

KD-14.000 VACUUM PUMP

HERTELL S. COOP.

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1.- INTRODUCTION.

1.1. Previous considerations.



Safety symbol. This symbol on the present document states that the point described thereafter involves very important information regarding the safety of the vacuum pump operation.



The vacuum pump is one component of the vacuum unit (tanker). It is totally necessary to read the operation booklet provided by the tank manufacturer before operating with the pump and the tanker.



The non-observance of the advised safety indications may cause injury to the pump operator.



Take special care of the distance to be kept to any mobile part of the vacuum pump. Read carefully all the information related to this point on the tank manufacturer booklet.



Never use the vacuum pump in inflammable atmospheres in order to prevent the risk of explosion due to the working temperature of the vacuum pump.

1.2.- General description.

The KD-14000 vacuum pump is a rotary blade pump on eccentric rotor indicate for vacuum tankers.

The compact and on-line disposition of the pump (Patent N° ES8603.099) allows:

- .- Reduction of noise level.
- .- Safer manipulation.
- .- Possibility of supplying all the KD models with oil pump.

1.3.- Models.

- ***KD-14.000. Water cooled.***

- .- Driven by PTO (DIN 9611 1" 3/8). 540 or 1000 rpm. Counter-clockwise rotation sense. Hydraulic drive at 540 rpm.

2.- SETTING UP.



Always be careful by hanging the vacuum pump. Use the hole situated at the top of the pump body to lift the pump, keeping always the safety distance to avoid injuries due to a sudden fall down of the pump.

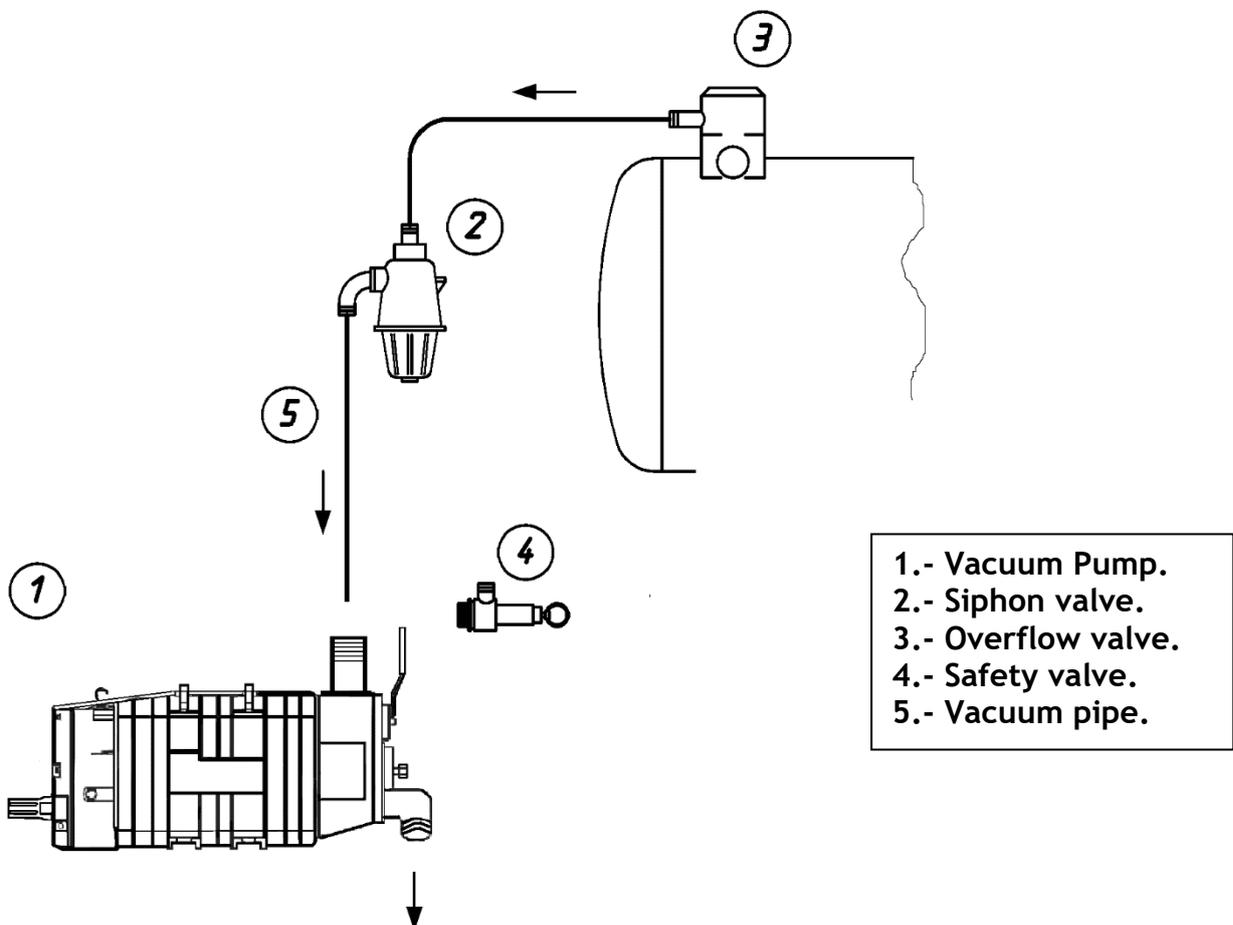
2.1. Setting up description.

Enclosed there is a basic setting-up schema of the vacuum pump on the vacuum tanker. End montage may vary from this basic description, which only shows the non-dispensable parts of the system.

Some accessories of the pump are packed in one carton box to make easier the process of palletising and transporting the vacuum pumps.



Never manipulate the pump when the cardan shaft or driven system of the vacuum pump is connected.



The overflow valve (3) guarantees that while filling up the tank the liquid cannot get into the vacuum pump. Anyway a setting up of one siphon valve (2) is highly recommended in order to be sure that no liquid comes into the vacuum pump.

It is recommended to use an Ø 80 mm pipe (5) or a Ø 100 mm pipe. To install a narrower pipe as the recommended one can follow to an overheating of the air sucked and may damage the pump.

In order to prevent the over pressure and the rupture risk of the tanker it is necessary to install a pressure safety valve (4) on the system. It is strongly recommended to install at least one of these valves on the vacuum pump.



Always be sure that the pressure safety valve is in good working conditions, particularly while installing a new pump in an old tanker.

Depending on the vacuum installation a vacuum relief valve (4 too) can be installed on the vacuum pump to limit the maximal vacuum level. The fact of decreasing the vacuum level increases the operation time of the pump. All these variables depend on the working conditions of the vacuum tanker.

