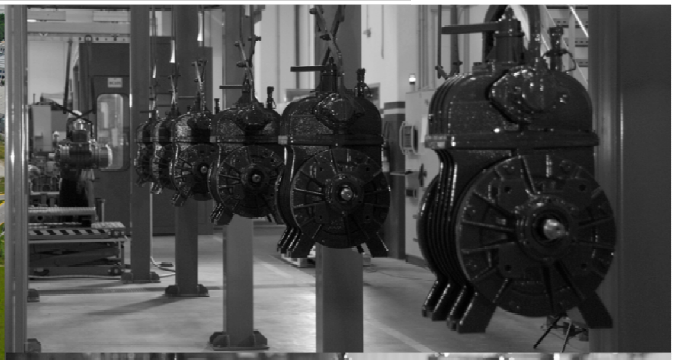
EN

JUROP - OPERATIONAL TRAINING




ASSISTANCE COURSE FOR WORKSHOPS

jurop

COMPANY WITH
QUALITY SYSTEM
CERTIFIED BY DNV GL
= ISO 9001 =

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Contents

1. Purpose of the course

JUROP promotes courses to personnel from external workshops with the intent to:

- Strengthen basic technical knowledge, in particular, further exploring areas of greatest interest.
- Provide informational concepts on all the mechanical, electrical and electronic parts of the equipment; illustrate the tasks, operation, malfunctions and their causes, maintenance rules.
- Illustrate, with the aid of specific manuals, correct repairs, maintenance and adjustment interventions on mechanical, electrical and electronic components.
- Allow personnel to gain good work independence, with adequate methods and execution times.
- Strengthen relationships with companies and personnel.

2. Company introduction

2.1 Company

Established in 1976, JUROP is an Italian technology company specialised in the production of vacuum and transfer pumps, low-pressure compressors and the manufacture of equipment for ecology and related components designed for the suction or transport of special and hazardous waste and high-pressure cleaning of industrial systems and sewer networks.

The experience matured over the years in various sectors (agriculture, industrial, civil and transport) makes corporate production technically advanced and of highly operational effectiveness. JUROP commits substantial resources to research and development to ensure its current and future leadership position.

Motivation for innovation and continuous improvement to provide extremely flexible and targeted products able to respond to customer needs, contributing to the success of their projects is a result of a comparison with a highly competitive market.

The company's commitment has always been aimed at achieving total quality, with regard to the entire production process: from the design phase to the implementation phase and standardisation of products. Design and production are the basis of the corporate activity but those who turn to JUROP know that they can rely on a global consulting service, carried out in collaboration with customers and which is long lasting. Even after placing a product on the market, and throughout its operating life, the company undertakes to ensure its assistance, providing their own staff or availing themselves of local technicians.

The service offered is not only limited to solving technical problems, but also to studying effective solutions addressing the onset of new and unforeseen needs. JUROP believes in research and development of technologies that reduce consumption and environmental impact, increasing ergonomics and ease of use; numerous and significant patents have been filed by the company.

To ensure the reliability of its products, JUROP boasts a number of certifications issued by the competent authorities in the field, both nationally and abroad.

JUROP's widespread presence within vast domestic and foreign markets is the greatest valid testimony to the reliability of the company and its products. Besides Italy, the company currently operates in over 80 countries worldwide.

2.2 Production offices and products

All Jurop's products are completed in-house using the most up-to-date techniques and technologies available.

In the **plant of Z.I. Fiumesino Nord** Azzano Decimo (PN) we produce:

- Air cooled, sliding vane vacuum/pressure pumps with lubrication
- Water cooled, sliding vane vacuum/pressure pumps with lubrication
- Air injection cooled vacuum/pressure blowers
- Air cooled vacuum/pressure blowers
- Multy purposes vacuum/centrifugal pumps
- Self priming rotary lobe liquid transfer pumps
- Grinder/shredder for liquid bio-waste
- Power take off
- 4-way changeover valves
- Overpressure safety valves

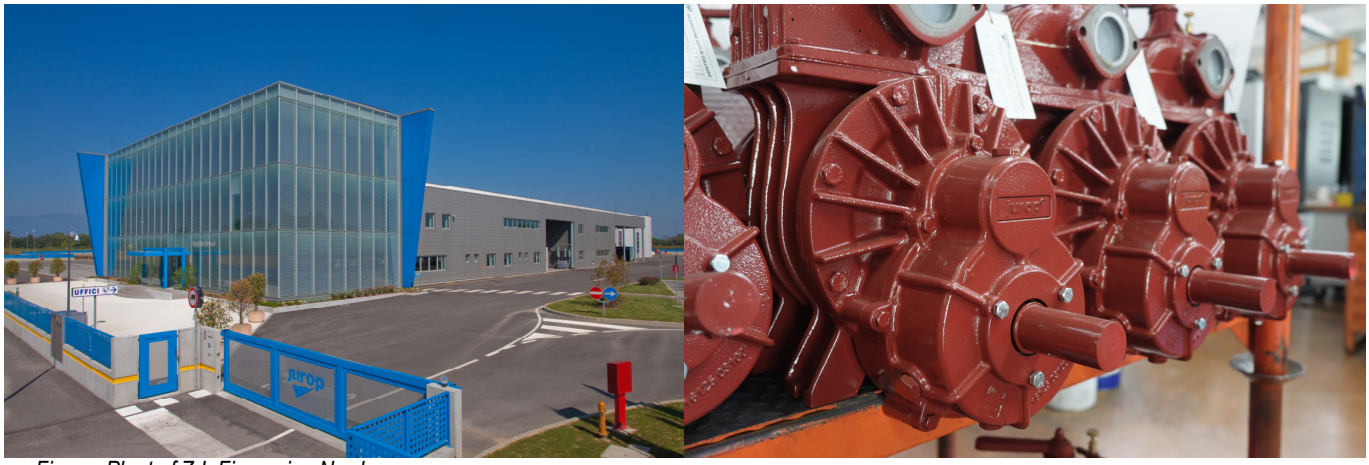


Figure: Plant of Z.I. Fiumesino Nord.

In the **plant in via Crosera** di Azzano Decimo (PN) we produce:

- Vac - liquid waste suction and transportation.
- Vac jet - liquid waste suction combined to high pressure cleansing.
- Adr - hazardous waste transport.
- Recycling - on combined units for filtration, recovering and recycling of dirty waters.
- Street washing unit - for street washing and cleansing.
- Atex - suction and cleansing in potentially explosive environments/atmospheres.
- Special Units - designed and developed upon request for special purpose and use.
- Vacuum line components.
- Accessories for tankers.
- Suction and liquid/sludge pumping units.
- Suction and air compression units.
- Powered grinders/shredders for organics.
- Custom units.

Figure: Plant in via Crosera.

3. Range of products

In this chapter, in addition to a quick presentation of JUROP products, the following will be briefly discussed:

- The criteria for the choice of a product suitable to meet initial needs.
- The underlying principles of proper product use.
- Some ordinary maintenance.

3.1 Pumps

• A **pump** is a mechanical device used to move liquids or gases. A pump is normally intended as a device used to move liquids while a compressor is the device designated to move gaseous fluids. Broadly speaking, the pumps can be divided into two categories:

- Volumetric pump.
- Centrifugal pumps / Cinematic.

• **Volumetric pump** is considered the one that uses the variation of the air volume in a chamber (tank) to cause an aspiration or push of a fluid. The flow rate is indipendent of the head (*out pressure*) and it is instead directly proportional to the speed of rotation (*more rpm, more flow*). There are different types of volumetric pumps:

- Gear pumps.
- Screw pumps.
- Piston pumps.
- Lobe pumps.
  JUROP models: DL, PVT, CT (Vacuum pumps and compressors). VL (Self priming rotary lobe liquid transfer pumps).
- Vane pumps.
  JUROP models: PN, PNR, LC, PR (Vacuum pumps and compressors).

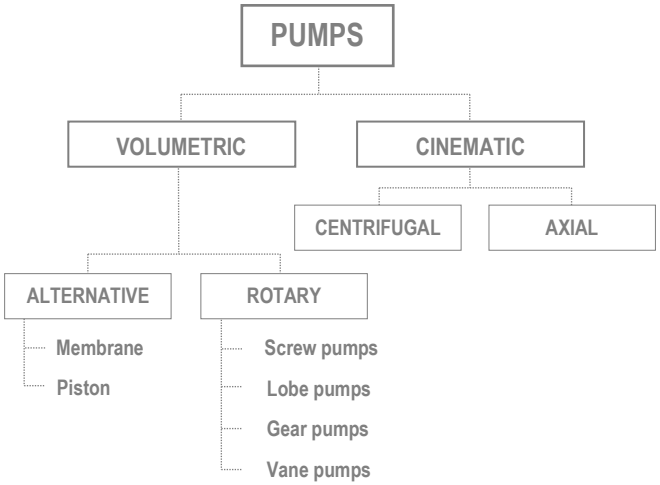
• With fluid-dynamic pumps the movement of the fluid is produced by a moment induced in the fluid itself. These pumps do not need valves, but have disadvantage that the flow and efficiency decrease with increasing pressure at the outlet. Typically these pumps have the need of self priming or to be initially filled with liquid to function. Some categories are:

- Axial pumps.
- Centrifugal pumps.
  JUROP models: Series Julia (Multy purposes vacuum/centrifugal pumps).

• A pump is usually intended as the device used to move liquids, while the device for the movement of gaseous fluids is usually called compressor or decompressor. In the JUROP production the centrifugal pumps are used for cooling of the vacuum pumps (*PR pumps*) and the jetting of liquid manure in agriculture (*Series Julia*).

• A brief word about **liquid ring pumps**; these are displacement pumps where the seal between the rotor and stator is guaranteed by the water. They are characterised by a reduced level of wear however, above 70% vacuum, they have cavitation phenomena that tend to damage the pump itself. A reserve of cold water is required, because if the water heats up, performance drops.

This type of pump does not fall within the JUROP products.



Pic. 3.1

Sliding vane vacuum/pressure pumps (with lubrication)

• The sliding vanes vacuum pumps consist of a rotor equipped with sliding vanes that rotates eccentrically in a stator. The vanes are held in contact with the inner surface of the stator by centrifugal force.

• Between the vanes and the stator there is always a film of oil as sealing and lubrication.

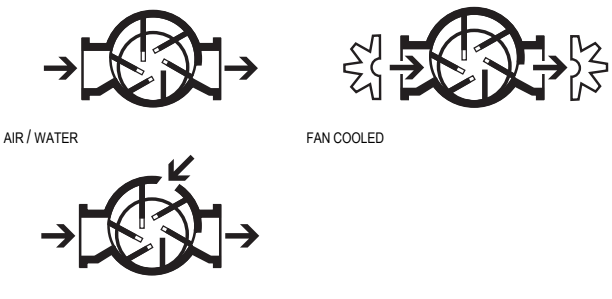
• The change of the volume of the chambers creates depression (suction phase) and compression of the air (during unloading). During the suction phase the gas is extracted from the inlet through the suction chamber created within two vanes, then through the eccentricity of the rotor the chamber continues to increase in volume. Once you reach the maximum volume, the suction area is closed by a second vane while the chamber of the pump begins to decrease in volume allowing gas to be expelled from the exhaust port.

