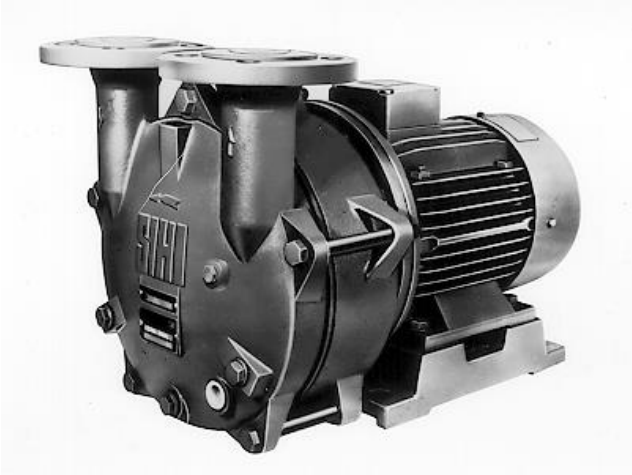
Liquid ring vacuum pumps
in compact design

FLOWSERVE
SIHI® Pumps

LEM 90, LEM 125, LEM 150
LEL 90, LEL 125, LEL 150

Pressure range: **33 to 1013 mbar**
Suction volume flow: **25 to 165 m³/h**



CONSTRUCTION

Flowserve SIHI liquid ring vacuum pumps are displacement pumps of uncomplicated and robust construction with the following particular features:

- non-polluting due to nearly isothermal compression
- oil-free, as no lubrication in the working chamber
- handling of nearly all gases and vapours
- small quantities of entrained liquid can be handled
- easy maintenance and reliable operation
- low noise and nearly free from vibration
- wide choice of material, therefore applicable nearly everywhere
- shaft not contact with the medium
- protection against cavitation as standard
- incorporated dirt drain
- incorporated central drain
- no metallic contact of the rotating parts

The Flowserve SIHI liquid ring vacuum pumps LEM/LEL are single-stage ones.

APPLICATION

Handling and exhausting of dry and humid gases; entrained liquid can be handled during normal duty. The pumps are applied in all fields where a pressure of 33 to 900 mbar must be created by robust vacuum pumps.

NOTE

During operation the pump must continuously be supplied with service liquid, normally water, in order to eliminate the heat resulting from the gas compression and to replenish the liquid ring, because part of the liquid is leaving the pump together with the gas. This liquid can be separated from the gas in a liquid separator (see catalogue part accessories).
It is possible to reuse the service liquid. The pumps are equipped with a device by which the contaminated service liquid can continuously be drained during operation (dirt drain), if necessary.

The direction of rotation is clockwise, when looking from the drive on the pump.

GENERAL TECHNICAL DATA

Pump Type		Units	LEM 90 LEL 90	LEM 125 LEL 125	LEM 150 LEL 150
Speed	50 Hz 60 Hz	rpm	1450 1750		
Maximum overpressure on compression		bar	LEM 0.3 / LEL 0.5		
Permissible pressure difference between suction and discharge side	max. min.	bar	LEM 1.1 / LEL 1.3 0.2		
Hydraulic test pressure (overpressure)		bar	3		
Moment of inertia of rotating parts of pump and water content		kg · m²	0.035	0.053	0.069
Noise level at 80 mbar suction pressure		dB (A)	65		
Maximum gas temperature	dry saturated	°C °C	200 100		
Service liquid Maximum permissible temperature Minimum permissible temperature Maximum viscosity Maximum density Liquid capacity up to middle of shaft		 °C °C mm²/s kg/m³ litre	 2.4	 80 10 4 1200 2.8	 3.2
Maximum flow resistance of the heat exchanger		bar	0.2		

