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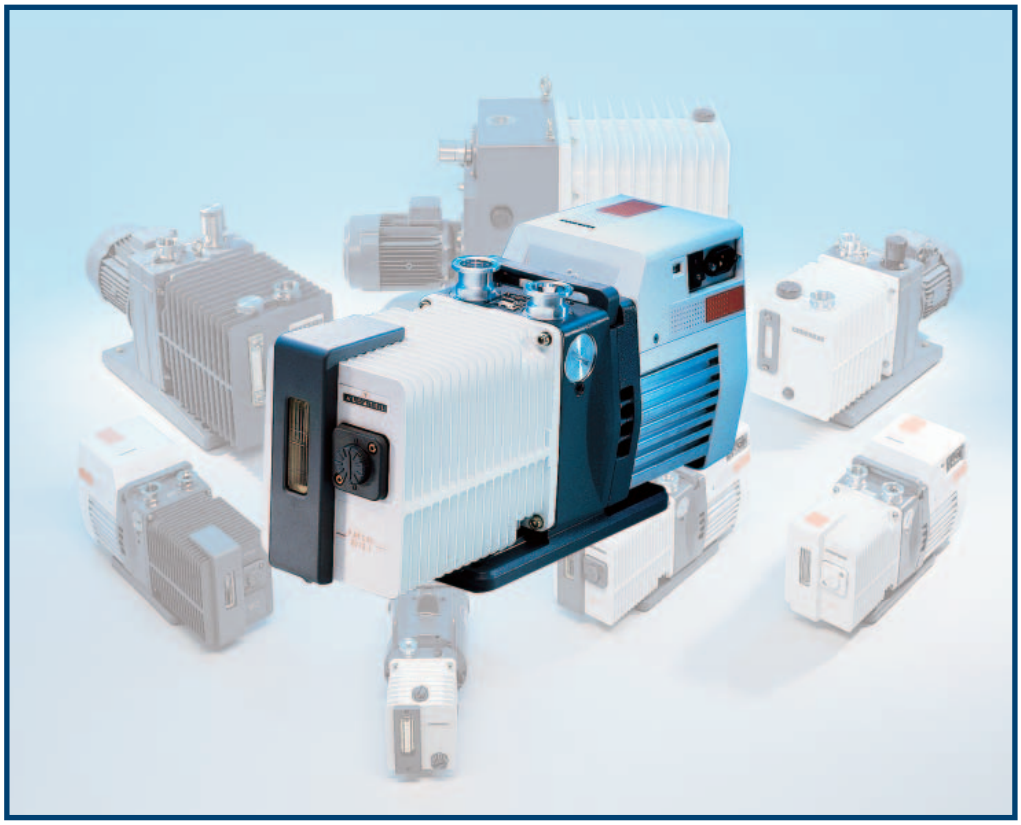
PASCAL Series
5 to 21 m³/h
I, SD, C1, C2 Series

ROTARY VANE PUMPS



User's Manual

adixen
by Alcatel Vacuum Technology

Alcatel Vacuum Technology, as part of the Alcatel-Lucent Group, has been supplying vacuum pumps, helium and hydrogen leak detection systems, plasma sensors, vacuum measurement for several years.

Thanks to its complete range of products, the company has become an essential player in multiple applications : instrumentation, Research & Developement, industry and semiconductors.

Alcatel Vacuum Technology has launched Adixen, its new brand name, in recognition of the company's international standing in vacuum position.

With both ISO 9001 and 14001 certifications, the French company is an acknowlegded expert in service and support, and Adixen products have the highest quality and environmental standards.

With 45 years of experience, AVT today has a worldwide presence, through its international network that includes a whole host of experienced subsidiaries, distributors and agents.

The first step was the founding of Alcatel Vacuum Products (Hingham- MA) in the United States, thirty years ago, reinforced today by 2 others US subsidiaries in Fremont (CA) and Tempe (AZ).

In Europe, AVTF-France headquarters and its subsidiaries, Alcatel Hochvakuumtechnik (Germany), Alcatel Vacuum Technology UK (Scotland), Alcatel Vacuum Technology Benelux (Netherlands), Alcatel Vacuum Systems (Italy) and more recently Adixen Sensistor AB in Sweden (in 2007) form the foundation for the European partner network.

In Asia, our presence started in 1993 with Alcatel Vacuum Technology (Japan), and has been strengthened with Alcatel Vacuum Technology Korea (in 1995), Alcatel Vacuum Technology Taiwan (in 2001), Alcatel Vacuum Technology Singapore, Alcatel Vacuum Technology Shanghai (China) (in 2004)

This organization is rounded off by more than 40 represensatives based in a variety of continents.

Thus, whatever the circumstances, the users of Adixen products can always rely on quick support of our specialists in Vacuum Technology.

Gb 02834 - Edition 04 - Aug 2007

Welcome

Rotary vane pumps

Dear customer,

You have just bought an Adixen rotary vane pump. We would like to thank you and are proud to count you among our customers.

This product is a result of experience acquired over many years by Alcatel Vacuum Technology in the design of rotary vane pumps.

APPLICATIONS:

- RESEARCH AND DEVELOPMENT
  Physics and chemistry laboratories, etc.
- INDUSTRY
  Foodstuffs (freeze-drying), Pharmaceuticals, Electronic tube manufacture, Metallurgy, Drying systems, Refrigeration systems, Chemical industry, etc.
- INSTRUMENTATION
  Mass spectrometetry, Centrifuges, Electronic microscopes, Leak detection systems, etc.
- VARIOUS SEMICONDUCTOR PROCESSES

We suggest that you read this manual, particularly the chapter on installation and operation, before you start to use this pump so that you can obtain optimum levels of performance and complete satisfaction from this equipment.

This product complies with the requirements of European Directives. listed in the Declaration of Conformity contained in page 55 of this manual. These Directives are amended by Directive 93/68/E.E.C (E.C. Marking).

CAUTION	**Indicates a potentially hazardous situation which, if not avoided, could result in property damage.**
⚠ CAUTION	**Indicates a potentially hazardous situation which, if not avoided, could result in moderate or minor injury. It may also be used to alert against unsafe practices.**
⚠ WARNING	**Indicates a potentially hazardous situation which, if not avoided, could result in death or severe injury.**
⚠ DANGER	**Indicates an imminently hazardous situation that, if not avoided, will result in death or severe injury (extreme situations).**

Contents

Presentation of the product range

A wide range

Specific solutions adapted to various applications

Oil seal rotary vane pumps are used in all vacuum technology applications.

They can be used on their own to achieve a maximum vacuum of 10^{-3} Torr (10^{-3} mbar). or in pumping assemblies. e.g. at the exhaust of a diffusion pump or turbomolecular pump.

SD series **Standard pumps for several purposes (non-corrosive applications)**.
Manufacture of light bulbs. production of TV tubes. manufacture of electronic tubes. metallurgy. centrifuges. etc.

I series **Pumps designed to meet the requirements of analytical instrumentation and R&D**.
Mass spectrometer. electronic microscopes. GC/MS. LC/MS. gas analyzers. leak detectors. sterilizers. etc.

C1 series **Pumps suited to the pumping of corrosive gases.**
R&D. laboratories. freeze-drying. pumping of solvents. etc.

C2 series **Pumps with increased resistance to meet the requirements of the more aggressive processes of the semiconductor industry.**
Ion implantation. sputtering. etc.

H1 series **Sealed pumps offering maximum tightness.**
Pumping of pure or precious gases.

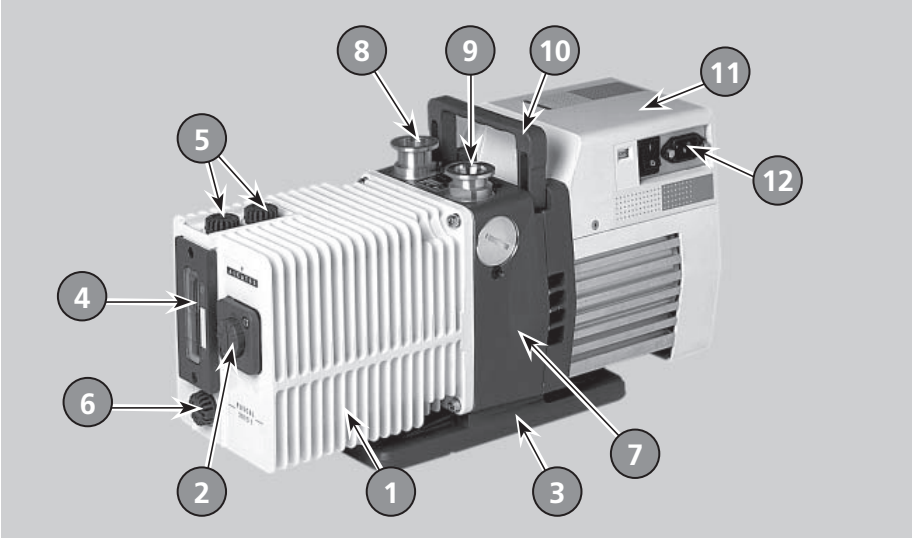
Nom. fl. rate	m^3/h	5	10	15	21
I series	2 stages	2005I	2010I	2015I	2021I
SD series	1 stage	1005SD	1010SD*	1015SD	1021SD*
	2 stages	2005SD	2010SD	2015SD	2021SD
C1 series	1 stage	1005C1*	1010C1*	1015C1*	1021C1*
	2 stages	2005C1	2010C1	2015C1	2021C1
C2 series	2 stages		2010C2	2015C2	2021C2
H1 series	2 stages	2005H1		2015H1	

* Not available for sales.

5 to 21 m³/h rotary vane pumps. I. SD. C1. C2 Pascal series

Four 5 to 21 m³/h pump models with the following main characteristics:

- A **direct drive motor.** making them very compact.
- An electrically insulated **fold-away handle** is used for easy carrying.
- An **anti-suckback system** ensures the tightness of the pump during accidental or voluntary shutdowns.
- A **gas ballast** enables the pumping of condensable vapours (except for C2 series).
- The universal three-phase or single- phase **motor** can be disassembled **independently** of the rest of the pump. without the need to drain the oil case.
- On the oil case. a **vertical sight glass** can be used to inspect the oil level easily when filling the tank and during the operation of the pump.
- A **neutral gas purge** is used to degas oil and dilute pumped gases on C2 series models.



1. Oil case
2. Gas ballast control
3. Base
4. Oil level sight glass
5. Filling plugs
6. Draining plug
7. Frame
8. Inlet end fitting
9. Exhaust end fitting
10. Fold-away handle
11. Electric motor
12. IEC electric socket

The inlet and exhaust end fittings are PNEUROP ISO-KF standardized.
They are fitted vertically on the pump at delivery but can be positioned on the horizontal openings if required by operating conditions.
They can also be used to connect many of our accessories (***see page 13***).

The main remplacement parts are interchangeable: This enables easier disassembly-assembly operations and replacement without changing the pump's performance.

Various accessories can be used to adapt the pump to meet the requirements of your application.

The moulded aluminium pump frame supports the pumping module and the motor.
All the parts of the pumping module in contact with gases are free of zinc. copper and cadmium.
The other construction materials include cast iron. aluminium alloy. stainless steel. fluorocarbons (FPM). nitril (NBR) and chemically resistant polymers.

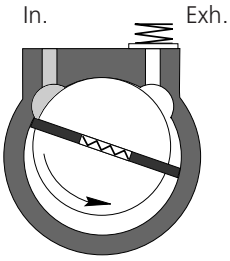
Operating principle of the rotary vane pump

Single-stage rotary vane pump

This is a volumetric pump. with a functional part composed of:
– A hollow cylindrical stator with inlet and exhaust valves.
– A rotor mounted eccentrically inside the stator for pumping.
– Two vanes sliding in the rotor. forced against the stator by centrifugal force and springs.

The pumping cycle is given below:

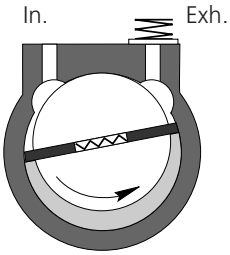
Inlet



As the vane passes in front of the inlet orifice. an increasing space is formed into which the gas from the chamber to be evacuated expands.

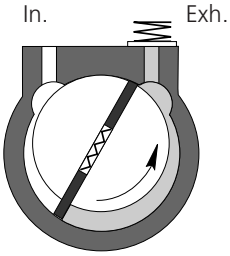
When the second vane passes. the space is closed.

Transfer



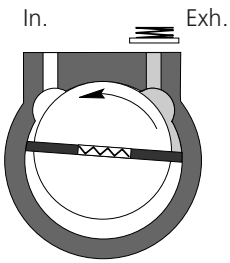
The gas trapped in the space between the two vanes is transferred to the exhaust orifice as the rotor rotates.

Compression



The space communicates with the exhaust. which is fitted with a valve: the gas is compressed until the safety valve is opened.

Exhaust



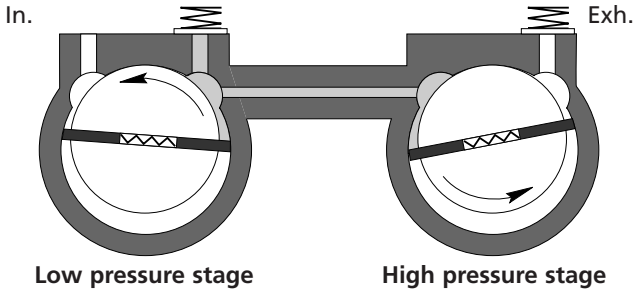
The gas is expelled into the oil casing when the pressure is sufficient to open the valve.

Applications

Single stage rotary vane pumps are the best choice for continuous pressures above 1.0 Torr (1.3 mbar). as well as applications where large amounts of condensable gases are present.

Two-stage rotary vane pump

To improve the backing pressure and flowrate at low pressure. two stages are connected in series. The second is similar to the first both structurally and operationally. The gases pulled in by the first (low pressure) stage are transferred to the second (high pressure) stage and discharged through the high pressure (HP) valve.



Applications

Two stage rotary vane pumps are the best choice for application requiring an ultimate vacuum as low as 10^{-3} Torr (1.33 x 10^{-3} mbar).

Note : when operating a two stage vane pump continously. greater than half an hour. above 1.0 Torr. the unit should be equipped with an oil mist eliminator and oil return system. see oil draining kit ***(page 13***). or a single stage pump should be used.

Oil

Its function

Oil has several important functions in the pump:
– It lubricates mechanical components (bearings. seals. rotor. vanes. etc.).
– It makes moving parts relatively tight by limiting internal leakage.
– It carries away the heat produced by the compressed gases.

Choosing the right oil

Not all oils produce the same ultimate pressure in a given pump. Ultimate pressure depends on the saturated vapour pressure of the oil. its viscosity and its ability to dissolve gases.

Good pumping conditions are related to the type of oil used.

The choice depends on:
– Expected pump performance.
– Chemical aggression and corrosion of pumped gases.
– Accessories used.
– Desired maintenance intervals and total operating cost.

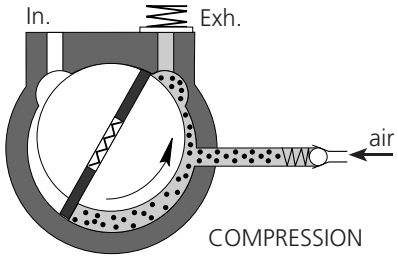
The manufacturer has selected various types of oil for its pumps (***see page 17***).

Lubrication and anti-noise device

The pump is equipped with a **lubrication** system which regulates the oil flow rate required in the vacuum pump. In addition this system also ensures the gassing of the lubrication oil and therefore **the low noise level** of the pump.

Gas ballast

When condensable vapours are being pumped. gas is compressed beyond its saturated vapour pressure in the "compression" phase and can condense. impairing pump performance.



The gas ballast can be used to inject a certain quantity of air (neutral or dry gas) into the last stage of the pump during the "compression" phase so that the partial pressure of the pumped gas is less than its saturated vapour pressure at the temperature of the pump. Condensation is therefore impossible if this limit is not reached. The maximum admissible vapour pressure is obtained at pump inlet for this value.

At the end of "compression". the pressure in the exhaust chamber is greater than atmospheric pressure. An anti-suckback device (valve + spring) prevents the gases and oil from being drawn back into the inlet.

The saturated vapour pressure of a body is higher when the system is hot than when it is cold; therefore. the pump must reach operating temperature before pumping condensable vapours.

⚠ CAUTION

- **Using the gas ballast increases the ultimate pressure of the pump as well as the temperature.**
- **The gas ballast control. located at the front of the oil case cannot be used to set the gas injection flow rate.**
- **When the gas ballast control is open. the pump is not tight when stopped. To guarantee this tightness. install an automatic gas ballast.**
- **Permanent operation with open gas ballast involves significant oil losses (mist) through the exhaust: use of accessories such as OME 25 HP + ODK (*see page 13*) or frequent oil level check is recommended.**

Technical characteristics

For analycal instrumentation: I Series

Two-stage pumps

Characteristics	Unit	2005 I		2010 I		2015 I		2021 I	
Frequency	Hz	50	60	50	60	50	60	50	60
Number of stages		2		2		2		2	
Rotation speed	tr/mn	1500	1800	1500	1800	1500	1800	1500	1800
Nominal flow rate	m^3/h cfm	**5.4**	**6.5** 3.8	**9.7**	**11.6** 6.8	**15**	**18** 10.6	**20.7**	**24.8** 14.6
Flow rate Pneurop method	m^3/h cfm	**4.8**	**5.7** 3.4	**8.5**	**10.2** 6	**12.5**	**15** 8.8	**16.5**	**20** 11.8
Partial ultimate pressure* with A120 oil	Torr/mbar Pa	**$7.5x10^{-5}$ / $1x10^{-4}$** $1x10^{-2}$							
Ultimate pressure with gas ballast closed	Torr/mbar Pa	**$1.5x10^{-3}$ / $2x10^{-3}$** $2x10^{-1}$							
Ultimate pressure with gas ballast open	Torr/mbar Pa	**$7.5x10^{-3}$ / $1x10^{-2}$** 1							
Oil capacity	l	0.83		0.95		0.95		0.98	
Maximum water vapour pumping capacity (Ballast flowrate 1.1 m^3/h)	mbar Pa	**35** 35.10^2	**25** 25.10^2	**20** 20.10^2	**15** 15.10^2	**12** 12.10^2	**10** 1.10^3	**7** 7.10^2	**7** 7.10^2
Water vapour pumping capacity	g/h	120	110	125	100	110	100	90	90
Weight (pump + motor)**	kg (lbs)	25 (55)		26 (57)		27 (59.5)		28 (62)	
Inlet and exhaust end fittings		DN 25 ISO-KF							

For industry: SD Series

Two-stage pumps

Characteristics	Unit	2005 SD		2010 SD		2015 SD		2021 SD	
Frequency	Hz	50	60	50	60	50	60	50	60
Number of stages		2		2		2		2	
Rotation speed	tr/mn	1500	1800	1500	1800	1500	1800	1500	1800
Nominal flow rate	m^3/h cfm	**5.4**	**6.5** 3.8	**9.7**	**11.6** 6.8	**15**	**18** 10.6	**20.7**	**24.8** 14.6
Flow rate Pneurop method	m^3/h cfm	**4.8**	**5.7** 3.4	**8.5**	**10.2** 6	**12**	**15** 8.8	**15.5**	**20** 11.8
Partial ultimate pressure* with A120 oil	Torr/mbar Pa	**$7.5x10^{-5}$ / $1x10^{-4}$** $1x10^{-2}$							
Ultimate pressure with gas ballast closed	Torr/mbar Pa	**$1.5x10^{-3}$ / $2x10^{-3}$** $2x10^{-1}$							
Ultimate pressure with gas ballast open	Torr/mbar Pa	**$7.5x10^{-3}$ / $1x10^{-2}$** 1							
Oil capacity	l	0.83		0.95		0.95		0.98	
Maximum water vapour pumping capacity (Ballast flowrate 1.1 m^3/h)	mbar Pa	**35** 35.10^2	**25** 25.10^2	**20** 20.10^2	**15** 15.10^2	**12** 12.10^2	**10** 1.10^3	**7** 7.10^2	**7** 7.10^2
Water vapour pumping capacity	g/h	120	110	125	100	110	100	90	90
Weight (pump + motor)**	kg (lbs)	25 (55)		26 (57)		27 (59.5)		28 (62)	
Inlet and exhaust end fittings		DN 25 ISO-KF							

* Partial ultimate pressure measured according to Pneurop 6602 specifications with A120 oil charge.
It may vary if other oils are used (***see page 17***).
** These values are for pumps equipped with universal single-phase motors.

Note: The pressure measurements were made with a capacitive diaphragm pressure gauge measuring a total pressure in the absence of a cold trap. Measurements using a Pirani type gauge can give different pressure values.

Corrosive applications: C1 Series

Two-stage pumps

Characteristics	Unit	2005 C1		2010 C1		2015 C1		2021 C1	
Frequency	Hz	50	60	50	60	50	60	50	60
Number of stages		2		2		2		2	
Rotation speed	tr/mn	1500	1800	1500	1800	1500	1800	1500	1800
Nominal flow rate	m^3/h cfm	**5.4**	**6.5** 3.8	**9.7**	**11.6** 6.8	**15**	**18** 10.6	**20.7**	**24.8** 14.6
Flow rate Pneurop method	m^3/h cfm	**4.8**	**5.7** 3.4	**8.5**	**10.2** 6	**12.5**	**15** 8.8	**16.5**	**20** 11.8
Partial ultimate pressure* with A120 oil	Torr/mbar Pa	**$7.5x10^{-5}$ / $1x10^{-4}$** $1x10^{-2}$							
Ultimate pressure with gas ballast closed	Torr/mbar Pa	**$1.5x10^{-3}$ / $2x10^{-3}$** $2x10^{-1}$							
Ultimate pressure with gas ballast open	Torr/mbar Pa	**$7.5x10^{-3}$ / $1x10^{-2}$** 1							
Oil capacity	l	0.83		0.95		0.95		0.98	
Maximum water vapour pumping capacity (Ballast flowrate 1.1 m^3/h)	mbar Pa	**35** 35.10^2	**25** 25.10^2	**20** 20.10^2	**15** 15.10^2	**12** 12.10^2	**10** 1.10^3	**7** 7.10^2	**7** 7.10^2
Water vapour pumping capacity	g/h	120	110	125	100	110	100	90	90
Weight (pump + motor)**	kg (lbs)	25 (55)		26 (57)		27 (59.5)		28 (62)	
Inlet and exhaust end fittings		DN 25 ISO-KF							

Corrosive applications: C2 Series

Two-stage pumps

Characteristics	Unit	2010 C2		2015 C2		2021 C2	
Frequency	Hz	50	60	50	60	50	60
Number of stages		2		2		2	
Rotation speed	tr/mn	1500	1800	1500	1800	1500	1800
Nominal flow rate	m^3/h cfm	**9.7**	**11.6** 6.8	**15**	**18** 10.6	**20.7**	**24.8** 14.6
Flow rate Pneurop method	m^3/h cfm	**8.5**	**10.2** 6	**12.5**	**15** 8.8	**16.5**	**20** 11.8
Partial ultimate pressure* with A113 oil	Torr/mbar Pa	**$3.75x10^{-4}$ / $5x10^{-4}$** $5x10^{-2}$					
Ultimate pressure with gas ballast closed	Torr/mbar Pa	**$2.25x10^{-3}$ / $3x10^{-3}$** $3x10^{-1}$					
Oil capacity	l	0.95		0.95		0.98	
Weight (pump + motor)**	kg (lbs)	26 (57)		27 (59.5)		28 (62)	
Inlet and exhaust end fittings		DN 25 ISO-KF					

* Partial ultimate pressure measured according to Pneurop 6602 specifications with A120 oil charge.
It may vary if other oils are used (***see page 17***).
** These values are for pumps equipped with universal single-phase motors.

Note: The pressure measurements were made with a capacitive diaphragm pressure gauge measuring a total pressure in the absence of a cold trap. Measurements using a Pirani type gauge can give different pressure values.