• Valves are not necessary.

• JUROP sliding vane pumps are both cooled by liquid or by air. On some series of pumps there is an air injection cooling system that allows the pump to work continuously even at high vacuum condition.

• The sliding vanes vacuum pumps are usually installed to create vacuum in a tank.

• The cooling system changes depending on the vane pump model: PN, C and PNE use air (natural convection), whereas LC and PR use water. The PNR series is characterised by an air injection cooling system. RV and RVC are cooled by forced air.



Sliding vane vacuum/pressure pumps (with lubrication)

Series	Mod	EX	S.L.	Flow			Rotation speed			HDR	Vacuum		Continuous vacuum		Pressure max abs		Power max vacuum		Weight	
				m³/h	l/min	(cfm)		rpm			%	Hg	%	Hg	bar	psi	kW	hp	kg	lbs
	23			156	2.600	92	D1300	M540		•	90	27"	60	18"	1,5	21,8	3,3	4,5	53	117
	33			216	3.600	127	D1300	M540		•	90	27"	60	18"	1,5	21,8	5,4	7,2	63	139
	45			318	5.300	187	D1300	M540	M1000	•	92	27,5"	60	18"	1,5	21,8	6,3	8,4	90	198
	58			390	6.500	230	D1300	M540	M1000	•	92	27,5"	60	18"	1,5	21,8	8,1	10,9	102	225
PN	84			540	9.000	317	D1300	M540	M1000	•	92	27,5"	60	18"	1,5	21,8	12,8	17,2	115	254
	106		•	660	11.000	388	D1300	M540	M1000	•	92	27,5"	60	18"	1,5	21,8	14,0	18,8	143	315
	130		•	774	12.900	456	D1350	M540	M1000	•	94	28,1"	60	18"	2,0	29,0	19,0	25,5	186	410
	140		•	830	13.850	490	D1350	M540	M1000	•	92	27,5"	60	18"	2,0	29,0	19,0	25,5	194	428
	155		•	910	15.200	536	D1150	M540	M1000	•	93	28"	60	18"	2,0	29,0	19,0	25,5	216	476
	60			390	6.500	230		M540							6,0	87,0	30,0*	40,2*	97	214
C	84			540	9.000	317		M540		•					6,0	87,0	42,0*	56,3*	108	238
	110			66	11.000	388		M540							6,0	87,0	52,0*	69,7*	118	260
	72			432	7.200	254	D1350	M540		•	93	28"	60	18"	2,0	29,0	10,0	13,4	136	300
PNE	82			492	8.200	290	D1350	M540		•	93	28"	60	18"	2,0	29,0	13,0	17,4	142	313
	102			612	10.200	360	D1300	M540	M1000	•	92	27,5"	60	18"	2,0	29,0	16,0	21,5	173	381
	122			732	12.200	430	D1300	M540	M1000	•	92	27,5"	60	18"	2,0	29,0	18,0	24,1	190	419
	72			432	7.200	254	D1350	M540		•	93	28"	70	21"	2,0	29,0	10,0	13,4	136	300
	82			492	8.200	290	D1350	M540		•	93	28"	70	21"	2,0	29,0	13,0	17,4	142	313
	102	•		612	10.200	360	D1300	M540	M1000	•	92	27,5"	70	21"	2,0	29,0	16,0	21,5	173	381
PNR	122	•		732	12.200	430	D1300	M540	M1000	•	92	27,5"	70	21"	2,0	29,0	18,0	24,1	190	419
	142		•	852	14.200	500	D1300	M540	M1000	•	90	27"	70	21"	2,5	36,0	19,0	25,5	255	562
	260R			620	10.300	365	D1300			•	92	27,5"	60	18"	2,0	29,0	14,0	18,8	180	395
	155R		•	910	15.200	536	D1300	M540	M1000	•	93	28"	70	21"	2,0	29,0	19,0	25,5	220	485
RV	360		•	612	10.200	360	D1300			•	95	28,5"	80	24"	2,0	29,0	11,0	15,0	175	386
	520		•	882	14.700	520	D1300			•	95	28,5"	80	24"	2,0	29,0	16,0	21,7	220	485
RVC	210			360	6.000	212	D1450			•	93	28"	75	22,5"	2,5	36,3	6,0	8,1	86	190
	360		•	612	10.200	360	D1300			•	95	28,5"	80	24"	2,0	29,0	11,0	15,0	176	388
	300		•	510	8.500	300	D1300	M540	M1000	•	92	27,5"	85	25,5"	2,0	29,0	14,0	18,8	200	441
LC	420		•	720	12.000	420	D1300	M540	M1000	•	92	27,5"	85	25,5"	2,0	29,0	18,0	24,1	215	474
	580		•	980	16.300	580	D1200	M540	M1000	•	95	28,5"	80	24"	2,0	29,0	17,0	22,8	252	555
	150	•		900	15.000	529	D1200			•	95	28,5"	95	28,5"	2,0	29,0	25,0	33,5	345	761
	200	•		1.250	20.800	735	D1200			•	95	28,5"	95	28,5"	2,0	29,0	32,0	43,0	445	981
PR	250	•		1.550	25.800	911	D1100			•	95	28,5"	95	28,5"	2,0	29,0	39,5	56,0	530	1168
	330	•		1.980	33.000	1.164	D1000			•	95	28,5"	95	28,5"	2,0	29,0	50,0	67,0	605	1334
	530	•		3.180	53.000	1.870	D900			•	95	28,5"	95	28,5"	2,0	29,0	72,0	96,5	980	2161

* Power max pressure.

Positive displacement lobe blowers / compressors oil free (series DL)

Series	Mod	EX	Flow			Rotation speed			HDR	Vacuum		Continuos vacuum		Pressure max abs		Power max vuoto		Weight	
			m³/h	l/min	(cfm)	rpm				%	Hg	%	Hg	bar	psi	kW	hp	kg	lbs
	60		400	6.670	235	M600	M1000		•	85	25,5"	70	21"	2,0	29,0	12,0	16,3	175	386
	80		500	8.330	295	M600	M1000		•	85	25,5"	70	21"	2,0	29,0	15,0	20,0	175	386
	100		625	10.400	368	M600	M1000		•	85	25,5"	70	21"	2,0	29,0	18,0	24,0	195	429
	120*		750	12.500	442	M600	M1000		•	85	25,5"	70	21"	2,0	29,0	23,0	31,0	230	507
	140*		885	14.750	521	M600	M1000		•	85	25,5"	70	21"	2,0	29,0	26,0	35,0	220	485
DL	170*		1.130	18.830	665	M600			•	85	25,5"	60	18"	2,0	29,0	31,0	42,0	255	562
	200*		1.250	20.830	736		M1000		•	85	25,5"	70	21"	2,0	29,0	40,0	54,2	255	562
	150		900	15.000	530	M600	M1000		•	85	25,5"	85	25,5"	2,0	29,0	23,0	31,0	195	430
	180		1.056	17.600	621	M600	M1000		•	85	25,5"	85	25,5"	2,0	29,0	26,0	35,0	188	414
	220		1.300	21.650	765	M600			•	85	25,5"	85	25,5"	2,0	29,0	31,0	42,0	215	474
	250		1.500	25.000	883		M1000		•	85	25,5"	85	25,5"	2,0	29,0	40,0	54,2	215	474

Positive displacement lobe blowers / compressors oil free (continued from previous page)

Series	Mod	EX	Flow			Rotation speed		HDR	Vacuum		Continuous vacuum		Pressure max abs		Power max vuoto		Weight	
			m³/h	l/min	(cfm)	rpm			%	Hg	%	Hg	bar	psi	kW	hp	kg	lbs
	200	•	1.280	21.350	755	D4200	M1400	•	93	28,0"	93	28,0"	2,0	29,0	35,0	47,0	160	352
	280	•	1.850	30.833	1.089	D3300		•	93	28,0"	93	28,0"	2,0	29,0	52,0	70,0	192	424
PVT	400	•	2.600	43.333	1.530	D3300		•	93	28,0"	93	28,0"	2,0	29,0	71,0	96,0	240	529
	700	•	4.150	69.170	2.445	D2500		•	93	28,0"	93	28,0"	2,0	29,0	112,0	151,0	640	1411
	1000	•	6.400	106.700	3.770	D2500		•	93	28,0"	93	28,0"	2,0	29,0	175,0	235,0	780	1720
	30		360	6.000	212	D5000		•	55	16,5"	50	15,0"	2,1	30,5	13	17,5**	45	99
	50		560	9.333	330	D5000		•	55	16,5"	50	15,0"	2,1	30,5	18	24**	55	121
	80	•	850	14.167	500	D4500	M1500	•	55	16,5"	50	15,0"	2,1	30,5	29	39**	106	234
	105	•	1.090	18.167	642	D4500	M1500	•	55	16,5"	50	15,0"	2,1	30,5	36	48**	118	260
CT	130	•	1.300	21.667	765	D4500	M1500	•	55	16,5"	50	15,0"	2,1	30,5	45	60**	132	291
	180	•	1.800	30.000	1.060	D3300		•	55	16,5"	50	15,0"	2,1	30,5	65	87**	190	419
	240	•	2.470	41.167	1.453	D3300		•	55	16,5"	50	15,0"	2,1	30,5	89	119**	300	660
	420	•	4.150	69.170	2.445	D2500		•	55	16,5"	50	15,0"	2,1	30,5	149	199**	617	1360
	600	•	6.400	106.700	3.770	D2500		•	55	16,5"	50	15,0"	2,1	30,5	207	277**	755	1665

* Models no longer available.

** Power max pressure kW (hp).

Positive displacement lobe blowers / compressors (oil free)

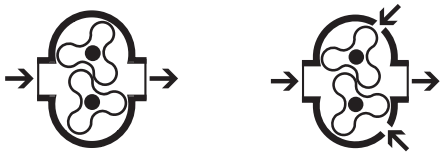
• Two rotors are properly shaped to rotate synchronously in opposite directions, creating progressive chambers from the inlet to the outlet.

• Built fairly simple these pumps are robust and durable. No lubricating oil is needed within the pumping chamber since the pump works without friction and consequently there is no oil mist delivered to the atmosphere.

• The vacuum pumps lobes pumps produced by JUROP are air-cooled and have an internal cooling system to work continuously even at a high vacuum condition.

• Usually installed to create vacuum in a tank.

• DL and PVT are cooled by air injection. The CT compressors use air (natural convection).



AIR AIR INJECTION

Self priming rotary lobe liquid transfer pumps

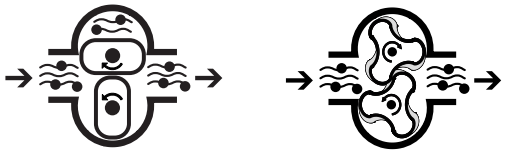
• Two rotors properly shaped to rotate synchronously in opposite directions, creating progressive chambers from the inlet to the outlet.

• Very simple construction. Rotors are coated with rubber that provides the seal between them and the stator (housing).

• The pump is self-priming, bidirectional, allows the pumping of liquids, sewage, sludge, oils, wood pulp, viscous materials, etc. that main contain solids up to 30 mm in diameter (for VL35/50) and with temperatures of 50-60 °C (according to the rubber used in lobes construction).

