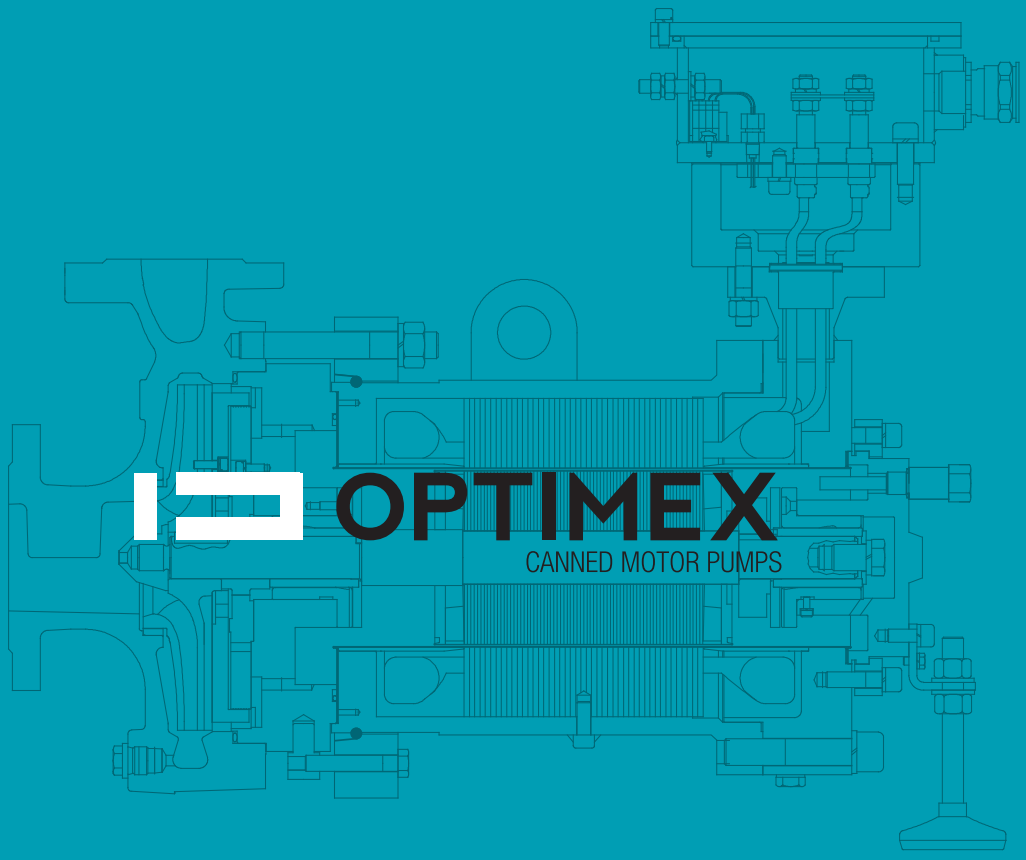


OPTIMEX

CANNED MOTOR PUMPS

Monocellular PREI range

API 685

DESIGN, MANUFACTURING, REPAIR

OPTIMEX is exclusively dedicated to conception, manufacturing, tests and after sales service of Canned Motor Pumps. Created in 1998, our company has been growing ever since, and has become a major actor in this field on the international market.

Canned Motor Pumps' technology is characterized by a compact and integrated unit, without mechanical seal. Used for dangerous, toxic and explosive liquids as well as for major and valuable processes, canned motor pumps are chosen for their robustness and reliability. They confer the highest safety level on the market thanks to its double hermetically sealed containment.

We design and manufacture our pumps according to the following standards:

- ISO 2858, ISO15783, API685, directive 2006/42/EC (Electrical machinery) directive 94/9/CE (ATEX), CUTR (Customs Union Technical Regulations For Belarus, Kazakhstan and Russia), directive 97/23/EC (PED), RCCM level 3, RCCM-X level 2 and 3.
- OPTIMEX answers the quality management requirements established by ISO 9001 and NF EN 13980.