For industry: SD Series

Single-stage pumps

Characteristics	Unit	1005 SD		1010 SD		1015 SD		1021 SD	
Frequency	Hz	50	60	50	60	50	60	50	60
Number of stages		1		1		1		1	
Rotation speed	tr/mn	1500	1800	1500	1800	1500	1800	1500	1800
Nominal flow rate	m^3/h cfm	**5.4**	**6.5** 3.8	**9.7**	**11.6** 6.8	**15**	**18** 10.6	**20.7**	**24.8** 14.6
Flow rate Pneurop method	m^3/h cfm	**4.8**	**5.5** 3.2	**8.5**	**10** 5.8	**12.5**	**15** 8.8	**16.5**	**20** 11.8
Ultimate pressure* with gas ballast closed	Torr/mbar Pa	**$3.75x10^{-2}$ / $5x10^{-2}$** 5							
Ultimate pressure* with gas ballast open	Torr/mbar Pa	**3 / 4** $4x10^2$				**5.25 / 7** $7x10^2$			
Oil capacity	l	1.1		1.0		1.0		1.0	
Maximum water vapour pumping capacity (Ballast flowrate 1.1 m^3/h)	mbar Pa	**30** 3.10^3	**25** 25.10^2	**40** 4.10^3	**35** 35.10^2	**35** 35.10^2	**30** 3.10^3	**25** 25.10^2	**22** 22.10^2
Water vapour pumping capacity	g/h	120	130	260	280	330	370	340	340
Weight (pump + motor)**	kg (lbs)	21 (46)		22 (48)		24.5 (54)		25 (55)	
Inlet and exhaust end fittings		DN 25 ISO-KF							

Corrosive applications: C1 Series

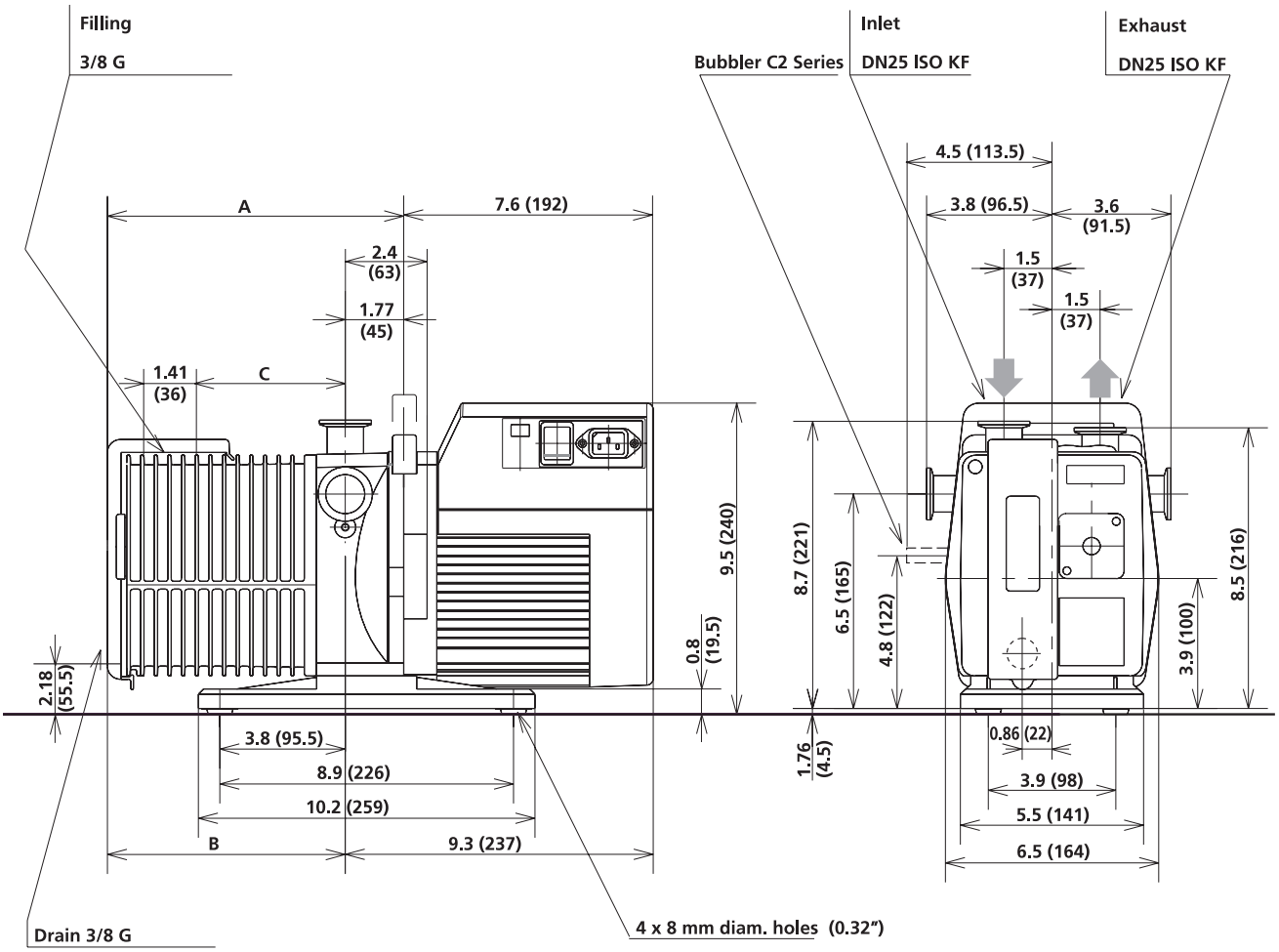
Single-stage pumps

Characteristics	Unit	1005 C1		1010 C1		1015 C1		1021 C1	
Frequency	Hz	50	60	50	60	50	60	50	60
Number of stages		1		1		1		1	
Rotation speed	tr/mn	1500	1800	1500	1800	1500	1800	1500	1800
Nominal flow rate	m^3/h cfm	**5.4**	**6.5** 3.8	**9.7**	**11.6** 6.8	**15**	**18** 10.6	**20.7**	**24.8** 14.6
Flow rate Pneurop method	m^3/h cfm	**4.8**	**5.5** 3.2	**8.5**	**10** 5.8	**12.5**	**15** 8.8	**16.5**	**20** 11.8
Ultimate pressure* with gas ballast closed	Torr/mbar Pa	**$3.75x10^{-2}$ / $5x10^{-2}$** 5							
Ultimate pressure* with gas ballast open	Torr/mbar Pa	**3 / 4** $4x10^2$				**5.25 / 7** $7x10^2$			
Oil capacity	l	1.1		1.0		1.0		1.0	
Maximum water vapour pumping capacity (Ballast flowrate 1.1 m^3/h)	mbar Pa	**30** 3.10^3	**25** 25.10^2	**40** 4.10^3	**35** 35.10^2	**35** 35.10^2	**30** 3.10^3	**25** 25.10^2	**22** 22.10^2
Water vapour pumping capacity	g/h	120	130	260	280	330	370	340	340
Weight (pump + motor)**	kg (lbs)	21 (46)		22 (48)		24.5 (54)		25 (55)	
Inlet and exhaust end fittings		DN 25 ISO-KF							

* Partial ultimate pressure measured according to Pneurop 6602 specifications with A120 oil charge.
It may vary if other oils are used (***see page 17***).
** These values are for pumps equipped with universal single-phase motors.

Note: The pressure measurements were made with a capacitive diaphragm pressure gauge measuring a total pressure in the absence of a cold trap. Measurements using a Pirani type gauge can give different pressure values.

Pump dimensions



Dim.	Type de pompe							
inch (mm)	1005	1010	2005	1015	2010	1021	2015	2021
A	9 (228)			9.6 (245)		10.6 (270)		11.5 (291)
B	7 (183)			8 (204)		8.9 (225)		9.7 (246)
C	4.55 (115.5)	5.4 (136.5)	4.55 (115.5)	6.2 (157.5)	5.4 (136.5)	7.03 (178.5)	6.2 (157.5)	7.03 (178.5)

Accessories

Name	Part number	Location	Fonctions
Oil mist eliminator OME 25 S/OME CH	**OME 25 S: 104200 OME 25 CH: 066849**	Exhaust	• Separates oil droplets and particles contained in exhaust gases emitted by the pump.
High pressure oil mist eliminator OME 25 HP/ OME 25 HP+	**OME 25 HP: 104199 OME 25 HP+: 108341**	Exhaust	• Separates oil droplets and particles contained in exhaust gases emitted by the pump. For high pressure pumping and/or frequent cycles. Can be fitted to the ODK 1 and ODK 2 kits.
Oil draining kit ODK 1	**104360**	Gas ballast	• Connected to the OME25HP, it is used to recover oil via the gas ballast. Note: the pump is not sealed when switched off.
Oil draining kit ODK 2 *	**104361 230V 50/60Hz 104362 115V 60Hz**	Gas ballast	• Connected to the OME25HP, it is used to recover oil via the gas ballast. Equipped with an electrovalve which seals the pump when switched off.
Condensate trap CT 25	**104201**	Inlet or exhaust	• Prevents liquids and solids contained in the pumped gases from entering the pump, or traps condensable vapors at the exhaust.
Dust filter DFT 25	**104202**	Inlet	• Prevents dust particles larger than 6 microns from entering the pump.
Liquid nitrogen trap LNT 25 S or LNT 25 C	**Aluminum 104197 St. steel 066889**	Inlet	• Protects the pump against condensable vapours. • Prevents oil from backstreaming into pumped chamber.
Sorption trap ST 25 S or ST 25 C	**Aluminum 104107 St. steel 066841 220V St. steel 066845 115V**	Inlet	• Prevents oil backstreaming when pumping in a "clean" vacuum.
Automatic gas ballast AGB 4 *	**104086 230V 50/60Hz 104087 115V 60Hz**	Gas ballast	• Remote control for gas ballast. • Allows the gas ballast to be closed when the pump is off, ensuring that the pump is tight.
Isolating safety valve ISV 25*	**066832 220V 50Hz**	Inlet	• In the event of power failure, it isolates the vacuum chamber from the pumping unit and ensures pump module venting.
Oil filter DE 1	**068990 220V 50/60Hz 068991 115V 50/60Hz**	External device	• Filters and/or neutralizes oil when pumping gases which are corrosive and could rapidly degrade oil quality.
Oil filter DE 2	**104374 220V 50/60Hz 104375 115V 50/60Hz**	External device	• Filters and/or neutralizes oil when pumping gases which are corrosive and could rapidly degrade oil quality.
Shock mount	**082691 LAX 100 model D**	Between base and machine frame	• Helps isolate pump vibration. • Allows pump to be mounted on a frame.

*Other voltages and frequencies available in the Adixen catalog.

⚠ CAUTION

In general, use accessories in which the tightness and materials are compatible with the pumped gases and the required safety conditions at both the inlet and the exhaust.

At the pump exhaust, the discharge circuit must be such that the resulting excess pressure in the oil case is as low as possible.
The maximum excess pressure recommended for correct pump operation is 0.5 bar (6 PSI).
A slight negative pressure in the oil case (0.1 to 0.2 bar / 1.5 PSI), at the exhaust, will prevent gases from accumulating and reduce pump corrosion and pollution.

⚠ CAUTION

If the exhaust orifice is connected to an extraction duct or an oil mist eliminator, you must remove the exhaust safety valve mounted in the pump's exhaust orifice.

Safety instructions concerning the installation and operation of pumping systems

CAUTION

Before switching on the equipment, the user must read all of the start-up and operation sections of this manual and observe the safety instructions listed in this manual.

Unpacking

When you receive the equipment, unpack it carefully. Do not discard the packaging until you have ensured that the pump has not been damaged during transport. Otherwise, take the necessary measures with the transporting company and, if necessary, notify the manufacturer.

For all handling, only use the devices provided for this purpose (lifting rings, handle, etc.).

The pump is not supplied filled with oil. The oil is contained in separate bottles. Similarly, it is recommended to drain the pump before redispatching the equipment.

Storage

• If the pump is to be stored, we guarantee the reliability of our equipment without particular storage precautions for up to 3 months (ambient temperature between 41°F and 149°F or 5 and 65°C).

• For storage periods of over 3 months, we recommend to fill the pump with oil during storage. For this, fill the pump and run it at ultimate vacuum (inlet orifice blocked) for approximately 1 hour in order to lubricate all the parts of the functional block (***see page 26***).
Then, stop the pump and store it with the inlet and exhaust orifices sealed: clamping ring, centring ring, plug, etc.
The shaft should be rotated by hand or by starting the pump every six months following this storage procedure.

• After 6 months storage without oil, factors such as temperature, degree of humidity, salt air, etc. may cause the deterioration of the pump components, particularly the hardening of O-rings and the "sticking" of lip seals on shafts and the gumming of oil. In this state, a pump may have operational problems, particularly oil leaks. Before any start-up (new pump as well as used), the pump must be disassembled (***see page 42***), and all the seals changed.

Note 1:
The seal kits must be stored with caution. Keep them away from heat and light (sunlight and ultraviolet light) in order to prevent the elostomers from hardening (AFNOR standard FD T 46.022).

Installation and start-up

• The machines must be connected to an electrical installation in compliance with decree 88-1056 dated 14th November 1988, as well as any local electrical codes that apply.

• It is important to isolate the machine from the power source before any intervention on the equipment (for maintenance purposes).

• When switching off the power of equipment containing capacitors loaded with over 60 VDC or 25 VAC, take precautions when accessing the connector pins (single-phase motors, equipment with mains filter, frequency converter, monitor, etc.).

• Vane roughing pumps use lubricants, it is recommended to request information from the manufacturer on the safety data sheets concerning the product used.

• Our pumps are tested in the factory with A120 oil or A119 for the USA (A113 oil for the C2 series). It is recommended to use the same oil during operation.
If changing the type of oil, refer to the chapter concerned for the procedure and the type of lubricant required.

• Our pumps are designed to prevent any thermal risk for user safety. However, specific operating conditions may generate temperatures which may justify particular attention on the part of the user (outer surfaces > 70°C).

Table of recommended oils

Recommended oils

In the vane pumps, we recommend to use only the manufacturer's oils in the table below:

Oil	Characteristics and applications	Density	Viscosity mm²/s (cst)	Vapor pressure at 25°C (mbar)	Total ultimate pressure* (mbar)	Flash point/ self ignition temperature (°C)
A102	Additivated hydro-carbon anti-emulsion mineral oil - oil and water separation (anti-emulsion) - drying and water vapor pumping - freeze-drying	0.88	98 to 40°C 11.1 to 100°C	$<1.10^{-3}$	$<3.10^{-2}$	230°C 260°C
A111	Hydro-carbon based synthetic oil - stable pumping at high temperature - gas circulation in recycling - oxidation sensitive (frequent atmospheric cycle prohibited)	0.87	100 to 40°C 7.8 to 100°C	$<1.10^{-3}$	$<1.10^{-2}$	212°C 245°C
A113	Perfluoropolyether (PFPE) synthetic oil - pure Oxygen pumping - highly inert to chemical - highly corrosive gas pumping - plasma etching compatible	1.9	90 to 40°C 11 to 100°C	$<3.10^{-5}$	$<5.10^{-3}$	None None
A119	Hydro-carbon mineral oil - general purposes (common use at 60 Hz) - non-corrosive products - low viscosity (low temperature starting)	0.86	54 to 40°C 8.1 to 100°C	$<4.10^{-5}$	$<3.10^{-3}$	213°C 244°C
A120	Hydro-carbon mineral oil non additivated - general purposes (common use at 50 Hz) - non-corrosive products - high viscosity	0.886	120 to 40°C 12.5 to 100°C	$<4.10^{-5}$	$<3.10^{-3}$	260°C 295°C
A121	Special hydro-carbon double distilled synthetic oil with anti-oxidant additive - atmospheric cycle pumping - high temperature and pressures - acid and organic vapor resistivity - plasma etching prohibited	0.83	64 to 40°C 10 to 100°C	$<1.10^{-7}$	$<3.10^{-3}$	268°C 296°C
A155	Synthetic oil organic ester type - compatible with hydro-carbon vapors - compatible with NH3, R134a, refrigerating agent fluids - oxidation resistivity - polymerization resistivity (low coating)	0.957	94 to 40°C 9.1 to 100°C	$<1.10^{-5}$	$<3.10^{-3}$	240°C 350°C
A200	Double distilled mineral oil non additivated - pumping of corrosive products - ionizer plasma resistivity - low backstreaming	0.86	58 to 40°C 8.5 to 100°C	$<1.10^{-5}$	$<2.10^{-3}$	223°C 259°C
A300	Hydro-carbon based mineral oil, double distilled, non additivated. - highly resistant to chemical attacks - highly ionizer plasma resistivity - pumping of Lewis acids, halogens - low backstreaming	0.86	56 to 40°C 8.9 to 100°C	$<1.10^{-5}$	$<5.10^{-3}$	243°C 270°C

* Ultimate pressure measured according to Pneurop 6602 specifications on 2015 pump.
These values are given as a rough guide only. They may vary according to the type of pump and the pumping conditions.

However, the following replacement fluids can be used:

Mineral oil:
ELF MOVIXA PV 100, TURBELF SA 100,
BP CS 100 (BP registered trademark)
SHELL VITREA 100 (SHELL registered trademark)
TOTAL CORTIS PV 100 (TOTAL registered trademark)
INLAND 19, INLAND 20 (INLAND registered trademark)
MR 200 (MATSUMURA registered trademark)

Mineral-based synthetic oils:
ELF BARELF F 100, ELF BARELF C 68 (ELF registered trademark)
INVOIL 20 (INLAND registered trademark)
INLAND TW (INLAND registered trademark)
ELITE Z (CAMBRIGE MILL PRODUCTS, INC. reg. trademark)

Ester type synthetic oils:
ANDEROL 555 (ANDEROL-BV registered trademark)
ANDEROL RCF 96 N (ANDEROL-BV registered trademark)

Fluorocarbon synthetic oils:
FOMBLIN YL VAC 25-6 (MONTEDISON registered trademark)
KRYTOX 15-25 (DU PONT DE NEMOURS registered trademark)
HALOVAC 100 (HALOCARBON registered trademark)
AFLUNOX 15.25 (SCM registered trademark)

Note: In this case, pump performances may be slightly different from those given in pages 9, 10, 11.

Filling with oil

5 to 21 m^3/h I, SD, C1 series pumps are tested in the factory with **A120** oil (or A119 for USA).

5 to 21 m^3/h C2 series pumps are tested in the factory with **A113** oil.

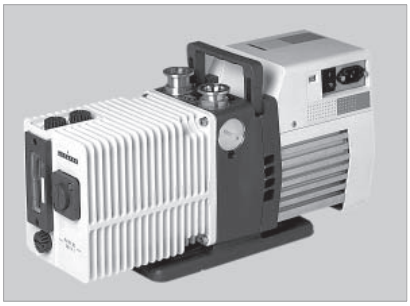
At delivery, there is some oil remaining in the functional block.

⚠ CAUTION

Our pumps are tested in the factory with manufacturer's oil: it is recommended to use the same oil during operation. To change the type of oil, refer to the Maintenance Chapter, "replacement of type of oil" section.
In all cases, follow the recommendations of the pump specifier for the choice of oil to be used.

If necessary, carry out the special preparation procedure for the pump, then, remove the filling cap and fill with oil until the oil reaches the highest mark on the sight glass.

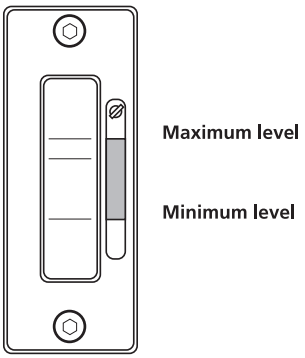
This operation must be performed with the pump switched off. The second filling orifice is used if an external oil filtration device is connected (***see accessories p. 13***).



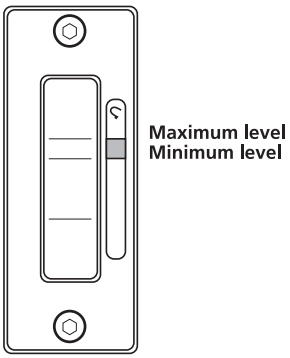
Checking the oil level

To use the pump in optimum conditions, the oil level must be observed and checked regularly. This level is checked with the pump switched off, hot and on a horizontal plane.

Oil level sight glass for "I", "C1, C2" series and 1015 SD, 1021 SD pumps



Oil level sight glass for "SD" series pumps except 1015 SD, 1021 SD



Note: Optimum pump performance and service life are obtained when the oil level is between the maximum level and the minimum level.

Mechanical connections

⚠ CAUTION

For a given application, pump performance, vacuum characteristics, temperature and reliability depend on the following:
- assembly conditions, accessory filters.
- the oil used.
- mechanical connections: pipes, etc.
- maintenance frequency and quality.
For the assembly of the vacuum circuit, provide the accessories required for maintenance: valves, purges, etc.

Mounting on a frame

The pump can be mounted on a frame using the 4 attachment holes on the base and the shock mounts supplied.

Note: Special shock mounts, effective against the pump's own vibrations, can also be used but they do not ensure correct attachment during the transfer of equipment. In this case, the pump should be clamped onto its support.

Ventilation

The pump and the motor are each equipped with a ventilation system. During pump installation, the pump should be placed in ventilated place. Provide a minimum gap of 25 mm around the pump.

The vents on the pump and the motor should be checked regularly to ensure that they are not blocked.

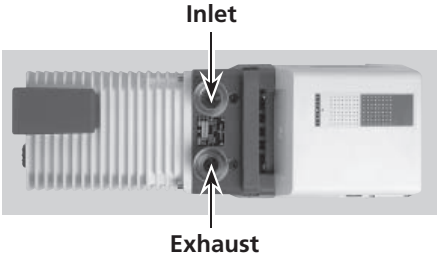
Pascal Series pumps are designed for operation at an ambient temperature between 53°F and 113°F (12 and 45°C).

Inlet and exhaust fitting

⚠ WARNING

Remove the protective caps on the inlet and exhaust orifices; these components prevent foreign bodies from entering the pump during transport and storage. It is dangerous to leave them on the pump during operation.

The pump inlet and exhaust orifices are equipped with DN 25 ISO-KF end fittings which can be used to fit various line components made of stainless steel, plastic, etc. (see the Adixen catalog).



⚠ WARNING

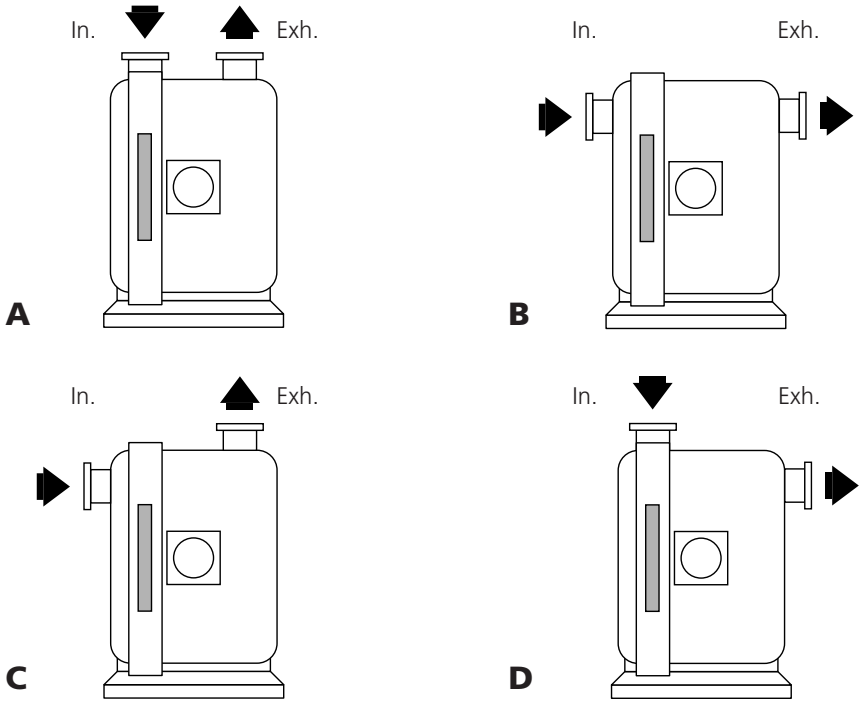
Make sure that all the components or chamber connected to the pump inlet withstand a negative pressure of 1 bar relative to atmospheric pressure.
Also make sure that the maximum excess pressure does not exceed 1 bar relative to atmospheric pressure (for security).

⚠ WARNING

It is recommended to connect the pump exhaust to a smoke evacuation duct.
• If the pump exhaust orifice is connected to an extraction duct or an oil mist eliminator, the exhaust stop valve fitted in the pump exhaust orifice must be removed.
• At the pump exhaust, the evacuation circuit must be such that the resulting excess pressure in the oil case is as low as possible: for correct pump operation the max. exhaust pressure recommended should be 1.125 Torr (1.5 bar) absolute pressure.

Changing position of inlet and exhaust fittings

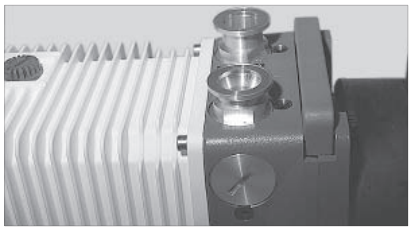
Depending on the types of accessories used and the pumping conditions, these orifices can be fitted vertically on the pump or horizontally as shown on the diagram below.
Note: The pump is supplied in configuration A.



Disassembling the fittings

4 Unfasten the attachment screw from the end fitting to be removed.

30 Unfasten the end fitting and remove it from its housing along with the O-ring. In the case of the inlet end fitting, also remove the inlet filter.



Horizontal reassembly

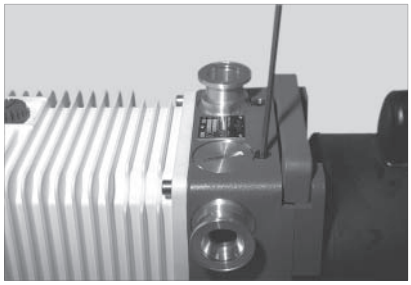
4 Remove the attachment screw from the lateral cap and using a wide screwdriver, remove the cap.

- Position the end fitting in the corresponding lateral orifice taking care to fit the O-ring.

Attach the end fitting with the screw.

In the case of the inlet end fitting, fit the filter at the bottom of the orifice.

- Close unused orifices with plugs and fasten the screws.



Electrical connections

⚠ WARNING

The pumps must be connected to an electrical installation in compliance with the decree 88-1056 dated 14 November 1988, as well as any local electrical codes that apply.

• Our products are designed to meet current EEC regulations. Any modification on the part of the user is liable to cause non-compliance with regulations or even affect the EMC (Electromagnetic compatibility) performance and safety of the product. The manufacturer cannot be held responsible for consequences resulting from such an intervention.

• Before any maintenance is performed on a product by a maintenance operator who has not been trained on safety regulations (EMC, electrical safety, chemical pollution, etc.), isolate the product from its various energy sources (electricity, compressed air, etc.).

• As a general rule, it is recommended to protect the motor for 120% of its nominal current (*see page 23*).

• Check that the electrical wiring and the voltage selector position of the motor correspond to the line voltage, before starting up the pump.

• Ensure that the electrical installation conforms with your local safety requirements. It must include the appropriate fuse and reliable earthground.

Three-phase version

Electrical motor is in accordance with major international standards (UL, CSA, CE) and offers two voltage ranges:
– Low voltage: 170 V to 254 V 50Hz - 170 V to 300 V 60Hz,
– High voltage: 342 V to 460 V 50Hz - 342 V to 520 V 60Hz.