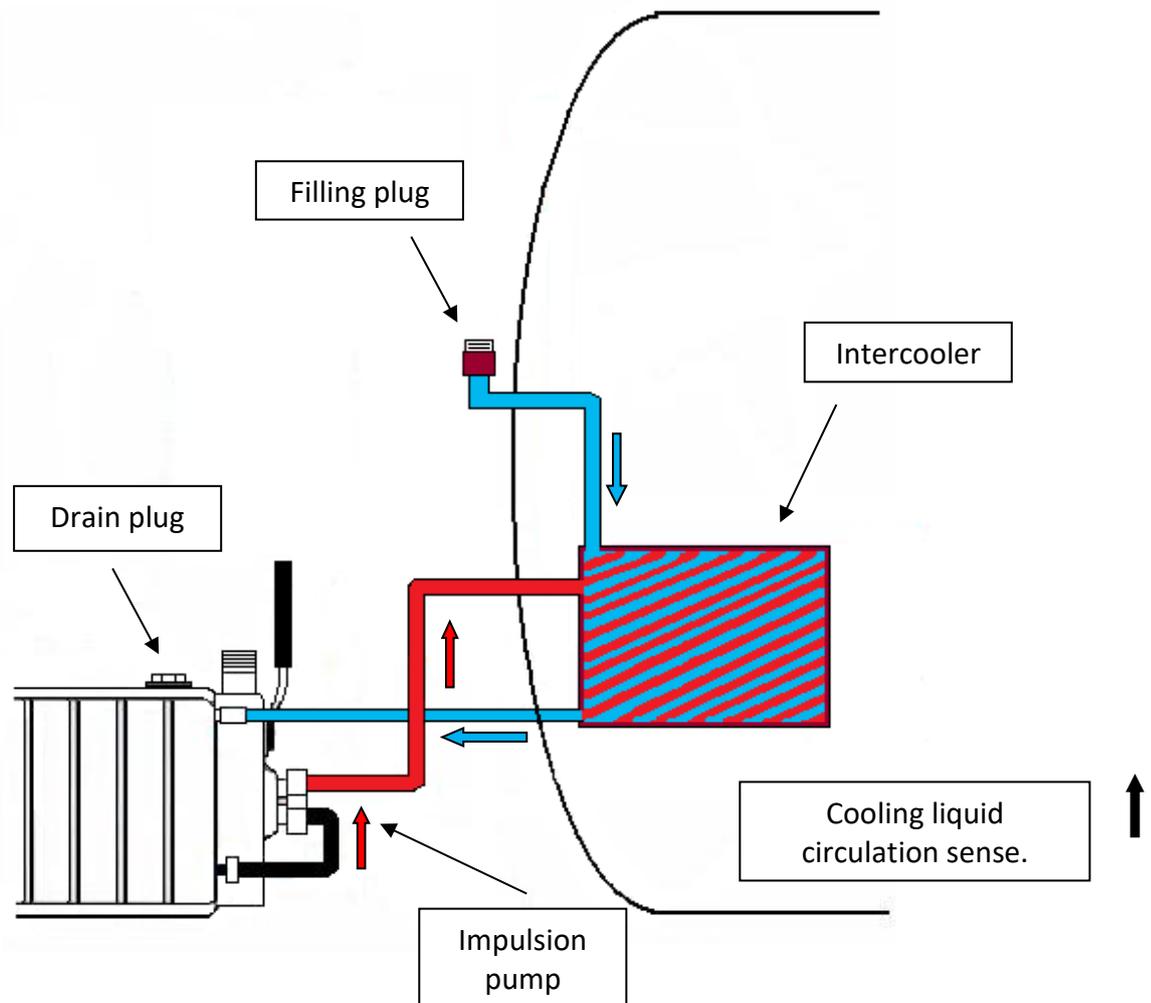
It is the decision of the tank manufacturer to choose the dimension of the pump the same way as the other accessories of the tanker.



No manipulations of the vacuum pump are permitted without the supervision of the tank manufacturer or his authorized technical service.

2.2. Cooling circuit description.

In order to guarantee the best working conditions of the vacuum pump, it is necessary to install a cooling circuit similar to the one shown in the following diagram:



The cooling chamber capacity of the KD-14000 is around 12 liters. It is recommended to install a circuit of around 80 liters. The cooling liquid has to be a Monetilenglicol watered to a 31 %.

The impulsion pump flow is 10 l/min at 1 bar pressure. The pipe (M) is the one connecting the impulsion pump output to the highest point of the cooling circuit. The pipe N represents the return of the cooling liquid to the vacuum pump cooling chamber.



The Intercooler has to guarantee the correct cooling of the cooling liquid. Each tank manufacturer can find the alternative that fits better with his tank configuration, like an external reservoir with or without radiator or an internal reservoir for cooling thanks to the contact between the reservoir and the liquid to be filled on the vacuum tanker. At the very end it is possible to reconnect the impulsion pump output back to the vacuum pump in order to guarantee at least the moving of the 12 liters of the cooling chamber:





Warning! It is not recommended to use the KD-14000 without any cooling liquid on the chamber, as this can damage the vacuum pump body.

In order to drain the air of the cooling chamber, the vacuum pump has a drain plug at the top of the body.

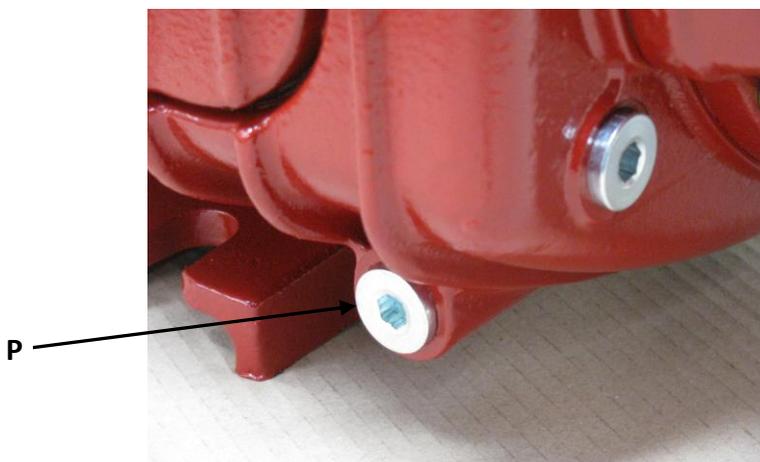


This plug allows the air drainage while first filling and must not be manipulated thereafter: it has to stay at close position.



Warning! The cooling chamber can come to very high temperature, close to 100 °, so a safety distance to the plug has to be kept just in case of some liquid damp expulsion through the plug.

