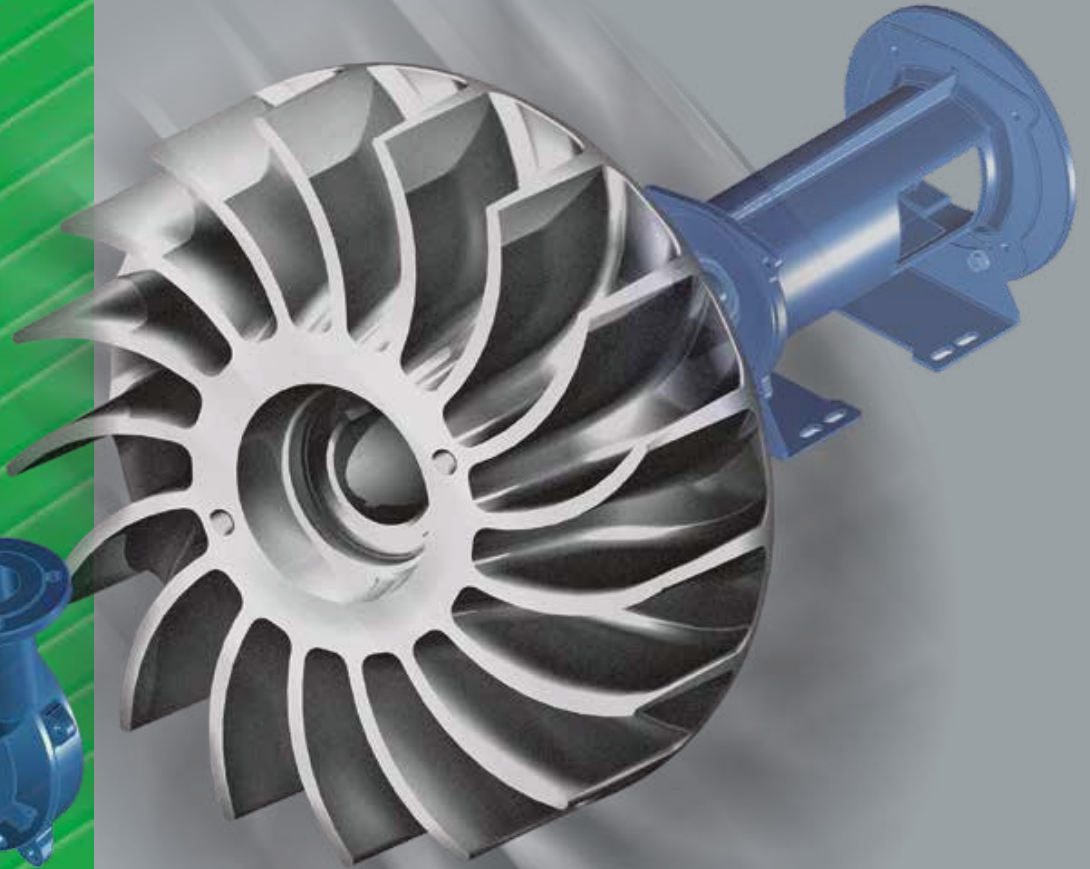


**Liquid ring
vacuum pumps**



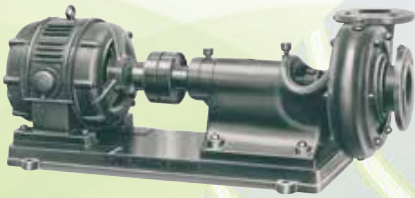
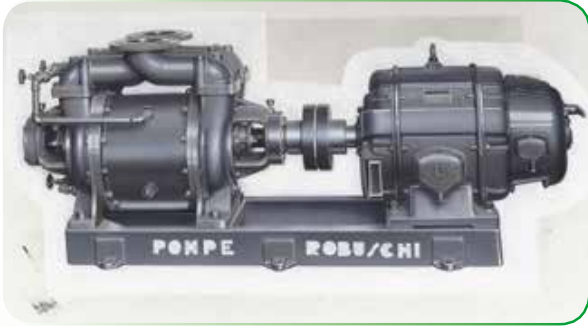
ROBUSCHI[®]
by Gardner Denver

R V S
S E R I E S



With **over 70 years** of history Robuschi are capable of combining, in the best possible manner, their experience with the most advanced of technological innovations. At the beginning in 1941, their main activity was the repair of centrifugal pumps that were mainly used in agriculture. Their production, design and financial growth commenced between the 60s and the 80s. They asserted themselves on a national and international level through the production of 3 lines: centrifugal pumps for the chemical industry and channel pumps for waste water; liquid ring vacuum pumps; low pressure positive displacement compressors ("blowers") and oil free screw compressors.