• These pumps do not require cooling and the material that is being pumped functions as a lubricant to the sliding of the lobes.

• The pump is mounted on fixed installations for the transfer of materials of a manufacturing process or used on vehicles for loading and unloading of materials.



STANDARD LOBES HELICOID LOBES

Multy purposes vacuum / centrifugal pumps

• Julia is provided with 2 power take off. The first is applied to a vacuum pump. The second power take off is applied to a torque flow centrifugal pump for sewage waters (**Julia series**) or to a water high pressure pump (**Julia HP**: 93-170 l/min; 110-210bar).

• Julia units, composed of vacuum pump and centrifugal pump, are built for installation upon trailers for agriculture application. Vacuum pump is used for suction or discharge of the tank used for manure transportation. The centrifugal pump instead is used for pressure spreading of manure.

• The following vacuum pumps can be coupled to centrifugal unit:

- *With Julia 3000-5000*
  PN45-58-84-106-130-140 / PNE-PNR72-82-102-122 / LC300-420 / DL150-180.
- *With Julia 7000-8000-8500-9000-HP*
  PN130-140-155-155R / PNR142 / LC300-420-580 / DL150-180-250.

Self priming rotary lobe liquid transfer pumps

Series	Mod	EX	Flow			Rotation speed	HDR	Pressure max abs		Power		Weight	
			m³/h	l/min	(cfm)	Rpm		bar	psi	kW	hp	kg	lbs
VL	2		12	200	53	1000	•	5,0	72,5	4,0	5,5	50	110
	4		24	400	106	1000	•	3,0	43,5	5,1	7,0	60	132
	7	•	42	700	185	540	•	5 : 9	72,5 : 130,5	8,0	11,0	97	214
	14	•	84	1.400	370	540	•	5 : 9	72,5 : 130,5	20,0	27,0	105	231
	20	•	120	2.000	528	540	•	5 : 7	72,5 : 101,5	25,0	34,0	119	262
	27	•	162	2.700	713	540	•	5 : 7	72,5 : 101,5	34,0	46,0	146	322
	40	•	240	4.000	1.057	540	•	3,0	43,5	42,0	57,0	170	375
	17		102	1.700	450	500		5,0	72,5	24,0	32,5	300	662
	35		210	3.500	924	500		5,0	72,5	46,0	62,0	335	739
	50		306	5.100	1.347	500		4,0	58,0	63,0	85,0	380	838
	70		420	7.000	1.850	600	•	6,0	87,0	80,0	107,0	455	1.003
	140		840	14.000	3.698	600	•	4,0	58,0	100,0	134,0	570	1.257

Multy purposes vacuum / centrifugal pumps

Series	Mod	Rotat. speed	Flow		Prevalence	Power		Flow max		Prevalence	Power		Weight	
		rpm	l/min	m³/h	m	kW	hp	l/min	m³/h	m	kW	hp	kg	lbs
JULIA	3000	540	1800*	108*	58*	40*	54*	3000	180	56	55	74	220 : 360	485 : 794
	5000	540	2200*	132*	74*	58*	78*	5000	300	71	90	121	220 : 360	485 : 794
	7000	1000	2400*	144*	88*	78*	105*	4000	240	86	100	134	357 : 437	787 : 963
	8000	1000	4500	270	22	42	56	7200	432	8	55	74	357 : 437	787 : 963
	8500	1000	5000	300	38	60	80	8400	504	12	95	127	357 : 437	787 : 963
	9000	1000	5500	330	44	78	104	7500	450	38	100	134	357 : 437	787 : 963

* Performance with Ø34mm nozzle. Working conditions recommended.
Data are referred to centrifugal pump.

3.2 Equipment for the environment

• Vacuum tanker vehicles are intended for loading, transporting and unloading, mainly wet wastes and if particularly equipped also bulk material of small size.

• To make these vehicles versatile, they are equipped with a pump or number of pumps that meet the requirements for loading and unloading of the material. You can load the suction material in the tanks through the vacuum generated inside the tank, or by a transfer pump (which can be used independently from the tank).

• The combined equipment can be equipped with a high pressure pump, particularly suitable for washing.

• The power required for operation of the pumps is taken from the vehicle engine through PTO, or by auxiliary engines.

• JUROP produces various types of fittings, designed to maximise operation of the equipment in the various processing phases. For the types of product fittings refer to paragraph 2.2.

3.3 Powered units

• JUROP pumps could be available with different power transmission: electric motors, diesel or petrol engines, compressed-air motors.

• There are many types, there are smaller units with the functionality of vehicles equipped with tanks, motor pumps with both electric and endothermic motors.

• Units can be finished, with wheels and pallets: they can have units included in a fitting.

3.4 Accessories

• Whether small or large, simple or complex, mechanical or technological, JUROP accessories are optional or aesthetic structural elements specially designed according to customer requirements to increase machine functionality, ease work and allow for independent maintenance and assembly.

The main accessories used for the equipment and for the pumps are on the following pages. The documentation is taken from the company brochures.

Accesories for tankers

Tankers can be equipped with suitable components and accessories to meet every operating requirement, placing or chassis, or according to working environment needs.
Jurop supplies a wide range of accessories, components, pumps, compressors to provide you with a full package equipment.
Those accessories are tested one by one and supplied «ready to go».

MANHOLE

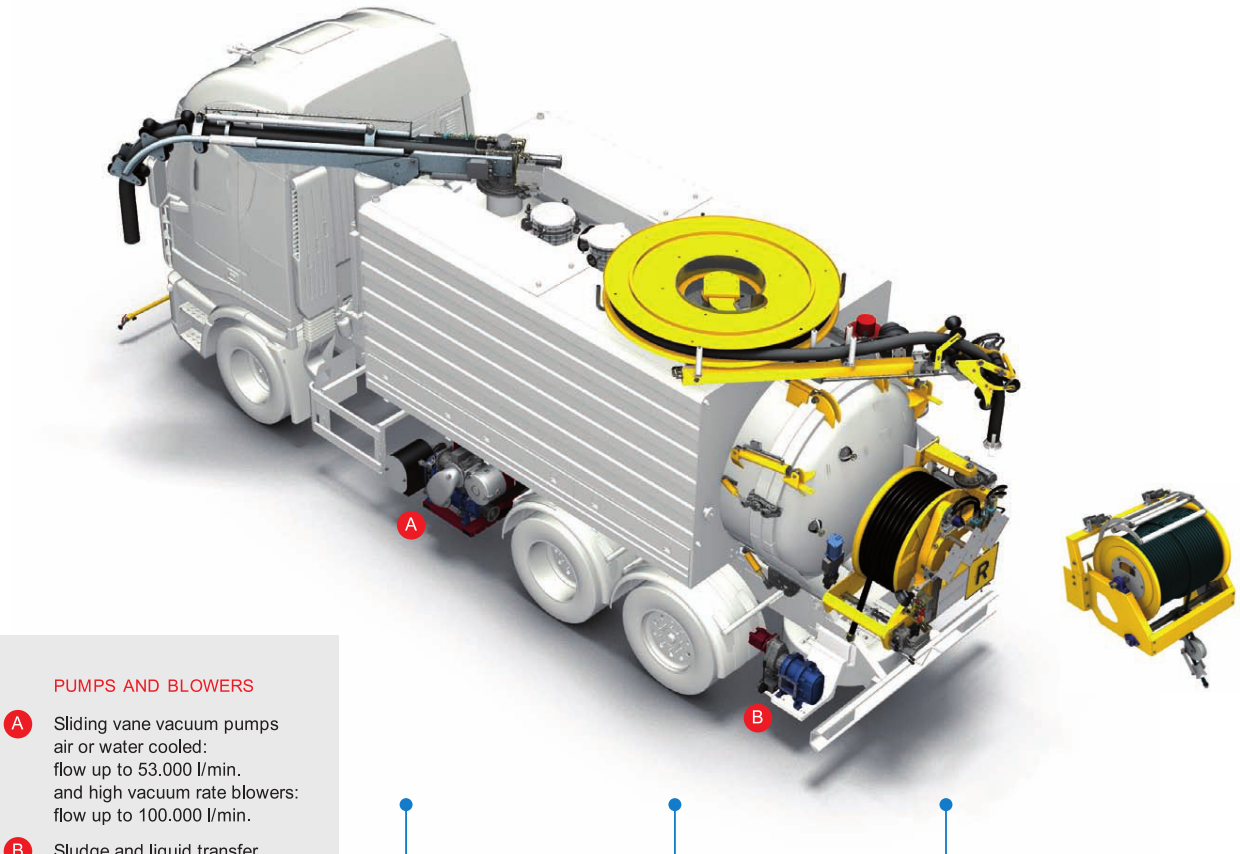
Stainless or mild steel made, from DN 300 up to DN 500 mm suitable for up to 4,0 bar pressure.

CLAMPS · HINGES

- Rear door clamps, manual type with brackets.
- Rear door clamps, hydraulic operated.
- Adjustable door hinges.
- Hydraulic cylinders.

SUCTION HOSE REEL

- Tank top mounted drum type, stainless steel made, suitable for DN 80÷150 hose.
  – with fixed arm;
  – with side mobile arm;
  – with central mobile arm, elevation, single or double hose.
- Rear tilting type suitable for DN 80÷100 hose.



PUMPS AND BLOWERS

A Sliding vane vacuum pumps air or water cooled: flow up to 53.000 l/min. and high vacuum rate blowers: flow up to 100.000 l/min.

B Sludge and liquid transfer rotary lobe pumps: flow up to 2.700 l/min. pressure up to max 10 bar.

C Trilobe compressors: flow up to 6.400 m^3/h.

D Triplex plungers high pressure pumps up to 180 kW.

STREET WASHING BAR

Complete with mobile device. Automatic horizontal adjustment.
Manually adjustable fixed nozzles.

SUCTION BOOM

DN 80÷150 and DN 200.
- ~ 300° automatic rotation.
- Automatic extension.
- Hydraulic elevation.
- Complete with controls and switches.

LEVEL SIGHT GLASS

For both water and sludge compartments.
- Cup type.
- Flat type.
- Floating level element (inside) and indicator (outside).
- Tubular plastic type DN 32÷75 and DN 100.

In the picture: Excerpt from accessories brochure. Accessories for equipment.

HIGH PRESSURE MAIN HOSE REEL

- Wide range of rear high pressure hose reels: manual or with hydraulic assisted swivelling, manual or automatic hose guide, available with cross-over shifting device as well.
- Fixed type.
- Stainless or mild steel made.
- Suitable for up to 160 mt., from ¾" to 1 ¼" high pressure hose.
- From ½" to 1 ¼" swivel joint.