TÜVRheinland CERTIFIED — Management System ISO 9001:2008 — www.tuv.com ID 9105018292

Remaining attentive to its international customers' requirements, OPTIMEX adapts its production to local Ex-proof directives (ATEX, CUTR, CSA, UL…).

SUMMARY

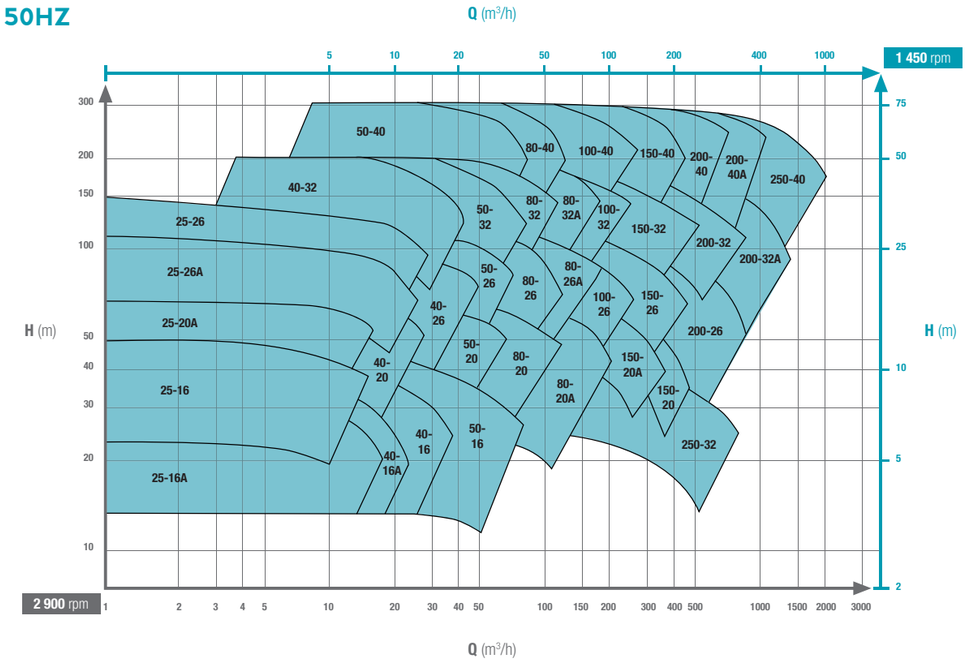
PREI RANGE

Based in Lyon, OPTIMEX has first developed a range of products dedicated to the chemical industry, to answer its nearest customers' needs in leak-proof and normalized pumps.

The growing demand for reliable and safer operating pumps in the oil and gas industry, gave OPTIMEX the opportunity to develop its own range of single stage canned motor pumps adapted to this field.

This was well coordinated with the introduction of the API 685 standard, exclusively dedicated to seal-less pumps. Our PREI range was thus designed according to this API 685 Standard, and to our customers' expectations, regarding their critical and severe applications.

50HZ



60HZ: Pump also available at 3500 and 1750 rpm

PREI RANGE DESIGNATION

Each OPTIMEX pump is identified by a unique serial number (BFXXXX) and a complete designation name that reflects all main characteristics of the pump (regarding hydraulic and motor selection, design specificities and main construction options)

Additional option
In: Inducer
Hp: High pressure design

Discharge nozzle diameter in mm

Motor size

Number of poles:
2: 2 poles
4: 4 poles

PREI: range of pump name
PREIH: PREI range with heating/cooling jacket

PREI - AR 80/20 IN P15F2 Bd

Construction options:
A: for classified area
F: filtered
R: cooled
S: pressurized
V: Vertical
I: Clear liquid injection
X: Special design

Impeller maximum diameter in cm

Terminal Box construction:
Without indication: standard
Deported terminal box: Bd

Insulation class of the winding:
F: class H (temp. liquide up to 100°C
T: class C240 (temp. liquide up to 160°C)
C: class C400 (temp. liquide up to 360°C)