The **innovations introduced at a production level and the investments** made on new markets are the launching pads to arrive to the preset targets. The company works until this occurs under a partnership condition within **and outside the company, through the professional growth of its employees and the enhancement of customer relations.**



1941 RG
Centrifugal pumps



1950-60 RBP
Vacuum pumps



1955-60 ROR
2 lobe blowers

RVS

ROBUSCHI®

by Gardner Denver

1013 atmospheric pressure



RBS



Vacuum blowers
Unit: **ROBOX evolution**
Vacuum: up to **500** mbar (abs)
Capacity: up to **25,000** m³/h
See specific catalogue



RB-DV



Vacuum blowers
Units: **ROBOX evolution-DV**
Vacuum: up to **100** mbar (abs)
Capacity: up to **10,000** m³/h
See specific catalogue



RVS



Liquid ring vacuum pumps
Vacuum unit: **KRVS**
Vacuum: up to **33** mbar (abs)
Capacity: up to **4,200** m³/h



ORVS



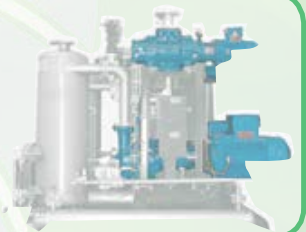
Oil vacuum units with liquid ring pump
Unit: **ORVS**
Vacuum: up to **10** mbar (abs)
Capacity: from **40** to m³/h of sucked gas
Provided through Gardner Denver - Gieffe Systems Division



RBS/AV



High vacuum blowers
Units: **RBS/AV + RVS**
Vacuum: up to **0.001** mbar (abs)
Capacity: up to **9,400** m³/h
See specific catalogue





RVS

Liquid ring vacuum pumps

The RVS series includes liquid ring pumps with innovative characteristics, which is able to suck in gas and vapours, without contamination from lubricants; also in the presence of dragged fluid and with nearly isothermal gas compression. Thanks to its construction features, the liquid ring vacuum pumps are

remarkable for low water consumption, low noise and vibrations, reliable service and minimum maintenance. The variety of construction materials allows a wide field of applications. In addition to this, they can also be used as a compressor within the limits shown in the use and maintenance manual.

			RVS 3	RVS 7	RVS 14	RVS 16	RVS 17	RVS 21	RVS 23	RVS 25	RVS 30	RVS 40	RVS 60	
Pump rotation speed	50Hz 60 Hz	rpm	2850 3420	1450 1750						970 1170		740 888		
Motor power (1)	50Hz 60 Hz	kW	1,5 2,2	3 4	4 5,5	5,5 7,5	7,5 11	11 15	15 18,5	22 30	30 37	45 55	90 127	
Min suction pressure		mbar	33											
Max discharge overpressure	/M /SG	mbar	100 -	100 200			-		200		300			
Max temperature of gas		°C	100											
Max temperature of service liquid		°C	70											
Max viscosity of service liquid		mm ² /s	8						20					
Contents of liquid in the pump up to shaft level		l	0,25	1,1	1,5	2,3	3	4	6	8	15	24	95	
Inertia moment of rotation parts		kg m ²	0,004	0,05	0,06	0,11	0,15	0,23	0,33	0,51	2,16	3,33	8,5	
Noise level at 80 mbar (2)		dB(A) ±3	72						74	76	78	79	82	

- (1) Bigger motor sizes can be installed under request (until size 21 only for the /SG pump).
 (2) Discharge noise excluded.



RVS 3/M



RVS 21/SG



RVS 25/CT



RVS 40/CT



RVS 60/CT



Liquid ring vacuum pumps

Casing

Reduced consumptions, thanks to the efficient layout of the internal intake and delivery gas baffles.

Shaft

The heavy-duty shaft is protected from the contact with the service fluid and conveyed gas, except for the RVS sizes 23 and 25, because they are made of stainless material (see the page Material execution)

Shaft seal

The RVS 3-25 includes single mechanical seals flushed from the service fluid. The sizes RVS 30-60 can be installed both packing seals flushed from the service fluid or from the outside, both double mechanical seals.

Impeller

The impeller is fitted with forward curved blades to give the service fluid the energy that is necessary for the compression and the front hub is conical to facilitate the discharge of compressed gasses.

Support

RVS 3 ÷ 16/M: impeller fitted directly on the shaft and motor flange.

RVS 3 ÷ 21/SG: cantilever impeller on the support with shielded self-lubricating bearings.

RVS 23 ÷ 25: equipped with two supports with self-lubricating bearings.

RVS 30 ÷ 60: lubrication with external greaser.