MOBILE PARTITION

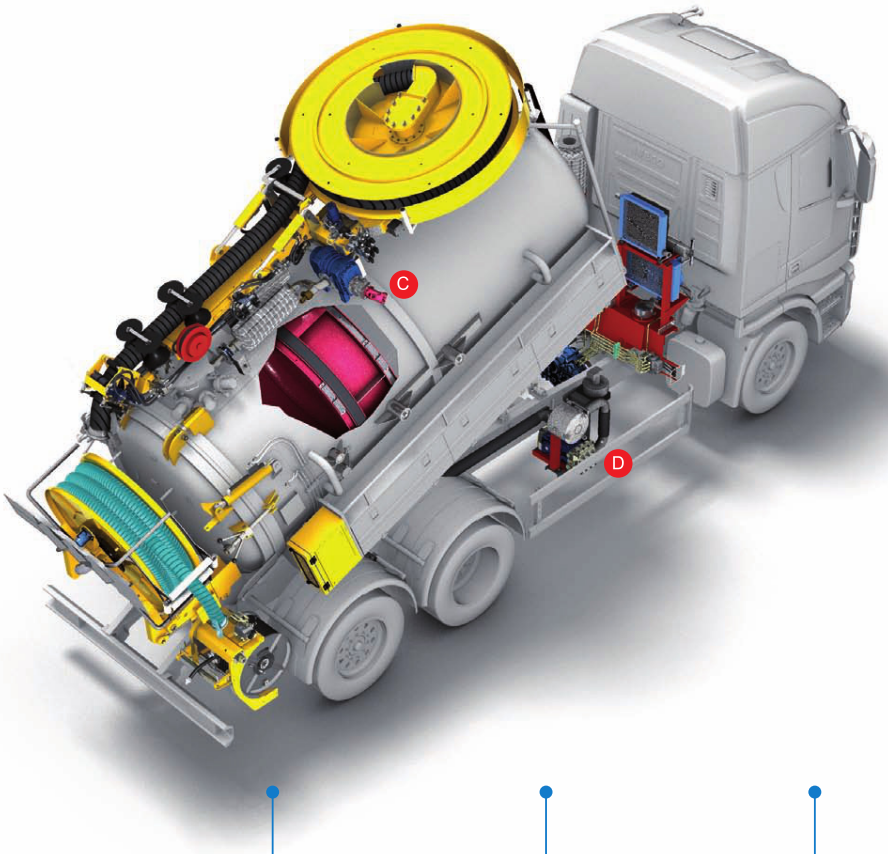
Stainless or mild steel made.
Manual or automatic block.

POWER TAKE OFF

Total power take off (split shaft) with one or two output. Pneumatic engage complete with clutches.
Max 3.000 kgm.

BEHIND THE CAB GROUP-FRONT FRAME ASSEMBLY

Complete with oil tank, tilting cylinder and air/oil/water heat exchanger.



GATE VALVES

- Lever gate valves.
- Ball valves.
- Cast iron or stainless steel made.
- Manual or pneumatic operated.

HIGH PRESSURE SIDE HOSE REEL

- Manual or hydraulic rotation.
- Fixed or pivoting.
- With manual or automatic hose guide.
- Stainless or mild steel made.
- Suitable for max 80 mt ½"÷¾" high pressure hose.

CONTROL PANEL

Stainless steel made.
Opening door with crystal glass and a side door for inspection.
Wired devices and controls.

WATER FILTER

Aluminium made housing.
Stainless steel cartridge with 54 mesh filtering grade.
Water flow up to 350 l/min.

In the picture: Excerpt from accessories brochure. Accessories for equipment.

Vacuum line components

Our fist class efficiency vacuum pumps are designed to work properly in combination to all other tanker elements or in a plant context.
Jurop supplies a full package service including all vacuum line components up to 100.000 l/min. flow for building a fixed plant or a tanker unit.

SECONDARY SHUTOFF

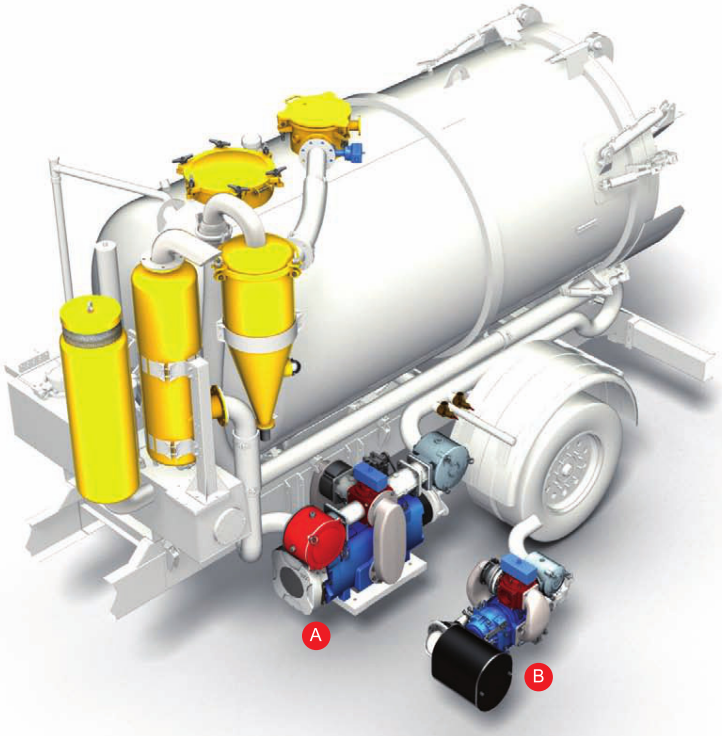
- Vertical type up to 15.000 l/min. flow.
- Cyclone type up to 100.000 l/min. flow.
- Complete with floating balls and sight level.
- Stainless steel or galvanized mild steel execution.
- Works also as moisture trap.

PRIMARY SHUTOFF

- With open lid, dome or flat type.
- Outside diameter 350 mm.
- Stainless steel floating ball dia. 150÷200 mm.

SILENCER

- For exhaust or on air injection ports.
- Horizontal or vertical setup.
- With or without oil trap.
- Air flow up to 100.000 l/min.



VACUUM PUMPS

A Sliding vane vacuum pumps, oil lubricated, air or water cooled, with flow up to 53.000 l/min. and complete with:
- suction air filter;
- non-return check valve;
- 4-way changeover valve;
- connecting manifold assembly.

B Air injection positive displacement lobe blowers with flow up to 100.000 l/min. and complete with:
- suction air filter;
- non-return check valve;
- 4-way changeover valve;
- compact air injection filter/silencer;
- connecting manifold assembly.

VALVES

- 4-way changeover valves, manual or pneumatic operated, up to 8".
- Check valves.
- Overpressure or vacuum relief safety valves.

AIR FILTER AND SPARK ARRESTOR

- Air suction filter up to 100.000 l/min. flow.
- ATEX/EX IIGTS compliant DRF model up to 6.400 m^3/h flow.

PUMP DRIVE

- Mechanical by belts and pulleys also with pneumatic clutch.
- Hydraulic with low or high pressure.

In the picture: Excerpt from accessories brochure. Accessories for pumps.

4. General warnings

4.1 Warranty terms and conditions

• The following provides the main **sales conditions**. The texts are taken from the warranty document (paragraph 8).

- 8.1. *JUROP guarantees the proper functioning of the item sold for a period 2 (two) years from the date of Delivery. This guarantee does not cover parts/components not produced by JUROP.*
- *8.2. The Customer must report a malfunction to JUROP within 10 (ten) days from its discovery, after which time the guarantee will lapse.*
- 8.3. *The guarantee of proper functioning shall not apply when the defects are due to: i) damage caused during transport: ii) repairs and/or tampering by the Customer without prior written approval from Jurop; iii) use of spare parts that are not original or not approved in writing by Jurop; and iv) failure to observe user, storage and maintenance instructions.*
- 8.4. *The item under guarantee must be delivered by the Customer, at its own direction and expense, to Jurop's premises in 50 Via Crosera, Azzano Decimo (PN), 33082, Italy. If Jurop agrees to carry out an inspection of the item under guarantee outside its premises the Customer shall only be charged the fixed call out fee. For repairs outside Jurop's premises, the Customer shall be charged: i) the fixed call out fee, (ii) the hourly labour cost, and (iii) subsistence costs for interventions lasting more than 6 (six) hours requiring workers to stay outside Jurop's premises.*
- 8.5. *The guarantee does not cover any other indemnity against and/or compensation for damages, including, but not limited to stoppage of the Customer's operations, delays in the replacement or repair of the item sold or any damage caused to third parties.*

4.2 Assistance service

• The completeness of the **JUROP assistance service** is divided into different types of interventions.

- **Operational** training, at our office or long distance, before the arrival of the product.
- **Technical advice** according to the occurrence of specific or unforeseen needs during machinery operation.
- After-sales **repairs and maintenance** with qualified JUROP personnel or affiliated technicians closest to the customer's offices.

• The maintenance worker is a point of reference for the operators of the equipment for any problems.

• Those who perform service assistance must know how to listen; the operator calls upon the occurrence of a problem that he is not able to resolve independently.

• When the request for intervention occurs at the center where maintenance will be carried out, the repairer may intervene personally.

• However, when the request for intervention is by telephone, the repairer must make use of the operator to gain a comprehensive analysis of the problems incurred, providing a possible resolution to the problem.

• The employee at the assistance service that controls certain operator actions must ensure that these are always implemented in safe conditions and are relevant to the specific case. It is therefore necessary to apply an effective diagnostic method, avoiding random attempts. You need provide a method.

• Maintenance of the vehicle and the equipment is a necessary condition in order to prevent damage, which may compromise the fundamental condition of safety for the operator.

5. Basic theory

• The equipment to load the tanks uses the vacuum: the air inside the tank is removed with a pump and, through an opening, the material is loaded.

• To understand why the material enters the tank, it is necessary to keep some basic concepts in mind, such as:

- Condition of the material.
- Mass, weight and specific weight.
- Pressure and atmospheric pressure.
- Vacuum.
- Steam pressure.
- Viscosity.

5.1 Condition of the material

• In nature, material is presented in three forms:

Material State	
Solid	Material in a solid state has its own volume and shape.
Liquid	Material in liquid state has its own volume, but acquires the shape of the container that contains it.
Gases and vapours	Gases and vapours have no volume or shape, they expand occupying the entire space of the container. As can be seen, each state has specific features, however among states there are commonalities, gaseous and liquids are amorphous (they do not have their own definite shape, but they take the shape of the container that contains them), and liquids and solids cannot be compressed.

5.2 Mass, weight and specific weight

• The **mass** is the quantity of matter that is in a body (m) measured in Kg.

• The **weight** is the force of attraction that the Earth exerts on a body (mass) measured in N (mxg), but in common usage is indicated in kg (1 kg = 1 daN).

• The **specific weight** is the ratio between the weight of a body and its volume Kg/dm^3.

5.3 Pressure and atmospheric pressure

• The **pressure** is the force acting on the unit surface.

• The **atmospheric pressure** is the pressure at any point of earth's atmosphere, and is the pressure exerted by a column of air, as high as the atmosphere. At sea level, the volume of a column of air of the section of 1 cm^2 weighs approximately 1.03 kg. The standard atmospheric pressure corresponds to a column of mercury of 760 mm, in other units of measurement it corresponds to:

1 atm = 760 mm Hg = 760 torr = 101325 Pa = 1013,25 mbar = 10,332 mH2O

• Due to the compressibility of air under its own weight the decrease in atmospheric pressure with altitude above sea level is not linear as in liquids. Various factors such as weather conditions and latitude influence its value. The following table provides the indicative values of the pressure in percentage of an atmosphere, according to altitude.