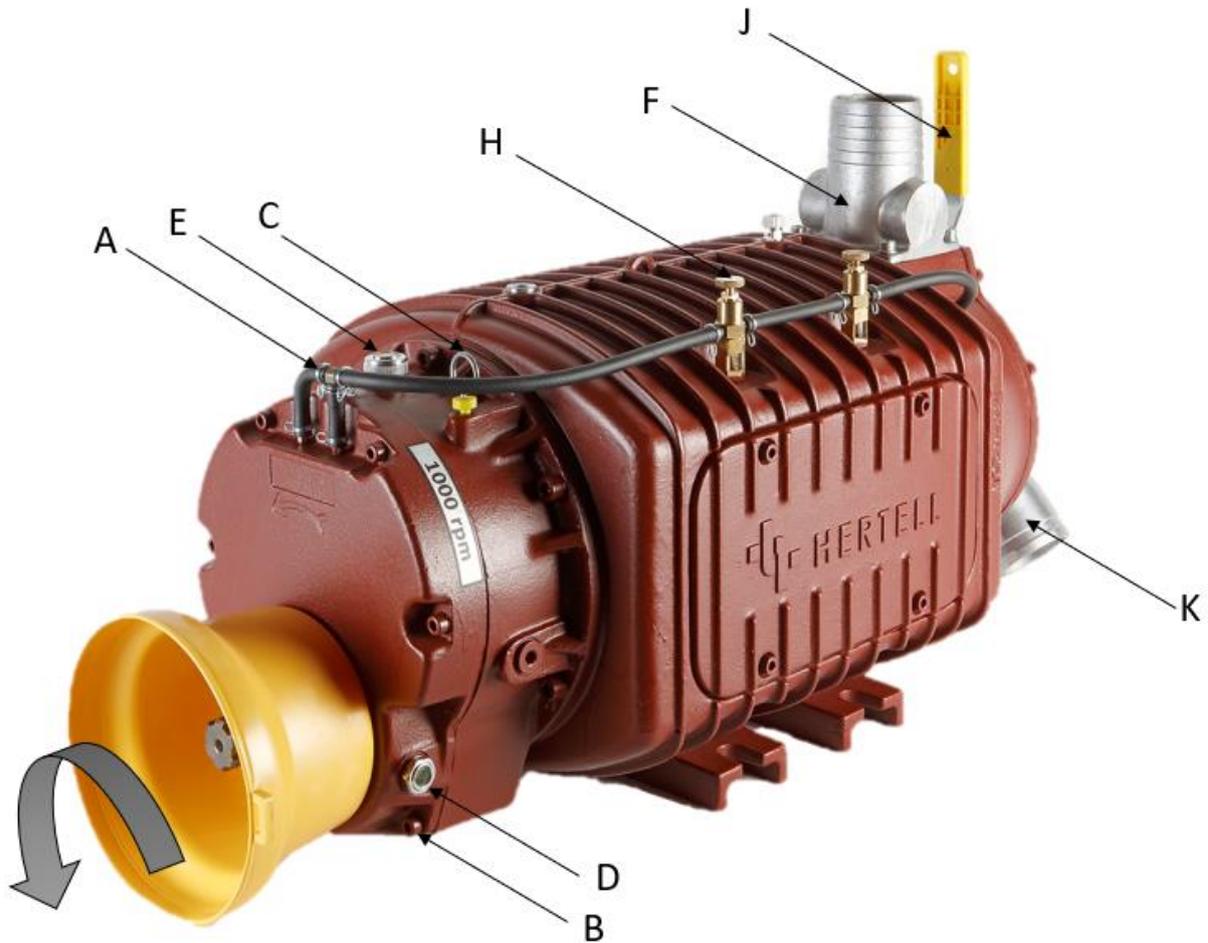
The cooling chamber can be emptied through the P plug before any pump maintenance procedure.



Final consideration: The continuous working time of a KD-14000 vacuum pump is similar to the continuous working time of a normal rotary vanes vacuum pump. Once the pump has come to its maximal vacuum rate (close to 90%) it has to be stopped in order to prevent any damage due to an overheating.

The aim of this cooled vacuum pump is to be mounted in tankers of big volume where the working time to the maximal vacuum rate is longer than usual or in tankers working under quite tough conditions, that is, very short vacuum / pressure phase sequences, as the cooled system guarantees a longer vanes life and therefore a longer pump life.

3.- PUMP OPERATION.



Maximal angle between cardan shaft axe and pump shaft should not exceed 15° for 540 rpm pumps and 7° for 1000 rpm pumps.



Never manipulate the pump when the cardan shaft or driven system is connected to the vacuum pump.



Vacuum / pressure phases are regulated by handle J. The vacuum tanker has to guarantee that the manipulation of this is possible without any risk for the operator.



Maximal working time at maximal vacuum level (with no vacuum relief valve on the system) must not exceed 8 minutes or 90° temperature. The non-observance of these indication can damage seriously the pump.

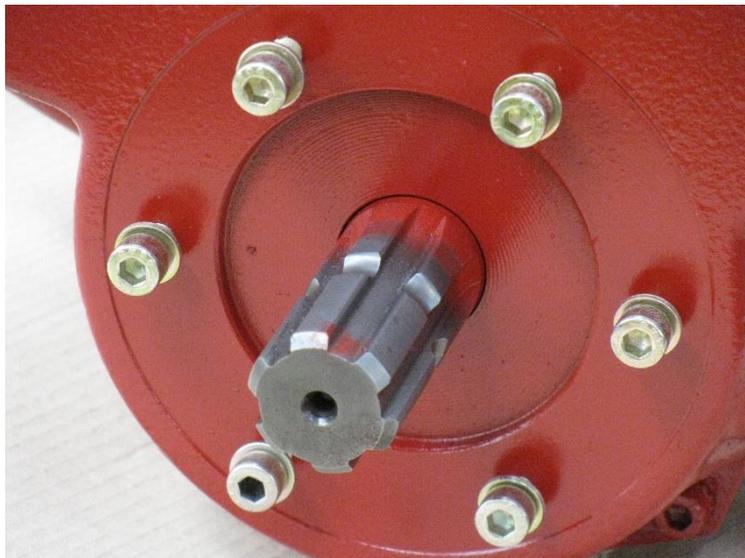
3.1.- First operation

KD-14000 pumps always run counter-clockwise sense, as stated at the front cover. Be sure that driven system (cardan shaft or similar) turns on the right sense. Pump coupling F has to be connected and secure to the vacuum pipe. For the first operation, just prepare the tanker for vacuum operation, put the handle (J) on “V” vacuum position and let the pump run at the estimated turning speed. Drop feeders (H) will be start lubricating after some seconds. Check that the minimal distance between the out-let K and any object in risk of being sucked into the pump is at least 100 cm.