P: standard range of motor
PR: motor with heating/cooling jacket

Pumps are delivered with a standard documentation list and standard set of tests and inspections:

STANDARD DOCUMENTATION:

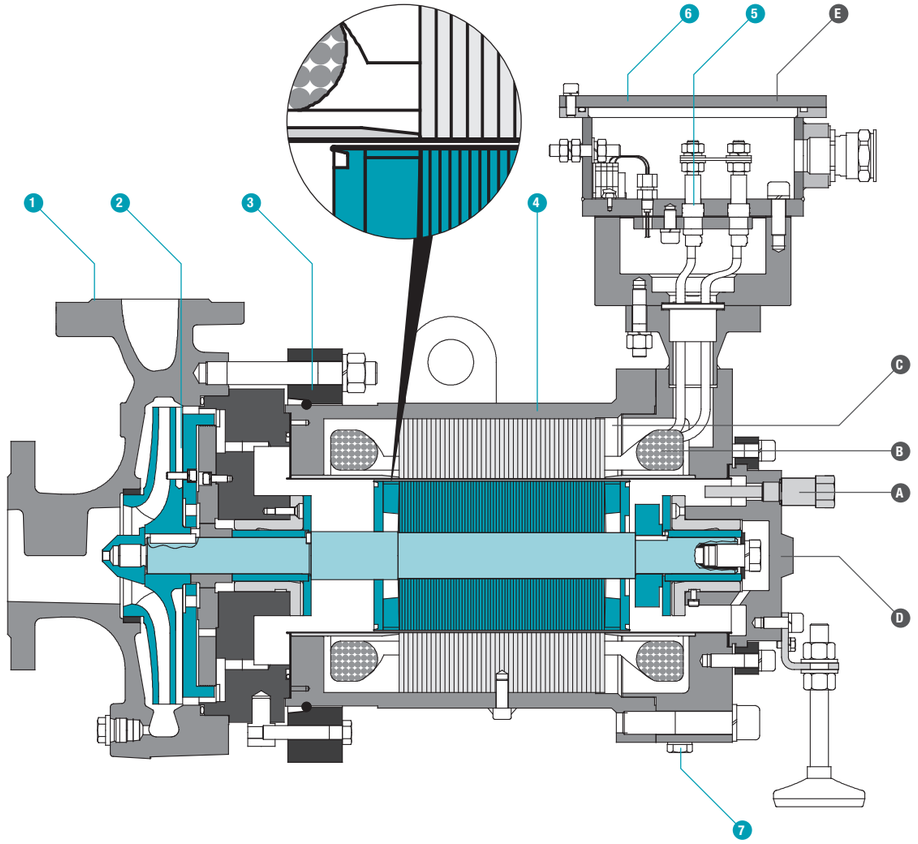
Vendor's data sheet + curve
Instrumentation list + manuals
General arrangement drawings
Cross Sectionnal drawing with parts list
Spare part list advised by OPTIMEX
Operation and maintenance instruction
Vendor Data Book
Ex-Proof certificate (ATEX, Ex-GOST R or other upon request and confirmation by OPTIMEX)
CE declaration of conformity

STANDARD CONTROLS:

Balancing test following ISO 1940
Hydrostatic tests
Performance test (QHP) following ISO 9906 with API 685 tolerances (5 points)
Balancing system test: axial thrust measurement
Final sealless test with air
Motor insulation test

Other document/test/inspection or certificate can be proposed upon request and after OPTIMEX confirmation.

SPECIFICATIONS OF DESIGN



STANDARD CONSTRUCTION

1. Standard flanges according to ASME B16.5, Class 300 RF
2. Thrust balancing system BL+2 (detailed page11)
3. Loose flange: allows adaptability between different motors and hydraulics of the PREI Range
4. Motor frame with same pressure design as the pump
5. Leak proof feedthrough with same design pressure as the pump
6. Terminal box: in "e" protection
7. Drainable second containment