All three phase motors (protection level IP 43. TEFC type) must be protected by a customer supplied starter consisting of a suitably rated contactor and thermal overload.

Furthermore, they are equipped with a dry contact (NC) thermal protection which is available in the terminal box.

Wire the motor according to the line voltage. The connections to be made are shown on a diagram inside the terminal box or on its lid. Check the direction of rotation of the motor (direction of arrow located on the motor cover). For this:
– Remove the protective caps on the inlet and exhaust orifices.
– Vent the pump to atmospheric pressure.
– Switch on the pump for 2 to 3 seconds, with your hand on the inlet orifice if suction is felt, the wiring is correct.

Otherwise, invert 2 consecutive phases.

The earth terminal must be connected correctly.

Single-phase version

Electrical motor is in accordance with major international standards (UL, CSA, CE) and offers two voltage ranges:
– Low voltage: 90 V to 132 V 50/60Hz,
– High voltage: 180 V to 254 V 50/60Hz.

Before connecting to the mains, check the position of the voltage selector: High Voltage (HV) or Low Voltage (LV) (***see table page 24***).

The plug is equipped with a ground pin which must be connected.

The motor rotation direction is set at the factory.

Note: single-phase motors (protection level IP 43 - TEFC type) have a thermal circuit interruptor with an automatic starting device: when the internal motor temperature reaches a value over the preset limit value, the motor stops. However, when the motor is cooled, it will start up again automatically.

External motor protection, electrical protection

Motor characteristics, connection, protection

The information below is given as a recommendation.

The user must comply with the electrical standards or recommendations (IEC, VDE, UL, CSA, etc.) applicable in the country in which the pump is used.

The use of electrical protection for the pump motor makes it possible to protect:

– The motor: in the event of excess voltage or rotor blocking, the resulting excess current may destroy the coil and possibly the start-up system (for a single-phase motor).
– The pump: in the event of a lubrication fault (contaminated oil, presence of particles), increased resistance will draw excessive motor current.

Differential thermal circuit-breakers should be used, in which the mechanism contains an instantaneous disconnection controlled by a bi-metal blade.

Never protect a three-phase motor with fuses not equipped with a differential system: if three phase motors are powered on 2 phases without a differential system, the motor could burn.

single-phase motor:

The table on the following ***page 24*** gives the characteristics at start-up (for temperatures ≥ 12°C) and in permanent operation.

In this table, you will find, for each pump, a standard fuse or motor-associated value.

three-phase motor:

The table on the following ***page 24*** gives, for each pump, the electrical characteristics in permanent operation and the proposed circuit breaker.

Single-phase motors

Specific internal protection

Single-phase motors have a thermal circuit switch with automatic starting device (CSA standard): when the internal motor temperature reaches a value over the preset limit value, the motor stops. However, when the motor is cooled, it will start-up again automatically.

Voltage range change

The voltage range can be read beside the motor switch: the dual frequency single-phase motor can be configured for low voltage (LV) or high voltage (HV).

To change this type of connection, proceed as follows:

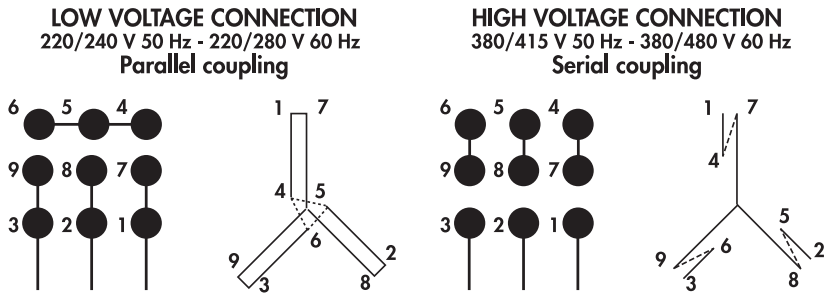
– make sure that the motor is not switched on, and the power cord is removed,
– unfasten the 4 attachment screws on the motor upper cover and tip it up,
– remove the voltage selector cover marked with the voltage, press on the voltage selector (position II).
– invert the position of the voltage selector cover in order to show the other voltage at the outside of the motor cover: "HV" for high voltages, or "LV" for low voltages. Check to be sure that the voltage selector has fully latched the rocket switch when the voltage selector cover is replaced.
– install the upper cover and refasten the 4 screws.
– secure the upper cover as follows:
  • Center it on the front motor flange,
  • Close the upper cover,
  • Install and tighten the 4 screws, starting installing the screws on the pump handle side first.

Three-phase motors

Electrical connections

The pumps are equipped with 9 wire terminal box motors, the wiring diagram of the terminals is given as a rough guide only. In the event of doubt, only the plate in the terminal box should be used as a reference.

Terminal box (9 wires)



Summary tables of various types of motors

The characteristics and ratings of fuses and circuit breaker associated with standard pump motors, 5 to 21 m^3/h, single-phase or three-phase.

Single-phase motor

	Current at ultimate pressure (A)		*Start-up current (A)		Proposed fuse protection (A)	
Voltage/Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**Standard**	**Type aM****
100V 50/60Hz	5.0	3.5	30.0	34.0	20/20	8/6
115V 60Hz		4.0		35.0	20	6
200V 50/60Hz	2.5	2.0	14.0	19.0	10/16	4/4
220V 60Hz		2.0		20.0	16	4
230V 50Hz	3.5		8.0		10	4

* Temperature = 12°C
** aM : Motor-associated type fuse

Three-phase motor

	*Start-up current (A)		Proposed circuit breaker protection (A)	
Voltage/Frequency	50 Hz	60 Hz	50Hz	60Hz
Low voltage				
200V 50/60Hz	3.1	2.8	4	3.5
220V 50/60Hz	3.5	3.1	4.5	4
240V 50Hz	4.0		5	
280V 60Hz		3.7		4.5
High voltage				
380V 50Hz	1.5		2	
415V 50Hz	1.6		2	
480V 60Hz		1.6		2

* Temperature = 12°C

Operation

Preliminary precautions

⚠ WARNING

• The performance and operating safety of this product can only be guaranteed if it is operated according to normal conditions of use.
• The vacuum pump is also a compressor: incorrect operation may be dangerous. Study the user manual before starting up the pump.
• The pumps are designed to prevent any thermal risk for user safety. However, specific operating conditions may generate temperatures which may justify particular attention on the part of the user > 70°C).
• Product tightness is guaranteed for normal operating conditions when the product leaves the factory. It is the user's responsibility to maintain the level of tightness particularly when pumping dangerous products (on C series pumps).

Operating temperature

At start-up, before switching on the motor, check that the oil bath temperature is greater than 53°F (12°C).

The ambient operating temperature for the pump must be between 53°F (12°C) and 113°F (45°C).

Under these conditions, **the stabilized pump temperature** (at the front of the oil case) will be between 140°F and 158°F (60 and 70°C) (depending on operating conditions).

Special case - Synthetic oils

Synthetic oils are much more viscous when cold than mineral oils.

Do not start up the pump at ambient temperatures below 59°F (15°C).

For the same reason and to facilitate lubrication of the pump, pour a few drops of oil (l to 2 cm^3) through the inlet orifice before starting.

Before starting-up the pump

⚠ CAUTION

Check that the exhaust orifice is not blocked.

In certain cases, when the pump is started up in cold ambient conditions, or with slightly contaminated oil, the current after start-up may remain high until the oil in the pump is heated up. These conditions are sufficient for the internal thermal protection to be activated, making start-up impossible (***see pages 23 and 24***).

Start-up

• When using a three phase motor, **check the direction of rotation of the motor** (see electrical connections ***start-up chap. page 22***).

• Check the oil level (***see page 19***).

• Start-up the pump.

• Allow the pump to run for one hour with the inlet blocked at ultimate vacuum:

During this operation, make sure that the oil circuit is operating. Remove one of the oil fill plugs to listen to the pump.

At start-up, the oil enters the lubrication circuit of the vacuum pump. As a result, noises will be heard (first irregularly, then regularly) which will reduce as the oil heats up. These noises will no longer be heard when the fill plug has been replaced.

Under normal temperature conditions, the oil circuit should start less than 1 minute after start-up (this time may vary with the type of oil and its degree of contamination).

• Using the gas ballast:

– to decontaminate the pump's oil;
– to accelerate heating. It is normal for the oil level to change (as can be seen through the oil sight glass) when the pump is hot, due to expansion of the oil, starting of the oil circuit and the operating conditions of the pump (inlet pressure). If necessary, stop the pump and adjust the oil level between the "max" and "min" levels on the sight glass.

In the event of a malfunction, refer to the "Troubleshooting and corrective actions" table (***page 34***).

Operation of gas ballast

Regeneration of pump oil

In a pump stored with the same oil for a long time, condensed vapours may contaminate the oil bath and affect performance. This is also the case after pumping vapours and when the oil appears cloudy or discolored through the sight glass.
– Run the pump, shutting it off from the system at the inlet by a valve or a plug.
– Open the gas ballast and allow the pump to operate for 1/2 hour to 1 hour, or longer if the oil remains cloudy. This operation accelerates the temperature rise of the pump while eliminating residual vapours present in the oil bath.

Pumping condensable vapours

To pump with condensable products, it is necessary to operate with a hot pump. For this, isolate the pump from the system and allow it to operate for 1/2 hour with the gas ballast open, or 1 hour (if possible) with the gas ballast closed. When the oil bath is hot, the condensation of vapours in the pump is reduced or prevented.

Choice of pump and system

The pump's capacity to eliminate condensable vapours is related to their type, the pump temperature and the quantity of air introduced by the gas ballast. Thus, for high vapour levels in a system, the single-stage pump is more suitable. However, when not pumping vapours, its ultimate pressure is higher. Care should be taken to limit the inlet pressure of the pump to its maximum admissible water vapor pressure with the pumped product. This is obtained by reading the pump characteristic table for water vapour (***see page 9 to 11***).

The use of cold traps or condensers are recommended when large quantities of vapours are to be extracted. Excessively intense or prolonged pumping may cause the products condensed in the trap to be evaporated a second time.

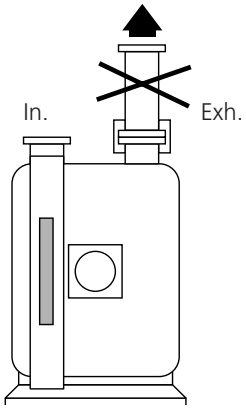
Choice of oil

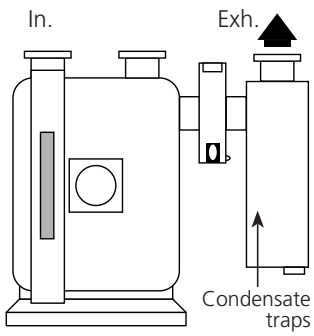
Choose an oil which facilitates the separation of pumped products which may be condensed in the oil bath (anti-emulsion oil for water-based compounds, etc.) (***see page 17***).

Assembly

The condensation of vapours at the pump exhaust is reduced if:
– the pump and oil temperature are high;
– the pressure at the exhaust is as low as possible (removal of the oil mist eliminator...);
– the condensates are collected separately from the oil bath and do not block the exhaust duct.

For this:
– avoid using any vertical ducting which promotes the condensation of products and the return of these products to the pump.
– use a condensate collector;
– we do not recommend an oil mist eliminator when pumping condensable vapors: if it is essential, do not connect it directly to the pump exhaust but place it outside the condensation zone.
– remove the stop valve from the pump exhaust;
– if possible, connect the exhaust to a mechanical device creating a negative pressure from 0.1 to 0.2 bar.





Operating mode

– Valve off the pump from the system and increase the pump temperature, 30 minutes with gas ballast (***see page 26***).
– Start pumping and check the oil level:
  • the level drops, oil is being lost;
  • the level rises, condensates have been added to the oil.
– After pumping, regenerate the oil using gas ballast if it is cloudy or discoloured.
  • if the level is too high, change the oil and regenerate.
– Change the oil as soon as inlet pressure characteristics drop and are not improved by regeneration.

Purges for pumping condensable, corrosive, and hazardous gases

All pumps models

Purges

The use of vane pumps may result in pumping gases or vapours which are flammable or that could contaminate the oil. In this case, these products must be diluted using purges supplied with dry gases, such as nitrogen to avoid undesirable reactions.

For this purpose, a filtered dry nitrogen supply or other inert gas with the same characteristics is required:
– condensation point < 22°C,
– dust < 1µm,
– minimum absolute pressure 2 bar.

Oil case purges

The purge dilutes pumped gases with a neutral gas:
it makes it possible to limit corrosion in the oil case, condensation and accumulation of gases in dead spaces of the pump.

Connect the nitrogen supply to one of the unused filling plugs on the oil case (BSPP 1/8 Gas connection).
Set the nitrogen pressure to approximately 1,2 PSIG (0.1 relativ bar) (flow 50 to 300 l/h) and the flow rate so as to satisfy the dilution conditions.
Caution: do not generate an excess pressure > 14 PSIG (1 relativ bar).

Use of purge with gas ballast

A neutral gas supply can also be connected via the gas ballast (BSPP 1/8 Gas connection).

C2 models

Purge with gas ballast

Due to the danger represented by the accidental opening of the gas ballast on a C2 series pump, manual operation of the gas ballast has been disabled. However, it is possible to disassemble it and connect it directly to a neutral gas line (BSPP 1/8 Gas connection).

The nitrogen flow rate should be from 900 to 1000 l/h with a pressure of 1 to 1,2 PSIG (0.05 to 0.1 relativ bar).

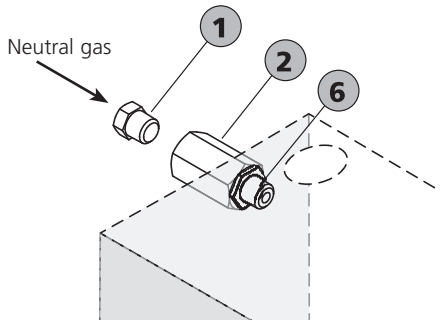
Use of the bubbler

The bubble device is composed of an air tube with several holes, located at the bottom of the oil case, which releases bubbles of neutral gas in the oil. In this way, the oil is saturated with neutral gas, which reduces its capacity to dissolve pumped gases. The bubbles of neutral gas released make it possible to eliminate the volatile vapours or acids condensed in the oil. The bubbler flow also lowers the pumps temperature which slows corrosion.

Neutral gas supply connecting to the bubbler

Remove the plug (**1**)

At this place connect in the coupling (**2**), the neutral gas supply (BSPP 1/8 Gas connection), without unscrewing the coupling (**2**) and the connector (**6**).



⚠ WARNING

Never unscrew the coupling (2) and the connector (6) from the housing.

Settings The gas flow rate is adapted according to the application and the installation, taking the following criteria into account (flow 60 to 500 l/h):

• When pumping high quantities of gas, a highly corrosive gas or an easily condansable gas, it is recommended to use a high nitrogen flow rate.
Caution ! It is assumed that a sufficient quantity of nitrogen is available.

• The pump exhaust circuit must be such that, for discharged flow rates, pressure drops do not cause an abnormal excess pressure in the oil case.

• The nitrogen flow rate must be such that oil losses have no effect on the operation of the pump throughout the pumping cycle (the oil level must be above the lower limit of the sight glass at the end of pumping).

Run the pump at ultimate vacuum for one hour and set the nitrogen flow rate as follows (at atmospheric pressure and at 20°C).

C2 Series Pumps	Nitrogen flow rate in l/h			Corresponding absolute pressures (bar)
	Min	Average	Maxi	
	60	200	500	1.05 to 1.10

Note: these characteristics apply for pumps operating at a constant inlet pressure (1 to 5 mbar): they are adapted for each case of pumping.

Start-up Start-up the pump at ultimate vacuum. When it is hot, run the nitrogen purge. Use it from the beginning and throughout pumping.

Stop When pumping stops, allow the purge to operate for approximately 1 hour (depending on the quantity of pumped gas) at ultimate vacuum, with the purge, in order to degas the oil effectively and clean the pump with nitrogen to eliminate the traces of pumped gases.

Oxygen pumping

In certain applications, mixtures containing oxygen at different concentrations, or even pure oxygen, are used.

Oils of mineral origin are combustible. Exposure to pure oxygen at high temperatures may cause them to self-ignite. In addition, they are highly oxidized during pumping and quickly lose their lubricating properties. Mineral oils must not be used for oxygen levels of over 21 % in pumped gases. In this case, perfluorinated synthetic oils must be used, see list on ***page 17***.

The use of these oils requires a special pump preparation (***see page 38***). The pump must be completely disassembled and all traces oil mineral oil removed. Flushing the oil case is not adequate.

⚠ WARNING

In addition, it is strongly recommended not to use fluids such as tri-aryl-phosphate-ester which are known to cause accidents.

Any accumulation of oxygen in the installation should be avoided and the oxygen or combustible mixture should be diluted with a neutral gas at the exhaust: the gas flow rate should be 4 times the oxygen flow rate.

Certain combustible or explosive gases require a higher degree of dilution. Our Support Services and Customer Services can advise you to help solve problems of this kind.

Recovery of oil (high pressure and cycling)

When the pump operates at high pressure, the oil heats up, becomes more fluid and is flushed out of the functional block by the gas stream.

Oil losses at the exhaust are increased.

For intermittent pumping

If the pump only operates for a very short time at high pressure, the lubricating oil is replaced when the pump returns to low pressure. The use of a oil mist eliminator prevents losses due to intermittent high pressure operation.

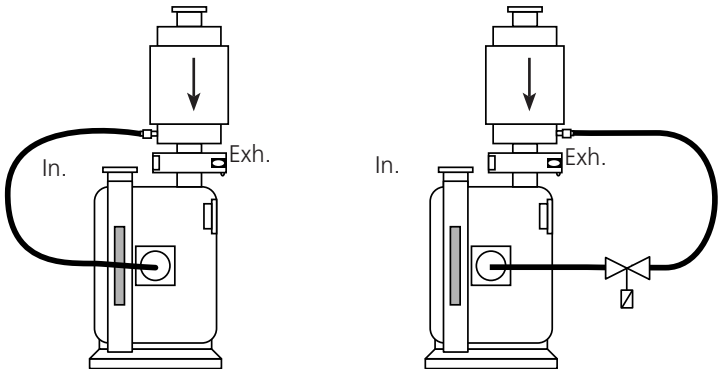
For cyclical pumping

If the pump operates at high pressure in a cyclical fashion, oil consumption may reach sufficiently high levels (according to the pumped volume and pumping cycle rates) causing the level to drop in the oil case.

There is then a risk of seizure due to a lack of oil. In addition, the high flow of gas passing through the eliminator prevents oil from returning to the oil case.

In order to pump in these conditions, the pump must be equipped with an OME 25 HP type oil mist eliminator and an ODK oil draining kit, which enables oil recovery via the gas ballast.

ODK type oil recovery device



OME 25 HP + ODK 1
⚠ Device is not tight when switched off.

OME 25 HP + ODK 2
An electrovalve ensures tightness when switched off.

For continuous pumping at high pressure

In this case, or when very large volumes (requiring several hours of pumping) are being pumped, it is recommended to recover the oil via the pump inlet.

In this case, please consult us directly.

Maintenance

General precautions

For normal operation, the maintenance of 5 to 21 m^3/h series pumps only require regular oil changes (***see page 37***).

Before any draining or maintenance operation, check the pumping conditions of the installation: potential toxicity, corrosion or radioacitivity of pumped gases.

Depending on the case, we recommend:

- **to purge the pumping installation with dry nitrogen before maintenance;**
- **wear gloves, protective goggles and, if necessary, a breathing apparatus;**
- **ventilate the premises well and disassemble the equipment under a suction hood;**
- **not to dispose of used oils and residues using the standard system and, if necessary, have them destroyed by a specialized company.**

⚠ DANGER

Certain gases can become corrosives and toxic when trapped in oil. Always wear protective gloves when handling used and dirty pump oil, drain it into a closable container,and do not breathe the fumes of the oil. Always use fully self-contained breathing apparatus.

⚠ WARNING

Always dispose of used dirty oil, or sub-products properly and in compliance with all local, state and federal environmental laws and regulations.

⚠ CAUTION

After a complete maintenance operation, it is recommended to perform a helium leak tightness test.

The manufacturer can provide specific training to know the tightness test methods and supply helium leak detectors. Contact us.

Decontamination – product dismantling

According to the regulations 2002/96/CE about Waste of electrical and electronical equipments, and 2002/95/CE about Restriction of Hazardous substances, the manufacturer provides a recycling paid service for the end-of-life of waste electrical and electronic equipment.

Any obligation of the manufacturer to take back such equipment shall apply only to complete not amended or modified equipment, using Alcatel Vacuum Technology original spare parts, delivered by Alcatel Vacuum Technology, containing i.e. all its components and sub-assemblies.

This obligation will not cover the shipping cost to an Alcatel take back facility.

Before returning the product, fill in the safety form, attach it to the product before shipping to the service-repair office closest to you.

Safety form available on this manual or can be downloaded on: www.adixen.com

Troubleshooting and corrective actions

Incidents	Causes	Corrective actions
The pump is not running	▶ Incorrect motor power supply.	Check the power supply.
	▶ Temperature too low.	Reheat the pump and its oil.
	▶ Gumming of seals after prolonged storage.	Disassemble the motor and try to turn the fan manually. Disassemble, clean the pump, replace seals, reassemble.
	▶ Oil contaminated after pumping.	Drain, flush and refill with clean oil.
	▶ Motor coupling damaged.	Replace by disassembling the motor.
	▶ Pump seized, due to a stopping after pumping in difficult conditions (no draining or flushing).	Disassemble, clean, hone the scratched metal parts (replace them if necessary) and reassemble.
The pump does not start	▶ Oil cold.	Warm pump.
	▶ Insufficient oil in the oil case.	Fill up to the level.
	▶ Oil contaminated.	Drain, flush and refill with clean oil.
	▶ Oil pump inlet partially blocked.	Drain, and clean the oil pump inlet duct.
	▶ Lubrication holes blocked.	Disassemble and clean.
	▶ Vane or spinner-cam (SD models) damaged.	Replace them.
	▶ Incorrect anti-suckback system assembly.	Repeat the assembly and the setting.
The vacuum pump does not produce a vacuum	**Ultimate pressure obtained: a few mbar, Torr**	
	▶ Direction of motor rotation incorrect (three phase).	Rewire.
	▶ Insufficient motor power.	Check the power supply.
	▶ Inlet filter blocked.	Clean it.
	▶ Insufficient oil in the oil case.	Add oil.
	▶ Oil cold, oil pump inlet blocked.	Warm, disassemble, clean.
	▶ Oil contaminated.	Drain, flush and start again with clean oil.
	▶ Oil pump inlet partially blocked.	Drain and clean the oil pump inlet duct.
	▶ One of the LP safety valves is damaged.	Replace.
	▶ Part forgotten in reassembly.	Repeat the reassembly.

Incidents	Causes	Corrective actions
The vacuum pump does not produce a vacuum (*continued*)	**Ultimate pressure obtained: a few 10^{-2} Torr (10^{-2} mbar)**	
	▶ Gas ballast adjustment button open.	Close.
	▶ O-ring pinched.	Replace.
	▶ One of the seals is damaged.	Replace.
	▶ One of the HP safety valves is damaged.	Replace.
	▶ Lubrication holes blocked.	Disassemble and clean.
	▶ Incorrect anti-suckback assembly.	Repeat the assembly and setting.
	▶ Part forgotten in reassembly.	Repeat the reassembly.
	Accessories	
	▶ At the pump exhaust, the installation produces an exhaust pressure of 1,125 Torr (1.5 bar).	Check the installation.
	▶ Oil mist eliminator cartridge clogged.	Replace.
Noisy pump	▶ Oil level too high.	Drain and fill with a new oil.
	▶ Oil contaminated (presence of particles).	Drain, flush and refill with clean oil.
	▶ Pump not prepared for the oil used.	Check the pump configuration or the type of oil.
	▶ Incorrect motor power supply.	Check the power supply.
	▶ Motor bearings damaged.	Replace the motor after inspection.
	▶ Motor coupling incorrectly set or damaged.	Check the setting.
	▶ Incorrect fan assembly.	Check the assembly.
	▶ Incorrect anti-suckback device assembly.	Repeat the assembly.
	▶ Vanes damaged or stuck.	Replace.
Pump too hot	▶ Ambient temperature too high.	
	▶ Pump placed in a poorly ventilated place or vents blocked.	Check the installation.
	▶ Operation at high pressure P > 22 Torr (30 mbar).	Check for system leaks.
	▶ Excess pressure at exhaust.	Check the exhaust line.
	▶ Motor in over-voltage or motor in short-circuit.	Check the voltage, replace the motor.
	▶ Oil contaminated.	Drain, flush and refill with clean oil.
	▶ Pump not prepared for the oil used or oil unsuitable.	Check pump configuration or type of oil.

Incidents	Causes	Corrective actions
Considerable oil losses	▶ Oil level too high.	Drain and fill with new oil.
	▶ Operation at high pressure.	Use an HP type oil mist eliminator with oil recovery.
	▶ Gas ballast open: 1 - accidentally, 2 - pumping of condensable vapours.	1 - Close. 2 - Use a condensate collector.
	▶ Leak at oil case seal or at front seal.	Check the assembly and replace the seals if necessary.
Poor pump tightness when switched off	▶ Gas ballast open.	Close.
	▶ Safety valve damaged.	Replace.
	▶ Incorrect anti-suckback assembly.	Repeat the assembly.
	▶ O-ring pinched.	Replace.
	▶ Seals damaged.	Replace.
	▶ Oil contaminated.	Drain, flush and refill with clean oil.
Oil in plate	▶ Oil case and frame cleaned poorly during reassembly.	Remove the base and clean.
	▶ Oil case seal pinched.	Disassemble the oil case, clean the faces and refit a new seal.
	▶ Front seal damaged or felt saturated.	Replace.