Altitude	% di 1 atm
1000	88,6
2000	78,5
4000	60,8

• Pressure can be classified in two ways:

- **Absolute or real pressure** (ata, absolute atm). Is the pressure measured taking the vacuum as reference.
- **Relative pressure** (ate, relative atm). Is the pressure measured taking another pressure (typically atmospheric) as a reference.

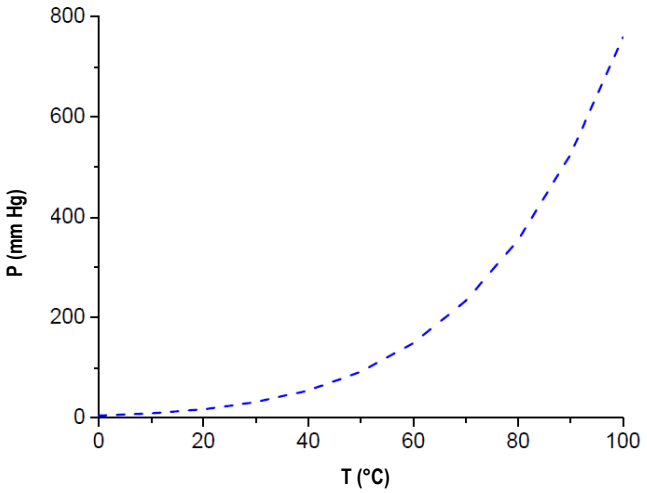
5.4 Vacuum

• The term “vacuum” refers to the physical condition that occurs in an environment where the gas pressure is less than atmospheric pressure.

5.5 Steam pressure

• The process of evaporation in a closed container continues until a balance is achieved between the molecules that come out from the liquid phase and those that return to the liquid phase itself. At this point, the steam is said to be saturated and its pressure (usually expressed in mmHg) is said pressure (or tension) of saturated steam.

• The following image shows the trend of the temperature of boiling water in relation to the pressure. In the presence of maximum vacuum (empty at 100%) water boils at 0°C.



Pic. 5.1

5.6 Viscosity

• The viscosity of a liquid indicates the resistance that it opposes to its movement, and significantly increases as the temperature decreases.

• As a result of viscosity there will be drops in pressure in the suction line and overpressure (sliding resistance) in the supply line. One of the viscosity units of measure is the Centistoke, which as per reference considers the viscosity of water at 20°C equal to 1 centistoke.

• On the side the average viscosity of some liquids is shown.

Type of liquid	Viscosity (Centistoke)		
	20°C	50°C	100°C
Aviation gasoline	0,7	0,5	-
Water	1	0,6	0,33
Diesel (average)	5	2,5	1,2
Naphta (average)	55	13	3,8
Linseed oil	75	21	7
Sugar syrup (density 1:35)	330	50	-
Molasses (average)	1750	750	-
Naphta (heavy)	2000	180	22
Oil for steam engines	3000	240	48
Tar (average)	21000	750	40

5.7 Suction and absolute vacuum

• **Absolute vacuum**(100%) is a completely matter-free space, it is not technically achievable, but with the use of decompressors one can get close (up to 90-95%).

• Decompressors are designed to extract the air or other gas from a closed system and allow it to flow into the environment.

• By connecting a tank, where a vacuum has been created, with a pipe immersed in a basin, the liquid contained in it will flow into the tank. The liquid flows into the tank as it is subject to a pressure difference, the atmospheric pressure pushes the liquid through the duct inside the tank.

5.8 Suction systems

• Valid for both suction in the tank and for the pumps.

• Under normal conditions, the standard atmospheric pressure is equal to the pressure of 10.332 meters of water column, therefore to the maximum, ideally creating a vacuum with the pump to the suction mouth, the water will go up from the water level thrust by the atmospheric pressure along the suction pipe, up to a height of 10.332 meters, from the conversion of 760 mm of Hg, actually raising the water to 10.332 meters this would boil (tends to become gaseous) in the suction pipe, since at “absolute” vacuum the boiling temperature is 0°C (273.15 K). There are therefore limitations to the vacuum conditions of the pumps, regardless of the constructive technology adopted. In reality, this water suction height is approximately 7.5 m; if the liquid suctioned has a specific weight higher than that of water, the height is reduced (see the mercury example). If we suction water at heights, the height is reduced as the atmospheric pressure is lower. A specific parameter of the pumps is the NPSH (difference between the pressure at a point of a generic hydraulic circuit and the steam pressure of the liquid at the same point).

5.9 Suction systems

- **Suction with depression (vacuum)** It is the system commonly used for the loading of tanker vehicles equipped with decompressor (vacuum pump) and takes place almost as described in the previous chapter. It’s a very effective system for very dense liquids and reduced heights of suction.
- **Suction with pneumatic transport** By means of appropriate suction pipes and devices the air is mixed with the material; the fast current of air creates drag that sucks up the material. The use of this technique allows you to easily aspirate liquid very dense, dry and granular dusty material. The height intake can exceed the 20/30 meters easily. Caution must be given to the balance between the degree of vacuum, air density, diameter of the siphon pipeline, air velocity in the pipe, tank size, decompression performance.

6. Choice of the vacuum pump

• The choice of the pump to be installed on equipment or vehicles, provided the economy of the product, must take into account various parameters:

Parameters	Description
Material to be loaded	If materials are liquid, more or less dense (i.e. yogurt), and mixed with small solids, a transfer pump is suitable (JUROP's VL model). The tank may be either atmospheric with closed door, such as semi-trailers with very thin steel plate; tank may not be withstand vacuum. If the presence of solid is constant and appreciable or with sand it is necessary to evaluate the wear and tear of the pump. If the storage basins have a lower catchment point than the bottom, they cannot be completely emptied (3-4 cm). If the materials to be loaded contain solid pieces or a lot of sand we should adopt a decompressor; in this case the tank must be able to withstand the vacuum. If materials to be loaded are dusty the vacuum pump will be subject to heavy wear (suitable filters should be fitted on).
Tank capacity	Generally the size of tankers has to be calculated to load much material as possible, within the limits of permitted weights of the vehicle.
Size of the pump	Generally the size of the pump is 2,5 or 3 times the size of the tank (i.e. 10.000 l tank = 25.000 l/m pump). With the range of 3 times the volume of the tank, you can have a good pneumatic transport [anyhow "pneumatic transport" loading efficiency is due also to the flow speed in the suction pipeline i.e. the relation between pipe diameter (flow section) and air flow (m^3/h – l/min)]. Increasing the size of the vacuum pump you will increase weight and size of the accessories and reduces the payload. The choice of pumps used in the fitting of tank trucks must comply with the following ratios: 1:1 (mountain) 0:9 (plain).
Operating cycles	Working duty or degree of vacuum are high a decompressor with forced air cooling or liquid cooling must be choosen.
Suction conditions	If the suction level is greater than 5 m oversize the decompressor to work in pneumatic transport. Lobe vacuum pumps (DL, PVT pumps) are more suitable for pneumatic transfer.
Operating altitude	If the allocation of the jobs is high at altitude, oversize the decompressor in order to work with pneumatic transport; also for this type of work a lobe decompressor is better.

• For the transfer pumps, the suction capacity of the liquid is subject to the same previously illustrated physical laws.

7. Power transmission

7.1 Drawing of power

• In the equipment the power for moving the pumps is normally drawn from the vehicle's motor. This drawing can be carried out by:

- **Interposed total PTO**:
  - Gearbox and differential.
  - Motor and gearbox.
- **PTO to the gearbox**.

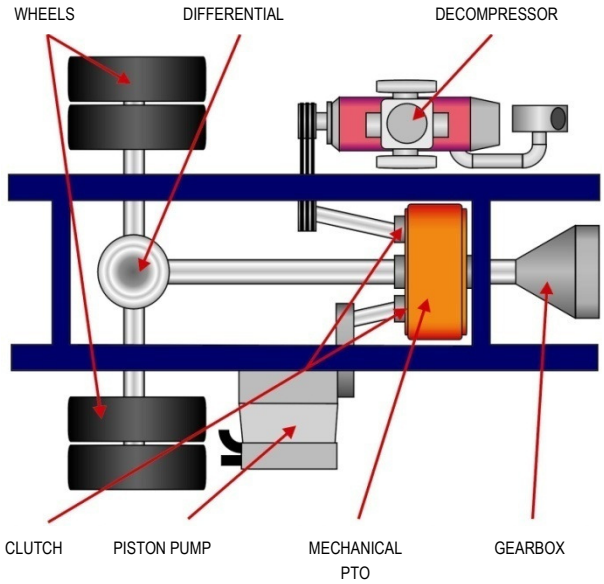
• The transmission of power to the utilities can be:

- **Mechanical** directly with drive and pulley belts.
- **Hydraulic** (oil hydraulic).
- **Mixed**.
- With an **auxiliary motor**.

7.2 Power take-off (PTO) between the gearbox and differential

• The fitter interposes the PTO into the transmission cinematic chain of the vehicle, including the gearbox and differential. When the pumps are used, the transmission of power to the differential stops and is distributed to the PTO output. With this type of PTO, it is not possible to move the vehicle when drawing power. The PTO is engaged from the driver's seat and the gear must be engaged (working speed).

• There are several types of PTO: horizontal and vertical. In addition, there are also PTO's with engagement of utilities with friction clutch.

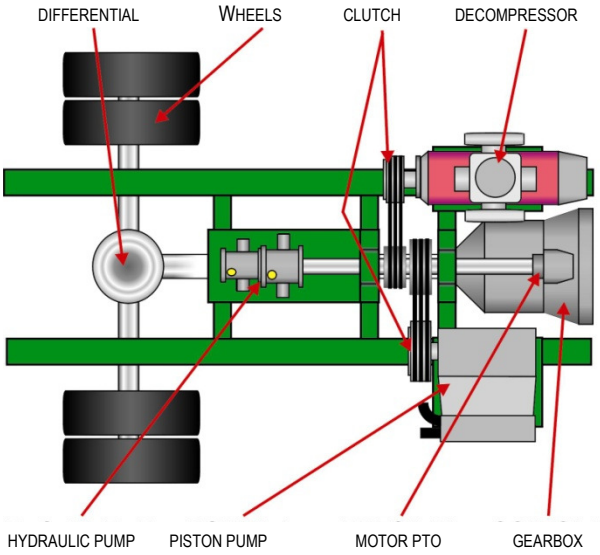


Pic. 7.1

7.3 PTO between the motor and gearbox

• It is an original vehicle accessory; the PTO is positioned between the engine and the gearbox.

• They can be with friction or clutch. The engagement and disengagement of the first takes place with the motor off, while the second occurs with the motor switched on; both are independent of the clutch of the motor.