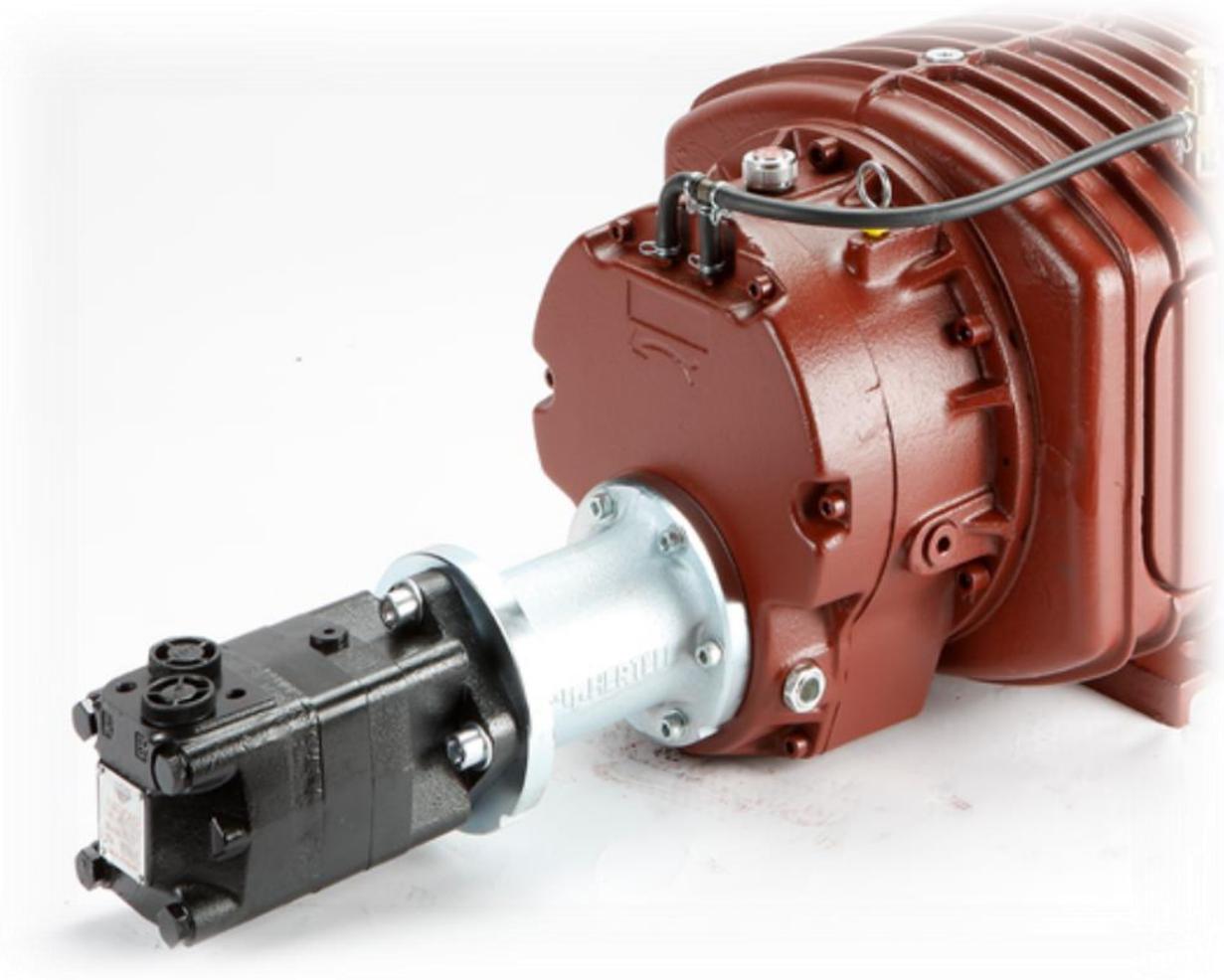


To stop operating with the pump, first stop the cardan shaft before manipulating the pump.

Each KD-14000 has a flange on the front cover to install a hydraulic kit in case of one hydraulic drive of the pump.



If the pump is going to be driven by a hydraulic motor, check the oil flow and pressure of the circuit needed to make turn the pump at a turning speed as close as possible to the nominal turning speed of the pump, and never quicker.



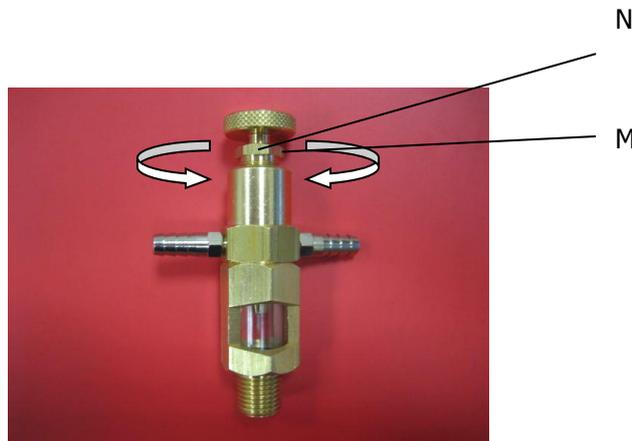
3.2.- Lubrication.

3.2.1.- Vanes lubrication.

While the pump is operating the vanes have to be lubricated. The vanes lubrication oil is filled up through plug E and controlled with the oil lever indicator C (see picture 1). This level has to be controlled each day to be sure that the pump is not running dry. Oil tank capacity allows 4 hours of working time.

Each vacuum pump has been tested and therefore the drop feeders (H) have been regulated before leaving the Works. The normal lubrication flow is between 15 and 20 drop per minute. Should the drop feeders need to be adjusted, then release set screw M and adjust turning the nipple N (Picture 2). If the nipple is turned in clockwise sense, the oil flow decreases, and it increases with the opposite operation. After adjusting, tighten the set screw M again.

(Picture 2)



Viscosity of the vanes lubrication oil: ISO VG - 68

3.2.2.-Gearbox lubrication.

The gearbox is filled to its maximal level (sight glass D) when the pump is delivered. Never fill up over this maximum level. To fill up the gearbox oil, use the plug A, and to empty use the plug B. The gearbox oil has to be exchanged after 500 operation or at least once a year.



Viscosity of the gearbox oil: ISO VG - 220

3.3.-Maintenance.

The rear bearing has to be lubricated at least once a month through oilier G. Use normal grease till the gap from bearing to the oilier is filled up.

The interior of the pump must be cleaned each time when any liquid of the tanker comes into the vacuum pump or, at least, once a year. It is highly recommended to do that when pump is going to stay for a long time without usage. For this operation, release the vacuum pipe on coupling F, put the handle J in vacuum position, drive the pump at low speed and give some detergent through the coupling F.

The vanes have to be controlled after 1000 hours of effective working time and have to be changed if the waste comes up to 10% of the original dimension:

KD-14000 (425 x 64 x 7,5) - 6 Un.

VANES CHECKING

It is possible to check the wearing of the pump vanes without dismantling the pump thanks the plug W place at the top of the pump body.



To do that, unscrew the plug W and turn manually the pump rotor to a point where a vane channel comes to the hole which is open now. Take the oil level indicator and measure the depth till the vane edge. Then turn a little bit more the pump rotor and repeat the measure operation till the rotor lateral surface in order to obtain the vanes wearing after both measures subtraction.

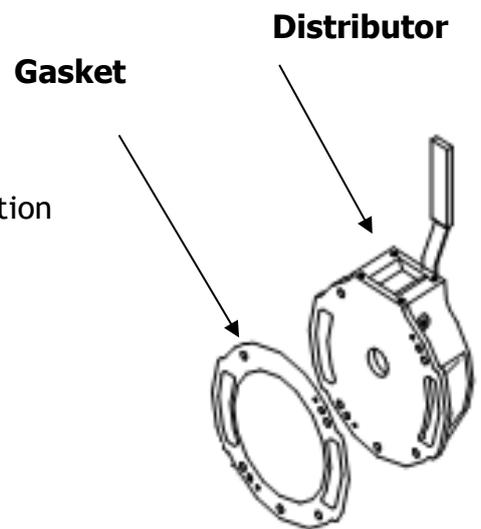
VANES CHANGE :

1.- Unscrew the distributor.