Maintenance

Maintenance frequency

	Frequency	Operating conditions
Oil	**6 months**	"normal", 24 / 24h
	1 year	"normal", < 12h / day
Pump	**1 year**	"normal", 24 / 24h
	2 years	"normal", < 12h / day

The frequency values are minimum values for «normal» operating conditions: pressure < 1 mbar (0.75 Torr), clean gas and non-corrosive gas.

An incorrect ultimate vacuum or a reduction in pumping speed are signs that the oil has deteriorated.

The periodic inspection of the state of the oil is performed by comparison with a sample of new oil in order to check the level of contamination or deterioration of the lubricant.

The frequency at which oil is renewed is adapted to the type of operation:
– if the oil is cloudy, this indicates that condensables have been absorbed during pumping. The oil can be regenerated using the gas ballast (***see page 27***).
– a thickening of the oil, together with a blackish color and a "burnt" smell indicate that the oil has deteriorated.

Drain the pump and flush it.

T**he oil should be changed every 6 months. This value is given as a guide only.** It may be extended to 1 year if the ultimate vacuum required is sufficient (for primary vacuum pumps). Similarly, **if the pump is stopped frequently for long periods, the oil should be changed at intervals of 6 months to a maximum of 1 year** (oil may become sticky).

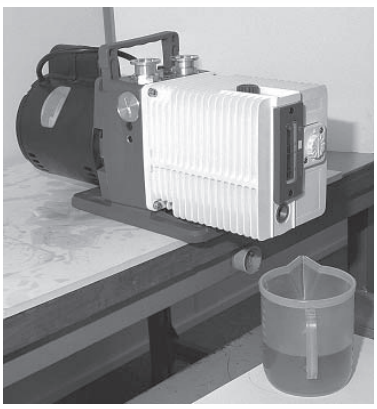
Note: Every pumping operation is different. This oil must therefore be changed at intervals adapted to each specific application. The use of certain accessories (***see page 13***) can reduce the frequency of these maintenance operations.

Draining

⚠ WARNING

The draining operation places the contaminated pumping circuit in communication with the outside atmosphere. Take all necessary steps to ensure personal safety.

The pump must be drained when hot and after the oil case has been vented to atmospheric pressure. For this:
– switch off the pump;
– isolate the pump or disconnect from the installation;
– tilt the pump;
– unscrew the draining plug on the side of the oil case and the filling plug on the top of the oil case.



When all the oil has drained, replace the two plugs temporarily and run the pump for about 10 seconds leaving the intake open. Take care with the oil mist which may appear at the exhaust. This operation removes the oil from the functional block;
– drain this oil by removing the draining plug;
– replace the draining plug and fill with fresh oil to the appropriate maximum level of the oil case oil sight glass through the filling orifice (***see page 18***).

Flushing

The draining operation can be followed by a flushing operation if the oil is particularly dirty. This operation requires a volume of oil equal to the capacity of the pump.

After draining the oil case (***see page 37***), replace the draining plug. Remove the intake filter, clean it and replace it. Run the pump at atmospheric pressure, pour the flushing oil **very slowly** through the inlet orifice. Take care with oil mist which may develop at the exhaust. Stop the pump and drain the flushing oil via the draining plug. Replace the plug and fill with fresh oil (***see page 18***).

Change of type of oil

5 to 21 m^3/h series pumps are tested in the factory with A120 oil or A119 for USA (A113 for C2 series pumps) unless specified otherwise in the order. When the pump is delivered, a certain quantity of oil remains in the functional block.
Thus, if you wish to use another type of oil, proceed as follows:

Compatible oils

Mineral oil can be replaced by another type of mineral oil. Simply flush the pump (***see above***) using the new oil and fill the pump (***see page 18***).
Mineral oils are also compatible with mineral-based synthetic oils ***(see page 17***).

Incompatible oils

This is the case when, for example, a mineral oil is replaced by a synthetic oil (e.g. A120 by A113).
Synthetic oils are considered to be incompatible with each other for practical reasons: they are expensive. A mixture may cause slight cloudiness of the resulting mixture, which could be interpreted mistakenly as a sign of contamination or deterioration.
For the same reasons, clear synthetic and mineral oils (A300), which are also expensive, are treated as synthetic oils.

These remarks apply to ester or fluorocarbon type synthetic oils and the oils A111, A113 and A300 (***see page 17***).

Proceed as follows:
– Disassemble the pump completely and clean it (***see page 42***).
– Reassemble it.
– Connect an oil mist eliminator to the pump exhaust.
– Fill the pump with the new oil (***see page 18***).

NOTE: to replace a synthetic oil by a mineral oil, proceed as for compatible oils.

In all cases, follow the recommendations of the pump integrators for the choice of the oil to be used.

Replacement of external shaft seal

In the event of an external oil leak on the pump, it is necessary to change the external shaft seal on the motor side (*see page N – 4*).

You will need:
– a front seal replacement kit (***see page 40***),
– a screwdriver,
– a 3, 4 and 5 mm Allen wrench.

• Stop the pump and disconnect the power cord motor.

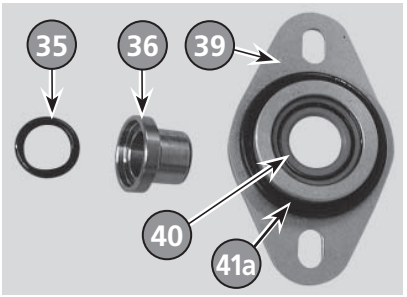
• Disconnect the pump from the installation to which it is connected.

• If possible, position the pump vertically, with the motor at the top, resting on the front side of the oil case; in this position, it is not necessary to drain the oil case. Otherwise, disassemble the pump in the horizontal position, resting it on its base, after it has been drained.

• Disconnect the motor by unscrewing the 4 fastening screws, simultaneously and alternately.

• Remove the motor vertically.

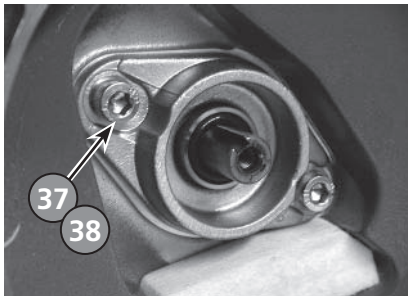
• Unscrew the fan fastening screw. Remove the fan, the key and the support washer.



• With a screwdriver, remove the shaft sleeve (**36**) and its O-ring (**35**).

• Unscrew the two seal-holder fastening screws (**37**, **38**) and remove the seal-holder (**39**).

• Remove the seal (**40**) from the seal-holder as described on ***page 46 (picture 1)*** and discard it.



• Clean the metal parts. Inspect the wearing side of the shaft sleeve: after cleaning, the sleeve may show a perfectly normal trace of rubbing (caused by polishing). Should the sleeve show any signs of indentation or grooves, it must be replaced.

• Preferably use new parts from the seal kit or set of seals.

• Reassemble the lip seal (**40**) in its housing as described on ***page 46***.

• Reinsert the new O-ring (**41a**) on the seal-holder (**39**).

• Insert the shaft sleeve inside the seal-holder (**36**).

• Engage the reassembled seal-holder on its axis and screw onto the frame.

• Insert the O-ring (**35**) in the shaft sleeve. Position the support washer. Then, install the key, reassemble the fan and the motor in the reverse order of disassembly.

• Immediately order a replacement maintenance set or kit (***see page 40***).

Tools and consumable products

Special precautions

Read the warning at the beginning of the maintenance chapter.
Before disassembling the pump, drain it (*see page 37*).
All the seals and faulty parts should be replaced, provided in a seal kit or a maintenance kit.

Spare parts

Minor kit

This kit contains all the seals on the pump which must be replaced at each complete disassembly.

Pumps	1005	1010	1015	1021	2005	2010	2015	2021
I	–				103912			
SD	103911		105515		103911			
C1	104975							
C2	–				104975			

Keep this kit in a dry place, away from heat and light (sunlight and ultraviolet light), in order to prevent any hardening of the elastomers (see AFNOR standards: "storage conditions for vulcanized elastomer based products" - FD T.46 022).

Major kit

In addition to the seal kit, this kit contains a set of spare parts to perform maintenance operations on the pump for a two year period, under normal operating conditions.

The pumps are equipped with :
- a **shouldered not chromed ring** (**36**) for I and SD models with serial number < AM656245
- a **shouldered chromed rin**g (**36**) for I and SD models with serial number ≥ AM656245
- a **shouldered chromed ring** (**36**) for C1 and C2 models.

The **shouldered not chromed ring** is a spare part that must be replaced. It is enclosed in the major kit.

The **shouldered chromed ring** needn't to be changed. It is not enclosed in the major kit for I and SD models. However, it is available in the external shaft seal kit (***see page 41***).

Pumps	1005	1010	1015	1021	2005	2010	2015	2021
I	–				103906	103907	103908	103909
SD	104622	104623	104643	104644	103902	103903	103904	103905
C1	104617	104618	104619	104620	104976	104977	104978	104979
C2	–				–	104614	104615	104616

Vane kits for 2-stage pumps

This kit contains only vanes and springs in order to maintain several pumps of the same model (see table here after).

Pumps	2005	2010	2015	2021
LP stage vane kit	**108417**	**108396**	**108397**	**108398**
Vane / Spring (quantity)	20 / 20	20 / 40	20 / 60	20 / 60
HP stage vane kit*	**108417**	**108399**	**108399**	**108399**
Vane / Spring (quantity)	20 / 20	20 / 20	20 / 20	20 / 20

* except model C2.

Pumps	2005	2010	2015	2021
Oil vane pump kit**	**108407** (10 vanes)			

** except model SD.

External shaft seal replacement kit (parts for shaft passage tightness on motor side)

This kit contains all the parts which must be replaced in the event of a leak on the shaft on the motor side.

Pump models	Part Nu.
All pumps	**065612**

Screw kit

This kit contains all screws and washers for all pump models.

Pump models	Part Nu.
All pumps	**104919**

Specific tools

Tools kit

This kit contains the usefull tools to disassemble and reassemble the shaft seals in the different flanges and flanged stators (see table bellow).

Pump models	Part Nu.
All pumps	**112397**

	HP and LP no flanged stator (*plan D*)	HP flanged stator (*plan C*)	LP flanged stator (*plan C*)
Lip seal assembly mandrel	**A462651**	**A462651**	**A462651**
Support washer	**073348**	**073348**	**–**
Protective sleeve	**A463545**	**A463545**	**A463545**
Lip seal disassembly mandrel	**–**	**–**	**A462649**

Protective sleeve

Lip seal disassembly mandrel

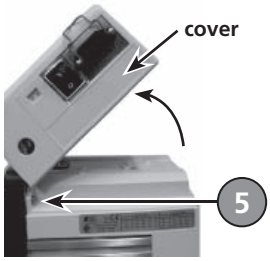
Recommended tools

- Two 5.5 x 100 flat screwdrivers
- Thin spanner: 10 mm on face
- Allen wrenches: 2.5 - 3 - 4 - 5 - 12 mm
- 12 mm box wrench

Disassembling the pump

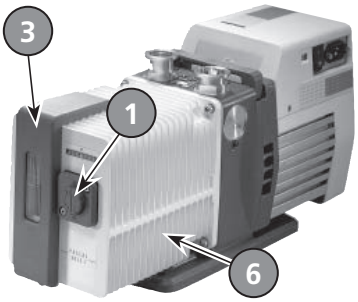
Follw the chronological order of disassembling instructions.
See the drawings and their part lists in pages *N – 1* to *N – 20*.

Disassembling the motor block



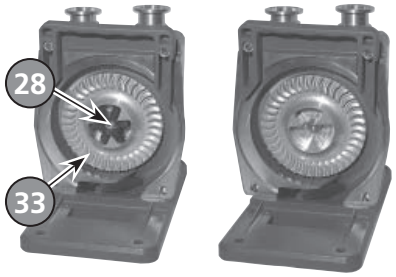
3 Remove the motor cover.

5 Remove the motor attachment screws (***see page N – 18***).



Disassembling the fan coupling
(*see page N – 2*)

4 Remove the fan (**33**) fastening screw (**28**) and the support washer (**26**). Remove the key.



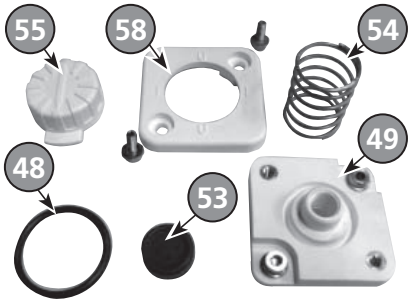
Replacing the front seal

See ***page 39***.

Disassembling the gas ballast
except model pump C2
(*see page N – 2*)

2.5 Remove the gas ballast cover (**58**) (2 screws), the adjustment button (**55**), the spring (**54**) and the sleeve (**53**).

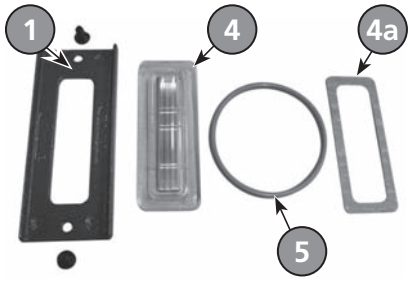
Remove the tank feed-through (**49**) (2 screws) and its seal (**48**).



Disassembling the oil sight glass
(*see page N – 2*)

3 Remove the sight glass cover (**3**).

Remove the plate (**1**), the ring (**4a**) (model C1), the sight glass (**4**) and the O-ring (**5**).



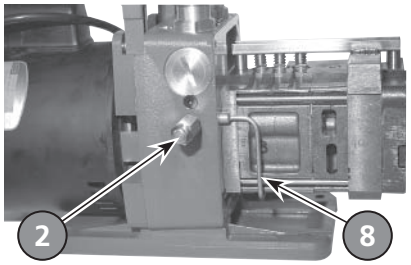
Removing the oil case
(*see page N – 2*)

5 Remove the oil case (**6**) and its O-ring (**11**) after removing the 4 fastening screws (**9**).

Disassembling the bubbler (C2 pump)
(*see page N – 20*)

10 Disconnect the nitrogen inlet. Remove the nitrogen inlet and disconnect the coupling (**2**) and the connector (**6**).

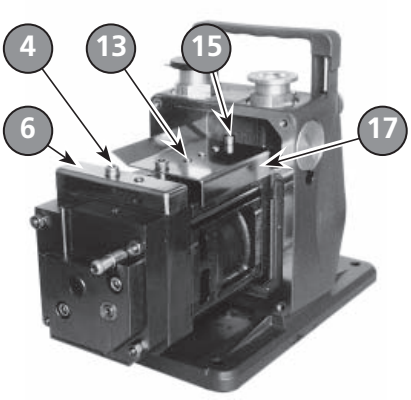
Disconnect the nut (**16**) which secures the tube on the functional block and pull the bubble (**8**) to release it from the frame.



Disassembling the exhaust valve cover

(*see page N – 6*)

5 Remove the screws (**4**) (**13**) (**15**) and the cover(s) (**6**) (**17**), the exhaust valves (**2**) (**11**) and their springs (**3**) (**12**).

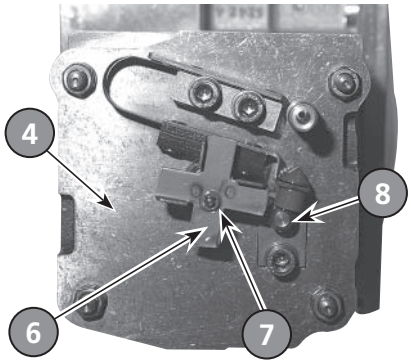


Disassembling the SD pump oil system

(except 1015 SD, 1021 SD)

(*see page N – 16*)

The oil system is set in the factory, it must be reset in the event of disassembly (see reassembly). However, the rear flange (**4**) can be disassembled without modifying the setting.
Remove the spinner-cam (**6**) by removing the circlip (**7**).
Do not disassemble the nozzle (**8**) to clean it. During the reassembly, check that it is not blocked by sending a jet of compressed air through it.



Disassembling the pump oil system

I, C1, C2 pumps and 1015 SD, 1021 SD

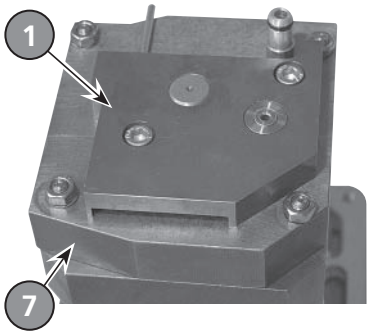
(*see page N – 14*)

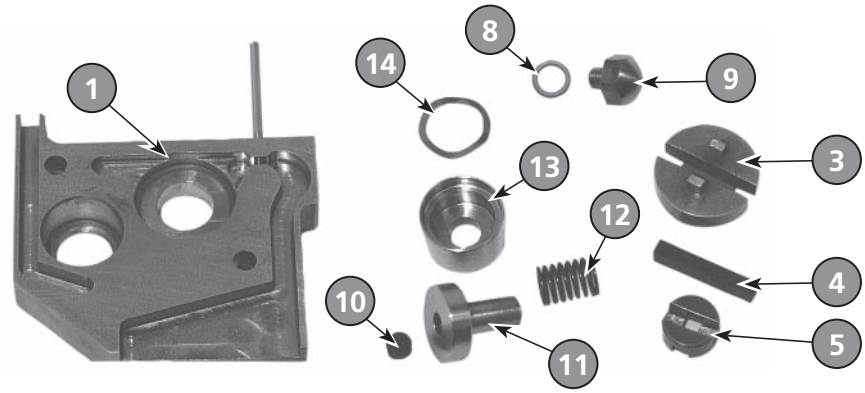
5 Remove the cover from the oil pump (**1**). Release the cylinder (**13**) equipped with the washer (**14**), piston (**11**) and spring (**12**).

Release the stop valve (**10**) from its housing.

12 In the rear flange, unscrew the seat of the stop valve (**9**) and remove the O-ring (**8**).

Then remove the vane (**4**), the oil pump rotor (**3**) and the Oldham coupling (**5**).





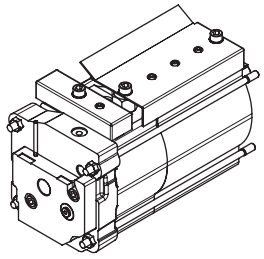
Disassembling the rear flange

(*see pages N – 14 et N – 16*)

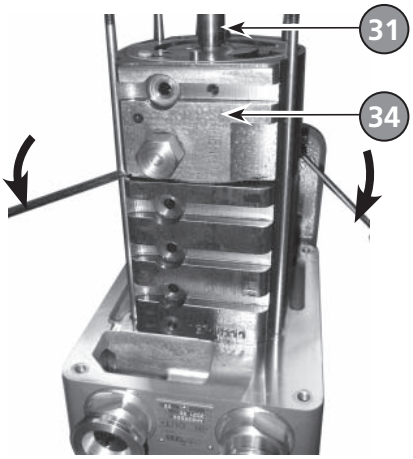
10 Remove the 4 nuts. Release the flange (**7**) in the axis.

Disassembling the pumping module with flanged stator

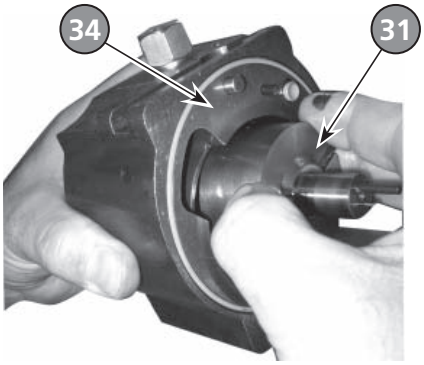
(see N – 10)



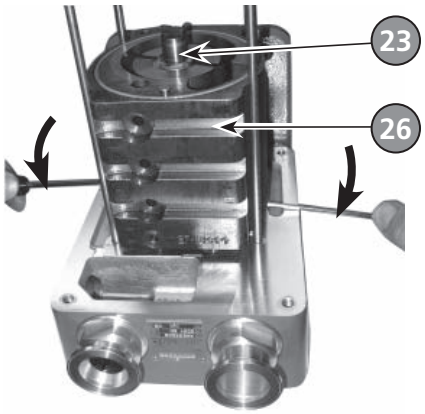
1 Insert two screwdrivers in the notches and release the set HP stator (**34**) and HP rotor (**31**) in the axis.



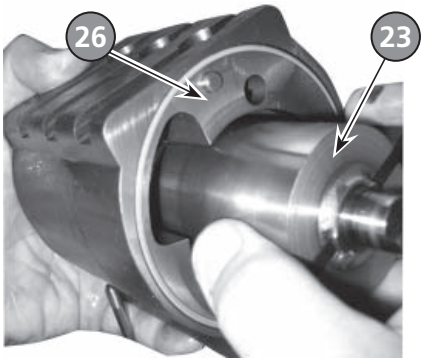
2 Release the HP rotor (**31**) from the HP stator (**34**) and the vanes.



3 Insert two screwdrivers in the notches and release the set BP stator (**26**) and BP rotor (**23**) in the axis.

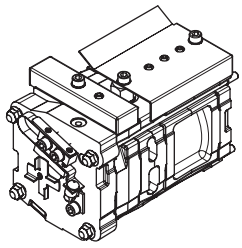


4 Release the BP rotor (**23**) from the BP stator (**26**) and the vanes.

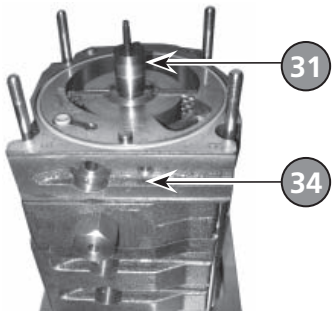


Disassembling the pumping module with no flanged stator

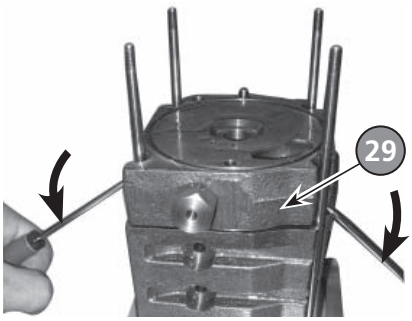
(see N – 6)



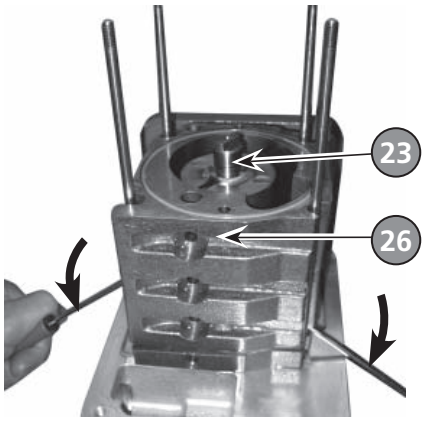
1 Remove the HP stator (**34**) by sliding it along the HP rotor (**31**).
Remove the HP rotor and the vanes.



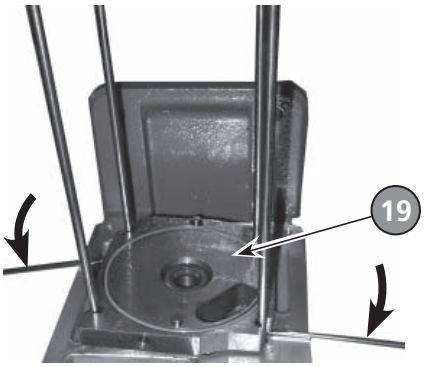
2 Insert two screwdrivers in the notches and release the central plate (**29**) in the axis.



3 Insert two screwdrivers in the notches and release the BP stator (**26**) by sliding it along the BP rotor (**23**).
Remove the BP rotor and the vanes.



4 Release the front plate (**19**).



Cleaning components

Cleaning metal components

Solvents are required to clean components.

Standard precautions should be taken in compliance with the manufacturer's instructions.

After use in mineral or synthetic oil, clean the metal components with a mineral products based solvent such as **AXAREL**(1) , **CARECLEAN**(2), **PREMACLEAN**(3), **NAPHTESOL**(4). Proceed as follows:
- Clean when cold or hot (max. 45°C) by dipping or using a cloth
- Vacuum dry in a ventilated oven
- **The component must be cleaned a second time with alcohol.**

After use in (perfluorinate) synthetic oil, clean the metal components in a solvent such as **GALDEN S 90**™(5) and proceed as follows:
- Clean when cold by dipping or using a cloth
- Dry the components in the air or with compressed air

After use in (non-perfluorinate) synthetic or mineral oil, clean the metal components with a solvent such as alcohol and proceed as follows:
- Clean when cold by dipping or using a cloth
- Dry the components in the air
- Industrial washing solutions can also be used. The cleaning operation should be followed by vacuum drying.

Cleaning the oil level sight glass

I, SD, C2 series pumps

When cleaning this plastic sight glass, avoid contact with alcohol or alcohol-based washing solutions. Clean the component with a solvent, but do not steep it, and rinse it immediately.

C1 series pumps

The sight glass of these pumps is made of glass: it can be cleaned with common used solvents.

(1) DUPONT DE NEMOURS registered trademark
(2) CASTROL registered trademark
(3) DOW registered trademark
(4) Nippon Oil Corporation registered trademark
(5) MONTEDISON registered trademark

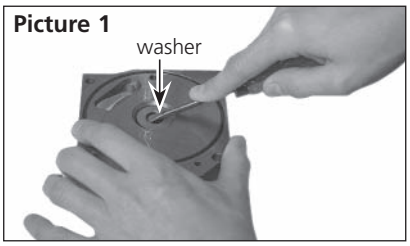
Replacement of shaft seals

Specific tools

- Specific extraction tool.
- Specific assembly mandrel.
- A support plate (or washer).