VGI

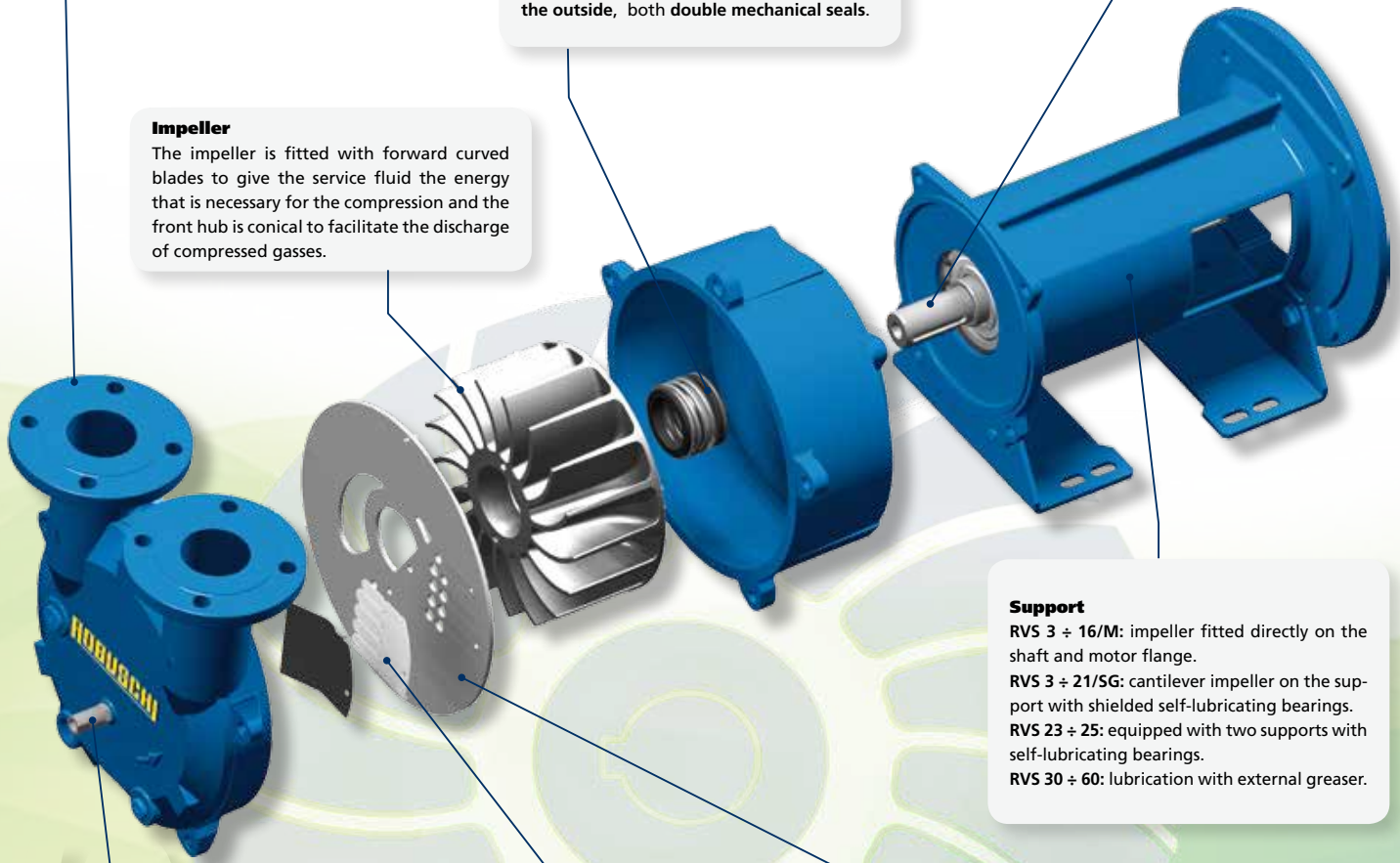
Anti-cavitation valve

Automatic valve

The automatic valve makes it possible to adopt the compression ratio of the pump at the installation conditions, with less energetic consumption.

Plate

A greater volumetric efficiency is possible thanks to the stainless steel laser-cut patented distribution plate and to the good layout of the intake and discharge lights.



CRVS - LRVS

Electropump Units

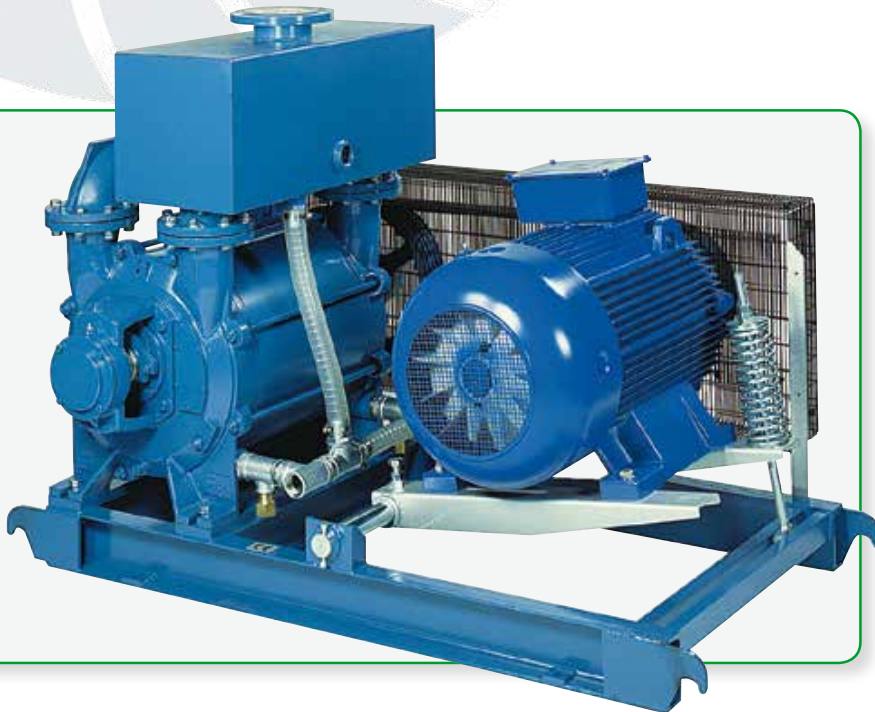


CRVS

The vacuum compact systems **CRVS** are equipped with a pump that is already coupled with the electric motor with elastic direct coupling. This ensures a perfect alignment, optimal and long-lasting operation. The **CRVS** base was specifically designed to guarantee high stiffness and low vibrations.

LRVS

The vacuum compact systems **LRVS** feature belt and pulley drive, a motor oscillating suspension patented system, which makes it possible to reduce the load on the motor bearings and pump, by keeping constant over time the belts tension. This makes it possible to easily adapt the drive to various motors sizes without modifying the unit's dimensions. The V-Belt coupling makes it possible to select the vacuum pump at the optimal speed, ensuring thus, the correct capacity that is necessary to the system, without waste of energy, with capacities of up to 4200 m³/h.