2.- Take apart the distributor. Use the two extraction holes

3.- Exchange the vanes.

4.- Before setting up, exchange the gasket.



3.4.- Troubles and solutions.



The pump is part of the vacuum tanker. So check that all the rest of the vacuum circuit is in good condition before checking the pump. It is advised to take apart vacuum pipe and make turn the pump to check if the pump is transferring air before start manipulating the interior of the pump. Always read the tank manufacturer instructions beforehand.

| TROUBLE | LIKELY ORIGIN | SOLUTION |
|--------------------------|---|--|
| Pumps is not turning | One vane is out. | Take apart the distributor and place the vanes. |
| | One object from the exterior has got into the pump. | Take apart and get our the object. |
| No vacuum or pressure | Non-correct turning sense. | Turn in correct sense. |
| | Low turning speed. | Turn at right speed. |
| | Pump body is damaged / wavy. | Change the pump body. |
| | Conic distributor is not in right position. | Place in right position. |
| No lubrication | Air aspiration on the lubrication pies. | Check pipes and nipples. |
| | Oil pump is broken. | Take apart oil tubes and check turning the shaft even by hand. I necessary, change the oil pump. |
| No retention of pressure | Retention flap is damaged | Change retention flap. |

3.5.- Repairing description.

Enclosed advised repairing description for the most usual maintenance operation and the recommended working time.

(See diagram on page 27)

To make any repair at the KD-14000, previously take apart the water pump N.34 as follows:

- 0.1 Take apart water cooling circuit.
- 0.2 Empty the cooling liquid.
- 0.3 Unscrew cover N.29 together with handle N.28.
- 0.4 Unscrew water pump N.34 and extract.
- 0.5 Set up water pump N.34 taking care while connecting rotor and water pump axe. In order to prevent further damages, place both at vertical position.
- 0.6 Set up cooling circuit and fill up the cooling liquid.
- 0.7 While refilling the cooling liquid the circuit has to be drain through the plug placed at the top of the vacuum pump body. Capacity of vacuum pump body cooling camera: 14 l. Advised capacity of cooling circuit: up from 50 lt.

Advised working time: 1 hour and 30 Minutes.

1. Vanes change (N.44).

- 1.1 Take apart distributor N.41. Use the two extraciton holes.
- 1.2 Exchange vanes N.44.
- 1.3 Put a new gasket N.42.
- 1.4 Set up distributor N.41.

Advised working time: 30 Minutes.

2. Flap change (N.40) / Conic distributor change (N.22).

- 2.1 Flap change (N.40).
 - 2.1.1 Unscrew cover N.29.
 - 2.1.2 Unscrew screw N.31. Exchange Flap. Put screw N.31.
 - 2.1.3 Change Gasket N.30.
 - 2.1.4 Set up cover N.29.

Advised working time: 20 Minutes.

2.2 Conic distributor change (N.22).

- 2.2.1 The same as 2.1.1.
- 2.2.2 Unscrew handle N.28.
- 2.2.3 Take apart conic distributor N.22 and exchange.
- 2.2.4 The same as 2.1.3 to 2.1.4.

Advised working time: 20 Minutes.

**3. Seal change (N.5) / Gears change (N.8 - N .56) / Oil pump change (N.48-
N.49-N.50-N.51).**

3.1 Seal change (N.5).

- 3.1.1. Empty gearbox oil (Screw N.4 at cover N.54).
- 3.1.2 Empty lubrication oil (Screw N.4 at Gearbox N.47)
- 3.1.3 Take apart Guard N.59.
- 3.1.4 Take apart lubrication tube N.12.
- 3.1.5 Unscrew cover N.54. Gear N.8 will come together.
- 3.1.6 Take apart bearing N.7 and / or seal N.5 and exchange.
- 3.1.7 Change gasket N.53.
- 3.1.8 Set up cover N.54. Take care while connecting rotor and oil pump axe. In order to prevent further damages, place both at vertical position.
- 3.1.9 Fill up gearbox and lubrication oil tanks.
- 3.1.10 Set up oil lubrication tube.
- 3.1.11 Set up Guard N.59.

Advised working time: 45 Minutes.

3.2 Gears change (N.8 – N.56).

- 3.2.1 The same as 3.1.1 to 3.1.5.
- 3.2.2 Unscrew set screw N.52.
- 3.2.3 Extract gear N.56 and exchange.
- 3.2.4 Screw set screw N.52.
- 3.2.5 The same as 3.1.7 to 3.1.11.

Advised working time: 1 hour.

3.3 Oil pump change (N.48 – N.49 – N.50 – N.51)

- 3.3.1 The same as 3.1.1 till 3.1.5.
- 3.3.2 Unscrew cover N.48 and extract and change gears N.50 and N.51.
- 3.3.3 Exchange gasket N.49.
- 3.3.4 Set up cover N.48.
- 3.3.5 The same as 3.1.7 to 3.1.11.

Advised working time: 45 Minutes.

4. Rotor - Body change (N.45 – N.43) / Rotor bearing - Seal change (N.35 – N.36).

4.1 Rotor - Body change (N.44 – N.43).

- 4.1.1 The same as 1.1
- 4.1.2 The same as 3.2.1 to 3.2.3.
- 4.1.3 Take apart oil tube N.12 and unscrew drop feeders N.15.
- 4.1.4 Unscrew Gearbox N.47.
- 4.1.5 Take apart rotor N.45 and body N.43, exchange and set up new ones. It is necessary to change vanes N.44. Set up drop feeders N.15.
- 4.1.6 Change gasket N.46 and set up gearbox N.47.
- 4.1.7 Set up gear N.56.
- 4.1.8 The same as 3.2.4. to 3.2.5.
- 4.1.9 The same as 1.3 to 1.4.

Advised working time: 1 hour and 30 Minutes.

4.2 Rotor bearing / seals exchange (N.35 – N.36).

- 4.2.1 The same as 4.1.1 to 4.1.4.
- 4.2.2 Extract bearing N.35 and seal N.36 and exchange for new ones.
- 4.2.3 Take apart cover N.34.
- 4.2.4 The same as 4.2.2. (Rear ones).
- 4.2.5 The same as 4.1.5 to 4.1.9.

Advised working time: 1 hour and 30 Minutes.

4.- TECHNICAL SPECIFICATIONS.

4.1. Material.

4.1.1. Cast

Both vacuum pump body and rotor are manufactured in steel-like GGG-60 cast. This material is three times more resistant than the usual GG cast iron. This material guarantees that the pump will not break or burst even when pumps blocks due to the entrance of one exterior object. Furthermore, the vacuum pumps rotor are hollow and balanced. This reduction on the weight decreases the inertia forces suffered on the pump.

By request one certificate of the composition of the pump material is available at any time.