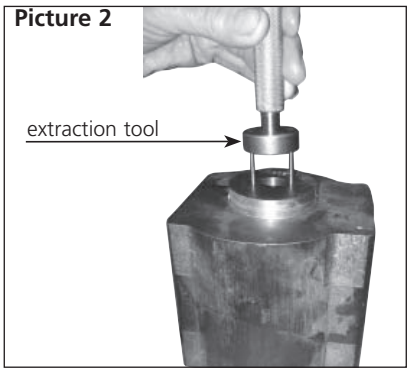
Recommended tools

- A flat screwdriver .
- A hammer.



Extracting a shaft seal from its housing

- Flange (**picture 1**): the seal is extracted using a screwdriver, resting on the plate (or washer) so as not to damage the seal housing, or
- Flanged stator (**picture 2**): the seal is extracted with the specific extraction tool.



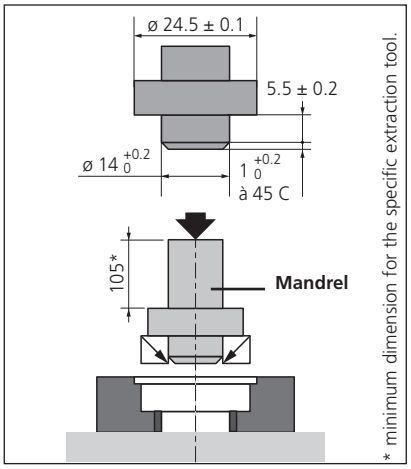
Assembling the shaft seal

The seal housing and the seal lip are lubricated with the lubricant used in the pump.
The flange is resting on a flat surface.

According to the direction of assembly specific to each pump, the seal is fitted on the assembly mandrel.

Using a press or a hammer, the seal is inserted in its housing.

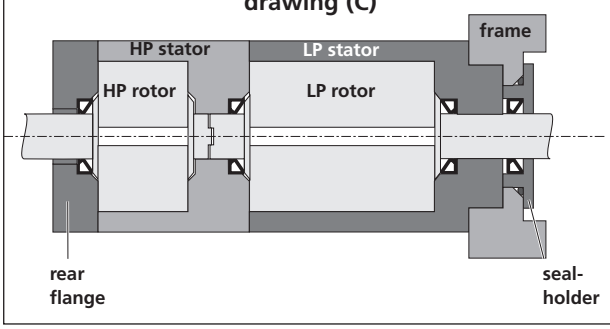
Check the position of the seal: it must lean against its bearing.



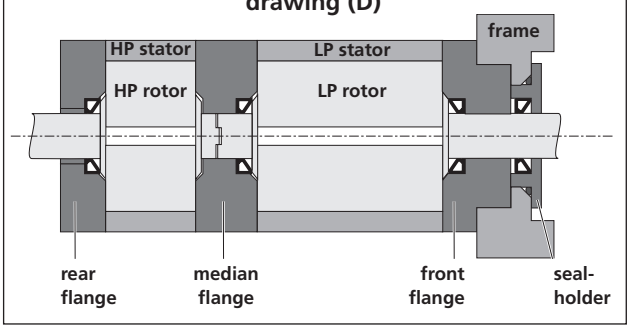
Direction of assembly of shaft seals

They are fitted using the assembly mandrel according to the direction of assembly below:

Assembly of pumping module with flanged stator drawing (C)



Assembly of pumping module with no flanged stator drawing (D)



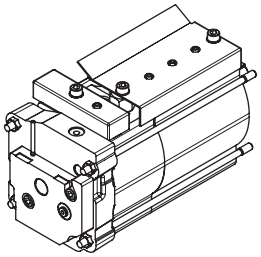
Reassembling the pump

Component preparation

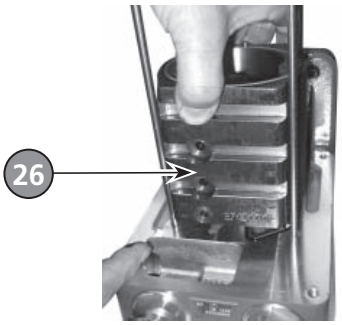
- All surfaces in contact are coated with oil.
- Check that the lubrication holes are not blocked.
- Observe the **nominal clamping torques for the reassembly of the functional block (see chapter "Nomenclature")**.
- Rest the frame (**42**) on a flat surface in order to raise the pump.

Reassembling the pumping module with flanged stator

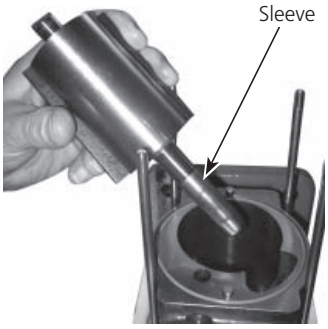
(see N – 10)



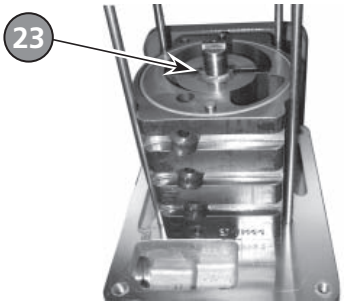
1 Place the BP stator (**26**) on the frame (**42**).



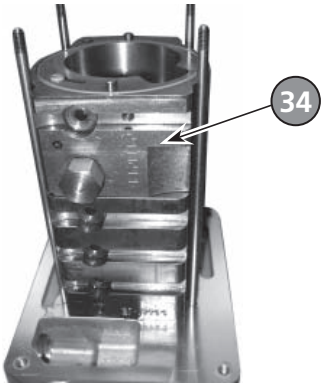
2 For not damage the shaft seal, use protective sleeve on the rotor axis (or wrap end of shaft with adhesive tape) and oil it.



3 Slide the BP rotor (**23**) equipped with its vanes and springs (rounded edges facing outwards) in the BP stator (**26**). Remove the protective sleeve

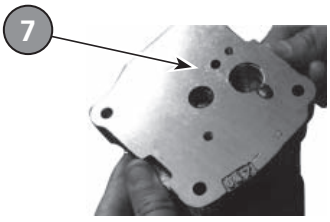


4 Place the HP stator (**34**) on the BP stator (**26**).



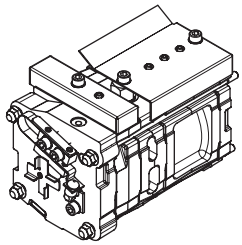
5 Slide the HP rotor (**31**) equipped with its vanes and springs (rounded edges facing outwards) in the HP stator (**34**).

6 Place the rear flange (**7**) on the HP stator (**34**).

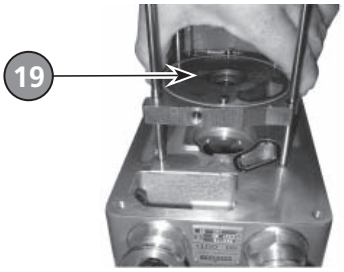


Reassembling the pumping module with no flanged stator

(see N – 6)

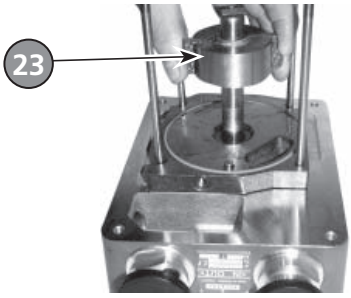


1 Fit the front plate (**19**) on the frame (**42**).

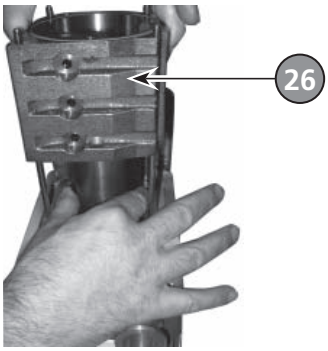


2 For not damage the shaft seal, use protective sleeve on the rotor axis (or wrap end of shaft with adhesive tape) and oil it.

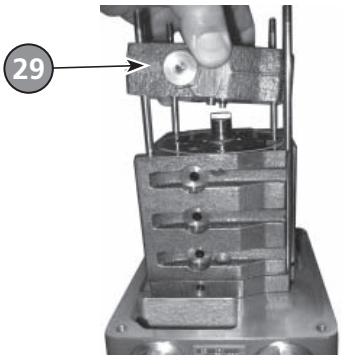
3 Place the BP Rotor (**23**) equipped with its vanes and springs (rounded edges facing outwards) on the front plate (**19**). Remove the protective sleeve.



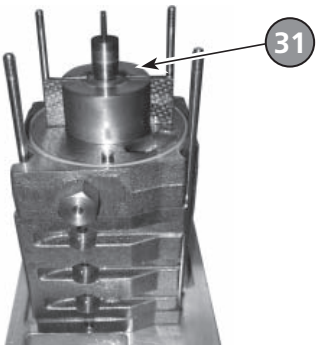
4 Slide the BP stator (**26**) on the BP rotor (**23**).



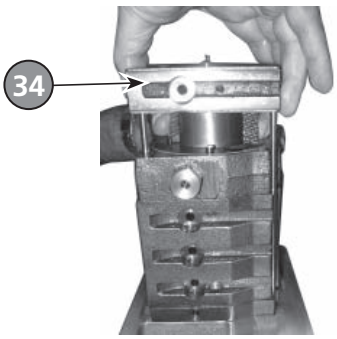
5 Place the central plate (**29**) on the BP stator (**26**).



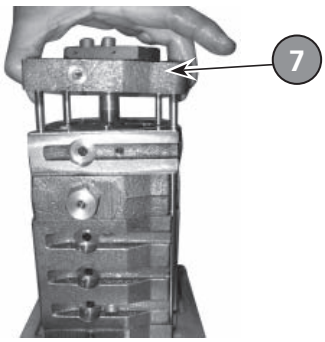
6 Place the HP rotor (**31**) equipped with its vanes and springs (rounded edges facing outwards) on the central plate (**29**).



7 Slide the HP stator (**34**) on the HP rotor (**31**).



8 Place the rear plate (**7**) on the HP stator (**31**).



Reassembling the oil system

Check that the nozzle is not blocked by sending a jet of compressed air through it.

Spinner-cam, SD pumps (except 1015 SD and 1021 SD) **(*see page N – 16*)**

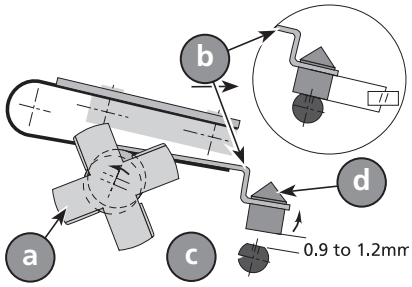
Place the spinner-cam system on the rear plate (**4**) and fix it with the clips (**7**).

Spinner-cam settings

Offset the spinner-cam (**a**) by pressing on the blades.

Turn the shaft up to the maximum displacement of the lever (**b**).

The distance between the seat (**c**) and the stop valve (**d**) must be 0.9 to 1.2mm (0.035 to 0.047 inch): it is set by adjusting the orientation of the lever.



The stop valve face must be perpendicular to the axis of the oil inlet hole; when free,the stop valve should rest on its seat: check the parallelism of the lever in relation to the bearing face of the stop valve seat. Orient the seat to obtain the correct setting.

Oil pump, I, C1 and C2 pumps (and 1015 SD, 1021 SD) **(*see page N – 14*)**

In the rear plate (**7**), place the Oldham coupling (**5**), the vane (**4**) and the rotor (**3**).

Screw the seat (**9**) equipped with its O-ring (**8**). Place the piston (**11**) with its antisck-back device (**10**), the spring (**12**), the cylinder (**13**) and the washer (**14**).

Oil pump settings

Position the rotor of the oil pump so that the slot is horizontal (or parallel with the pump base). To turn it, use the fan.

Reassembling the exhaust valve cover

(*see page N – 6*)

Pump in a horizontal position, pour a small quantity of oil beforehand around the exhaust valve holes.
Place the valves (**2**) or (**11**) equipped with the springs (**3**) or (**12**)
Place the valve covers (**6**) or (**17**) and fix them with screws and washers.

Reassembling the bubble device

C2 pump (*see page N – 6*)

Insert the bubbler (**8**) equipped with its o-ring in the frame.
Position the tube fastener (**9**) on the pin and tighten the nut on the rear plate (**7**).
Insert the ball (**4**), the spring (**5**) in the coupling (**2**) and tighten it on the connector (**6**).

Reassembling the oil casing

(*see page N – 6*)

Fit the oil casing (**6**) equipped with its o-ring (**11**) on the frame (**42**).
Tighten it with screw (**9**) and washers (**10**) (after making sure that the seal is positioned in its seal groove).

Reassembling the oil level sight glass

(*see page N – 2*)

Place the o-ring (**5**) in its groove and fit the sight glass (**4**), (the flat ring (**4a**) for C1 pump), the oil sight glass cover (**3**) and tighten with screws (**2**).

⚠ CAUTION

C1 series pump: The sight glass is made of glass: gradually tighten the two attachment screws in alternation to avoid placing the sight glass under stress.

Reassembling the gas ballast
(*see page N – 2*)

Position the oil case feed-through (**49**) equipped with its o-ring (**48**) in its housing by centering it on the gas ballast tube (**46**). Assemble using the screws (**52**).

Equip the adjustment knob (**55**) with the sleeve (**53**) and the spring (**54**). Position the assembly in the cover (**58**) and secure on the oil case feed-through (**49**) with screws (**57**).

Reassembling the seal-holder
(*see page N – 2*)

See ***page 39***.

Reassembling the fan and the motor side components
(*see page N – 2*)

Fit the coupling fan (**33**) and secure it with the screw (**28**) and washer (**26**).
Fit the drive key on the motor shaft. Install the motor coupling (**3**) down to the stop on the motor shaft and secure it with the screw (**2**).
Install the plastic coupling (**4**) on the motor coupling (**3**).
Fit the motor on the frame and secure with the 4 mounting bolts (**5**).

Fill with oil

After reassembling, fill the pump with oil (***see page 18***) before start-up the pump (***see page 25***).

Safety questionnaire

Procedure for returning ADIXEN products

You wish to return an Adixen product for maintenance. The equipment will be dismantled and possibly cleaned by a technician from our Service Centre.
In compliance with European Community's L360 directives, French labor code L231 - R231 and Federal OSHA Safety Standard 1910-1200, Alcatel Vacuum Technology requires this form to be completed to preclude the potential health risk to its service personnel that can occur when receiving, disassembling, or repairing potentially contaminated products.

Equipment returned without this form completed and secured to outside of package will be returned to customer unprocessed.
Equipment must be drained of fluids and residue, securely packaged and shipped prepaid.
Concerning the closing of the ports (inlet & outlets of the product), metallic airtight blank flanges should be used if toxic or copper gases have been pumped.

We wish to draw your attention to the following points:

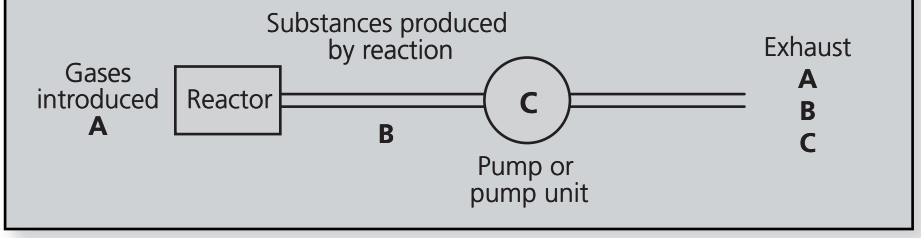
- **The risk may be of the following nature:**
  - **Chemical**: Danger to health, risks of explosion, fire, risks for the environment. Please indicate the chemical formula and name of the gases or substances that have been in contact with the equipment (pump or detector).
  - **Biological**: in case of contamination (such as pathogenic germs, micro-organisms (bacteria, viruses, etc.) classes 1 to 4 and group E), our Service Center is currently unable to decontaminate and recycle such material without risk to the safety of our staff. Please contact us **before sending** the product to the Service center.
  - **Radioactive**: In case of contamination, our Service Center is currently unable to decontaminate and recycle such material without risk to the safety of our staff. Please contact us **before sending** the product to the Service center.
  - **Copper contamination**: Copper based by products formed in sputtering or etching processes are considered as a poison in some semi-conductor processes.

If following inspection and quotation, customer elects to not proceed with repair, he will be subject to service fee to cover product decontamination, disassembly, cleaning and evaluation costs.

Please to fill in the following form, print it and attach it to the product before shipping to the service-repair office closest to you.

⚠ WARNING

In the event of chemical contamination, please indicate the following gases or substances:



- Gases (or substances) introduced into the reactor and which may be found at the exhaust (A).
- Gases (or substances) resulting from the reaction or process (B).
- Gases (or substances) that may possibly be formed inside the pump (due to a thermodynamic or chemical reaction, condensation, deposition, precipitation, etc.) (C).

- **Precautions need to be taken before transferring contaminated pumps.**
  Please contact Service Center for recommendations.

QUESTIONNAIRE DE SECURITE – *SAFETY QUESTIONNAIRE*

Ce questionnaire est téléchargeable sur le site : www.adixen.com
This questionnaire can be downloaded from: www.adixen.com

Procédure de retour des produits ADIXEN
(Ce formulaire ne peut être rempli et signé que par une personne habilitée)

Procedure for returning ADIXEN products
(This questionnaire is only to be filled in and signed by an authorized person)

SOCIETE - *COMPANY*

Nom Société - *Name of company :* .....

Nom personne - *Name of person :* .....
....
(Qui remplit ce formulaire) - *(Who has filled in questionnaire)*

Fonction - *Position :* .....

N° Tél. - *Tel. no :* .....
...

N° Fax - *Fax no :* .....
(Pour renseignements éventuels sur les produits utilisés) - *(for any information on products used)*

EQUIPEMENT - *EQUIPMENT*

Description : .....
.....
.....

N° de Série - *Serial no :* .....

Type de procédé - *Type of process :* .....
(Pour lequel l'équipement est utilisé) - *(for which equipement is used)*

Date de l'expédition - *Date of consignment :* .....

INTERVENTION - *SERVICE*

Intervention souhaitée (Révision, réparation,...) - *Service required (overhaul, repair, etc.) :*

Type d'anomalie constatée - *Type of anomaly observed :*

PROCEDE CUIVRE - *COPPER PROCESS*

Produit utilisé sur un procédé Cuivre - *Product used on a Copper process* Oui - *Yes* Non - *No*

ASPECT SECURITE - *SAFETY ASPECT*

L'équipement mentionné ci-dessus a été en contact avec les produits suivants - *The above equipment has been in contact with the following substances :*

(nom et formule chimique) - *(name and chemical formula)*

Ces produits présentent un risque de nature - *These susbstances present the following risks*

Chimique - *Chemical*			Explication détaillée - *Detailed explanation*
Toxique - *Toxic*	Oui - *Yes*	Non - *No*	Si «Oui» risque de nature - *If «Yes», what type of risk*
Cancérigène - *Carcinogenic*	Oui - *Yes*	Non - *No*	.....
Combustible - *Combustible*	Oui - *Yes*	Non - *No*	.....
Corrosive - *Corrosive*	Oui - *Yes*	Non - *No*	.....
Explosive - *Explosive*	Oui - *Yes*	Non - *No*	.....
Biologique - *Biological*	Oui - *Yes*	Non - *No*	.....
Radioactive - *Radioactive*	Oui - *Yes*	Non - *No*	.....
Autre - *Other*			.....
(Vous reporter éventuellement à la page précédente) - *(See preceding page if necessary)*			.....

SIGNATURE

Vous avez répondu "Oui" à une des questions précédentes :

Je confirme que seules les substances précisées ont été en contact avec l'équipement sus-mentionné, et que les procédures de préparation, d'emballage, et de transport ont été respectées.

You have replied "yes" to one of the above questions:

I confirm that only the substances mentioned have been in contact with the above equipment and that the preparation, packing and transport procedures have been complied with.

Je confirme que le matériel sus-mentionné n'a été en contact avec aucune substance dangereuse, et a été vidé de son huile. (Si applicable)

I confirm that the above equipment has not been in contact with any dangerous substance and has been emptied of oil. (If applicable)

Réponse **"Oui"** (fermeture étanche de l'aspiration et du refoulement) *Reply* **"Yes"** *(seal inlet and outlet ports with blank flanges)*	Réponse **"Non"** (sans risque) *Reply* **"No"** *(no risk)*
Nom - *Name :* ..... Fonction - *Position :* ..... Date :..... Signature autorisée - *Authorised signature :*	Nom - *Name :* ..... Fonction - *Position :* ..... Date :..... Signature autorisée - *Authorised signature :* .....
Tampon / *Cachet* Stamp / *Seal*	Tampon / *Cachet* Stamp / *Seal*

DECLARATION OF CONFORMITY

We, Alcatel Vacuum Technology France,
98, Avenue de Brogny, BP 2069
74009 ANNECY FRANCE

ISO 9001 CERTIFIED

declare under our sole responsibility that the listed below products

2002 I / 2002 C1
1015 / 1015 SD / 1015 C1 / 1021 / 1021 SD / 1021 C1
2005 I / 2005 SD / 2005 C1 / 2005 H1
2010 I / 2010 SD / 2010 C1 / 2010 C2
2015 I / 2015 SD / 2015 C1 / 2015 C2 / 2015 H1
2021 I / 2021 SD / 2021 C1 / 2021 C2
2033 SD / 2033 C1 / 2033 C2 / 2033 H1
2063 SD / 2063 C1 / 2063 C2 / 2063 H1
1033 SD / 1033 C1 / 1063 SD / 1063 C1
2100 SD / 2100 C1

to which this declaration relates are in conformity with the following European Directives

73 / 23 / EEC	Low voltage Directive
98 / 37 / EEC	Machinery Directive
89 / 336 / EEC	Electromagnetic Compatibility Directive
93 / 68 / EEC	Council directive (E.C Marking)

The standards, normative documents, and/or specifications to which the products comply are :

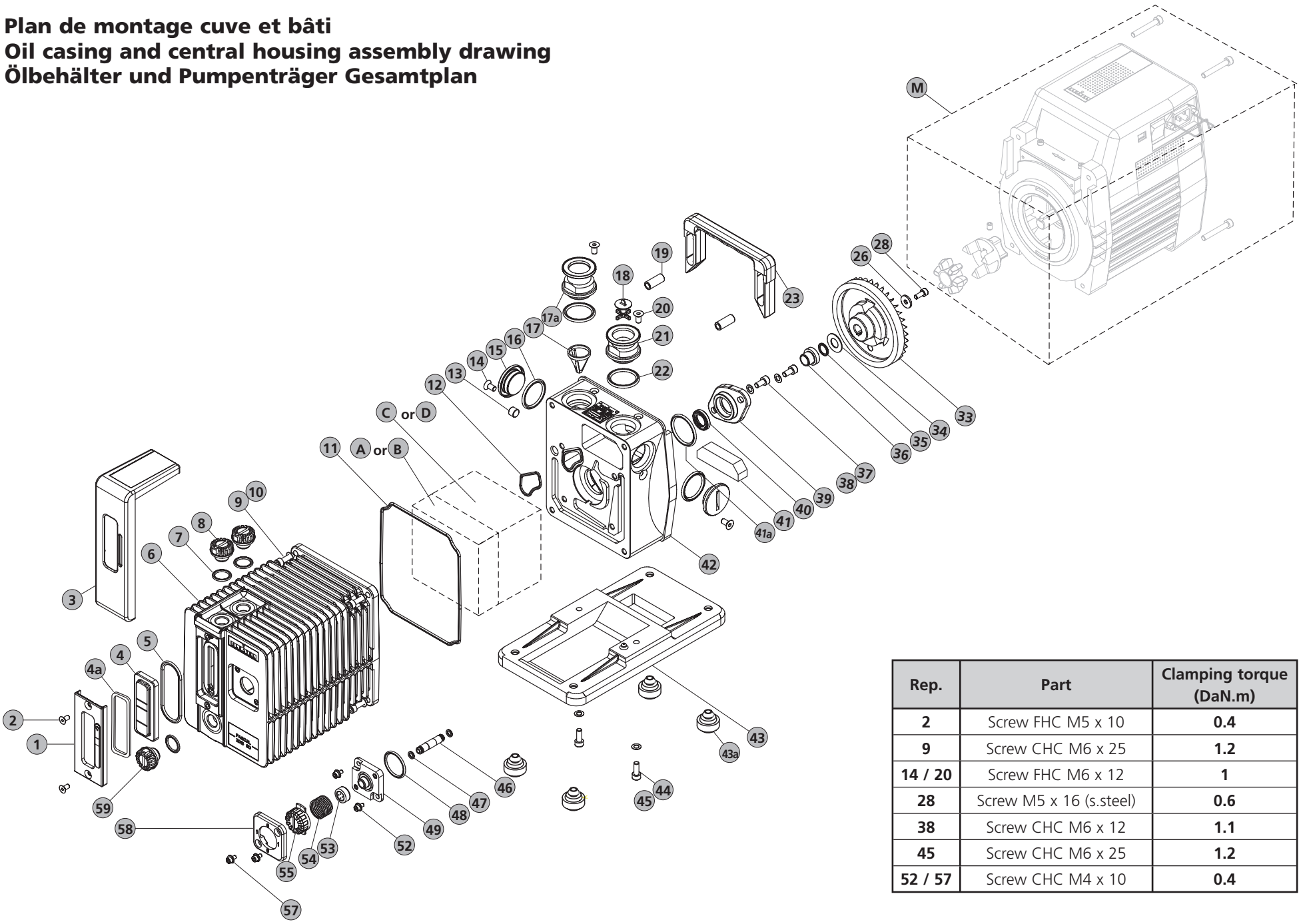
NF EN 60204-1	Safety of Machinery / Electrical Equipment of Machinery
NF EN 292-1	Safety of Machinery / Basics
NF EN 292-2	Safety of Machinery / General Principles for Design
IEC 34 parts 1, 5, 11	General Requirements for Rotating Electrical Machines
NF EN 55011 cl B	EMC / Limits for Electromagnetical Conducted and Radiated Interferences
NF EN 61000-6-4	EMC / Generic emission standard / Light industry
NF EN 61000-6-2	EMC / Generic immunity standard / Industrial environment
NF EN 61000-4-2	EMC / Immunity to Electrostatic Discharges
NF EN 61000-4-4	EMC / Immunity to Transient Burst
NF EN 61000-4-3	EMC / Immunity to Radiated electromagnetic Field
NF EN 61000-4-6	EMC / Conducted disturbances induced by radio-frequency Fields