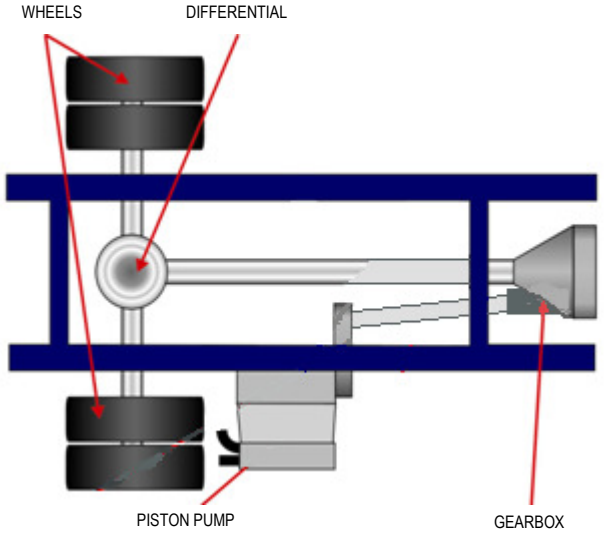


Pic. 7.2

7.4 PTO to the gearbox

• It is the most common PTO fitted by vehicle manufacturers and mechanics. It is the most suited for tippers and cranes.

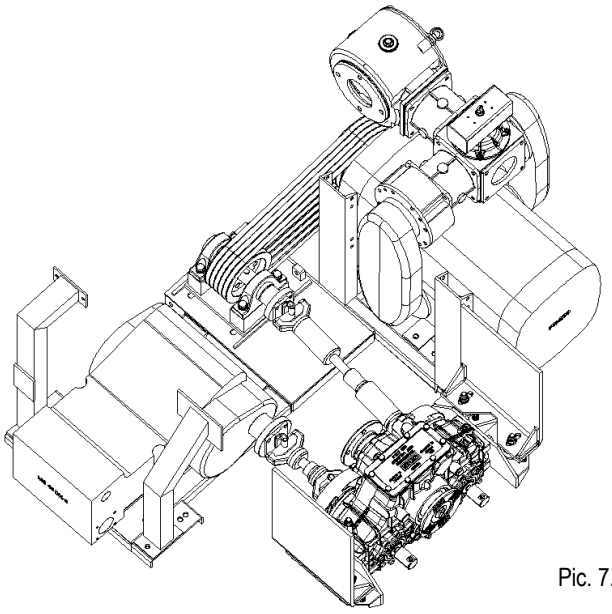
• In fittings, it is used for low power or to operate pumps feeding street washers. It is dependent on the motor clutch.



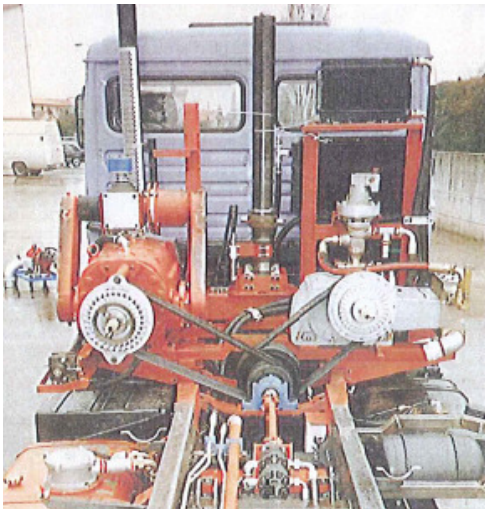
Pic. 7.3

7.5 Mechanical power transmission

• It is preferable to use mechanical transmission, if there is sufficient space to fit it. It offers advantages in weight savings, material cost and performance benefits. As the PTO is installed on vibration dampers, the use of shaft drives is necessary for the recovery of displacements. The gear unit consisting of pulleys and belts serves to change the number of revolutions to make it suitable for use.



Pic. 7.4



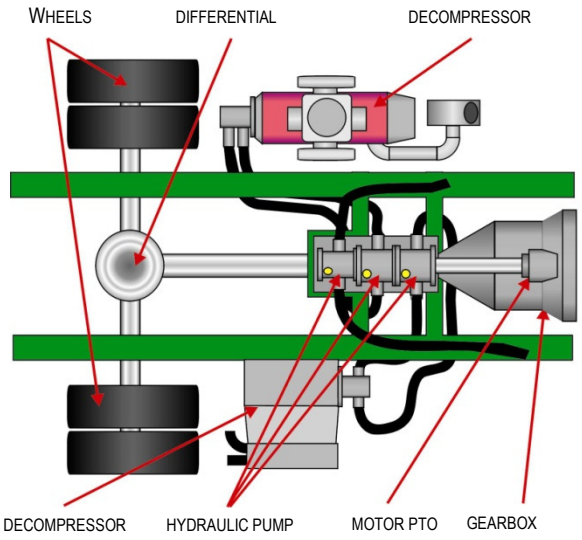
Pic. 7.5

In the photo above, there is an example of mechanical transmission from total MNV type PTO. Configuration with PTO positioned between the motor and gearbox.

7.6 Hydraulic power transmission

• The hydraulic transmission allows the position of the accessories to be released. If the hydraulic pump is driven by a MNV type of PTO, you can work whilst moving.

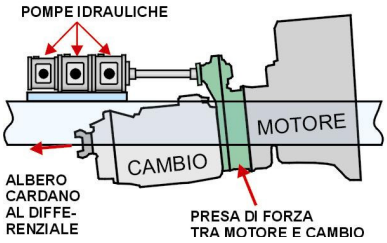
• This transmission is used in specialised equipment for the cleaning of street drains. The adoption of a hydraulic transmission implies oil tanks, heat exchangers, low temperature drainage protection valves.



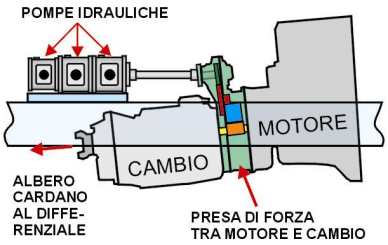
Pic. 7.6

• The image below provides examples of various types of PTO between the motor and gearbox (without clutch and utilities always in PTO; with built-in clutch; with external clutch).

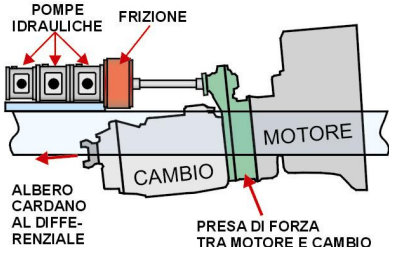
- **Clutch and utilities always in PTO**



Built-in clutch



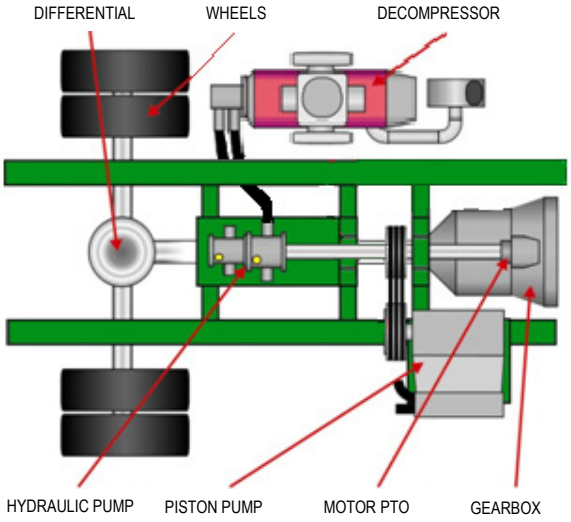
- **External friction** (JUROP installed)



Pic. 7.7

7.7 Mixed power transmission

• The transmission may be of mixed type: use with mechanical transmission and with hydraulic transmission.

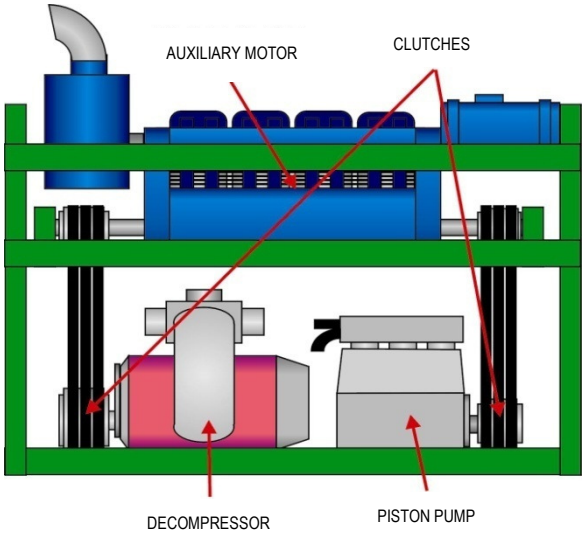


Pic. 7.8

7.8 Power transmission with auxiliary motor

• In some fittings, power is supplied by an auxiliary motor for the operation of the accessories. This solution is usually adopted on semi-trailers, trailers or roll-off trailers.

• The use of an auxiliary motor installed, together with the pumps, inside a soundproofed cabin, aids in reducing the noise of the machine when it operates.



Pic. 7.9

8. PTO

8.1 Malfunctions

PTO OMSI			
Problems	**Intervention area**	**Cause**	**Remedy**
The PTO will not engage and/or does not disengage	Hand brake	Handbrake not engaged	Apply the handbrake. For safety, the PTO can only be engaged with the handbrake engaged
	Selector switch in the cabin to engage PTO	The selector switch or contacts do not work	Replace selector switches and contacts
	Fuse box	The 10A fuse to protect the circuits has tripped	Replace the fuse. If it trips again, check for short circuit
	Equipment circuit	No air to the equipment circuit	Open shut-off valve ensuring you have at least 6-7 bar
	Solenoid valve engage PTO	The double-action solenoid valve does not work	Check the cause of the block: circuit interruption, coils burned solenoid valve block. The solenoid valve can be activated manually
	Equipment circuit	Air leak in the equipment circuit. The loss is noticeable at the rear of the control panel, where the returns converge	Check the pneumatic drives individually disconnecting the return. Replace the accessory if the air leak is evident
	PTO circuit	Air leakage PTO circuit due to PTO piston engaged/disengaged or of the tank block piston	Activate one piston at a time, isolating the others from the system. Replace or service any leaking pistons
The PTO utilities do not engage	Rotating the clutch selector switch the light does not turn on	The selector switch does not work	Check the selector switch contacts or the circuit that runs from the selector switch to the timer
		Timer	The timer is not powered or is not working
		Coil power circuit interruption by the timer	The timer intervenes, but the coil drive circuit has stopped
	Rotating the clutch selector switch the light turns on	No air in the system	Check air intake in the system open shut-off valve, the system must have at least 7-8 bar
		Solenoid valve coil	The solenoid valve coil has stopped, replace it
		Solenoid valve	The solenoid valve is blocked, replace it
		Swivel joint	The swivel joint is leaking or has come off, replace it
		Clutch	The clutch slips or is blocked, service it