Thanks to the **recovery manifold** both the **CRVS** and **LRVS** units can be supplied with partial recirculation, achieving thus a substantial saving of service water (for further details, please see the corresponding page: Accessories).

Vacuum units

The **KRVS** are units developed for the vacuum generation in the most varied sectors, such as the chemical, petrol-chemical, pharmaceutical, textiles sectors....and many more....

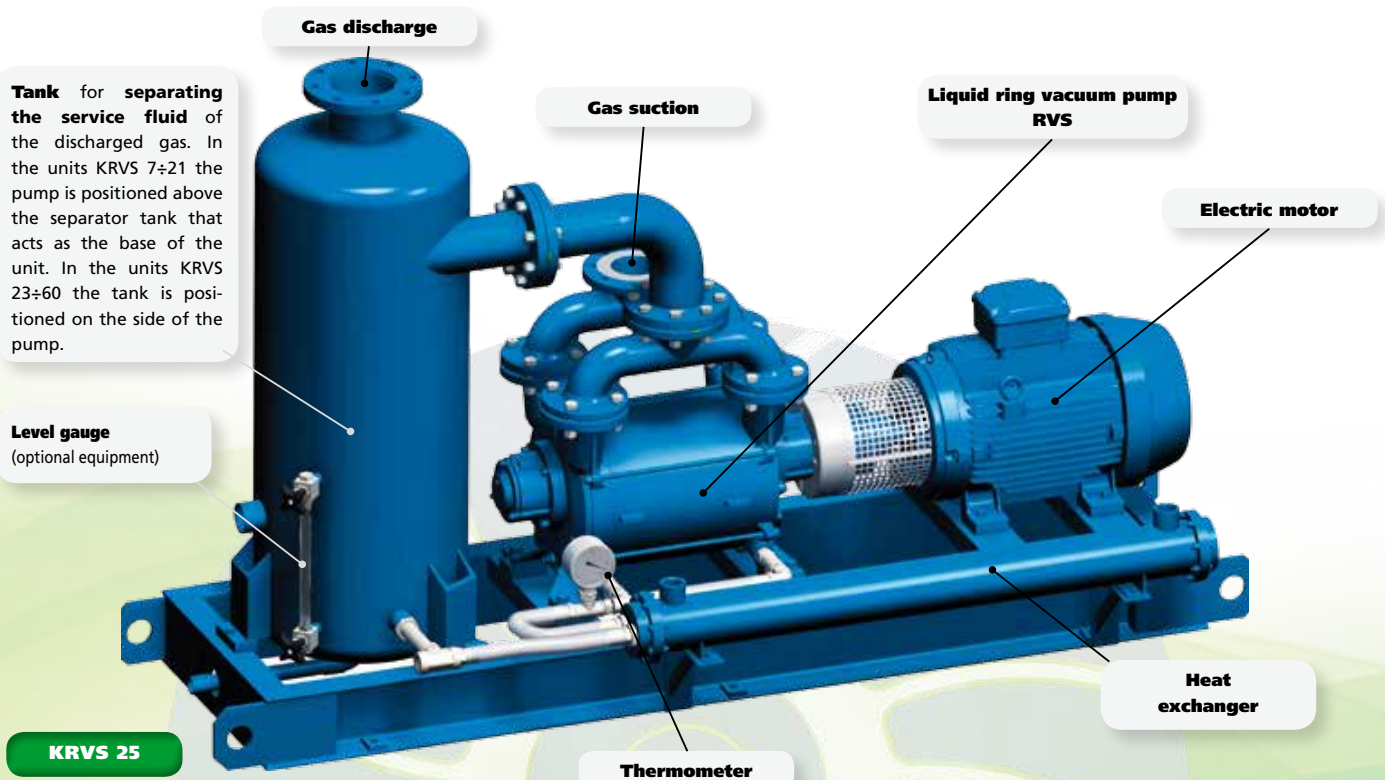
They consist of **liquid ring vacuum pumps** of the **RVS** series **with separation tank for the partial recirculation of the service fluid and corresponding connection pipes (P); in the version with total recirculation (T)** the unit is fitted with a **heat exchanger**.

The separator tank also silences the noise at the pump discharge.

The partial recirculation units (P) are the Robuschi answer for the recovering of most part of the service liquid, which is used to supply the pump. However, it is necessary to provide a minimum supply of fluid in order to prevent overheat-

ing of the liquid ring, which would penalise the pump efficiency. Depending on the vacuum degree that you wish to achieve, it is possible to recover up to 70% (for details, please see corresponding table).

The vacuum units KRVS with total recirculation (T) are especially recommended in case of polluting gasses and /or liquids, with consequent disposal issues. In these cases, it is indeed necessary to supply the pump in closed circuit and cool the fluid by means of the heat exchanger, which prevents the contact between the cooling fluid and the fluid itself. The service fluid temperature can be adjusted by acting on the capacity of the cooling fluid.



Such characteristics ensure low noise and vibrations and extremely simplicity of installation, start-up, adjustment and maintenance.



accessories

Anti-cavitation valves

VGI: a new anti-cavitation device, which operates by means of a direct non-condensable gas injection into the compression chamber. The VGI device consists of a calibrated orifice, which is specific for each pump size, and of a non return valve, which was specifically designed to prevent the outflow of service fluid when the pump stops.