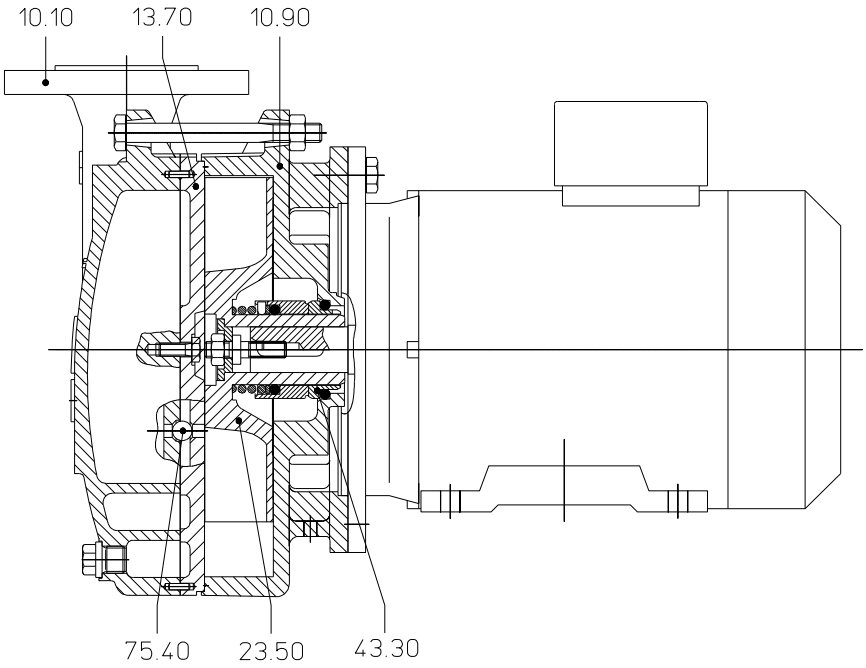
The combination of several limiting values is not admissible.

Materials

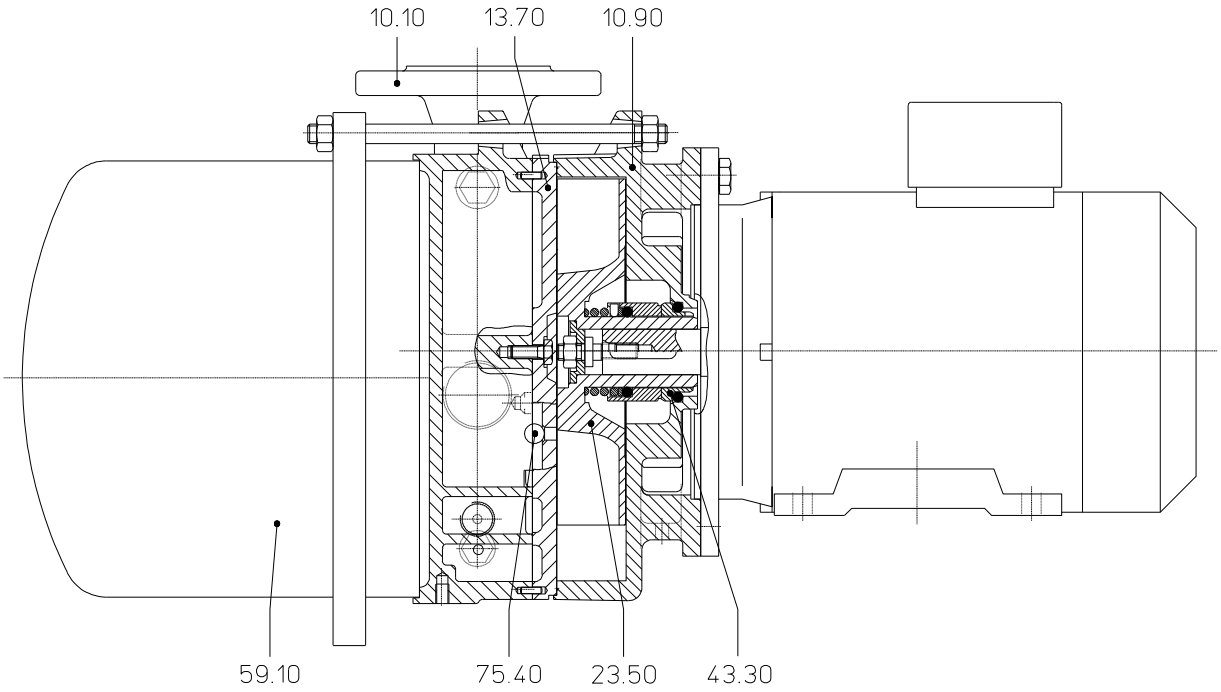
Item	COMPONENTS	MATERIALS 0K
10.10	Vacuum casing	0.6025
10.90	Central body	
13.70	Guide disc	
21.00*	Shaft	1.1191+N
23.50	Vane wheel impeller	1.4308
34.01*	Motor carrier	0.6025
43.30	Standard mechanical seal	Cr-steel / Carbon / Butadiene rubber
59.10	Integrated pre-arranged separator	1.0038
75.40	Valve balls	Polyamide A