4.1.2. Gears and Vanes

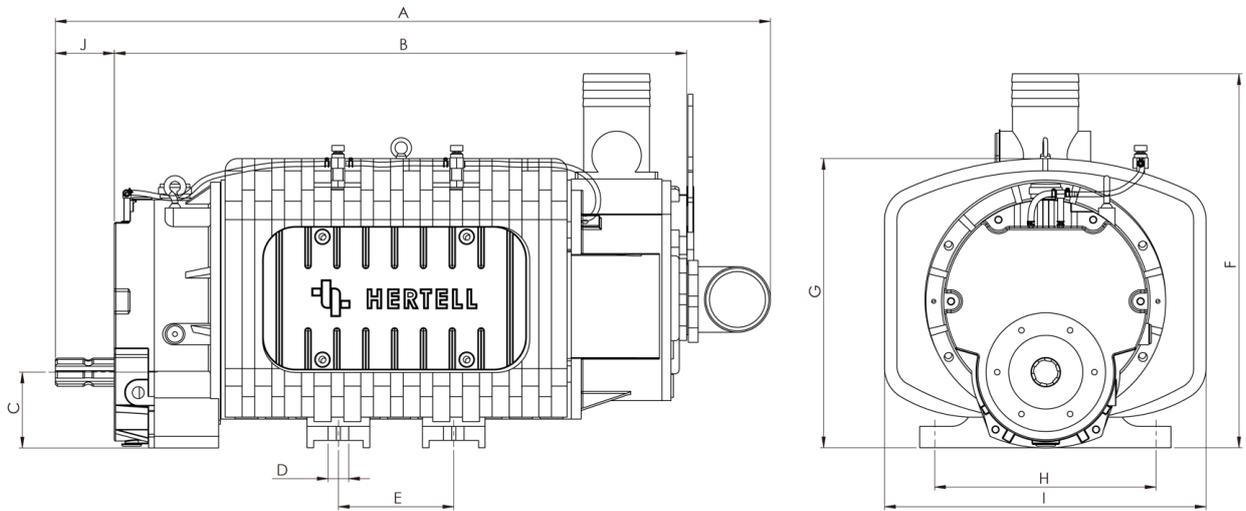
Both small gear and attack gear are tempered and ground. The vanes are made of special material and are complete free of asbestos.

Gears dimensions:

| | | |
|------------------------------------|----------------------------------|-----------------|
| KD-14.000 540 rpm | 28 TEETH ∅ Int.: 32 mm | 55 TEETH |
|------------------------------------|----------------------------------|-----------------|

| | | |
|--------------------------------------|----------------------------------|-----------------|
| KD-14.000 1.000 rpm | 34 TEETH ∅ Int.: 32 mm | 49 TEETH |
|--------------------------------------|----------------------------------|-----------------|

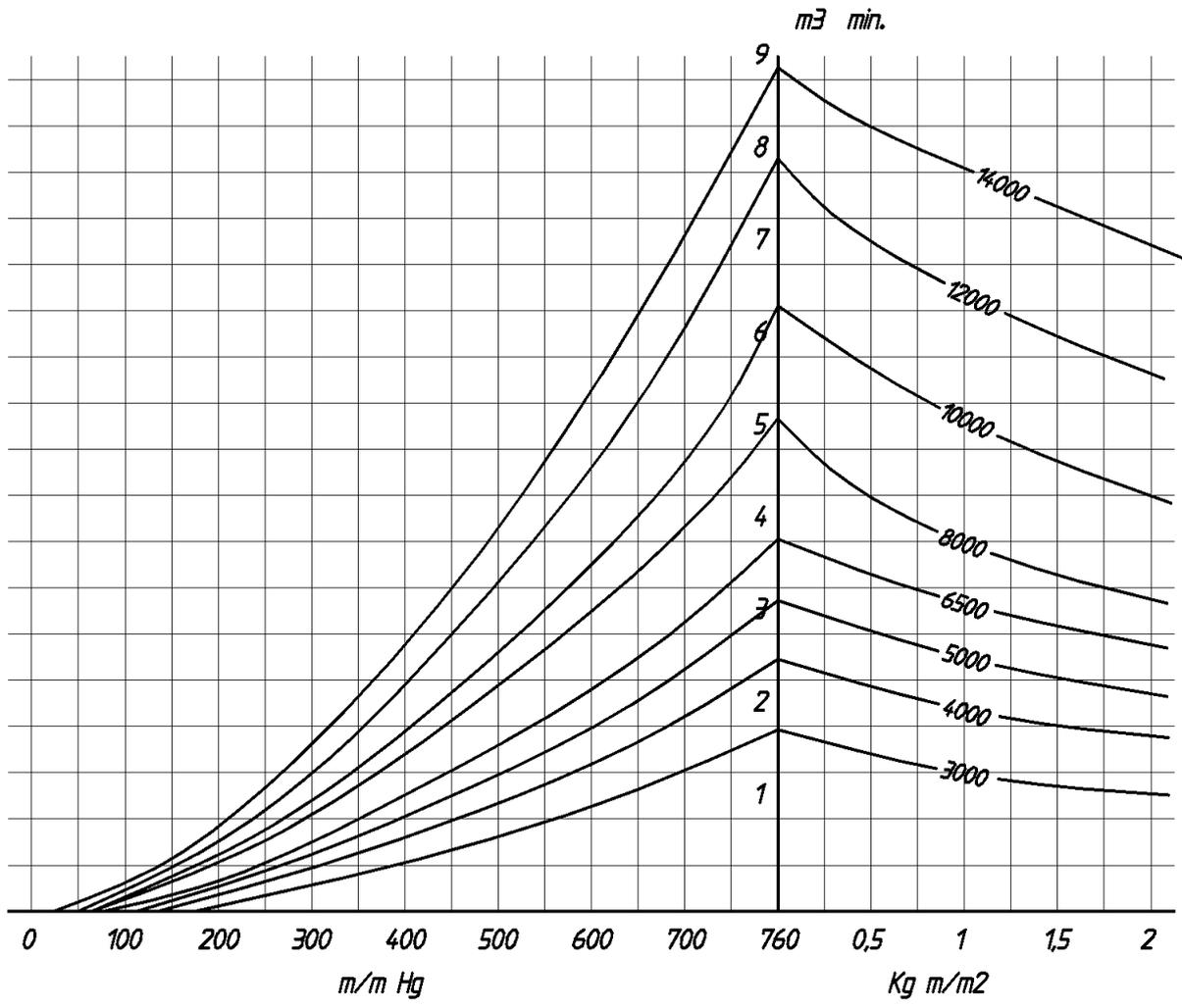
4.2. - Dimensions:



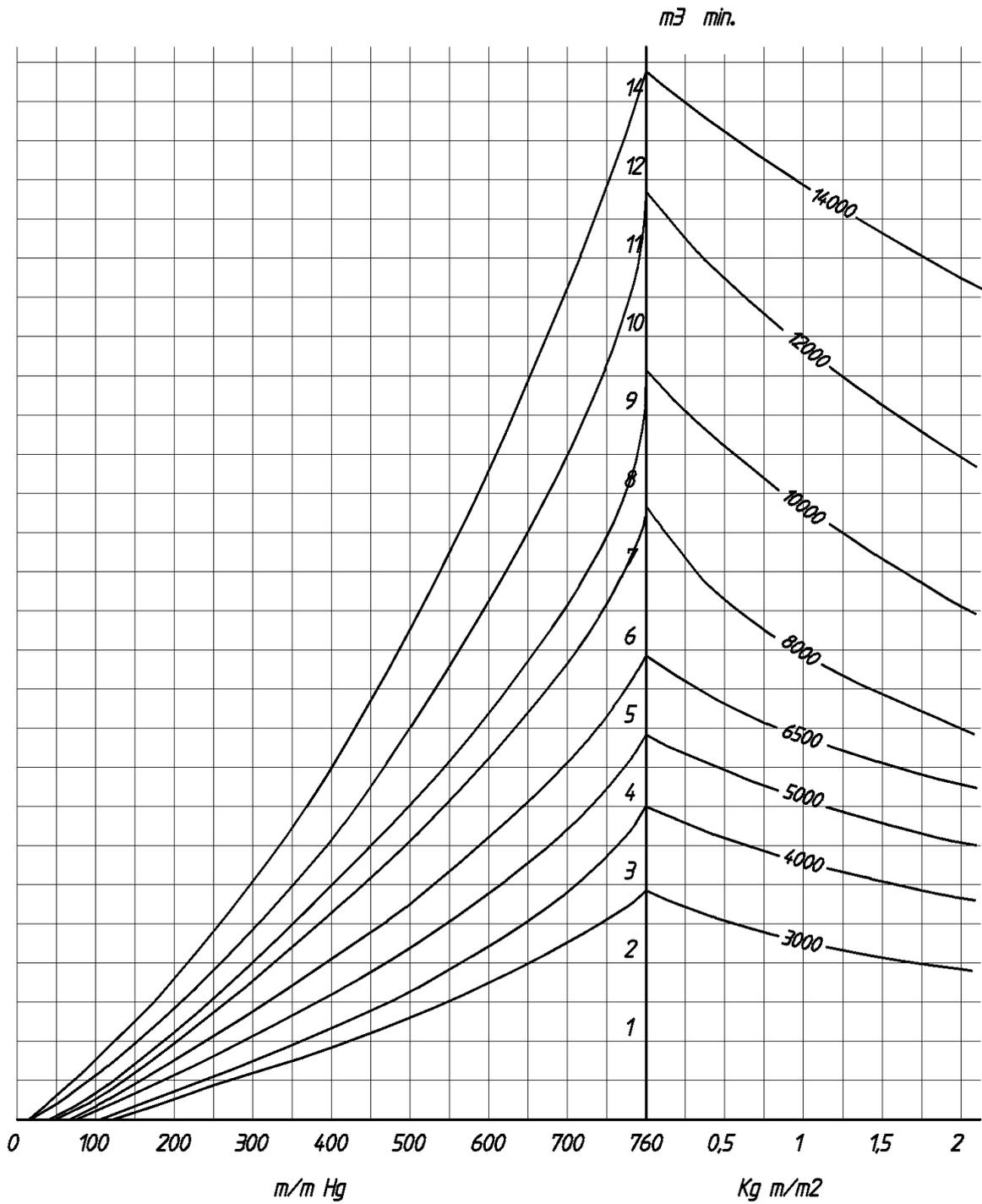
| Mod. | A | B | C | D | E | F | G | H | I | J | Weight Kg |
|-----------|-----|-----|----|----|-----|-----|-----|-----|-----|----|-----------|
| KD-14.000 | 895 | 675 | 95 | 20 | 140 | 460 | 340 | 280 | 390 | 79 | 185 |

4.3. Air flow

Air flow diagrams depending on the rotor turning speed:



Cubic meters / minute. Rotor turning speed: 1.000 rpm.



Cubic meters / minute. Rotor turning speed: 1.450 rpm.

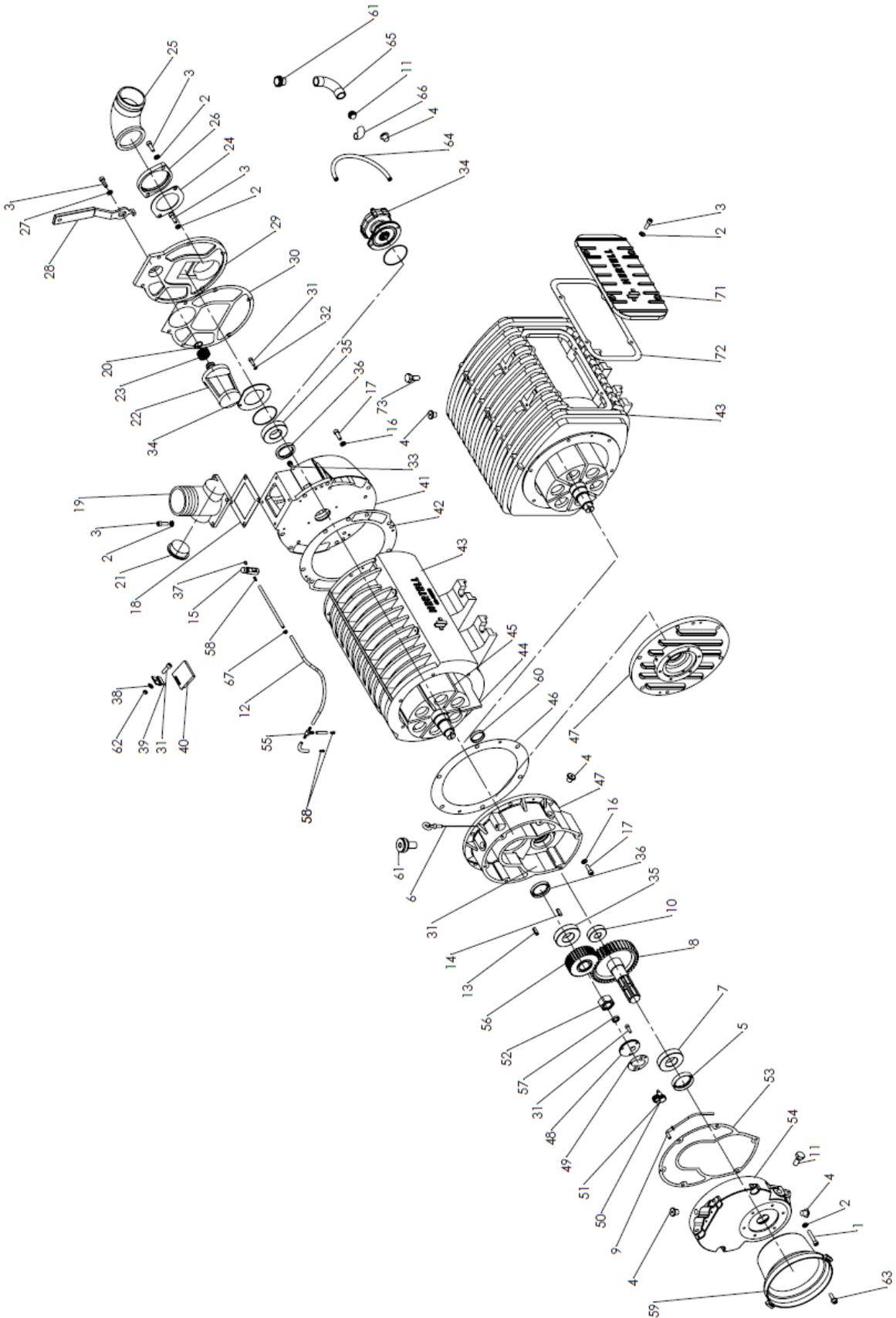
4.4. Other specifications.

| Mod. | KD-14.000 |
|------------------------|------------------|
| Rpm. (Max.) | 540 1.000 |
| Maximum vacuum (%) | 90 |
| Maximum pressure (bar) | 1,5 |
| Weight (kG) | 175 |
| Noise level (dB) | 87 |
| Power consumption (kW) | 28 |

Power consumption and noise level at maximum pressure.