This reduces thus the injection load losses.

The non-condensable gas is also supplied to the pump straight after the closing of the suction phase, avoiding, therefore, the pump's volumetric efficiency penalizing.

The device is made of stainless steel.

In the RVS ATEX version, the valve is connected to the separator tank or inert gas tank.



VGI

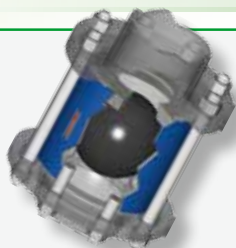


Vacuum breaker valve VDF

It can be inserted on the suction of RVS vacuum pumps, as a safety valve and it allows the calibration of the vacuum degree.

Automatic drainage valve VAD

It ensures the correct level of service fluid during the pump start-up phase, by draining the possible access of fluid and preventing thus damaging start-ups



Check valve VAC

It ensures the maintenance of the vacuum degree in systems with on/off adjustment. At the same time, this ensures minimum load losses during the suction phase.

Manifolds

They make it possible an easy and speedy connection of the pump to the system pipes.



Air/fluid separator CR (available for the sizes RVS 23- 60)

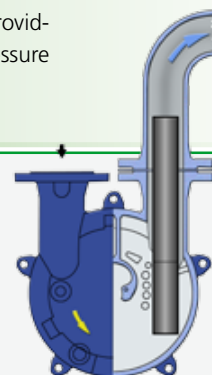
It separates the liquid from the gas and allows the partial recovery of the service liquid. Recirculation pipe is provided separately. Especially designed for pump inlet pressure lower than 500 mbar absolute.

For higher pressure please contact Robuschi.

Silencers

They are inserted into the pumps nozzles to dampen the noise generated by the pump characteristic frequency.

They are particularly useful when the pump discharge does not need to be conveyed.



applications

sectors

- CEMENT FACTORIES
- PETROCHEMICALS
- IRON AND STEEL INDUSTRY
- TANNING
- HOSPITALS
- DAIRY INDUSTRY
- WINERY AND DISTILLERIES
- ENERGY
- AUTOMOTIVE
- FOUNDRIES (HEAT TREATMENT)
- INDUSTRIAL CLEANING
- WOOD
- ELECTRONICS
- PAINTING
- SHIPYARDS
- INDUSTRIAL LAUNDRIES
- PHARMACEUTICALS
- PAPER INDUSTRY
- CHEMICALS
- FOOD INDUSTRY
- PLASTICS
- MINING
- TEXTILES
- GLASS INDUSTRY
- ...



Foodstuffs:

vacuum pumps for multi-effect evaporation process in systems for the production of fruit juices.

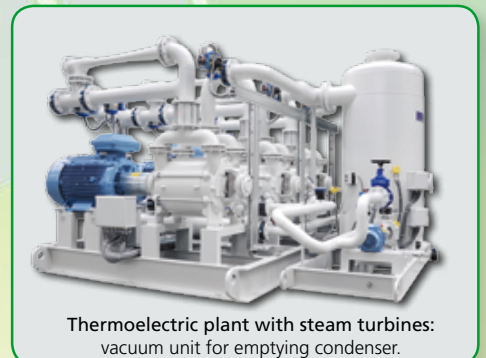


Foodstuffs: vacuum pumps used for the vegetable peeling phase in the agricultural-industrial sector.



Pharmaceutical industry:

primary vacuum system with RVS vacuum pump for distillation processes.



Thermoelectric plant with steam turbines:
vacuum unit for emptying condenser.



RVS compressor units for **BIOGAS** circulation in the digester.



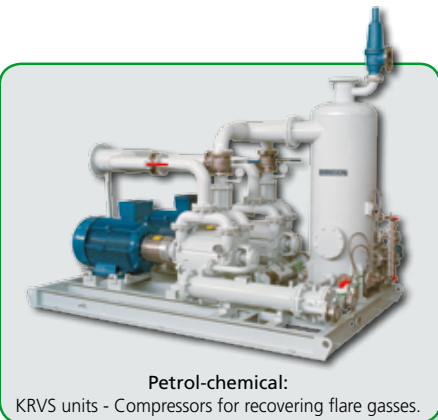
Vacuum units for **biomasses co-generation** plants



Bottling:
vacuum pumps used to suck
in air in the glass bottles filling
systems.



Mines:degassing systems



Petrol-chemical:
KRVS units - Compressors for recovering flare gasses.



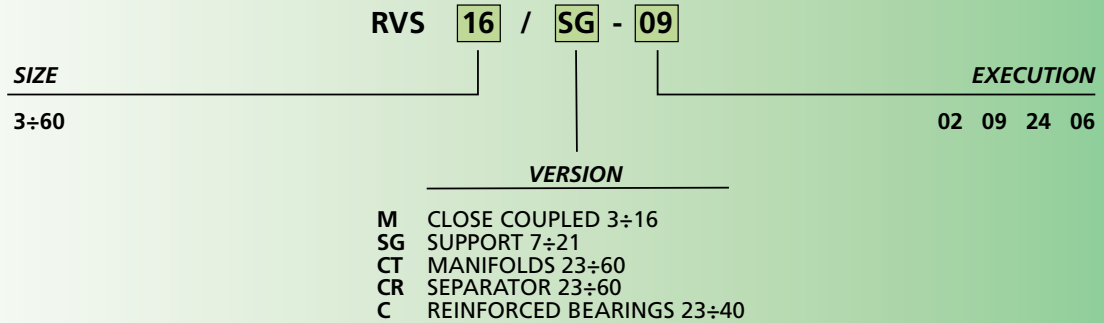
Desalination: vacuum from condenser.