Mr J.Y. GUEGAN, Président Directeur Général

Made in Annecy, 03/11/03

Composants de maintenance / Maintenance components / Unterhaltung Teile

Plan de montage cuve et bâti
Oil casing and central housing assembly drawing
Ölbehälter und Pumpenträger Gesamtplan



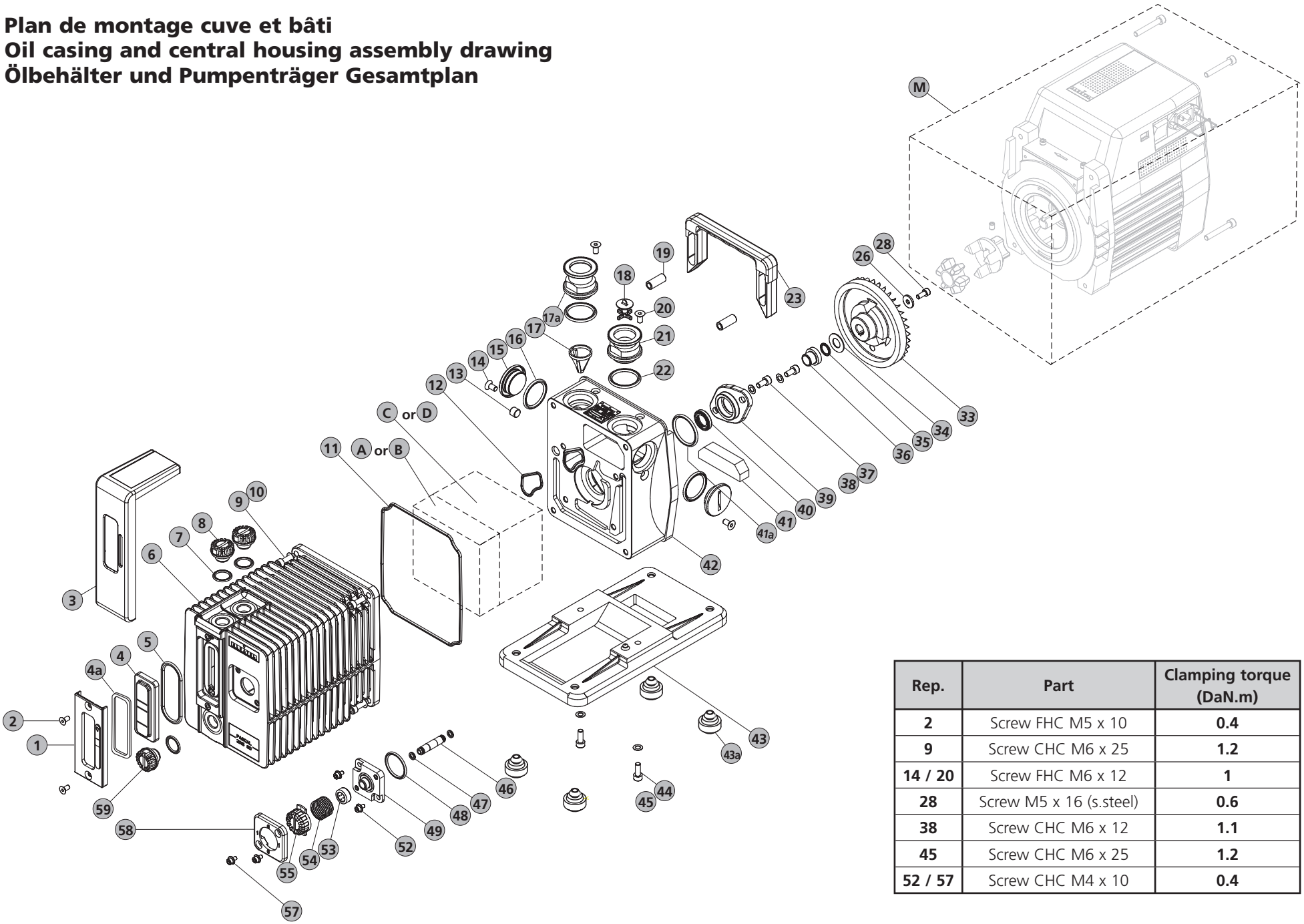
Rep.	Part	Clamping torque (DaN.m)
2	Screw FHC M5 x 10	**0.4**
9	Screw CHC M6 x 25	**1.2**
14 / 20	Screw FHC M6 x 12	**1**
28	Screw M5 x 16 (s.steel)	**0.6**
38	Screw CHC M6 x 12	**1.1**
45	Screw CHC M6 x 25	**1.2**
52 / 57	Screw CHC M4 x 10	**0.4**

Nomenclature cuve et bâti / Oil casing and central housing part list / Ölbehälter und Pumpenträger Nomenklatur

REP	DÉSIGNATION	SPECIFICATION	BENENNUNG	Types/model																								REF. P/N Bestell. Nr
				2005 I	2010 I	2015 I	2021 I	2005 SD	2010 SD	2015 SD	2021 SD	1005 SD	1010 SD	1015 SD	1021 SD	2010 C2	2015 C2	2021 C2	2005 C1	2010 C1	2015 C1	2021 C1	1005 C1	1010 C1	1015 C1	1021 C1		
1	Plaque de niveau	Level plate	Ölmesstab	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		103391
2	Vis FHC M5 x 10	Screw FHC M5 x 10	Schraube FHC M5 x 10	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		✣
3	Cache de niveau	Oil sight glass cover	Ölschauglassdeckel																									102848
3	Cache de niveau	Oil sight glass cover	Ölschauglassdeckel	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		102849
4	Voyant	Oil level sight glass	Ölschauglas	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		■
4a	Joint de niveau	Flat ring	Flachdichtung																1	1	1	1	1	1	1	1		●
5	Joint torique c 3,53 - d 63,1	O-ring c 3.53-d 63.1	Dichtung c 1,9 - d 7,2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		●
6	Cuve équipée	Oil casing	Ölbehälter	1				1				1	1															103546
6	Cuve équipée	Oil casing	Ölbehälter		1				1					1														103548
6	Cuve équipée	Oil casing	Ölbehälter			1				1					1													103550
6	Cuve équipée	Oil casing	Ölbehälter				1				1																	103390
6	Cuve équipée	Oil casing	Ölbehälter													1				1					1			103547
6	Cuve équipée	Oil casing	Ölbehälter														1				1					1		103549
6	Cuve équipée	Oil casing	Ölbehälter															1				1						103392
6	Cuve équipée	Oil casing	Ölbehälter																1				1	1				103545
7	Joint torique c 2,7 - d 16,9 - Bague R13	O-ring c 2.7 - d 16.9 - Ring R13	Dichtung c 2,7 - d 16,9 - Ring R13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3		●
8	Bouchon G 3/8	Plug G 3/8	Blindstopfen G 3/8	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3		■
9	Vis CHC M6 x 25	Screw CHC M6 x 25	Schraube CHC M6 x 25	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6	4/6		✣
10	Rondelle	Washer	Unterlegscheibe	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8	4/8		✣
11	Joint torique c 3-d 165	O-ring c 3 - d 165	Dichtung c 3 - d 165	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		●
12	Joint torique c 2,5-d 33,5	O-ring c 2.5 - d 33.5	Dichtung c 2,5 - d 33,5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		●
13	Bouchon G 1/8	Plug G 1/8	Blindstopfen G 1/8	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3				1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3		■
14	Vis FHC M6 x 12	Screw FHC M6 x 12	Schraube FHC M6 x 12	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4		✣
15	Obturateur M 30x1	Stopper M 30 x 1	Deckel M 30 x 1	2	2	2	2	2	2	2	2	2	2	2	2													065821
15	Obturateur M 30x1	Stopper M 30 x 1	Deckel M 30 x 1													2	2	2	2	2	2	2	2	2	2	2		065816
16	Joint torique c 3,6-d 29,3	O-ring c 3.6-d 29.3	Dichtung c 3,6 - d 29,3	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4		●
17	Filtre d'aspiration	Inlet filter	Ansaugfilter	1	1	1	1	1	1	1	1	1	1	1	1													065787
17	Filtre d'aspiration	Inlet filter	Ansaugfilter													1	1	1	1	1	1	1	1	1	1	1		103395
17a	Embout d'aspiration	Inlet nipple	Ansaugstutzen	1	1	1	1	1	1	1	1	1	1	1	1													065819
17a	Embout d'aspiration	Inlet nipple	Ansaugstutzen													1	1	1	1	1	1	1	1	1	1	1		065814
18	Soupape de refoulement	Exhaust valve	Auspuffventil	1	1	1	1	1	1	1	1	1	1	1	1													●
19	Entretoise poignée	Handle brace	Griffsteg	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		102930
20	Idem 14	Idem 14	Ebenso 14	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4		✣
21	Embout refoulement DN 25	Exhaust nipple DN 25	Auspuffstutzen DN 25	1	1	1	1	1	1	1	1	1	1	1	1													065820
21	Embout refoulement DN 25	Exhaust nipple DN 25	Auspuffstutzen DN 25													1	1	1	1	1	1	1	1	1	1	1		065815
22	Idem 16	Idem 16	Ebenso 16	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4		●
23	Poignée	Handle	Griff	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		103342

● Lot joints / Minor kit / Dichtungssatz ■ Lot maintenance / Major kit / Wartungssatz ✣ Lot visserie / Screw kit / Schraubensatz ❍ Lot palettes / Vane kit / Schieberssatz ✱ Kit joint avant / Front seal kit / Dichtungssatz

Plan de montage cuve et bâti
Oil casing and central housing assembly drawing
Ölbehälter und Pumpenträger Gesamtplan



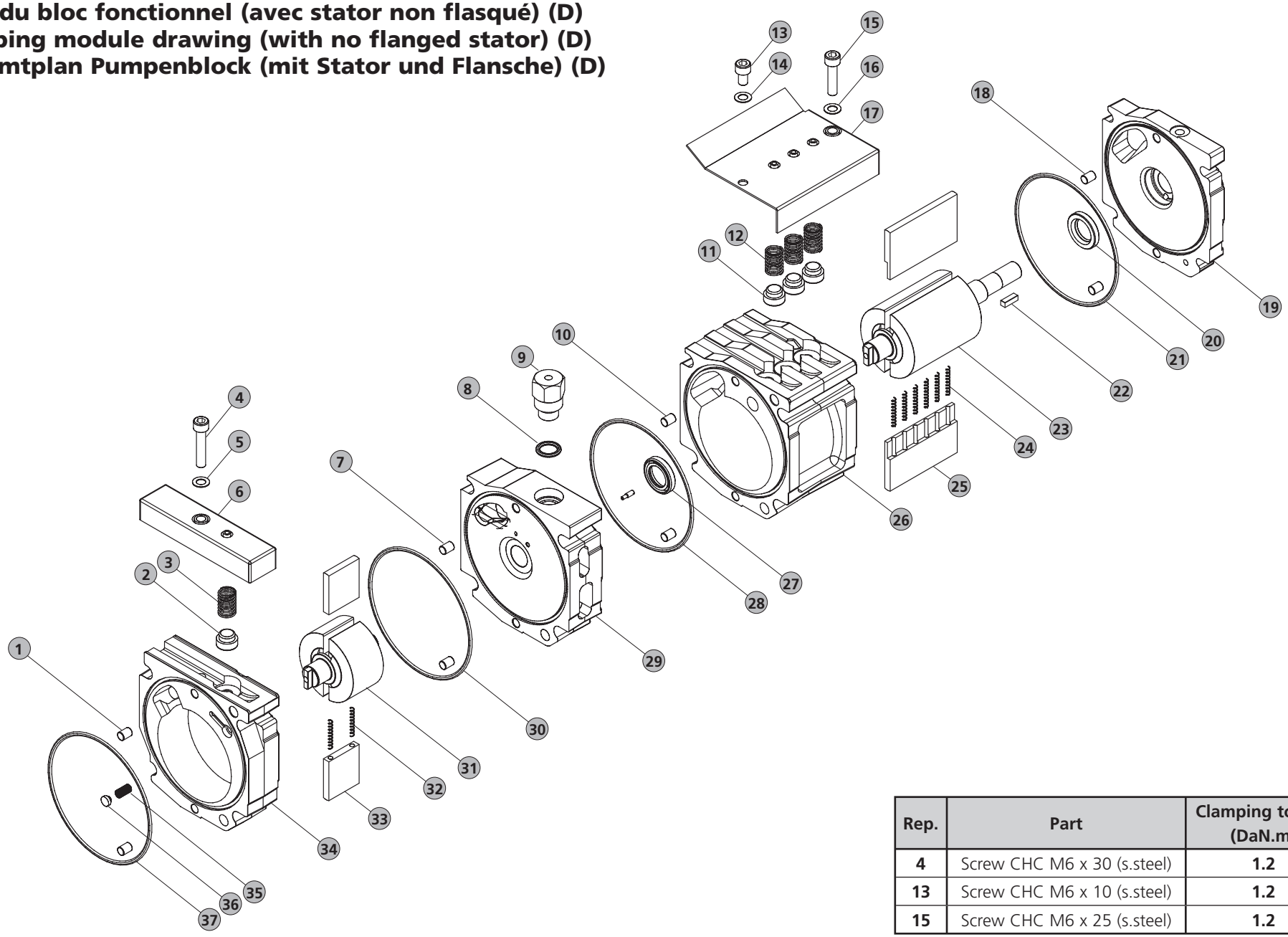
Rep.	Part	Clamping torque (DaN.m)
2	Screw FHC M5 x 10	**0.4**
9	Screw CHC M6 x 25	**1.2**
14 / 20	Screw FHC M6 x 12	**1**
28	Screw M5 x 16 (s.steel)	**0.6**
38	Screw CHC M6 x 12	**1.1**
45	Screw CHC M6 x 25	**1.2**
52 / 57	Screw CHC M4 x 10	**0.4**

Nomenclature cuve et bâti / Oil casing and central housing part list / Ölbehälter und Pumpenträger Nomenklatur

REP	DÉSIGNATION	SPECIFICATION	BENENNUNG	Types/model																						REF. P/N Bestell. Nr
				2005 I	2010 I	2015 I	2021 I	2005 SD	2010 SD	2015 SD	2021 SD	1005 SD	1010 SD	1015 SD	1021 SD	2010 C2	2015 C2	2021 C2	2005 C1	2010 C1	2015 C1	2021 C1	1005 C1	1010 C1	1015 C1	1021 C1	
26	Rondelle	Washer	Unterlegscheibe	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	065107
28	Vis à collerette M5 x 16	Screw M5 x 16	Schraube M5 x 16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	✣
33	Manchon ventilateur	Fan coupling	Ventilator Kupplungshälfte	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	103386
34	Rondelle d'appui	Washer	Unterlegscheibe	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	065847
35	Joint torique c 2,7 - d 12,1 Bague R1O	O-ring c 2.7 - d 12.1 - Ring R1O	Dichtung c 2,7 - d 12,1 - Ring R1O	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	●
36	Bague épaulée	Shouldered ring	Abnutzungring	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	✱
37	Idem 10	Idem 10	Ebenso 10	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	✣
38	Vis CHC M6 x 12	Screw CHC M6 x 12	Schraube CHC M6 x 12	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	✣
39	Porte joint	Seal holder	Lippendichtung-sockel	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	065744
40	Joint à lèvre 15 x 25,5 x 4,6 FMP81	Shaft seal 15 x 25.5 x 4.6 FMP81	Lippendichtung 15 x 25,5 x 4,6 FMP81	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	● ✱
41	Feutre	Felt	Filz	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	●
41a	Joint torique c 3,6-d 34,1	O-ring c 3.6-d 34.1	Dichtung c 3,6 - d 34,1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	● ✱
42	Bâti équipé	Equipped central housing	Pumpenträger einrichtet	1	1	1	1																				103424
42	Bâti équipé	Equipped central housing	Pumpenträger einrichtet					1	1	1	1	1	1	1	1												103423
42	Bâti équipé	Equipped central housing	Pumpenträger einrichtet													1	1	1									103474
42	Bâti équipé	Equipped central housing	Pumpenträger einrichtet																1	1	1	1	1	1	1	1	106703
43	Socle	Base	Fuss	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	108712
43a	Amortisseur	Shock mount	Schwingunsdämpferm	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	065790
44	Idem 10	Idem 10	Ebenso 10	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	2/8	✣
45	Idem 9	Idem 9	Ebenso 9	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	2/6	✣
46	Tube lest d'air	Gas ballast tube	Gasballasttrohr	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1					104631
46	Tube lest d'air	Gas ballast tube	Gasballasttrohr									1											1				065842
46	Tube lest d'air	Gas ballast tube	Gasballasttrohr										1	1	1									1	1	1	065839
47	Joint torique c 1,9 - d 5,7 Bague R5	O-ring c 1.9 - d 5.7 - Ring R5	Dichtung c 1,9 - d 5,7 - Ring R5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	●
48	Joint torique c 3 - d 28	O-ring c 3 - d 28	Dichtung c 3 - d 28	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	●
49	Traversée de cuve	Oil case feedthrough	Ölbehälterdurchfuhrung	1	1	1	1	1	1	1	1	1	1	1	1												102853
49	Traversée de cuve	Oil case feedthrough	Ölbehälterdurchfuhrung	1	1	1	1	1	1	1	1	1	1	1	1												102852
49	Traversée de cuve	Oil case feedthrough	Ölbehälterdurchfuhrung													1	1	1	1	1	1	1	1	1	1	1	100952
52	Vis M4 x 10	Screw M4 x 10	Schraube M4 x 10	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	✣
53	Manchon lest d'air	Gas ballast sleeve	Gasballastmuffe	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	●
54	Ressort lest d'air	Gas ballast spring	Gasballastfeder	1	1	1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	■
55	Bouchon de manoeuvre	Gas ballast knob	Gasballastknopf	1	1	1	1	1	1	1	1								1	1	1	1	1	1	1	1	102846
55	Bouchon de manoeuvre	Gas ballast knob	Gasballastknopf									1	1	1	1												102845
57	Idem 52	Idem 52	Ebenso 52	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	✣
58	Couvercle lest d'air	Gas ballast cover	Gasballastdeckel	1	1	1	1	1	1	1	1								1	1	1	1	1	1	1	1	107789
58	Couvercle lest d'air	Gas ballast cover	Gasballastdeckel									1	1	1	1												107790
58	Couvercle lest d'air	Gas ballast cover	Gasballastdeckel													1	1	1									107792
59	Idem 8	Idem 8	Ebenso 8	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	■

● Lot joints / Minor kit / Dichtungssatz ■ Lot maintenance / Major kit / Wartungssatz ✣ Lot visserie / Screw kit / Schraubensatz ❍ Lot palettes / Vane kit / Schieberssatz ✱ Kit joint avant / Front seal kit / Dichtungssatz

Plan du bloc fonctionnel (avec stator non flasqué) (D)
Pumping module drawing (with no flanged stator) (D)
Gesamtplan Pumpenblock (mit Stator und Flansche) (D)



Rep.	Part	Clamping torque (DaN.m)
4	Screw CHC M6 x 30 (s.steel)	**1.2**
13	Screw CHC M6 x 10 (s.steel)	**1.2**
15	Screw CHC M6 x 25 (s.steel)	**1.2**

Nomenclature du bloc fonctionnel (avec stator non flasqué) (D)

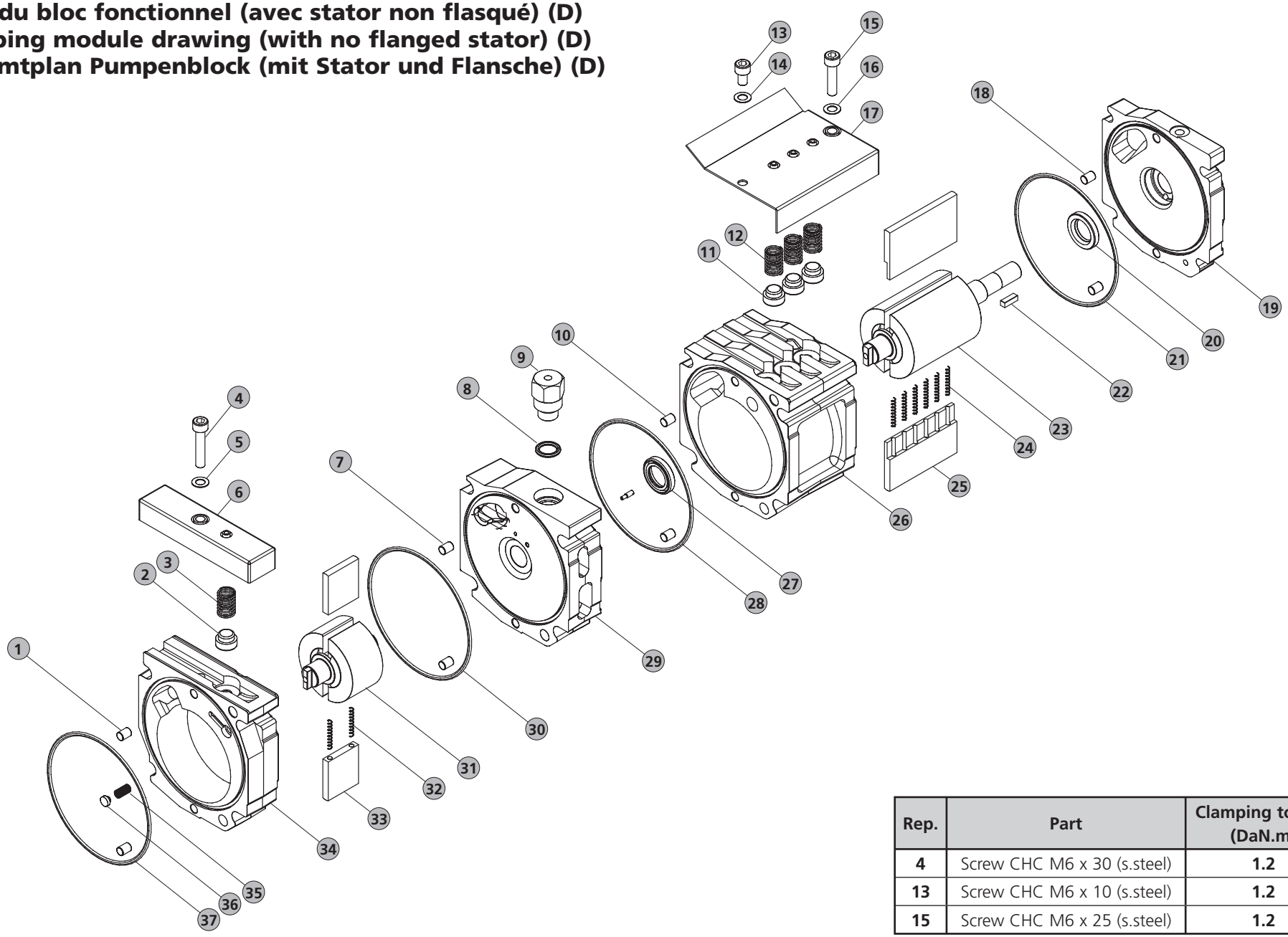
Pumping module list (with no flanged stator) (D)

Nomenklatur Pumpenblock (mit Stator und Flansche) (D)