* only at LEL 90, 125, 150

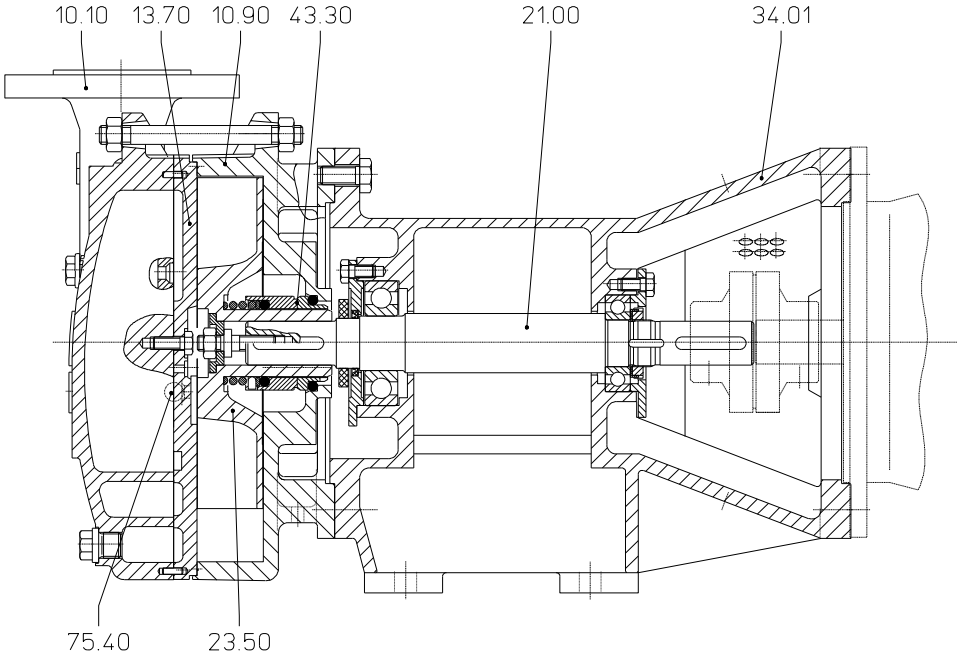
Cut-away diagram LEM 90, LEM 125, LEM 150