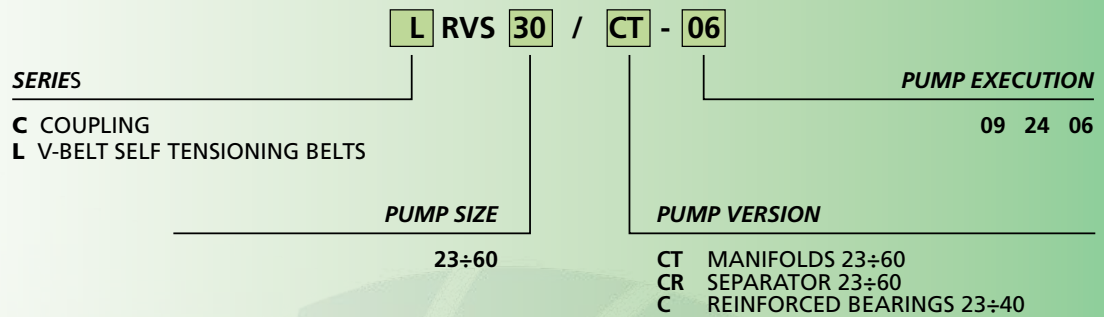
Mines: KRVS units for gas circulation in vacuum.

code description

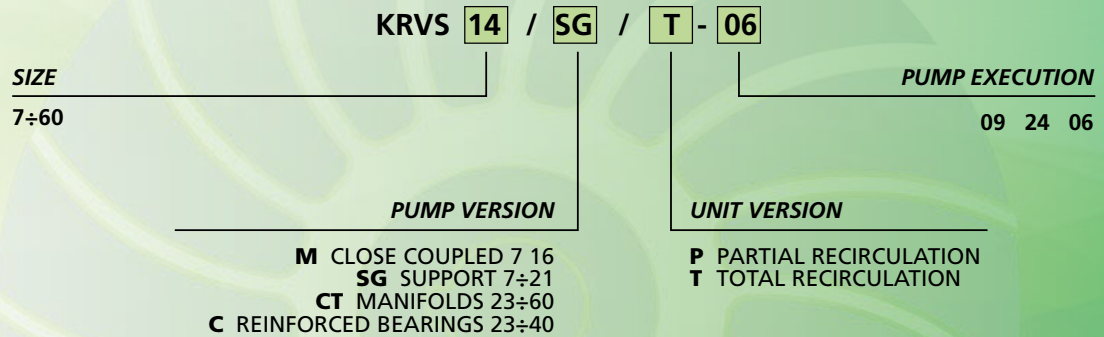
VACUUM PUMP



ELECTROPUMP UNIT



VACUUM UNIT



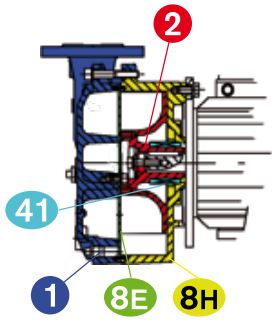
RVS

Available upon request, **RVS ATEX**:

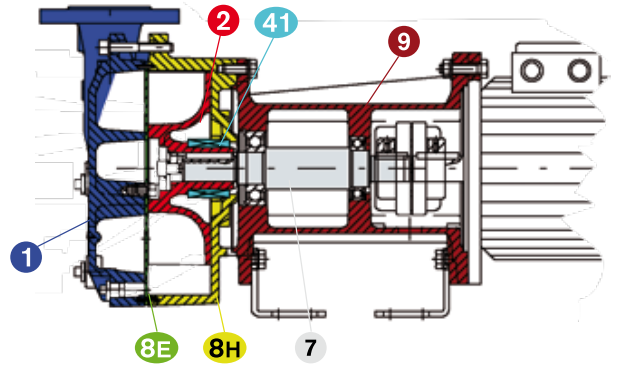
-**RVS/M** only **ATEX 3**

-**All other RVS versions**, both **ATEX 3** and **ATEX 2**.