REP	DÉSIGNATION	SPECIFICATION	BENENNUNG	Types/model																							REF. P/N Bestell. Nr
				2005 I	2010 I	2015 I	2021 I	2005 SD	2010 SD	2015 SD	2021 SD	1005 SD	1010 SD	1015 SD	1021 SD	2010 C2	2015 C2	2021 C2	2005 C1	2010 C1	2015 C1	2021 C1	1005 C1	1010 C1	1015 C1	1021 C1	
1	Goupille D6 LG8	Centering pin D6 LG8	Zentrierstift	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4					1/4	1/4	1/4	1/4	1/4	1/4	1/4					■
2	Soupape	Valve	Auslassventil	1	1/3	1/4	1/4	1	1/3	1/4	1/4					1/3	1/4	1/4	1/2	1/3	1/4	1/4					●
3	Ressort de soupape	Valve spring	Ventilfeder	1	1/3	1/4	1/4	1	1/3	1/4	1/4					1/3	1/4	1/4	1/2	1/3	1/4	1/4					■
4	Vis CHC M6 x 30	Screw CHC M6 x 30	Schraube CHC M6 x 30	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1					✣
5	Rondelle	Washer	Unterlegscheibe	1	1/2	1/2	1/2	1	1/2	1/2	1/2					1/2	1/2	1/2	1	1/2	1/2	1/2					✣
6	Capot de soupape	Valve cover	Ventilgehäusedeckel	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1					**103521**
7	Idem 1	Idem 1	Ebenso 1	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4					1/4	1/4	1/4	1/4	1/4	1/4	1/4					■
8	Joint torique c 2,7 - d 12,1 - Bague R9	O-ring c 2.7 - d 12.1 - Ring R9	Dichtung c 2,7 - d 12,1 - Ring R9	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1					●
9	Bouchon support capot	Cover holder	Gehäusedeckelhalter	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1					**103544**
10	Idem 1	Idem 1	Ebenso 1	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/2	1/2	1/2	1/2	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/2	1/2	1/2	1/2	■
11	Idem 2	Idem 2	Ebenso 2		2/3	3/4	3/4		2/3	3/4	3/4	1	2	3	3	2/3	3/4	3/4	1/2	2/3	3/4	3/4	1	2	3	3	●
12	Idem 3	Idem 3	Ebenso 3		2/3	3/4	3/4		2/3	3/4	3/4	1	2	3	3	2/3	3/4	3/4	1/2	2/3	3/4	3/4	1	2	3	3	■
13	Vis CHC M6 x 10	Screw CHC M6 x 10	Schraube CHC M6 x 10		1	1	1		1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	✣
14	Rondelle	Washer	Unterlegscheibe		1/2	1/2	1/2		1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2		1/2	1/2	1/2	1/2	1/2	1/2	1/2	✣
15	Vis CHC M6 x 25	Screw CHC M6 x 25	Schraube CHC M6 x 25		1	1	1		1	1	1	2	2	2	2	1	1	1		1	1	1	2	2	2	2	✣
16	Rondelle	Washer	Unterlegscheibe		1/3	1/3	1/3		1/3	1/3	1/3	1/2	1/2	2/2	2/2	1/3	1/3	1/3		1/3	1/3	1/3	1/2	1/2	1/2	1/2	✣
17	Capot de soupape	Valve cover	Ventilgehäusedeckel		1				1							1				1							**103523**
17	Capot de soupape	Valve cover	Ventilgehäusedeckel			1				1							1				1						**103525**
17	Capot de soupape	Valve cover	Ventilgehäusedeckel				1				1							1				1					**103394**
17	Capot de soupape	Valve cover	Ventilgehäusedeckel									1											1				**103521**
17	Capot de soupape	Valve cover	Ventilgehäusedeckel										1											1	1	1	**104309**
17	Capot de soupape	Valve cover	Ventilgehäusedeckel											1													**104310**
17	Capot de soupape	Valve cover	Ventilgehäusedeckel												1												**104311**
18	Idem 1	Idem 1	Ebenso 1	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/2	1/2	1/2	1/2	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/2	1/2	1/2	1/2	■
19	Flasque avant assemblé	Equipped front plate	Einrichtet vorderer Flansche	1	1	1	1	1	1	1	1	1	1	1	1												**103401**
19	Flasque avant assemblé	Equipped front plate	Einrichtet vorderer Flansche													1	1	1	1	1	1	1	1	1	1	1	**103396**
20	Joint à lèvre 15 x 25,5 x 4,6	Shaft seal 15 x 25.5 x 4.6	Lippendichtung 15 x 25,5 x 4,6	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1	1	1	1	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1	1	1	1	●
21	Joint torique c 2 - d 90	O-ring c 2 - d 90	Dichtung c 2 - d 90	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/2	1/2	1/2	1/2	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/2	1/2	1/2	1/2	●
22	Clavette Parallèle A4 x 4 x 12	Shaft key A4 x 4 x 12	Nutenstein A4 x 4 x 12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	■
23	Rotor BP	LP rotor	Niederdruckrotor	1				1																			**065745**
23	Rotor BP	LP rotor	Niederdruckrotor		1				1																		**065749**
23	Rotor BP	LP rotor	Niederdruckrotor			1				1																	**065750**
23	Rotor BP	LP rotor	Niederdruckrotor				1				1																**065751**
23	Rotor BP	LP rotor	Niederdruckrotor									1															**103880**
23	Rotor BP	LP rotor	Niederdruckrotor										1														**100631**
23	Rotor BP	LP rotor	Niederdruckrotor											1													**103569**

● Lot joints / Minor kit / Dichtungssatz ■ Lot maintenance / Major kit / Wartungssatz ✣ Lot visserie / Screw kit / Schraubensatz ❍ Lot palettes / Vane kit / Schieberssatz ✱ Kit joint avant / Front seal kit / Dichtungssatz

Plan du bloc fonctionnel (avec stator non flasqué) (D)
Pumping module drawing (with no flanged stator) (D)
Gesamtplan Pumpenblock (mit Stator und Flansche) (D)



Rep.	Part	Clamping torque (DaN.m)
4	Screw CHC M6 x 30 (s.steel)	**1.2**
13	Screw CHC M6 x 10 (s.steel)	**1.2**
15	Screw CHC M6 x 25 (s.steel)	**1.2**

Nomenclature du bloc fonctionnel (avec stator non flasqué) (D)

Pumping module list (with no flanged stator) (D)

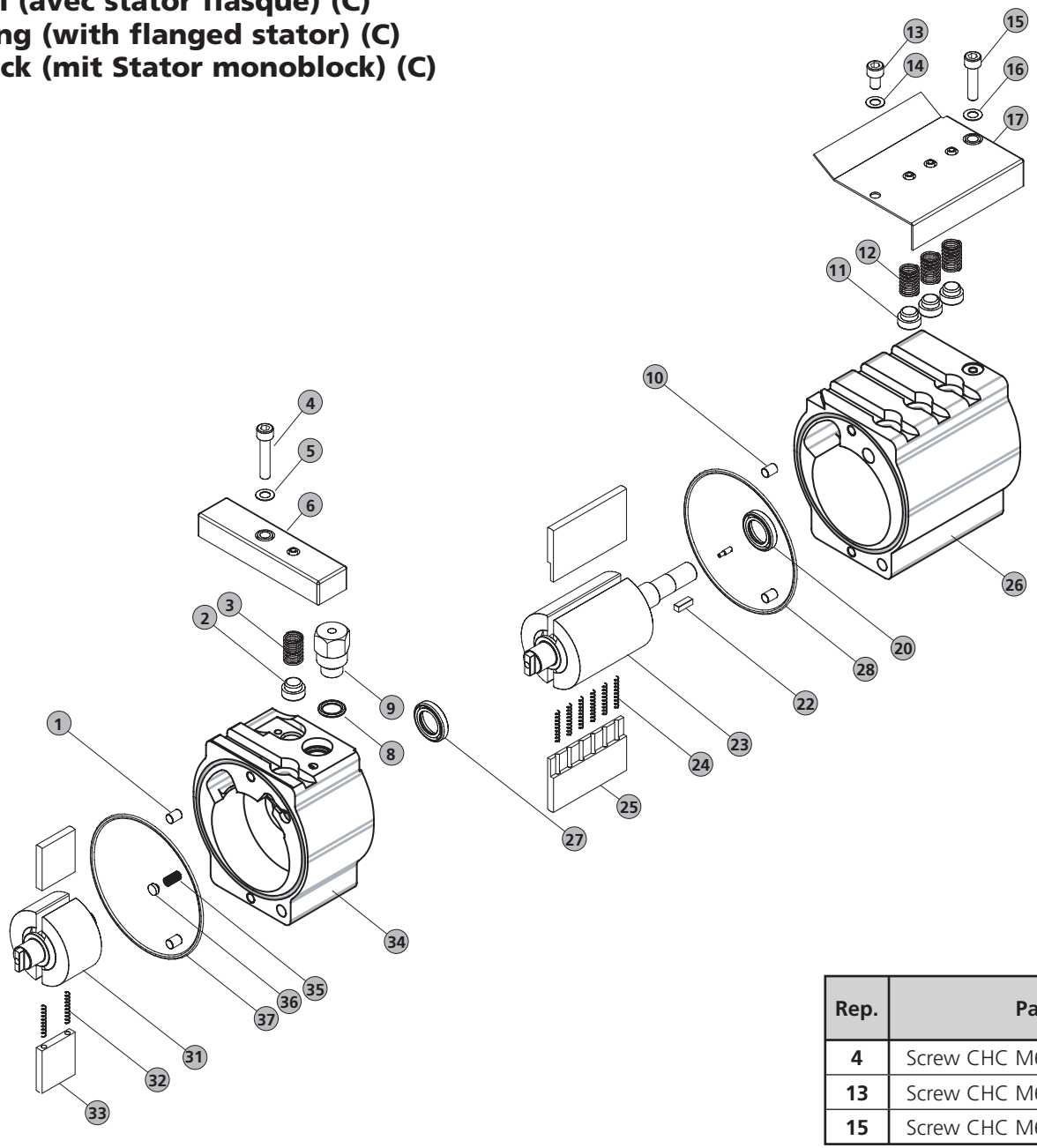
Nomenklatur Pumpenblock (mit Stator und Flansche) (D)

REP	DÉSIGNATION	SPECIFICATION	BENENNUNG	Types/model																							REF. P/N Bestell. Nr
				2005 I	2010 I	2015 I	2021 I	2005 SD	2010 SD	2015 SD	2021 SD	1005 SD	1010 SD	1015 SD	1021 SD	2010 C2	2015 C2	2021 C2	2005 C1	2010 C1	2015 C1	2021 C1	1005 C1	1010 C1	1015 C1	1021 C1	
23	Rotor BP	LP rotor	Niederdruckrotor												1												**103568**
23	Rotor BP	LP rotor	Niederdruckrotor													1				1								**065801**
23	Rotor BP	LP rotor	Niederdruckrotor														1					1						**065802**
23	Rotor BP	LP rotor	Niederdruckrotor															1										**065803**
23	Rotor BP	LP rotor	Niederdruckrotor																1									**065601**
23	Rotor BP	LP rotor	Niederdruckrotor																				1					**103397**
23	Rotor BP	LP rotor	Niederdruckrotor																					1				**103399**
23	Rotor BP	LP rotor	Niederdruckrotor																						1			**103400**
23	Rotor BP	LP rotor	Niederdruckrotor																							1		**103407**
24	Ressort de palette	Vane spring	Schieberfeder	2/4	4/6	6/8	6/8	2/4	4/6	6/8	6/8	2	4	6	6	4/6	6/8	6/8	2/4	4/6	6/8	6/8	2	4	6	6	■❍
25	Palette BP	LP vane	Niederdruckscheiber	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	■❍
26	Stator BP	LP stator	Niederdruckstator	1				1											1								**103507**
26	Stator BP	LP stator	Niederdruckstator		1				1							1				1							**103512**
26	Stator BP	LP stator	Niederdruckstator			1				1							1				1						**103510**
26	Stator BP	LP stator	Niederdruckstator				1				1							1				1					**103393**
26	Stator BP	LP stator	Niederdruckstator									1											1				**103409**
26	Stator BP	LP stator	Niederdruckstator										1											1			**103881**
26	Stator BP	LP stator	Niederdruckstator											1											1		**103882**
26	Stator BP	LP stator	Niederdruckstator												1											1	**103883**
27	Idem 20	Idem 20	Ebenso 20	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2					1/2	1/2	1/2	1/2	1/2	1/2	1/2					●
28	Idem 21	Idem 21	Ebenso 21	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/2	1/2	1/2	1/2	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/2	1/2	1/2	1/2	●
29	Flasque médian	Central plate	Zwischenflansche	1	1	1	1	1	1	1	1																**103408**
29	Flasque médian	Central plate	Zwischenflansche													1	1	1	1	1	1	1					**103410**
30	Idem 21	Idem 21	Ebenso 21	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4					1/4	1/4	1/4	1/4	1/4	1/4	1/4					●
31	Rotor HP	HP rotor	Hochdruckrotor					1	1	1	1																**065852**
31	Rotor HP	HP rotor	Hochdruckrotor	1	1	1	1																				**103417**
31	Rotor HP	HP rotor	Hochdruckrotor													1	1	1	1	1	1	1					**102854**
32	Idem 24	Idem 24	Ebenso 24	2/4	2/6	2/8	2/8	2/4	2/6	2/8	2/8					2/6	2/8	2/8	2/4	2/6	2/8	2/8					■❍
33	Palette HP	HP vane	Hochdruckscheiber	2	2	2	2	2	2	2	2					2	2	2	2	2	2	2					■❍ *
34	Stator HP	HP stator	Hochdruckstator	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1	1	1	1	1	**103409**
35	Ressort clapet anti-retour	Spring of the antisuck-back	Federrückschlagventil	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1					■
36	Clapet anti-retour	Antisuck-back device	Rückschlagventil	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1					**065798**
37	Idem 21	Idem 21	Ebenso 21	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4					1/4	1/4	1/4	1/4	1/4	1/4	1/4	1	1	1	1	●

● Lot joints / Minor kit / Dichtungssatz ■ Lot maintenance / Major kit / Wartungssatz ✣ Lot visserie / Screw kit / Schraubensatz ❍ Lot palettes / Vane kit / Schieberssatz ✱ Kit joint avant / Front seal kit / Dichtungssatz

* sauf C2 / except C2 / ausgemomen C2

Plan du bloc fonctionnel (avec stator flasqué) (C)
Pumping module drawing (with flanged stator) (C)
Gesamtplan Pumpenblock (mit Stator monoblock) (C)



Rep.	Part	Clamping torque (DaN.m)
4	Screw CHC M6 x 30 (s.steel)	**1.2**
13	Screw CHC M6 x 10 (s.steel)	**1.2**
15	Screw CHC M6 x 25 (s.steel)	**1.2**

Nomenclature du bloc fonctionnel (avec stator flasqué) (C)

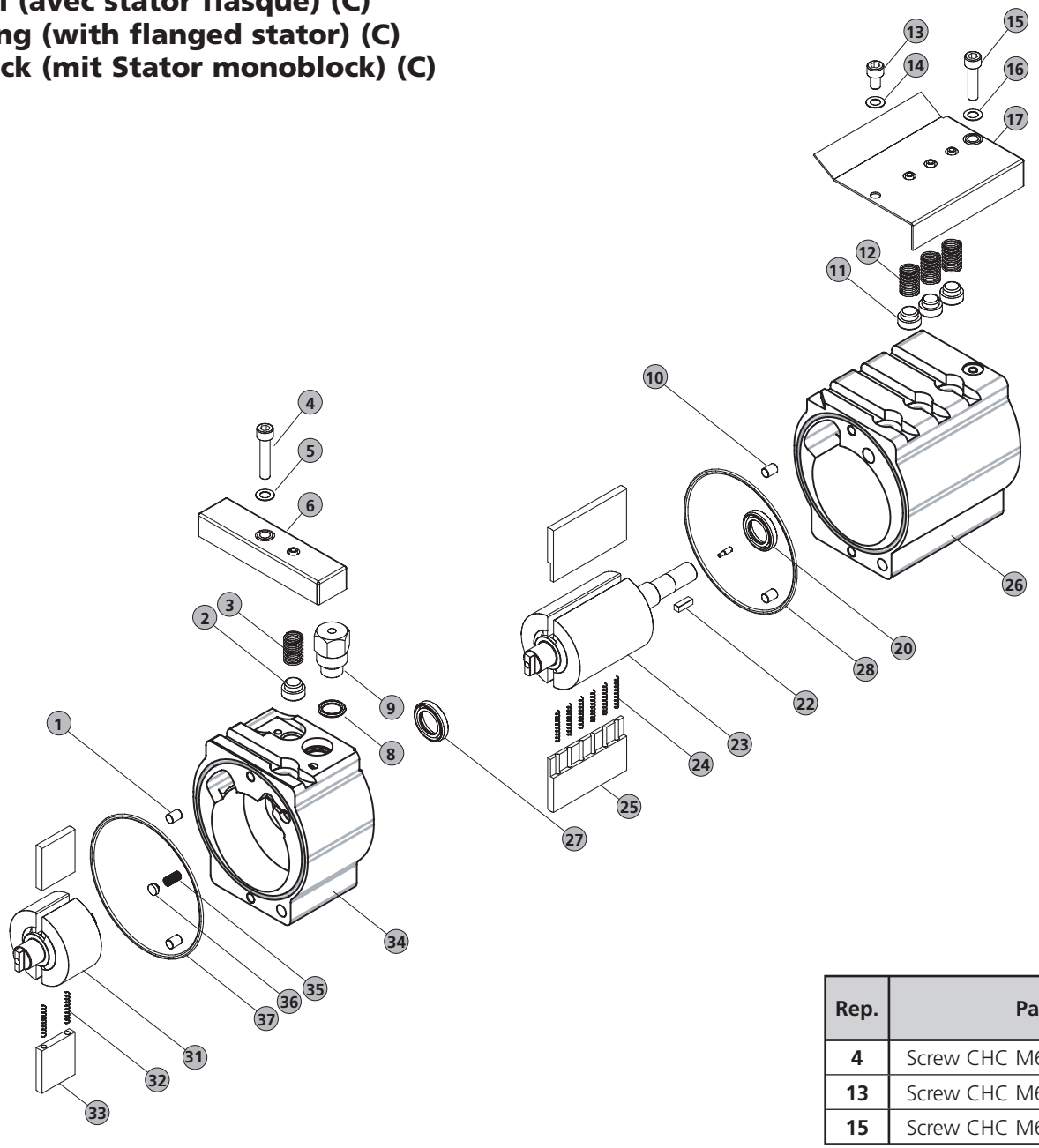
Pumping module list (with flanged stator) (C)

Nomenklatur Pumpenblock (mit Stator monoblock) (C)

REP	DÉSIGNATION	SPECIFICATION	BENENNUNG	Types/model																							REF. P/N Bestell. Nr
				2005 I	2010 I	2015 I	2021 I	2005 SD	2010 SD	2015 SD	2021 SD	1005 SD	1010 SD	1015 SD	1021 SD	2010 C2	2015 C2	2021 C2	2005 C1	2010 C1	2015 C1	2021 C1	1005 C1	1010 C1	1015 C1	1021 C1	
1	Goupille D6 LG8	Centering pin D6 LG8	Zentrierstift	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4					1/4	1/4	1/4	1/4	1/4	1/4	1/4					■
2	Soupape	Valve	Auslassventil	1	1/3	1/4	1/4	1	1/3	1/4	1/4					1/3	1/4	1/4	1/2	1/3	1/4	1/4					●
3	Ressort de soupape	Valve spring	Ventilfeder	1	1/3	1/4	1/4	1	1/3	1/4	1/4					1/3	1/4	1/4	1/2	1/3	1/4	1/4					■
4	Vis CHC M6 x 30	Screw CHC M6 x 30	Schraube CHC M6 x 30	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1					✣
5	Rondelle	Washer	Unterlegscheibe	1	1/2	1/2	1/2	1	1/2	1/2	1/2					1/2	1/2	1/2	1	1/2	1/2	1/2					✣
6	Capot de soupape	Valve cover	Ventilgehäusedeckel	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1					**A330714**
8	Joint torique c 2,7 - d 12,1 - Bague R9	O-ring c 2.7 - d 12.1 - Ring R9	Dichtung c 2,7 - d 12,1 - Ring R9	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1					●
9	Bouchon support capot	Cover holder	Gehäusedeckelhalter	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1					**103544**
10	Idem 1	Idem 1	Ebenso 1	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/2	1/2	1/2	1/2	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/2	1/2	1/2	1/2	■
11	Idem 2	Idem 2	Ebenso 2		2/3	3/4	3/4		2/3	3/4	3/4	1	2	3	3	2/3	3/4	3/4	1/2	2/3	3/4	3/4	1	2	3	3	●
12	Idem 3	Idem 3	Ebenso 3		2/3	3/4	3/4		2/3	3/4	3/4	1	2	3	3	2/3	3/4	3/4	1/2	2/3	3/4	3/4	1	2	3	3	■
13	Vis CHC M6 x 10	Screw CHC M6 x 10	Schraube CHC M6 x 10		1	1	1		1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	✣
14	Rondelle	Washer	Unterlegscheibe		1/2	1/2	1/2		1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2		1/2	1/2	1/2	1/2	1/2	1/2	1/2	✣
15	Vis CHC M6 x 25	Screw CHC M6 x 25	Schraube CHC M6 x 25		1	1	1		1	1	1	2	2	2	2	1	1	1		1	1	1	2	2	2	2	✣
16	Rondelle	Washer	Unterlegscheibe		1/3	1/3	1/3		1/3	1/3	1/3	1/2	1/2	2/2	2/2	1/3	1/3	1/3		1/3	1/3	1/3	1/2	1/2	1/2	1/2	✣
17	Capot de soupape	Valve cover	Unterlegscheibe		1				1							1				1							**A330712**
17	Capot de soupape	Valve cover	Unterlegscheibe			1				1							1				1						**A330711**
17	Capot de soupape	Valve cover	Unterlegscheibe				1				1							1				1					**A330710**
17	Capot de soupape	Valve cover	Unterlegscheibe									1											1				**A331482**
17	Capot de soupape	Valve cover	Unterlegscheibe										1											1			**A331483**
17	Capot de soupape	Valve cover	Unterlegscheibe											1											1		**A330713**
17	Capot de soupape	Valve cover	Unterlegscheibe												1											1	**A331484**
20	Joint à lèvre 15 x 25,5 x 4,6	Shaft seal 15 x 25.5 x 4.6	Lippendichtung 15 x 25,5 x 4,6	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1	1	1	1	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1	1	1	1	●
22	Clavette Parallèle A4 x 4 x 12	Shaft key A4 x 4 x 12	Nutenstein A4 x 4 x 12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	■
23	Rotor BP	LP rotor	Niederdruckrotor	1				1																			**065745**
23	Rotor BP	LP rotor	Niederdruckrotor		1				1																		**065749**
23	Rotor BP	LP rotor	Niederdruckrotor			1				1																	**065750**
23	Rotor BP	LP rotor	Niederdruckrotor				1				1																**065751**
23	Rotor BP	LP rotor	Niederdruckrotor									1															**103880**
23	Rotor BP	LP rotor	Niederdruckrotor										1														**100631**
23	Rotor BP	LP rotor	Niederdruckrotor											1													**103569**
23	Rotor BP	LP rotor	Niederdruckrotor												1												**103568**
23	Rotor BP	LP rotor	Niederdruckrotor													1				1							**065801**
23	Rotor BP	LP rotor	Niederdruckrotor														1				1						**065802**
23	Rotor BP	LP rotor	Niederdruckrotor															1				1					**065803**
23	Rotor BP	LP rotor	Niederdruckrotor																1								**065601**
23	Rotor BP	LP rotor	Niederdruckrotor																				1				**103397**
23	Rotor BP	LP rotor	Niederdruckrotor																					1			**103399**

● Lot joints / Minor kit / Dichtungssatz ■ Lot maintenance / Major kit / Wartungssatz ✣ Lot visserie / Screw kit / Schraubensatz ❍ Lot palettes / Vane kit / Schieberssatz ✱ Kit joint avant / Front seal kit / Dichtungssatz

Plan du bloc fonctionnel (avec stator flasqué) (C)
Pumping module drawing (with flanged stator) (C)
Gesamtplan Pumpenblock (mit Stator monoblock) (C)



Rep.	Part	Clamping torque (DaN.m)
4	Screw CHC M6 x 30 (s.steel)	**1.2**
13	Screw CHC M6 x 10 (s.steel)	**1.2**
15	Screw CHC M6 x 25 (s.steel)	**1.2**

Nomenclature du bloc fonctionnel (avec stator flasqué) (C)

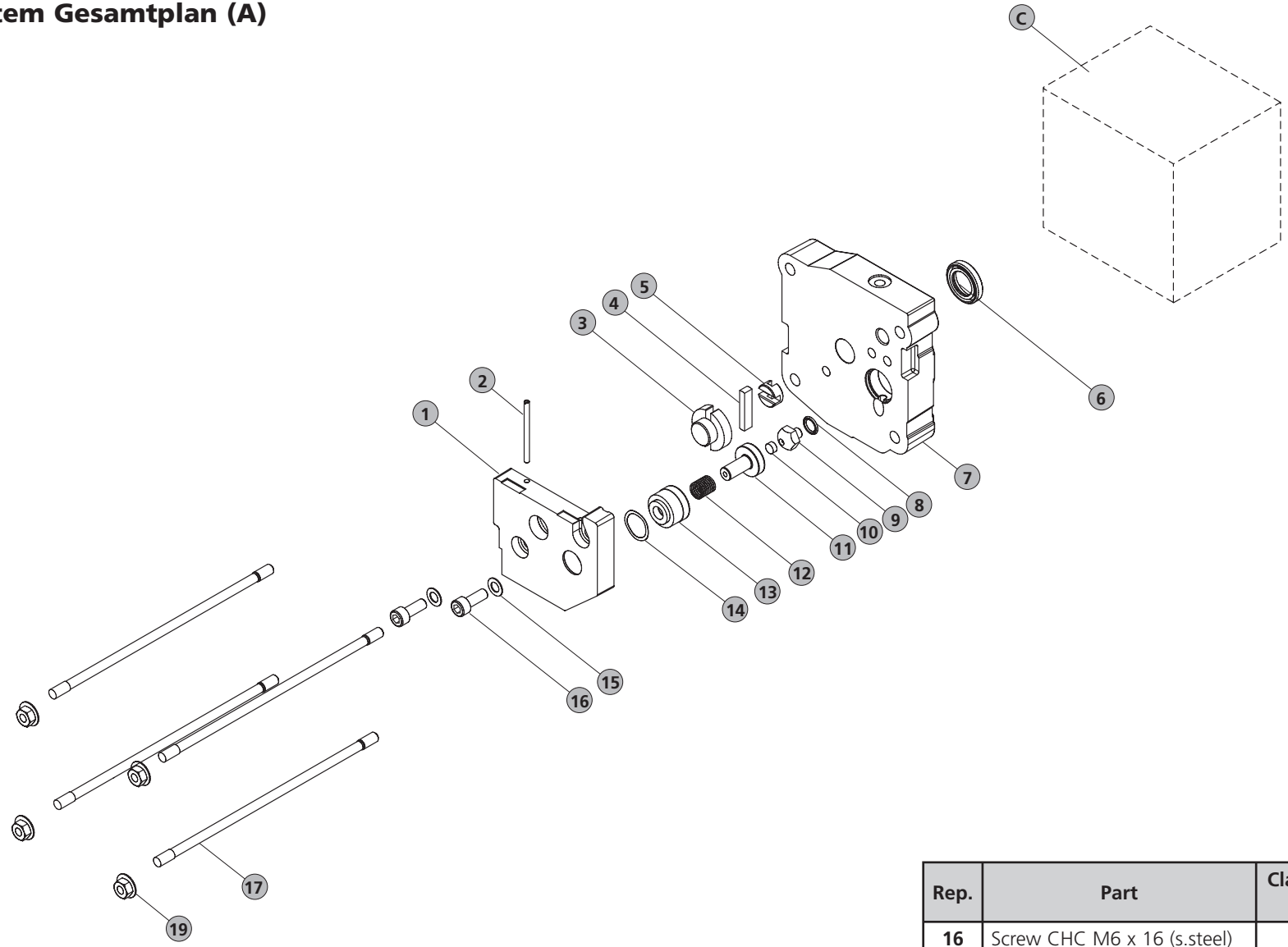
Pumping module list (with flanged stator) (C)