9. Vacuum / pressure line

9.1 Configuration vacuum / pressure line

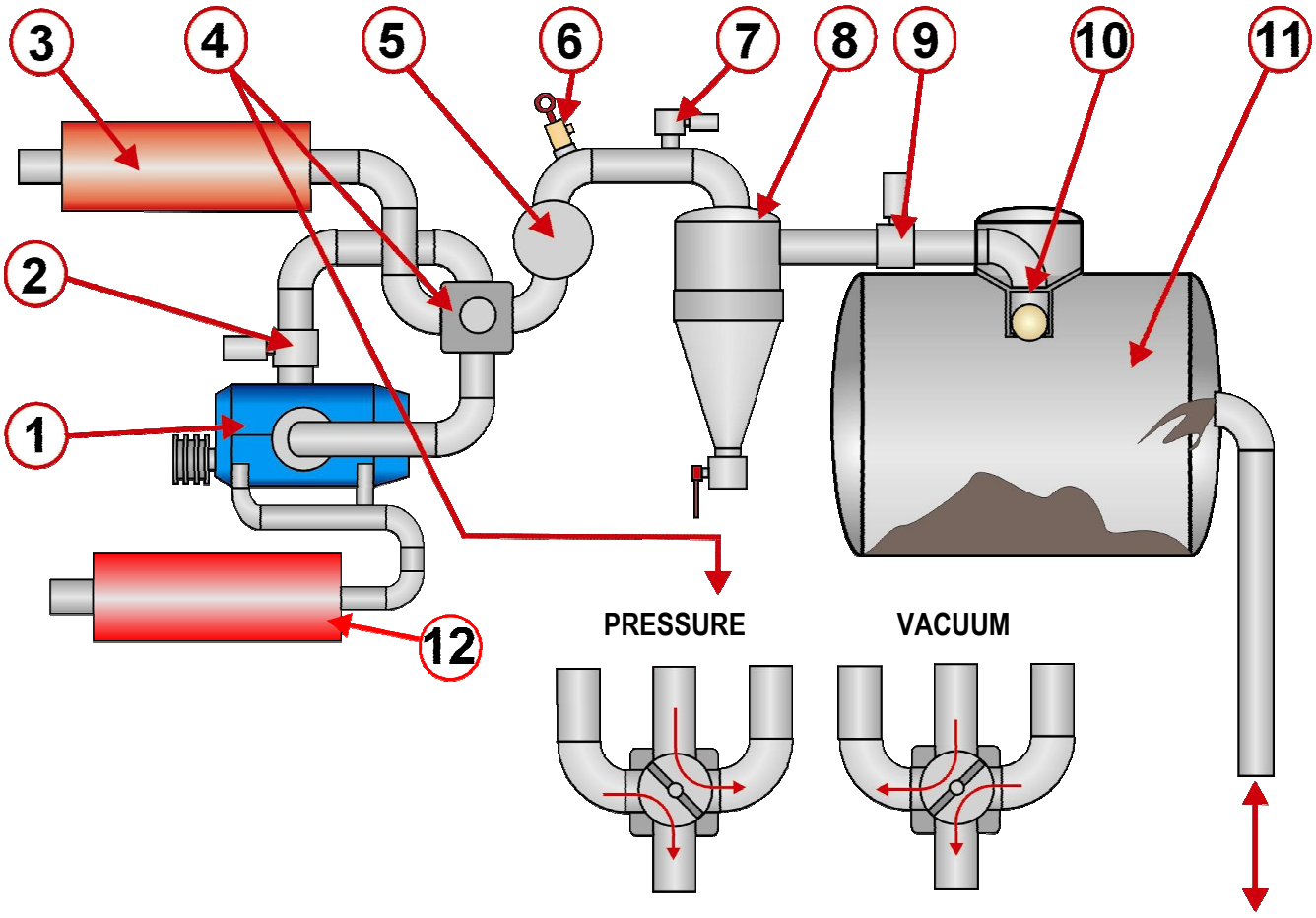
• The vacuum system is in addition built to:

- Connect the decompressor to the tank.
- Protect the pump.
- Allow suction with tank lifted.
- Reverse the flow of the pump.

• It is called a vacuum/pressure circuit since, through a 4-way valve, it can operate in suction or compression (*for the emptying of a sludge compartment*).

• The drawing of the material to be suctioned can be carried out by means of a rear, upper suction hose reel, by means of a suction boom or directly through the valves located in the rear bottom. The decompressor sucks air from the sludge tank, through an overflow valve, a cyclone purification system and a safety cartridge filter. The sucked air is discharged by means of a silencer into the atmosphere (that can be provided with an oil trap) reducing the noise (and in case of oil trap, it would pick up the eventual steam). The vacuum pump can be driven by a mechanic or hydraulic motor; depending on the employment requirement, more or less steady, it is supplied with an air or liquid cooling system.

Vacuum / Pressure line components	
1	Pump
2	Non-return valve
3	Exhaust muffler
4	4-Way changeover valve (vacuum / pressure)
5	Cartridge filter / Spark arrestor
6	Overpressure safety valve
7	Vacuum system breathe valve
8	Secondary shutoff
9	Vacuum line - suction tank communication valve
10	Primary shutoff
11	Suction tank (sludge compartment)
12	Standard Injection muffler (e.g. PVT pumps)



9.2 Malfunctions

DECOMPRESSOR, VACUUM LINE, TANK					
Problems	**Check action**	**Result**	**Intervention area**	**Cause**	**Remedy**
The tank does not fill. Filling speed is lower than normal.	Check the maximum degree of vacuum that reaches the decompressor. Close all intake, discharge, vent valves, sump suction shut-off valve, and any trailer connections; bring the decompressor to maximum revolutions and read the maximum degree of vacuum reached by the vacuum gauge.	The maximum degree of vacuum reached is normal.	Material intake limit.	The siphon pipeline is immersed at approximately 7 m deep.	Switch to pneumatic transport.
				The material suctioned has a high specific weight, which, translated into the water column, is approximately 7 m deep.	Switch to pneumatic transport.
			Impediments on material suction line (tank, basin).	The loading valve is not completely open.	Release the valve.
				The siphon or the siphon pipeline is clogged by material.	Reverse the flow of air to release the pipe. If the operation is not successful, manually remove the material that is blocking the siphon or pipeline.
				The siphon pipeline is glued to the bottom of the tank.	Lift the siphon pipeline from the bottom.
			Impediments on the vacuum line (line between the decompressor and tank).	Check suction from drain cock filter.	If suction is good, the decompressor does not decrease in performance. Continue the vacuum line check.
				Check suction from drain cock fork-turning device.	If suction is nil or poor, check that the tap is free.If it is free but the flow is poor, clean the pump filter; if suction is good continue, checking the vacuum line.
				Open vent if present, otherwise release purifier cover pipe connection.	If the suction is poor or nil, probable separation of the inner cloth on the rubber hoses, replace rubber hose, if the suction is good continue checking the vacuum line.
				Open drainage purifier.	If the suction is nil the overflow of the purifier is closed, the ball is glued to the biconical seal; pay attention to the material collected. If suction is good, continue checking the vacuum line.
				Check opening of suction pump shut-off valve.	Check the rotation of the first panel at the top of the pneumatic actuator; if it does not open try to release the valve manually. Caution operation to be performed in safety.
				The tank overflow is closed, the ball is glued to biconical seal.	Decompressor reverse, apply pressure in the tank to release the ball from the double cone.Check the pressure through tank vent.
		The maximum degree of vacuum reached is low.	Suction unit 4-way valve.	The valve is positioned under pressure.	Reverse the 4-WAY changeover valve from the control panel.
				The diverter valve is not in the correct position.	Increase the clearance between the diverter and casing Check actuator efficiency.
			Vacuum line.	Air leaks into the line.	Check filter cover, pneumatic and manual gate valves, safety valve or vacuum breaker valve left open, rubber hoses, quick release purifier, purifier cover, water inlet compartment open.
			Tank.	Air leakage from the tank.	Check that there are no open vents, rear bottom open.
			Decompression problems.	Suction unit.	Manifold flanges loose.
				Possible gluing (decompressor to vane).	Washing of decompressor.
				Check valve blocked.	Service the valve.
			Discharge line.	Clogged silencer.	Service the silencer.

No pressure from the compressor.	Turn on the decompressor and operate the compressor switch, close all intake, discharge, vent valves, shut-off valve, suction sump and any trailer connections. Leave the decompressor at minimum and read the pressure on the vacuum gauge.	If there is no pressure.	Pump injection suction unit (lobe)	Air intake from injection enters from the silencer filter. The injection works only in vacuum.	Check that no air escapes from the injection suction silencer filter. If air comes out, clean or replace the injection clapet valve. On certain DL models, there is a valve that must remain closed during the pressure phase. Replace it if it remains blocked open.
			suction unit 4-WAY changeover valve	Rotating the reverse selector switch the status light does not turn on and the reverse is not activated.	The contact of the selector switch does not work or a contact came off. Replace the contact or reset the circuit.
				Rotating the reverse selector switch the status light turns on and the reverse is not activated.	The circuit from the solenoid selector contact or the solenoid valve coil have stopped, or the solenoid valve is blocked. Check the circuit, replace the solenoid valve or coil where possible.
				Rotating the reverse selector switch, the status light turns on and solenoid activation is perceived, but the reverse is not activated or rotation is not complete (90°).	The pneumatic actuator of the 4-WAY changeover valve short circuits the air internally; loss of air is detected behind the control box. Replace the pneumatic actuator.
					The 4-WAY changeover valve is blocked. Turn the adjustment screw under the valve, by screwing a ½ turn.
				Reverse functions.	Check that the fitting between the actuator and diverter is solidly connected.
			Decompressor	Check valve blocked.	Circuit interrupted, replace the valve (on the PVT suction).
				Vane glued.	Execute a wash cycle.
			Suction / supply line	Pressure relief valves discharge prematurely.	Clean the valves; if expected results are not achieved replace and calibrate them. At maximum pump revolutions the pressure must stabilise on 0.5 bar relatively.
				Cyclone cover and detachment not fully connected.	Check that the cover and detachment of the cyclone are connected and tightened.
				Cut suction rollover (if equipped).	Check the position of the cone on the ball.
			Discharge line	Exhaust silencer.	The compression discharge silencer becomes suction; check that there is air flow. If not, check for any obstructions, removing them.
		If there is pressure.	Tank	Sump vents and covers, open.	Close vent valves.

Problems	Intervention area	Cause	Remedy
The decompressor is running in reverse.	For vane decompressor.	Discharge check valve blocked.	Replace the valve.
	For the flanged version of PVT and DL lobe decompressor.	Injection check valve blocked.	Replace valve.
	For DL lobe decompressors.	Injection check valve blocked or sump shut off valve open.	Check valve automation or replace the valves.
The decompressor fills with liquid.	Tank overflow valves and purifier do not block. Tank overflow valves and purifier do not block.	Biconical seal missing.	Restore the seal.
		The ball does not float.	Because it is perforated, or because the specific weight of the liquid suctioned is too low.
		The ball is blocked.	Clean the ball retaining basket.
	The sucked up material foams.	The steam pressure of the material is low with the vacuum it bubbles and foam forms that rises and is sucked into the sumps.	Add an anti-foaming product to the liquid being suctioned.

Problems	Cause	Remedy
Water cooling system consumption (for water-cooled pumps).	Loss of water from the cooling system, the water is dispersed in the environment.	Leaks may be on the fittings, heat exchanger, circulation pump.
	Pump casing breakage or burned head gasket; water enters the pump casing.	This is noted because water and glycol are found in the discharge silencer, service the pump.
Water cooling system consumption (for water-cooled pumps).	Water recirculation pump drive belt breakage.	Belt replacement.
	Water recirculation pump blocked.	Pump replacement.
	Heat exchanger solenoid valves broken.	Replace fans.
	Faulty thermostat.	Replace it.
	Air bubbles in the system.	Bleed the system.