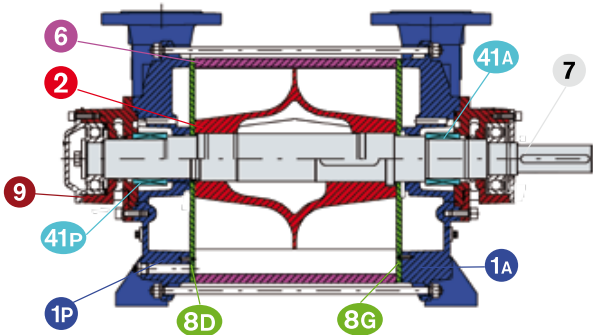
RVS - materials



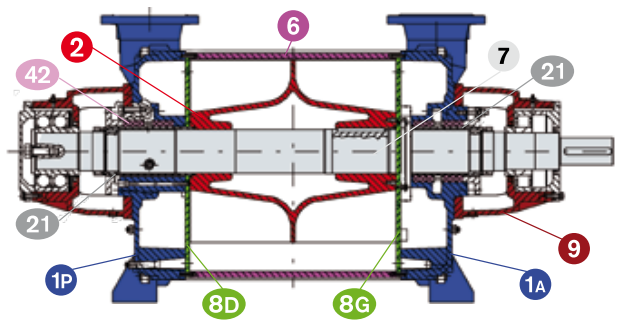
RVS 3-16M



RVS 7-21SG



RVS 23-25

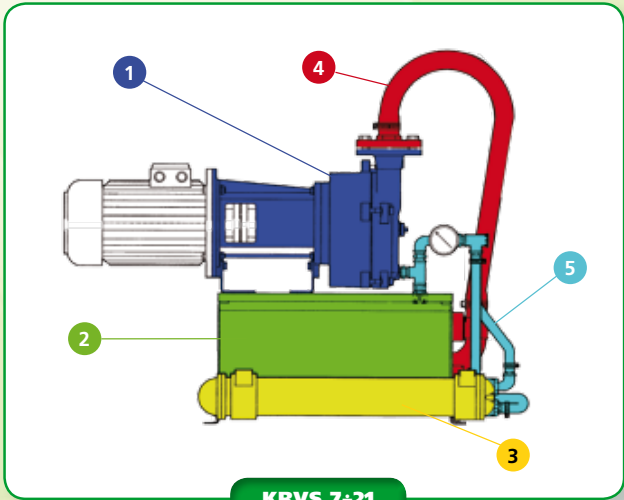


RVS 30-60

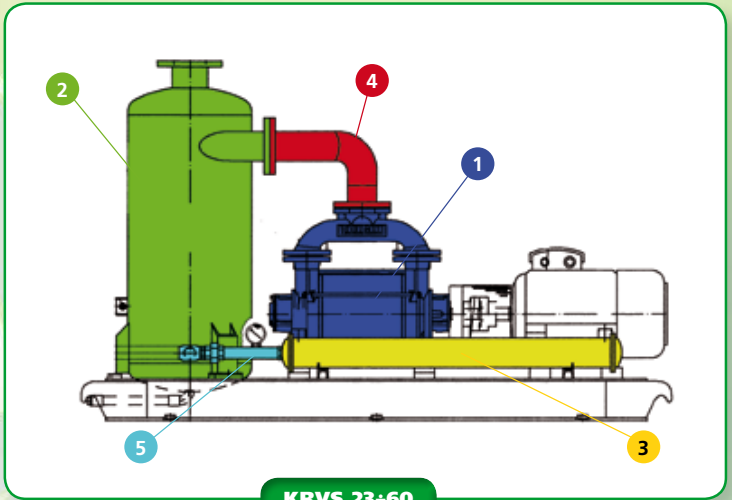
POS.	COMPONENT		NORMS	MATERIAL DESIGN			
				02 ⁽¹⁾	09 ⁽²⁾	24 ⁽²⁾	06 ⁽²⁾
1 - 1A/P	Body	RVS 3-25	UNI-EN	GJL250 - UNI EN 1561		GX6CrNiMo2011 - UNI EN 10213-4	
		RVS 30-60	ASTM	A48 No. 35 A		A351 CF8M	
2	Impeller	RVS 3-25	UNI-EN	BRONZE - G-CuSn5Zn5Pb5 UNI EN 1982	CAST IRON - GJS400-15 UNI EN 1563	STAINLESS STEEL - GX6CrNiMo2011 UNI EN 10213-4	
		RVS 30-60	ASTM	BRONZE	CAST IRON A536-84 GR 60-40-18	STAINLESS STEEL A351 CF8M	
6	Casing	RVS 3-25	UNI-EN	-	CARBON STEEL - Fe510 UNI EN 10297-1	STAINLESS STEEL - X5CrNiMo1712 UNI EN 10088-3	
		RVS 30-60	ASTM	-	CARBON STEEL A 501	STAINLESS STEEL A276 316	
7	Shaft	RVS 7÷21	UNI-EN	-	CARBON STEEL - C40 -- UNI EN 10083-1		
		RVS 23-25	ASTM	-	CARBON STEEL A576 GR 1040		
		RVS 23-25	UNI-EN	-	STAINLESS STEEL - X30Cr13 UNI EN 10088-3	STAINLESS STEEL - X5CrNiMo1712 UNI EN 10088-3	
		RVS 30-40-60	ASTM	-	STAINLESS STEEL - A276 420	STAINLESS STEEL - A276 316	
8E/G/D	Port Plate	RVS 3-25	UNI-EN	X2CrNiMo1712 -- UNI EN 10088-3			
		RVS 30-60	ASTM	A276 316L			
8H	Plate with casing	RVS 3-25	UNI-EN	CAST IRON - GJL250 - UNI EN 1561		STAINLESS STEEL - GX6CrNiMo2011 UNI EN 10213-4	
		RVS 30-60	ASTM	CAST IRON - A48 No. 35 A		STAINLESS STEEL	
9	Support	RVS 7÷21 - 30÷60	UNI-EN	CAST IRON - GJL200 - UNI EN 1561			
		RVS 7÷21 - 30÷60	ASTM	CAST IRON - A48 No. 30A			
		RVS 23-25	UNI-EN	CAST IRON - GJL250 - UNI EN 1561			
		RVS 23-25	ASTM	CAST IRON - A48 No. 35A			
21	Shaft sleeve	RVS 7÷21 - 30÷60	UNI-EN	-	STAINLESS STEEL - X30Cr13 UNI EN 10088-3	STAINLESS STEEL - X5CrNiMo1712 UNI EN 10088-3	
		RVS 23-25	ASTM	-	STAINLESS STEEL - A276 420	STAINLESS STEEL - A276 316	
41-41A/P	Mechanical seal	RVS 3-25	UNI	CARBON-GRAPHITE / SIC / VITON / STAINLESS STEEL X6CrNiMoTi1713 / X6CrNiMoTi1713			
42	Soft packing seal	RVS 3-25	EN	BQ1VGG - EN 12756			
-	Valve	RVS 3-25	-	ARAMIDIC FIBRE 40% PTFE			
-	O-rings	RVS 3-25	-	PTFE			
-	O-rings	RVS 3-25	-	VITON (fluorinated rubber)			
-	Seals	RVS 3-25	-	ANAEROBIC SEALING			

