhaust filters, vac pump coupling, vac pump oil, panel bulb, vac chamber & condensate chamber covers, flow switch, heat thermocouple, replacement element set for vacuum chamber and particulate housing.

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