CONSTRUCTION OPTIONS

- Welded drain with flange and valve
- SIC30 slide bearings: detailed page 7
- Inducer: for low NPSH application
- Circulation plan selection: detailed page 10
- Hydraulic and motor heating or cooling jacket for crystallizing or polymerizing liquids
- Additionnal separate instrumentation junction box

INSRUMENTATION OPTIONS

- **A** Control of the liquid temperature at the hottest point of the pump.
- **B** Winding overheat protection PT100 or/and PTC
- **C** Control and monitoring of the second containment pressure: to detect the stator liner failure
- **D** Control and Monitoring of the mobile position, mounted on the rear bearing support: to detect any deviance of thrust balancing or bearings capacity.
- **E** Rotating direction indicator with local indicator: to guarantee the appropriate electrical connection

Other instrumentation can be supplied for your installation, such as liquid level switch, power controller, frequency converter…

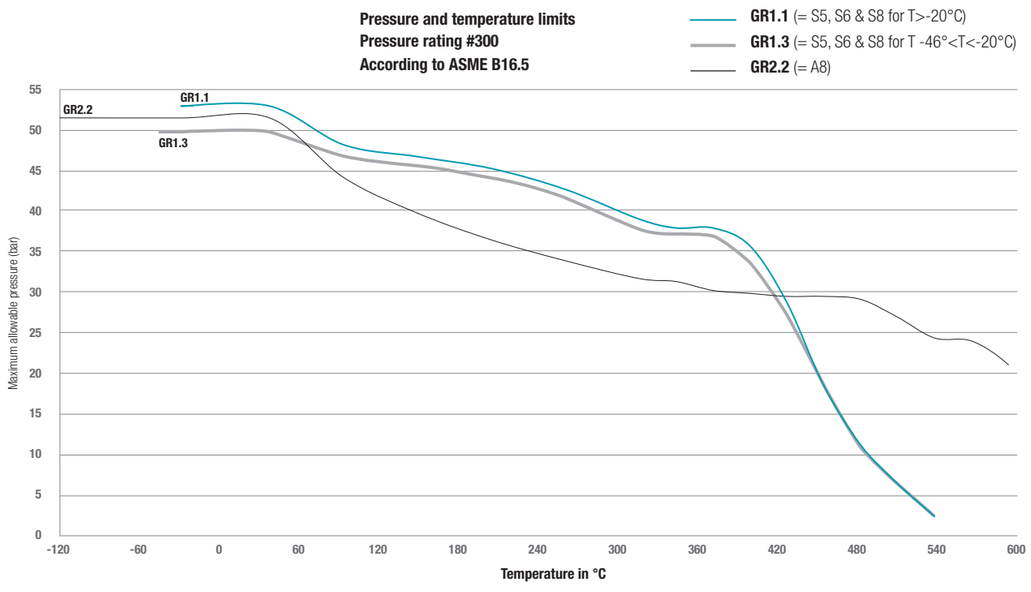
IMPORTANT: Minimum requirement in hazardous area is liquid level control and temperature control

MATERIALS

In accordance with the materials required by API685, OPTIMEX has made a standard selection that covers to its maximum your usual applications, in terms of liquid compatibility and operating temperature range.

		S-5 & S-6		S-8		A-8
		T>-20°C	-46°C<T<-20°C	T>-20°C	-46°C<T<-20°C	T<-46°C
Pressure casing	Castings	A216WCB	A352LCB	A216WCB	A352LCB	A351 GrCF3M
	Forgings	A350LF2	A350LF2 Cl1	A350LF2	A350LF2 Cl1	A182 Gr F 316L
	Tubes	A106Grb	A333Gr6	A106Grb	A333Gr6	A312 type 316L
Impeller		A890 Gr1A	A890 Gr1A	A890 Gr1A	A890 Gr1A	A890 Gr1A
Casing and impeller wear rings		A276 Type 410 +T	A276 Type 410 +T	A312 Type 316L	A312 Type 316L	A312 Type 316L
Motor Casing		E355	E355	E355	E355	E355
Shaft		A276 Type 420	A276 Type 420	A312 Type 316L	A312 Type 316L	A312 Type 316L

Standard flanges rating is #300 in accordance with ASME B16.5.
Maximum acceptable pressure versus the operating temperature are described in the graphic below.