Problems	Check action	Result	Intervention area	Remedy
Overheating on lobe decompressor.	Check if there is repetitive behaviour or if it is random.	If the interventions seem random.	Pump thermostat.	Check the thermostat and replace it.
		If they are repetitive.	Poor pump cooling.	Check if the cartridge filter is clean.
				Check injection efficiency.
				Check patency of the drain.
			Reached pump operating limits.	Reduce the degree of vacuum; suction in pneumatic transport with a negative pressure of 60%.
The decompressor is slower than what it should be.	For mechanical transmission: there is slipping of the belt or clutch.	Belts slip.	Check integrity of transmission bearings.	Tension and replace belts.
		Clutch slips.	Check pneumatic system if it has a good flow and the pressure is 8 bar, check the swivel joint.	Replace PTO oil clutch and check system integrity.
	For hydraulic transmission.	Relief valve, distributor or solenoid valve.	The relief valve of the distributor or solenoid valve leaks.	Tighten the valve. If it continues to leak, replace it; caution, do not exceed the components' maximum pressure.
		Decompressor hydraulic motor.	The hydraulic motor has lost performance due to wear, drainage too small.	Replace motor, check drainage.
		Hydraulic pump.	The hydraulic pump has lost performance due to wear.	Replace pump, caution when opening suction.

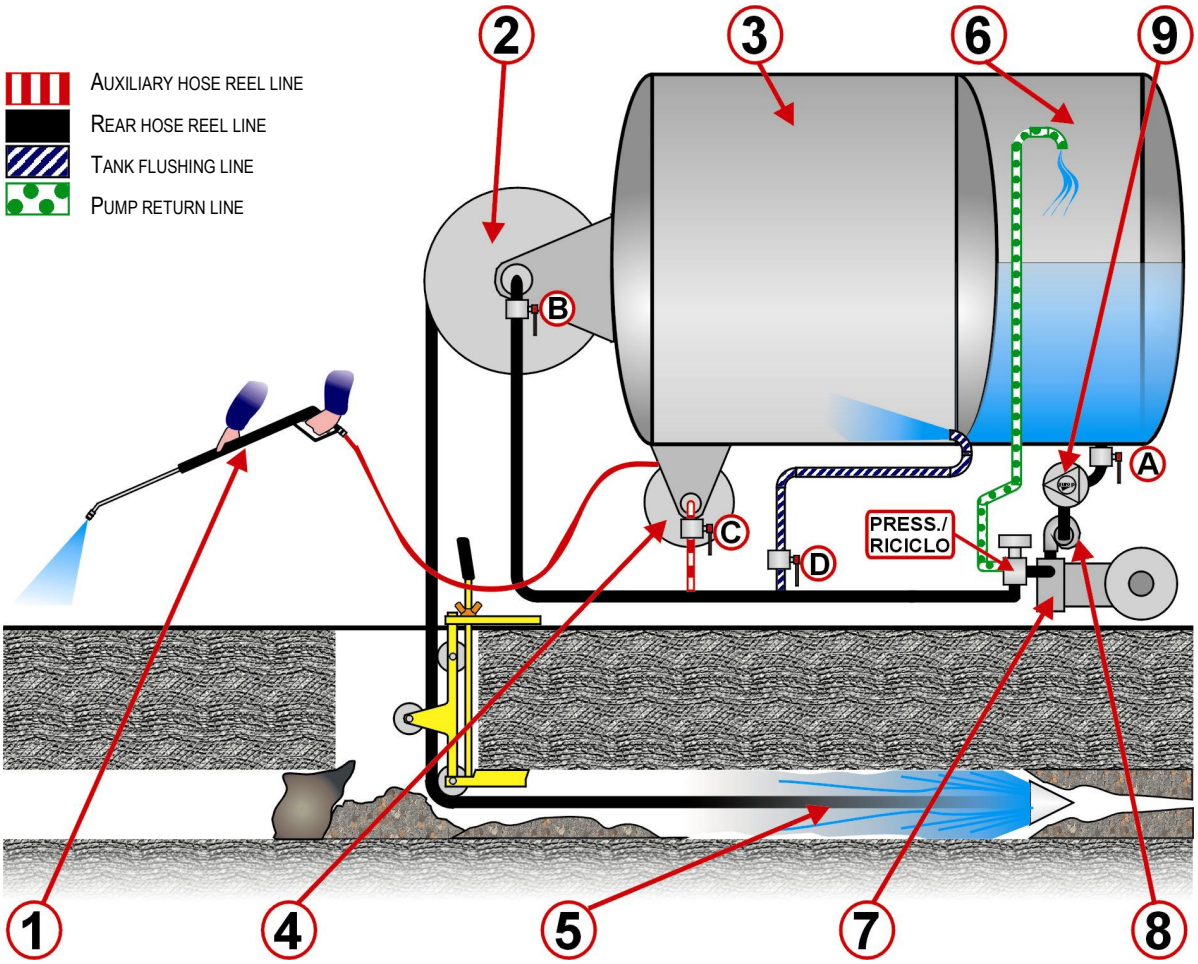
10. High pressure water system

10.1 System configuration

• The drain cleaning and unblocking system is made up of a clean water tank fed by a high-pressure pump (equipped with a control valve) and by at least one hose reel with a special tube and relative nozzle. The latter, taking advantage of the pressure of the jets of water, is able to move forward in the hose, freeing it from obstructions. During the hose return phase the jets push the material to the mouth of the duct (outlet).

(*) On pumps with power absorption greater than or equal to 150 hp.

Line components	
1	Spray nozzles
2	Rear hose reel
3	Sludge compartment
4	Auxiliary hose reel
5	Rear nozzle hose reel
6	Wash water compartment
7	High pressure pump
8	Booster pump (*)
9	Suction filter cartridge



10.2 Malfunctions

DECOMPRESSOR, VACUUM LINE, TANK					
Problems	**Check action**	**Result**	**Intervention area**	**Cause**	**Remedy**
The pump operates normally by actioning the pressure control however, water does not reach the water hose reel.	With pump stopped: check that there is water in the compartment, ensure that the suction line valves are open, open the low pressure side pump head drainage cock, water must fully exit the cock continuously.	No water comes out. A small amount comes out for a brief period.	Tank.	Closed tank vent, the suction has generated vacuum in the tank that opposes the flow of water.	Open the vent.
			Suction line without overcharging.	Open the fork-turning device cock, if no water comes out it means the line that runs from the fork-turning device to the tank is clogged.	Flush the line with a pressure jet.
				If water comes out from the fork-turning device of the drainage cock and no water comes out from the filter cock: either the filter is clogged or the line between the fork-turning device and the filter is clogged or the shut-off valve line does not open.	Close shut-off gate valve, drain filter, open the filter and remove the cartridge for cleaning, open shut-off gate valve and check the quantity of flow, if reduced clean the line.
				Open the fork-turning device cock, if no water comes out it means the line that runs from the fork-turning device to the tank is clogged.	Flush the line with a pressure jet.
			Overcharging line with booster pump.	Open drain cock booster pump, if not water comes out, possible obstruction of the booster pump suction or non-return valve is stuck.	Close shut-off gate valve, drain booster pump filter and disconnect the pump supply flange for internal check, remove any obstructions or replace non-return valve.
				If opening the water filter cock water does not come out, the filter cartridge is clogged.	Close shut-off valve gate, drain filter, open the filter and remove the cartridge for cleaning.
		A lot of water comes out of the cock continuously.	Manual pressure control valve.	Manual control valve positioned in the by-pass.	Set valve pressure.
				Low calibrated control valve and shut-off valve closed.	Open cock and adjust valve.
			Pneumatic control valve.	Control valve set to 0.	Act on potentiometer.
				By using the potentiometer air reaches the valve, but the valve does adjust it.	Valve stuck, or membrane rupture, service valve.
			Electrical circuit.	By using the potentiometer air does not reach the valve.	Check whether there is air in the system.
					Check whether rotating the dial the LEDs light up the regulation board. If they do not light up, check that the board is powered; that potentiometer signals are received.
					The LEDs light up, check if there is output signal and check that the signal reaches the conductor transducer; if the signal does not come out of the card, replace it; if the signal does not reach the transducer, check the cables; if the signal reaches the transducer check the power supply, if there is no signal, restore it if there is, replace the transducer. (Caution 8bar air system).
The pump functions in an irregular manner and/or the hose vibrates.	With pump stopped: check that there is water in the compartment, ensure that the suction line valves are open, open the low pressure side pump head drainage cock, water must fully exit the cock continuously.	No water comes out; a small amount comes out for a brief period.	See previous paragraph.		
		A lot of water comes out of the cock continuously.	Tank.	The siphon sucks air.	Divert return water flow into the compartment away from the siphon.
				Vent closed or insufficient.	There is no water at the pump, open vent and drain with hydrant.
			Suction line.	Dirty filter cartridge.	Small amount of water reaches the pump, clean the cartridge.
			Booster pump.	Loose or broken belts.	Tension and replace belts
			Pump head valves.	The suction valves or pump delivery valves are glued or worn out.	Try to unblock or service them.

			Pump head.	The head may be corroded and the water leaks internally.	Service head bushing of all three seats.
			Pumping seal.	The pump should drip from the central part, unless the hole is blocked or obstructed.	Service seals and pumps.
			Transmission.	Check the pump's transmission power.	Drive clearance, clutch air pressure.

Problems	Intervention area	Cause	Remedy
The pump leaks water.	Pumping seal.	The seals are worn, or damaged by the detachment of the ceramic coating of the piston.	Service pump seals.
The pump does not exert pressure and/or flow.	Pump speed.	The number of revolutions of the pump is lower than the rated value.	Low engine revolution, wrong gear.
	Suction line.	Insufficient flow.	See previous paragraphs.
	Pump head valves.	The suction valves or pump delivery valves are glued or worn out.	Try to unblock it, otherwise service them.
	Pump head.	The head may be corroded and the water leaks internally.	Service head bushing of all three seats.
	Pumping seal.	The pump should drip from the central part, unless the hole is blocked or obstructed.	Service pump seals.
	Control valve.	Valve out of adjustment, insufficient air pressure or worn seals.	Pumps the minimum maximum air to the valve, open return drain, wait for water discharge from the pipeline, accelerate up to maximum pressure, if the seals are in good condition there should be no leaks.
	Tank flushing.	Flushing valve opened or damaged.	Close or replace the cock.
	Hose nozzle.	Worn nozzle.	Replace.
		Clogged nozzle.	Clean.

Problems	Cause	Remedy
The pump overheats.	The pump works outside the rating, pressure and/or revolutions.	Reduce the pressure and/or revolutions.
	Presence of water in oil.	Replace oil.
	Oil level too high.	Return the level to nominal values.
	The oil type is incorrect or needs to be changed.	Replace oil.
	Excessive pump inclination.	Reduce inclination by shifting the vehicle.

Model	Issue date	Revision No.	Revision date	Filled out by	Viewed by
OPERATIONAL TRAINING	15.02.2016	00		U.T.	A.T.

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