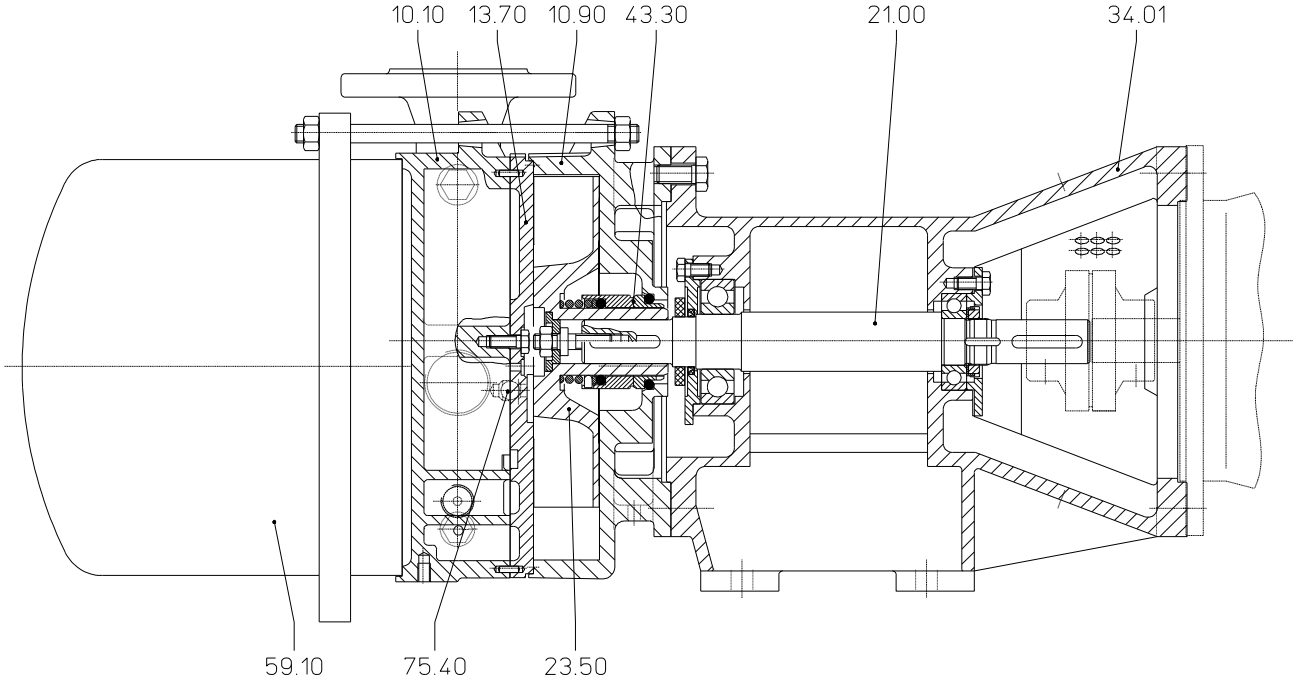
Cut-away diagram LEM 90, LEM 125, LEM 150 with integrated pre-arranged separator



Cut-away diagram LEL 90, LEL 125, LEL 150



Cut-away diagram LEL 90, LEL 125, LEL 150 with integrated pre-arranged separator



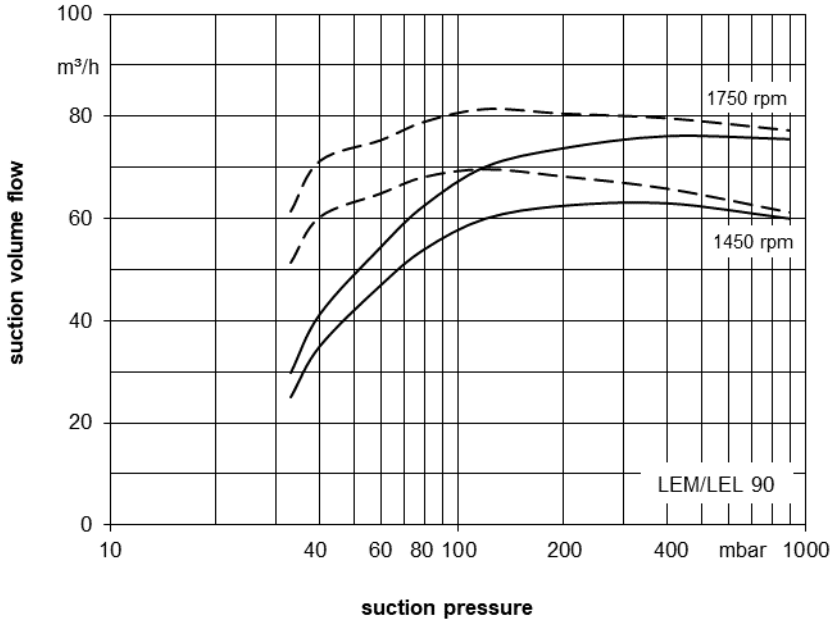
Make-up liquid consumption in [m³/h] dependent upon suction pressure, speed, drive type and temperature difference