Nomenklatur Pumpenblock (mit Stator monoblock) (C)

REP	DÉSIGNATION	SPECIFICATION	BENENNUNG	Types/model																						REF. P/N Bestell. Nr
				2005 I	2010 I	2015 I	2021 I	2005 SD	2010 SD	2015 SD	2021 SD	1005 SD	1010 SD	1015 SD	1021 SD	2010 C2	2015 C2	2021 C2	2005 C1	2010 C1	2015 C1	2021 C1	1005 C1	1010 C1	1015 C1	1021 C1	
23	Rotor BP	LP rotor	Niederdruckrotor																					1		**103400**
23	Rotor BP	LP rotor	Niederdruckrotor																						1	**103407**
24	Ressort de palette	Vane spring	Schieberfeder	2/4	4/6	6/8	6/8	2/4	4/6	6/8	6/8	2	4	6	6	4/6	6/8	6/8	2/4	4/6	6/8	6/8	2	4	6	6	■❍
25	Palette BP	LP vane	Niederdruckscheiber	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	■❍
26	Stator BP	LP stator	Niederdruckstator	1				1																			**A006001**
26	Stator BP	LP stator	Niederdruckstator		1				1																		**A006000**
26	Stator BP	LP stator	Niederdruckstator			1				1																	**A005999**
26	Stator BP	LP stator	Niederdruckstator				1				1																**A005997**
26	Stator BP	LP stator	Niederdruckstator									1															**A006227**
26	Stator BP	LP stator	Niederdruckstator																				1				**103409**
26	Stator BP	LP stator	Niederdruckstator										1											1			**103881**
26	Stator BP	LP stator	Niederdruckstator											1													**A006043**
26	Stator BP	LP stator	Niederdruckstator																						1		**103882**
26	Stator BP	LP stator	Niederdruckstator												1											1	**103883**
26	Stator BP	LP stator	Niederdruckstator																1								**A006037**
26	Stator BP	LP stator	Niederdruckstator													1				1							**A006038**
26	Stator BP	LP stator	Niederdruckstator														1				1						**A006039**
26	Stator BP	LP stator	Niederdruckstator															1				1					**A006040**
26	Stator BP	LP stator	Niederdruckstator												1												**A006043**
26	Stator BP	LP stator	Niederdruckstator													1	1	1	1	1	1	1					**A006042**
27	Idem 20	Idem 20	Ebenso 20	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2					1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	●
28	Joint torique c 2 - d 90	O-ring c 2 - d 90	Dichtung c 2 - d 90	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1	1	1	1	1/2	1/2	1/2	1/2	1/2	1/2	1/2					●
31	Rotor HP	HP rotor	Hochdruckrotor					1	1	1	1																**065852**
31	Rotor HP	HP rotor	Hochdruckrotor	1	1	1	1																				**103417**
31	Rotor HP	HP rotor	Hochdruckrotor													1	1	1	1	1	1	1					**102854**
32	Idem 24	Idem 24	Ebenso 24	2/4	2/6	2/8	2/8	2/4	2/6	2/8	2/8					2/6	2/8	2/8	2/4	2/6	2/8	2/8					■❍
33	Palette HP	HP vane	Hochdruckscheiber	2	2	2	2	2	2	2	2					2	2	2	2	2	2	2					■❍
34	Stator HP	HP stator	Hochdruckstator	1	1	1	1	1	1	1	1	1															**A005996**
34	Stator HP	HP stator	Hochdruckstator													1	1	1	1	1	1	1					**A006042**
35	Ressort clapet anti-retour	Spring of the antisuck-back	Federrückschlagventil	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	■
36	Clapet anti-retour	Antisuck-back device	Rückschlagventil	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					**065798**
37	Idem 28	Idem 28	Ebenso 28	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4					1/4	1/4	1/4	1/4	1/4	1/4	1/4					●

● Lot joints / Minor kit / Dichtungssatz ■ Lot maintenance / Major kit / Wartungssatz ✜ Lot visserie / Screw kit / Schraubensatz ❍ Lot palettes / Vane kit / Schieberssatz ✱ Kit joint avant / Front seal kit / Dichtungssatz

Plan du système de lubrification pompe à huile (A)
Oil pump system drawing (A)
Ölpumpsystem Gesamtplan (A)



Rep.	Part	Clamping torque (DaN.m)
16	Screw CHC M6 x 16 (s.steel)	**1.2**
17	Pin (s.steel)	**1.4**
19	Nut HM6 (s.steel)	**1.4**

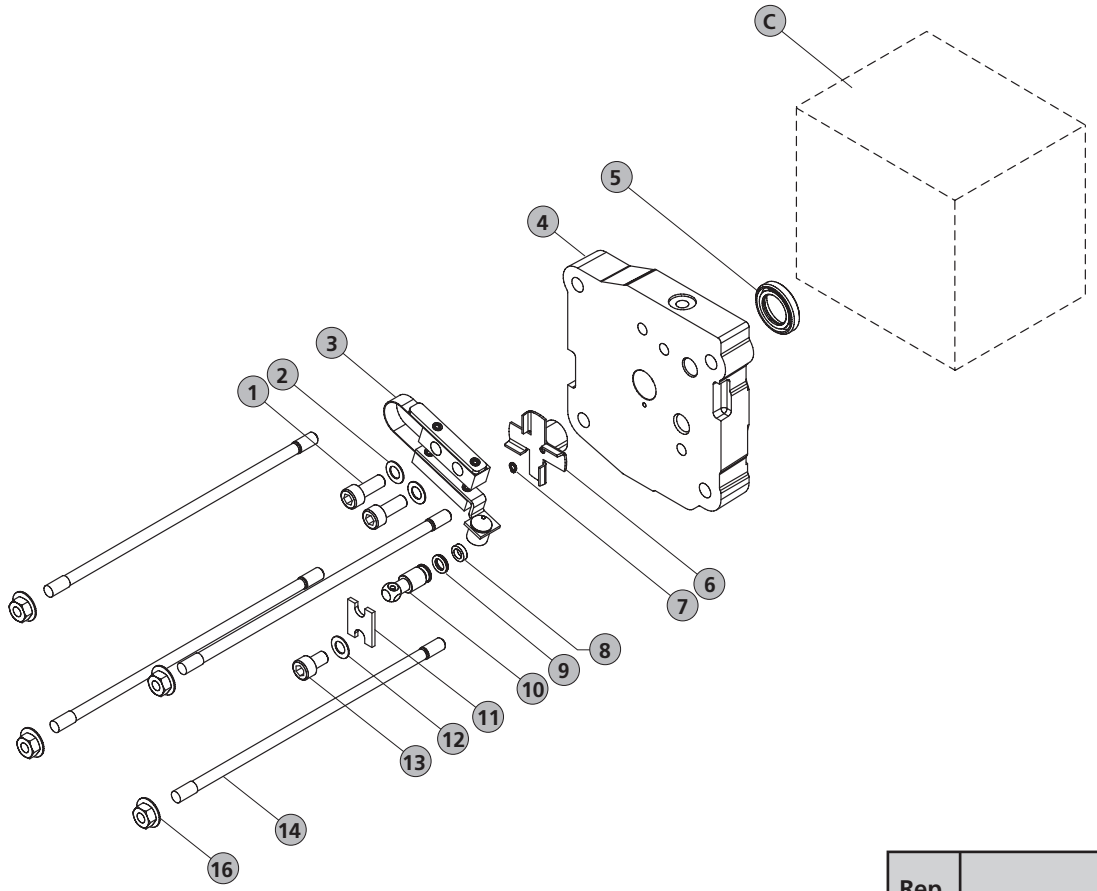
Nomenclature du système de lubrification pompe à huile / Oil pump system part list / Ölpumpsystem Nomenklatur

REP	DÉSIGNATION	SPECIFICATION	BENENNUNG	Types/model																REF. P/N Bestell. Nr
				2005 I	2010 I	2015 I	2021 I	1015 SD	1021 SD	2010 C2	2015 C2	2021 C2	2005 C1	2010 C1	2015 C1	2021 C1	1005 C1	1010 C1	1015 C1	1021 C1	
1	Couvercle pompe à huile	Oil pump cover	Ölpumpendeckel	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**103416**
2	Tube entrée d'air	Air admission tube	Lufteinlass	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**104334**
3	Rotor pompe à huile	Oil pump rotor	Ölpumpenrotor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**103412**
4	Palette pompe à huile	Oil pump vane	Ölpumpenschieber	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	■❑
5	Joint de oldham	Oldham coupling	Oldhamring	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**103413**
6	Joint à lèvre 15 x 25,5 x 4,6	Shaft seal 15 x 25.5 x 4.6	Lippendichtung 15 x 25,5 x 4,6	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	●
7	Flasque arrière	Rear plate	Hintererflansche	1	1	1	1	1	1												**A215413**
7	Flasque arrière	Rear plate	Hintererflansche							1	1	1	1	1	1	1					**A215414**
7	Flasque arrière	Rear plate	Hintererflansche														1	1	1	1	**103398**
8	Joint torique c 1,5 - d 7,5	O-ring c 1.5 - d 7.5	Dichtung c 1,5 - d 7,5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	●
9	Siège	Seat	Sitz	1	1	1	1	1	1	1											**102909**
9	Siège	Seat	Sitz								1	1	1	1	1	1	1	1	1	1	**103389**
10	Clapet anti-retour	Antisuck-back device	Rückschlagventil	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	●
11	Piston anti-retour	Antisuck-back piston	Kolber	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**102962**
12	Ressort d'étanchéité	Spring	Feder	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	■
13	Cylindre anti-retour	Oil pump antisuck-back cylinder	Rückschlagzylinder	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**102963**
14	Rondelle élastique	Spring washer	Scheibe	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	●
15	Rondelle	Washer	Unterlegscheibe	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	✜
16	Vis CHC M6 x 16	Screw CHC M6 x 16	Schraube CHC M6 x 16	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	✜
17	Goujon M6-106 / 12	Pin M6-106 / 12	Stift M6-106 / 12					4													**103524**
17	Goujon M6-129 / 19	Pin M6-129 / 19	Stift M6-129 / 19	4					4				4							4	**102855**
17	Goujon M6-142 / 12	Pin M6-142 / 12	Stift M6-142 / 12		4					4				4							**065806**
17	Goujon M6-164 / 12	Pin M6-164 / 12	Stift M6-164 / 12			4					4				4						**065805**
17	Goujon M6-187 / 12	Pin M6-187 / 12	Stift M6-187 / 12				4					4				4					**065804**
17	Goujon M6-72 / 19	Pin M6-72 / 19	Stift M6-72 / 19														4				**065636**
17	Goujon M6-84 / 12	Pin M6-84 / 12	Stift M6-84 / 12															4			**103522**
17	Goujon M6-106 / 12	Pin M6-106 / 12	Stift M6-106 / 12																4		**103524**
19	Ecrou à embase HM6	Shoudered nut HM6	Schraubenmutter HM6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	✜

● Lot joints / Minor kit / Dichtungssatz ■ Lot maintenance / Major kit / Wartungssatz ✜ Lot visserie / Screw kit / Schraubensatz ❑ Lot palettes pompe à huile / Oil vane pump kit / Ölpumpenschieberssatz

Sous-ensemble A / Subassembly A / Gesamtplan A

Plan du système de lubrification levier moulinet (B)
Oil system drawing (B)
Ölpumpsystem Gesamtplan (B)



Rep.	Part	Clamping torque (DaN.m)
1	Screw CHC M6 x 16 (s.steel)	**1.2**
13	Screw CHC M6 x 10 (s.steel)	**1.2**
14	Pin (s.steel)	**1.4**
16	Nut (s.steel)	**1.4**

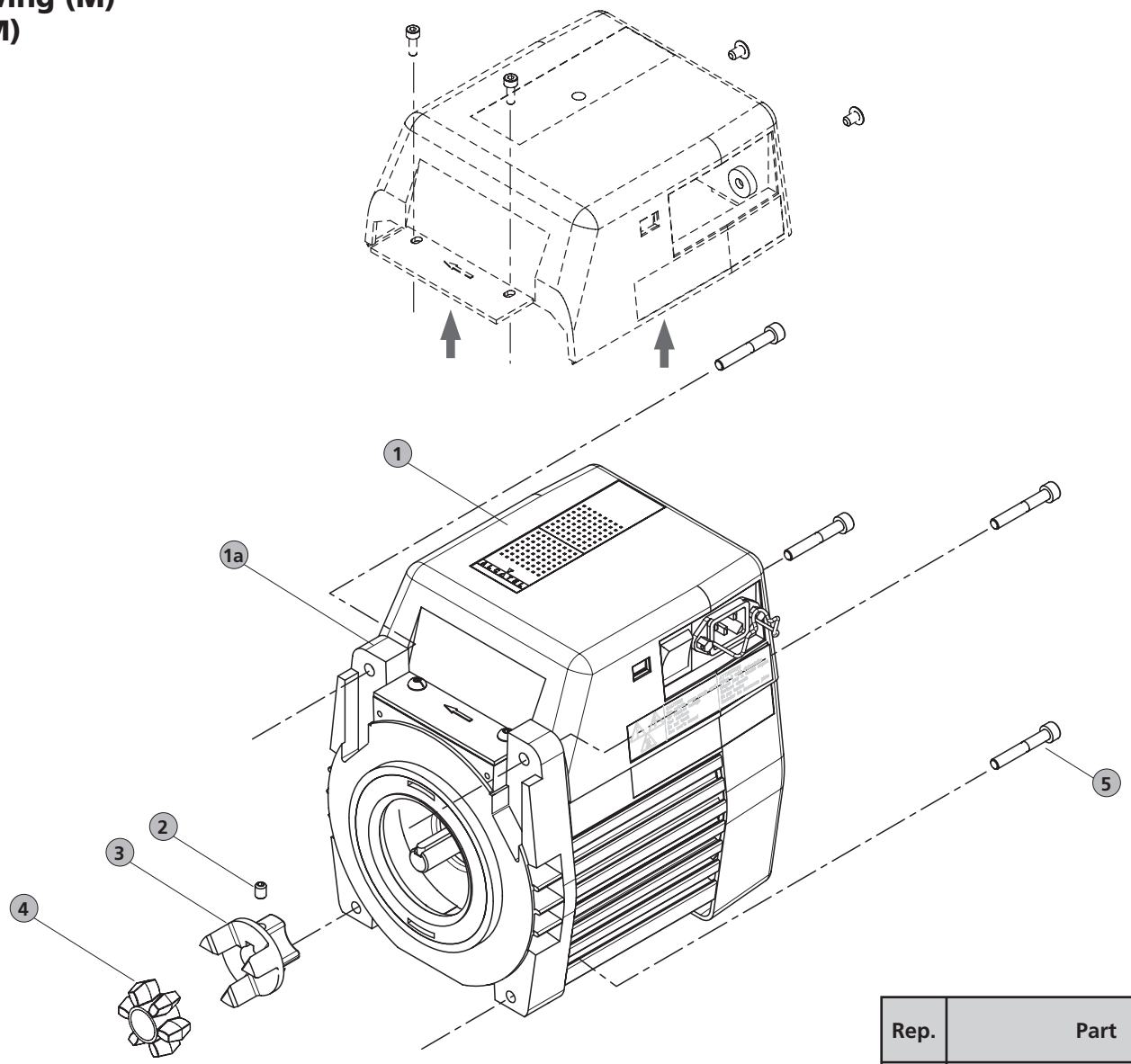
Nomenclature du système de lubrification levier moulinet / Oilsystem part list / Ölpumpsystem Nomenklatur

REP	DÉSIGNATION	SPECIFICATION	BENENNUNG	Types/model						REF. P/N Bestell. Nr
				2005 SD	2010 SD	2015 SD	2021 SD	1005 SD	1015 SD	
1	Vis CHC M6 x 16	Screw CHC M6 x 16	Schraube CHC M6 x 16	2	2	2	2	2	2	✣
2	Rondelle	Washer	Unterlegscheibe	2/3	2/3	2/3	2/3	2/3	2/3	✣
3	Levier oscillant	Equipped lever	Hebel	1	1	1	1	1	1	■
4	Flasque arrière	Rear plate	Hintererflansche	1	1	1	1			**A215412**
4	Flasque arrière	Rear plate	Hintererflansche					1	1	**103485**
5	Joint à lèvre 15 x 25,5 x 4,6	Shaft seal 15 x 25.5 x 4.6	Lippendichtung 15 x 25,5 x 4,6	1	1	1	1	1	1	●
6	Came moulinet	Impeller	Flügelnocke	1	1	1	1	1	1	**052721**
7	Bague d'arrêt	Clips	Sprengring	1	1	1	1	1	1	■
8	Rondelle	Washer	Unterlegscheibe	1	1	1	1			**052758**
8	Gicleur	Jet	Düse					1	1	**102910**
9	Joint torique c 1,9 - d 5,7 - Bague R5	O-ring c 1.9 - d 5.7 - Ring R5	Dichtung c 1,9 - d 5,7 - Ring R5	1	1	1	1	1	1	●
10	Siège de clapet	Seat	Ventilsitz	1	1	1	1	1	1	**052718**
11	Bride	Flange	Klammer	1	1	1	1	1	1	**052569**
12	Idem 2	Idem 2	Ebenso 2	1/3	1/3	1/3	1/3	1/3	1/3	✣
13	Vis CHC M6 x 10	Screw CHC M6 x 10	Schraube CHC M6 x 10	1	1	1	1	1	1	✣
14	Goujon M6-129 / 19	Pin M6-129 / 19	Stift M6-129 / 19	4						**102855**
14	Goujon M6-142 / 12	Pin M6-142 / 12	Stift M6-142 / 12		4					**065806**
14	Goujon M6-164 / 12	Pin M6-164 / 12	Stift M6-164 / 12			4				**065805**
14	Goujon M6-187 / 12	Pin M6-187 / 12	Stift M6-187 / 12				4			**065804**
14	Goujon M6-72 / 19	Pin M6-72 / 19	Stift M6-72 / 19					4		**065636**
14	Goujon M6-84 / 12	Pin M6-84 / 12	Stift M6-84 / 12						4	**103522**
16	Ecrou à embase HM6	Shoudered nut HM6	Schraubenmutter HM6	4	4	4	4	4	4	✣

● Lot joints / Minor kit / Dichtungssatz ■ Lot maintenance / Major kit / Wartungssatz ✣ Lot visserie / Screw kit / Schraubensatz

Sous-ensemble B / Subassembly B / Gesamtplan B

Plan ensemble motorisation (M)
Motor assembly drawing (M)
Motor Gesamtplan (M)



Rep.	Part	Clamping torque (DaN.m)
5	Screw CHc M6 x 40 (s.steel)	**1.1**
2	Screw Hc M6 x 8.8 (s.steel)	**0.8**

Nomenclature ensemble motorisation (M) / Motor assembly part list (M) / Motor Gesamtheit Nomenklatur (M)

MOTEUR UNIVERSEL / UNIVERSAL MOTOR / UNIVERSELLE MOTOR					
REP	**DÉSIGNATION**	**SPECIFICATION**	**BENENNUNG**	**Qty**	**REF. P/N Bestell. Nr**
1	Moteur monophasé standard avec interrupteur*	Single phase motor with on/off switch*	Wechselstrommotor* mit Shalter	1	**108694**
1	Moteur monophasé sans interrupteur*	Single phase motor without switch*	Wechselstrommotor* ohne Shalter*	1	**108698**
1	Moteur triphasé standard	Three-phase motor	Drehstrommotor	1	**108695**
1a	Kit d'adaptation pour moteur bride CEI (bride CEI + vis + 1/2 manchon + intercalaire)	CEI flange motor coupling kit (CEI flange + screw +motor side coupling+ plastic coupling)	CEI Klammer Motorflanschssatz (Klammer Motorflanschssatz + Schraube +Kupplugshälfte + Küpplungsstern)	1	**104558**
1b	Kit d'adaptation pour moteur bride Nema (bride Nema + vis + 1/2 manchon US + intercalaire)	Nema flange motor coupling kit (Nema flange + screw +US motor side coupling+ plastic coupling)	Nema Klammer Motorflanschssatz (Klammer Motorflanschssatz + Schraube +US Kupplugshälfte + Küpplungsstern)	1	**105952**
2	Vis Hc M6 x 8,8	Screw Hc M6 x 8.8	Schraube Hc M6 x 8,8	1	✣
3	1/2 Manchon moteur	Motor side coupling	Kupplungshälfte	1	**065742**
4	Intercalaire	Plastic coupling	Kupplungstern	1	●
5	Vis CHc M6 x 40	Screw CHc M6 x 40	Schraube CHc M6 x 40	4	✣

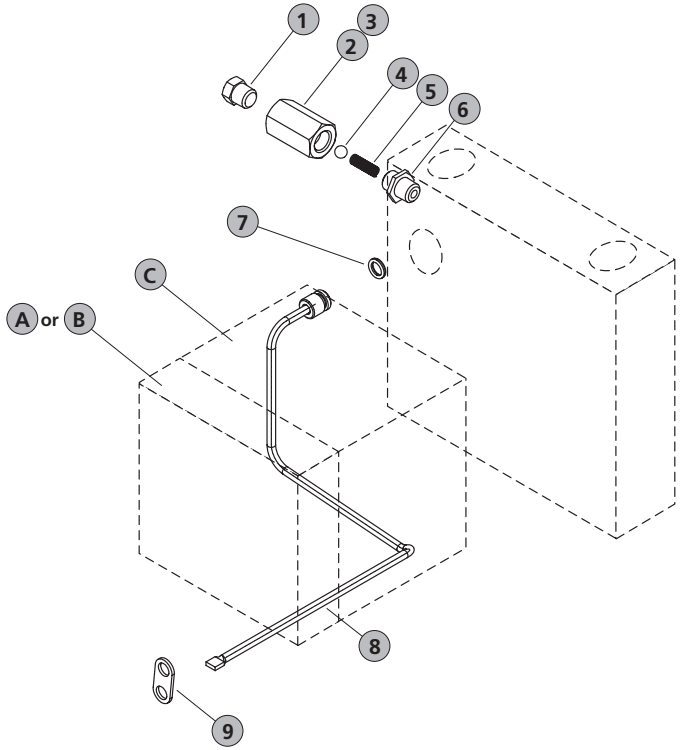
* Moteur livré sans câble mais équipé avec 2+3+4 — * Delivered without cable but equipped with 2+3+4 — * ohne Netzkabel aber mit 2+3+4 einrichtet

● Lot joints / Minor kit / Dichtungssatz ■ Lot maintenance / Major kit / Wartungssatz ✣ Lot visserie / Screw kit / Schraubensatz

CÂBLE ÉLECTRIQUE POUR MOTEUR MONOPHASÉ / ELECTRICAL CABLE FOR SINGLE PHASE MOTOR / NETZKABEL FÜR WECHSELSTROMMOTOR (L = 2M)			
DÉSIGNATION	**SPECIFICATION**	**BENENNUNG**	**REF. P/N Bestell. Nr**
USA (Basse tension)	USA (Low voltage)	Netzkabel (Niederspannung) (USA)	**103567**
USA (Haute tension)	USA (High voltage)	Netzkabel (Hochspannung) (USA)	**103898**
EUROPE	EUROPE	Netzkabel (EUROPA)	**103566**
JAPON (Basse tension)	JAPAN (Basse tension)	Netzkabel (Niederspannung) (JAPAN)	**103567**
JAPON (Haute tension)	JAPAN (Haute tension)	Netzkabel (Hochspannung) (JAPAN)	**104559**
ROYAUME UNI	UNITED KINGDOM	Netzkabel (GB)	**104411**
SUISSE (Coudé)	SWITZERLAND (elbow)	Netzkabel (SCHWEIZ)	**A459212**

Des moteurs spéciaux sont disponibles sur demande (anti-déflagrant…)
Specific motors are available on request (Explosion-proof…)
Spezialmotore (z.B. explosionsgeschützt) sind auf Anfrage erhältlich

Plan du système bulleur
Bubbler system drawing
Bubbler system Gesamtplan



Nomenclature du système bulleur / Bubbler system part list / Bubbler system Nomenklatur

REP	DÉSIGNATION	SPECIFICATION	BENENNUNG	Types/model			REF. P/N Bestell. Nr
				2010 C2	2015 C2	2021 C2	
1	Bouchon 1/8 NPT	Plug 1/8 NPT	Blindstopfen 1/8 NPT	1	1	1	**082926**
2	Manchon	Coupling	Kupplung	1	1	1	**065866**
3	Ruban teflon	Teflon band	Teflon band	1	1	1	**060975**
4	Bille inox 18/8 d. 5,8	Ball 18/8 d. 5.8	Kugel 18/8 d, 5,8	1	1	1	**087593**
5	Ressort	Spring	Feder	1	1	1	**065149**
6	Raccord G 1/8 -1/8 NPT	Connector G 1/8 -1/8 NPT	Verbindungselement	1	1	1	**065867**
7	Joint torique c 1,9 - d 7,2	O-ring c 1.9 - d 7.2	Dichtung c 1,9 - d 7,2	1	1	1	●
8	Bulleur	Bubbler	Bubler	1	1		**065836**
8	Bulleur	Bubbler	Bubler			1	**065835**
9	Attache tube	Tube fastener	Rohrbefestigung	1	1	1	**065835**

● Lot joints / Minor kit / Dichtungssatz ■ Lot maintenance / Major kit / Wartungssatz ✣ Lot visserie / Screw kit / Schraubensatz

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