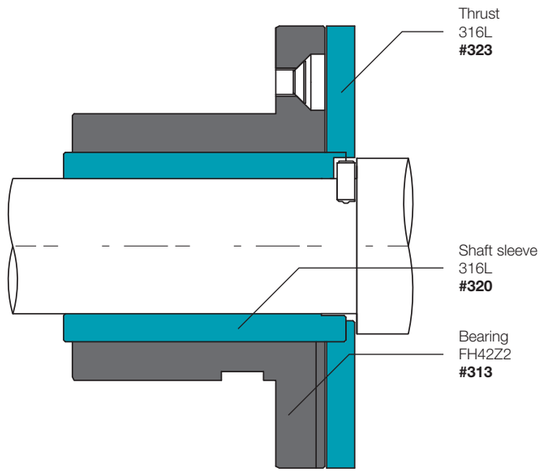
SLIDE BEARINGS

316L/GRAPHITE

Slide bearings are one of the major parts that confer such a good reliability to seal-less pumps.

In single stage canned motor pumps, the monobloc shaft composed of all the rotating elements of the machine is supported by 2 slide bearings that are totally submersed in the pumped liquid.

Once the pump's filling is guaranteed (and controlled with the appropriate instrumentation), and the pump is started, the mobile will rotate free from any friction and wearing, thanks to a thin film.