5. Parts list. Drawings.

The following list and drawings identify the spare parts of any KD-14.000:



KD-14.000 Spare Parts:

| Refer. | Article |
|------------|--|
| 01KD140001 | N. 1. Screw for KD-6500/14000 |
| 01KD140002 | N. 2. Washer for KD-3000/14000 |
| 01KD140003 | N. 3. Screw for KD-3000/14000 |
| 01KD140004 | N. 4. Plug for KD-3000/14000 |
| 01KD140005 | N. 5. Seal for KD-3000/14000 35x55x10 |
| 01KD140006 | N. 6. Oil level indicator KD-3000/14000 |
| 01KD140007 | N. 7. Bearing for KD-6500/14000 6307 |
| 01KD140008 | N. 8. Attack gear 55 teeth KD-6500/14000 |
| 01KD141008 | N. 8. Attack gear 1000 rpm KD-6500/14000 |
| 01KD140009 | N. 9. Nipple 90 for KD-3000/14000 |
| 01KD140010 | N.10. Bearing for KD-3000/14000 6304 |
| 01KD140011 | N.11. Oil sight glass KD-3000/14000 |
| 01KD140012 | N.12. Oil tube for KD-14000 |
| 01KD140013 | N.13. Elastic pin for KD-3000/14000 |
| 01KD140014 | N.14. Key for KD-6500/14000 |
| 01KD140015 | N.15. Drop feeder for KD-3000/14000 |
| 01KD140016 | N.16. Washer for KD-3000/14000 |
| 01KD140017 | N.17. Screw for KD-3000/14000 |
| 01KD140018 | N.18. Gasket for KD-6500/14000 |
| 01KD140019 | N.19. Outlet \varnothing 80 KD-6500/14000 |
| 01KD141019 | N.19. Outlet \varnothing 100 KD-14000 |
| 01KD142019 | N.19. Double outlet \varnothing 80 KD-6500/14000 |
| 01KD140020 | N.20. O-Ring for KD-3000/14000 |
| 01KD140021 | N.21. Plug for KD-3000/14000 |
| 01KD140022 | N.22. Conic distributor for KD-6500/14000 |
| 01KD140023 | N.23. Spring for KD-3000/14000 |
| 01KD140024 | N.24. Outlet gasket KD-3000/14000 |
| 01KD140025 | N.25. Outlet for KD-3000/14000 |
| 01KD140026 | N.26. Flange for KD-3000/14000 |
| 01KD140027 | N.27. Washer for KD-3000/14000 |
| 01KD140028 | N.28. Handle for KD-3000/14000 |
| 01KD140029 | N.29. Distributor cover KD-14000 |
| 01KD140030 | N.30. Gasket for KD-6500/14000 |
| 01KD140031 | N.31. Screw for KD-3000/14000 |
| 01KD140032 | N.32. Washer for KD-3000/14000 |
| 01KD140033 | N.33. Lubrication nipple for KD-3000/14000 |
| 01KD140034 | N.34. Bearing cover for KD-6500/14000 |
| 01KD141034 | N.34. Water pump for KD-14000 |
| 01KD140035 | N.35. Bearing for KD-6500/14000 6208 |
| 01KD140036 | N.36. Seal for KD-6500/14000 45x60x12 |
| 01KD140037 | N.37. Plug M6 for KD-3000/14000 |
| 01KD140038 | N.38. Copper washer KD-3000/14000 |

| | |
|------------|---|
| 01KD140039 | N.39. Hinge for KD-3000/14000 |
| 01KD140040 | N.40. Plug for KD-6500/14000 |
| 01KD140041 | N.41. Distributor for KD-14000 |
| 01KD140042 | N.42. Gasket for KD-6500/14000 |
| 01KD140043 | N.43. Body for KD-14000 |
| 01KD140044 | N.44. Vane for KD-12/14000 (425x64x7,5) 6 |
| 01KD140045 | N.45. Rotor for KD-14000 |
| 01KD140046 | N.46. Gasket for KD-6500/14000 |
| 01KD140047 | N.47. Gearbox for KD-6500/14000 |
| 01KD140048 | N.48. Oil pump cover KD-3000/14000 |
| 01KD140049 | N.49. Oil pump gasket KD-3000/14000 |
| 01KD140050 | N.50. Oil pump attack gear KD-3000/14000 |
| 01KD140051 | N.51. Oil pump gear KD-3000/14000 |
| 01KD140052 | N.52. Lock nut for KD-3000/14000 |
| 01KD140053 | N.53. Gasket for KD-6500/14000 |
| 01KD140054 | N.54. Gearbox cover for KD-6500/14000 |
| 01KD140055 | N.55. T-connection for KD-3000/14000 |
| 01KD140056 | N.56. Small gear 28 teeth KD-6500/14000 |
| 01KD141056 | N.56. Small gear 1000 rpm KD-6500/14000 |
| 01KD140057 | N.57. Seal for KD-3000/14000 12x20x5 |
| 01KD140058 | N.58. Pipette for KD-3000/14000 |
| 01KD140059 | N.59. PTO Guard for KD-3000/14000 |
| 01KD140060 | N.60. Rotor plug for KD-3000/14000 |
| 01KD140061 | N.61. 1/2" plug para KD-3000/14000 |
| 01KD140062 | N.62. Nut for KD-3000/14000 |
| 01KD140063 | N.63. PTO Guard screw KD-3000/14000 |
| 01KD140067 | N.67. Bracket for KD-3000/14000 |
| 01KD140099 | N.99. Accessories kit for KD-6500/14000 |

6.- Warranty.

Each pump is checked in our Test-bank by vacuum and pressure before leaving our Works, being the oil system regulated as well. Thereafter each vacuum pump is identified with a manufacture number.

Our pumps have one year warranty after delivery against defects of material or assembly. HERTELL S.COOP is not responsible of direct or indirect costs caused by the pump misuse. In case of reclamation, it is decision of Hertell S.Coop. to verify the origin of the claim. It is the responsibility of the tank manufacturer to verify that the pump is going to be used according to the advised instructions.

The vacuum pumps fulfil the 89/392/CEE directive about machines (partly completed machine) and its posterior modification 98/37/CEE and 2006/42/CEE, according to the norms concerning vacuum pumps and compressors UNE - EN 1012-1 and UNE - EN 1012-2. By request a certificate according to this directive is available.

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