(1) Only for size 3 - (2) Except for size 3

KRVS - materials



KRVS 7÷21



KRVS 23÷60

POS.	COMPONENT	MATERIAL DESIGN	
		09 - 24	06
1	PUMP	09 - 24	06
2	SEPARATOR	Fe360 UNI EN 10028-1	X5CrNiMo1712 UNI EN 10088-3
3	EXCHANGER (KRVS/T only) Heads Blanket Plates Pipes	GJL250 UNI EN 1561 C40 UNI EN 10083-1	GX6CrNiMo2011 UNI EN 10213-4 X5CrNiMo1712 UNI EN 10088-3
		X5CrNiMo1712 UNI EN 10088-3 X5CrNiMo1712 UNI EN 10088-3	
PIPES			
4	Gas - Water RVS 7 ÷ 21	PVC	
	Gas - Water RVS 23 ÷ 60	Fe360 UNI EN 10028-1	X5CrNiMo1712 UNI EN 10088-3
5	Water	PVC	



selection software



Robuschi has created a specific selection program to determine the **operating parameters** of the liquid ring vacuum pumps, depending on the **system conditions**, such as the **pressure and the inlet temperature**, the **capacity**, the **sucked gas humidity** and the **liquid ring's temperature**.

The selection program provides a detailed data sheet of the machine, fitted with the **selection of the electric motor and completed with the operating charts**.

The program is available through Robuschi sales network and on the internet site www.roboschi.com in the download area.

ROBUSCHI
GARDNER DENVERS s.r.l. - Divisione ROBUSCHI
Via S. Leonardo, 71/A - 43122 Parma (ITALY)
Tel. +39 0521 274911 - Fax +39 0521 771242
Internet: <http://www.roboschi.com>
E-mail: info@roboschi.com

LIQUID RING PUMP OPERATING CURVES

MODEL : RVS 17 /SG - 24

GENERAL DATA
Ref :
Customer :

FLUID
Gas : Air
Mol. Weight Mg (kg/mole) : 28.96
Specific Heat Cp (kJ/kg°C) : 1.010

LIQUID
Liquid : Water
Capacity (kg/h) : Qw : 1.137
Inlet Temperature (°C) : Ti : 25
Outlet Temperature (°C) : To : 35
Wasted Heat (kW) : Wd : 13

OPERATION POINT
Inlet pressure (mbar a) : P1 : 70
Actual Delivery (m³/h) : Q1 : 331
Absorbed Power (kW) : N : 5.9

Perfomances tolerances following the Robuschi procedure TE3.S.0015

Quantity :
Plant Item :
Service : Vacuum pump

H2O : 18.00
2.000.000
80.0

SW : 1.000
nu : 1
Tw : 31.405
4.186

T1 : 40
P2 : 1.013 [n/min] (%) = 23.9
n : 1.450

Spec. Weight (kg/m³) :
Viscosity (cSt) :
Vapour Tension (mbar) :
Specific Heat (kJ/kg°C) :

ROBUSCHI
GARDNER DENVERS s.r.l. - Divisione ROBUSCHI
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Tel. +39 0521 274911 - Fax +39 0521 771242
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LIQUID RING PUMP SELECTION

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Spec. Weight (kg/m³) :
Viscosity (cSt) :
Vapour Tension (mbar) :
Specific Heat (kJ/kg°C) :

Working curve (Q1 . N) => P1

Gardner Denver



- GARDNER DENVER
Headquarter
- ROBUSCHI Division
Manufacturing facilities

GARDNER DENVER S.r.l. **Divisione ROBUSCHI**

Manufacturing facilities
Via S. Leonardo, 71/A
43122 Parma - Italy
Phone +39 0521 274911

Filiale di Milano
Phone +39 02-51-62-80-65

Filiale di Padova
Phone +39 049-807-8260

info.italy@gardnerdenver.com

www.robuschi.com

GARDNER DENVER **Industrials Group**

Head office
222 East Erie Street,
Milwaukee (WI) 53202 - USA
Phone +1 414-212-4700

www.gardnerdenver.com/Industrials

GARDNER DENVER Ltd. **United Kingdom**

Claybrook Drive,
Washford Industrial Estate
Redditch, B98 ODS - UK
Phone: +44 1527-838-200
sales.red@gardnerdenver.com

ROBUSCHI Benelux BV **Netherlands**

Kanaaldijk 100
6956 AX Spankeren
Netherlands
Phone: +31 313-415-570
robuschi-benelux@gardnerdenver.com

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