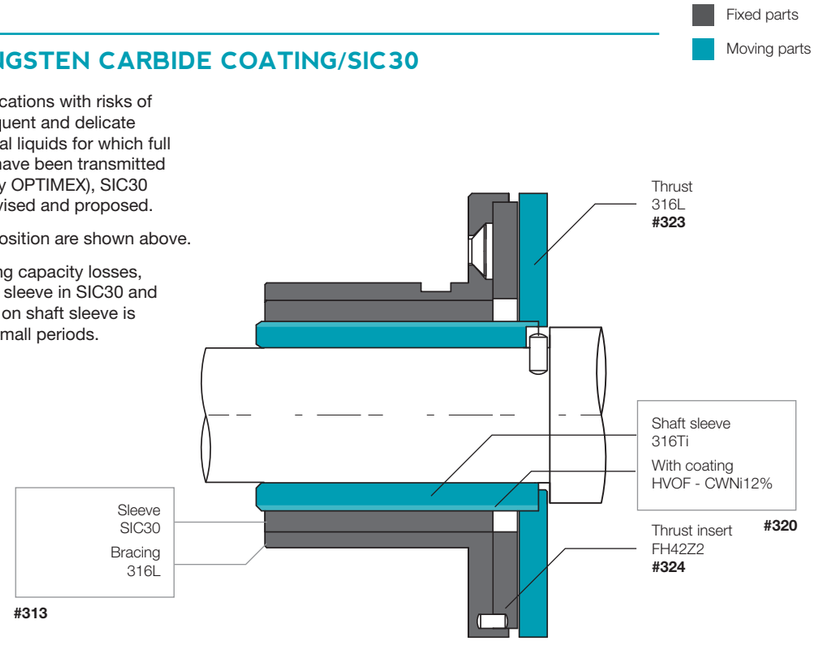


316Ti/TUNGSTEN CARBIDE COATING/SIC30

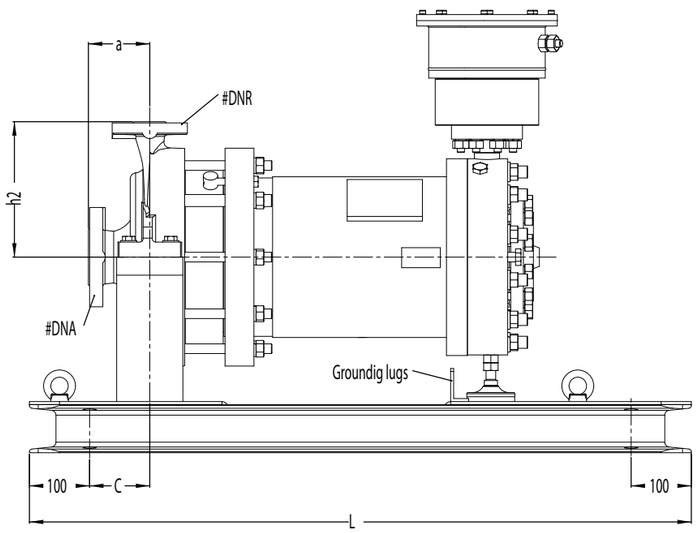
For critical applications with risks of dry running (frequent and delicate start-up or critical liquids for which full characteristics have been transmitted and approved by OPTIMEX), SIC30 bearings are advised and proposed.

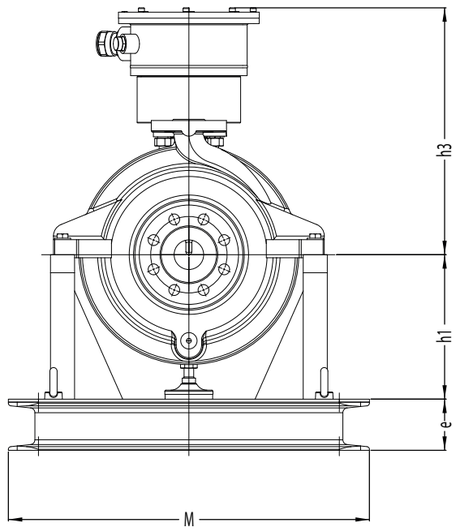
Parts and composition are shown above.

In case of bearing capacity losses, friction between sleeve in SIC30 and specific coating on shaft sleeve is acceptable for small periods.



+ ARRANGEMENT DRAWING





	HYDRAULIC					P4	P7	P10	P15	P30	P37	P45	P69	P80	M100	M120
	DNA inches	DNR inches	a mm	h2 mm	c mm											
25-16A	2	1	80	160	130	1000	1100									
25-16	2	1	80	160	130											
40-16	3	2	100	160	150											
50-16	3	2	100	180	150											
25-20	2	1	80	180	130		1000	1100								
25-20A	2	1	80	180	130											
40-20	3	2	100	200	150				1300							
50-20	3	2	100	200	150	1010		1200	1310							
80-20	4	3	100	225	150	1020		**1210**	1320							
80-20A	6	3	140	250	190			1220	1330	1400		1600	1700			
100-20	6	4	125	280	175			1230	1340	1410	1410	1605	1705			
150-20A	6	6	160	355	210				1350	1420		1610	1710			
150-20	8	6	200	355	250					1430	1500	1615	1715	1800		
25-26	2	1	100	225	150											
25-26A	2	1	100	225	150		1110	1220	1330							
40-26	3	2	100	225	150						1410					
50-26	3	2	125	225	175		1120		1360			1620				
80-26	4	3	125	280	175								1720			
80-26A	6	3	125	280	175				1350		1420	1625	1725	1710	1900	
100-26	6	4	140	280	190							1610	1710			
150-26	8	6	165	380	215							1630	1730		1910	2000
200-26	8	8	236	450	286							1635	1735	1810	1920	2010
40-32	3	2	125	250	175				1350	1440	1420	1625	1725			
50-32	3	2	125	280	175									1710		
80-32	4	3	125	315	175										1900	
80-32A	6	3	140	315	190							1640	1740	1730	1910	2000
100-32	6	4	140	315	190							1645	1745	1800	1930	2020
150-32	8	6	170	400	220							1635	1735		1940	2010
200-32	8	8	236	450	286										1950	2030
50-40	3	2	150	335	200						1510	1650	1750	1820	1960	2040
80-40	4	3	140	400	190											
100-40	6	4	170	400	220							1655	1755		1950	2030
150-40	8	6	170	450	220										1970	2050

Each combination between an hydraulic and a motor match a specific code that gives the corresponding dimensions.
As an exemple, see the underlined selection.

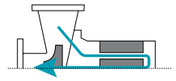
	h1 mm	L mm	h3 mm	M mm	e mm
1000	220	1000	335	400	85
1010	220	1000	335	500	85
1020	240	1000	335	500	85
1100	220	1200	335	400	85
1110	260	1000	335	500	85
1120	260	1200	335	600	85
1200	220	1200	335	500	85
1210	240	1200	335	500	85
1220	260	1200	335	500	85
1230	280	1200	335	500	85
1300	220	1200	410	400	85
1310	220	1200	410	500	85
1320	240	1200	410	500	85
1330	260	1200	410	500	85
1340	280	1200	410	500	85
1350	280	1200	410	600	85
1360	260	1200	410	600	85
1400	260	1400	410	500	85
1410	280	1400	410	500	85
1420	280	1400	410	600	85
1430	320	1400	410	600	85
1440	280	1200	410	600	85
1500	320	1600	410	600	85
1510	220	1400	410	400	85
1600	260	1800	160	500	105
1605	280	1800	160	500	105
1610	280	2000	160	600	105
1615	320	2000	160	600	105
1620	260	1800	160	600	105
1625	280	1800	160	600	105
1630	300	2000	160	600	105
1635	340	2000	160	800	105
1640	300	1800	160	600	105

	h1 mm	L mm	h3 mm	M mm	e mm
1645	320	1800	160	600	105
1650	360	1800	160	800	105
1655	380	2000	160	800	105
1700	260	1800	460	500	105
1705	280	1800	460	500	105
1710	280	2000	460	600	105
1715	320	2000	460	600	105
1720	260	1800	460	600	105
1725	280	1800	460	600	105
1730	300	2000	460	600	105
1735	340	2000	460	800	105
1740	300	1800	460	600	105
1745	320	1800	460	600	105
1750	360	1800	460	800	105
1755	380	2000	460	800	105
1800	320	2000	460	600	105
1810	340	2200	460	800	105
1820	360	2000	460	800	105
1900	280	2000	515	600	105
1910	300	2000	515	600	105
1920	340	2200	515	800	105
1930	320	2000	515	600	105
1940	340	2000	515	800	105
1950	380	2000	515	800	105
1960	360	2000	515	800	105
1970	380	2000	515	900	105
2000	300	2600	515	600	105
2020	320	2600	515	600	105
2030	340	2600	515	800	105
2030	380	2600	515	800	105
2040	360	2600	515	800	105
2050	380	2600	515	900	105

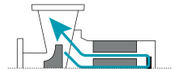
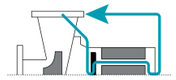
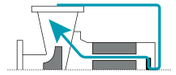
CIRCULATION PLANS

According to the operating conditions and fluid properties, OPTIMEX selects the appropriate circulation plan to optimize the pump's functioning. Above are shown our standard circulations in normal conditions, liquefied gas (pressurized), hot liquids (cooling loop) and liquids with particles (filtered). For critical applications, OPTIMEX can develop customized circulation plans that ensures the right lubrication and cooling of the motor.

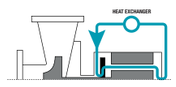
N: NORMAL CIRCULATION

Réf. OPTIMEX	Réf. API 685	Liquid in the motor	Circulation description	Diagram
N1	Plan 1-S	Pumped liquid	Injection in the motor from the hydraulic casing (at the impeller periphery), circulation through the gap, and return to the pump suction via the hollow shaft.	

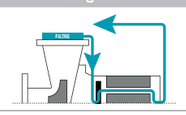
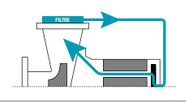
S: OVERPRESSURED CIRCULATION

Réf. OPTIMEX	Réf. API 685	Liquid in the motor	Circulation description	Diagram
S1	Plan 1-SD	Pumped liquid	Injection in the motor from the hydraulic casing (at the impeller periphery), passage through the hollow shaft, overpressure by an auxiliary impeller, circulation through the gap and return in the hydraulic casing at the impeller periphery.	
S3	-	Pumped liquid	Injection in the motor from the discharge nozzle, overpressure by a large auxiliary impeller, passage through the gap and return to the discharge nozzle via an external pipe.	
S5	-	Pumped liquid	Injection in the motor via an external pipe from the discharge nozzle, overpressure by an auxiliary impeller, passage through the gap and return in the hydraulic casing in high pressure zone at the impeller periphery.	

R: COOLED CIRCULATION

Réf. OPTIMEX	Réf. API 685	Liquid in the motor	Circulation description	Diagram
R1	Plan 23-S	Pumped liquid	Pumped liquid and motor liquid are identical and they slightly communicate in order to establish an equipressure between the 2 areas (high and low temperature). On the motor side the liquid circulates in an external heat exchanger, flow is established by an auxiliary impeller. A thermal barrier is built between the hydraulic casing and the motor (air or water).	
R3	-	Pumped liquid	Pumped liquid and motor liquid are identical and they slightly communicate in order to establish an equipressure between the 2 areas (high and low temperature). On the motor side the liquid circulates in an external heat exchanger, flow is established by a large auxiliary impeller. A thermal barrier is built between the hydraulic casing and the motor (air or water).	

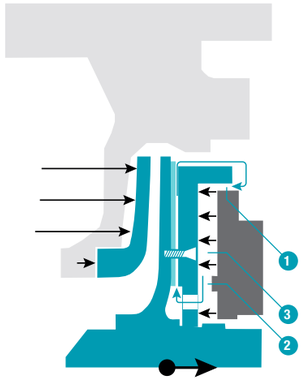
F: FILTERED CIRCULATION

Réf. OPTIMEX	Réf. API 685	Liquid in the motor	Circulation description	Diagram
F3	-	Pumped liquid	Injection in the motor from the discharge nozzle through a tangential filter, overpressure by a large auxiliary impeller, passage through the gap and return to the discharge nozzle via an external pipe.	
F5	-	Pumped liquid	Injection in the motor from the discharge nozzle through a tangenatial filter, overpressure by a large auxiliary impeller, passage through the gap and return in the hydraulic casing in high pressure zone at the impeller periphery.	

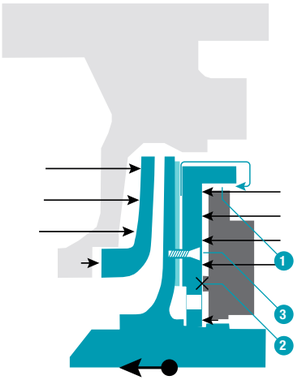
THRUST BALANCING SYSTEM

Over the years OPTIMEX has developed a performing and reliable thrust balancing system. BL+2 system is composed of two restrictions, one is stable (1), the other one is variable (2). These orifices regulate the pressure into the regulating chamber (3) that insures thrust balance of the complete mobile.

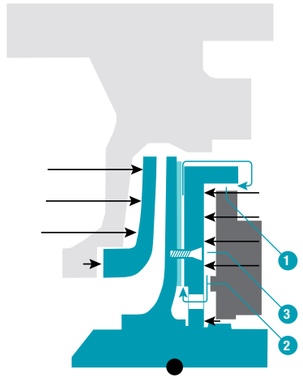
If the mobile moves to the left: restriction orifice (2) is widely opened, chamber's (3) pressure is balanced with low pressure given by impeller's rear fins through the balancing hole. As a consequence resultant force is positive, and the system moves back rearwardly.

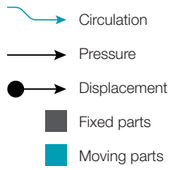


If the mobile moves to the right: restriction orifice (2) is closed and prohibits any balancing with low pressure. As a consequence, pressure increases in regulating chamber (3), the resultant is negative and the mobile moves back forwardly.



In the real functioning position, pressure in the chamber is regulated between high and low pressure. Resultant force is null and the mobile is stable and perfectly balanced between both.





OPTIMEX

CANNED MOTOR PUMPS

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