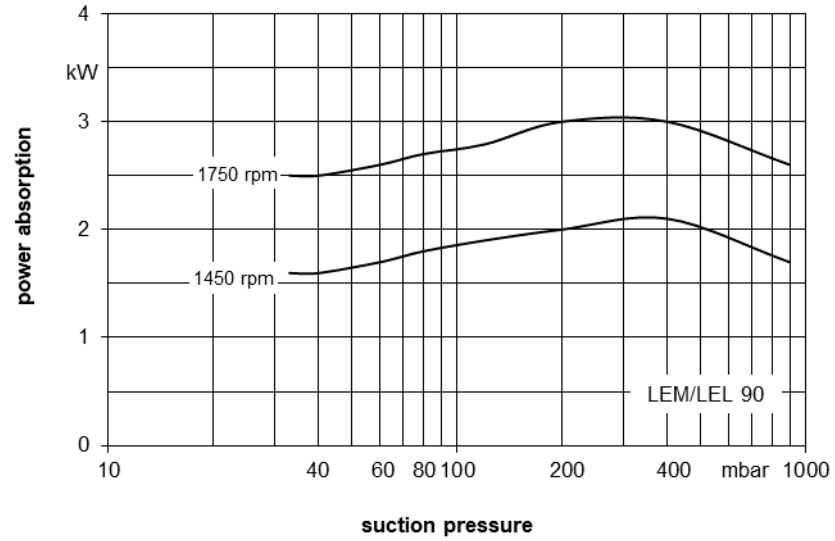
Suction pressure [mbar]		33				120				200				400			
pump type	speed	KB Temperature difference [°C]			FB	KB Temperature difference [°C]			FB	KB Temperature difference [°C]			FB	KB Temperature difference [°C]			FB
	[rpm]	10	5	2		10	5	2		10	5	2		10	5	2	
LEM / LEL 90	1450	0.12	0.22	0.41	1.0	0.14	0.24	0.44	0.95	0.14	0.25	0.44	0.9	0.15	0.24	0.41	0.75
	1750	0.18	0.30	0.52		0.19	0.32	0.53		0.20	0.33	0.53		0.19	0.31	0.47	
LEM / LEL 125	1450	0.17	0.28	0.50	1.0	0.19	0.31	0.52	0.95	0.19	0.31	0.51	0.9	0.18	0.29	0.46	0.75
	1750	0.22	0.36	0.59		0.24	0.39	0.60		0.26	0.40	0.60		0.24	0.37	0.53	
LEM / LEL 150	1450	0.19	0.32	0.54	1.0	0.22	0.36	0.58	0.95	0.23	0.37	0.57	0.9	0.23	0.35	0.51	0.75
	1750	0.26	0.41	0.63		0.29	0.44	0.65		0.30	0.45	0.64		0.29	0.41	0.57	

FB = total service liquid flow rate on once-through system

KB = flow of make-up water when combined with partial recirculation liquid at a temperature of 10 °C, 5 °C, 2 °C warmer than make-up water

Performance Characteristics LEM 90 / LEL 90



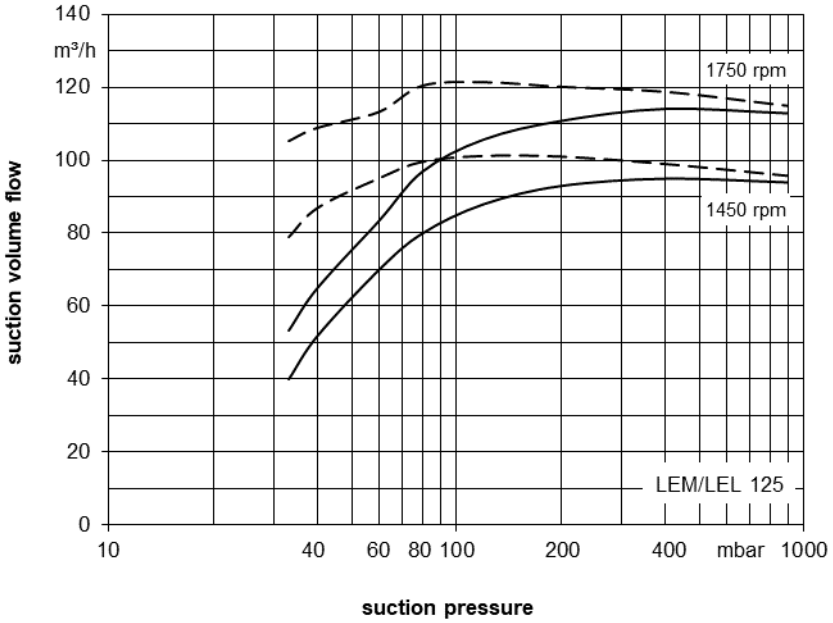


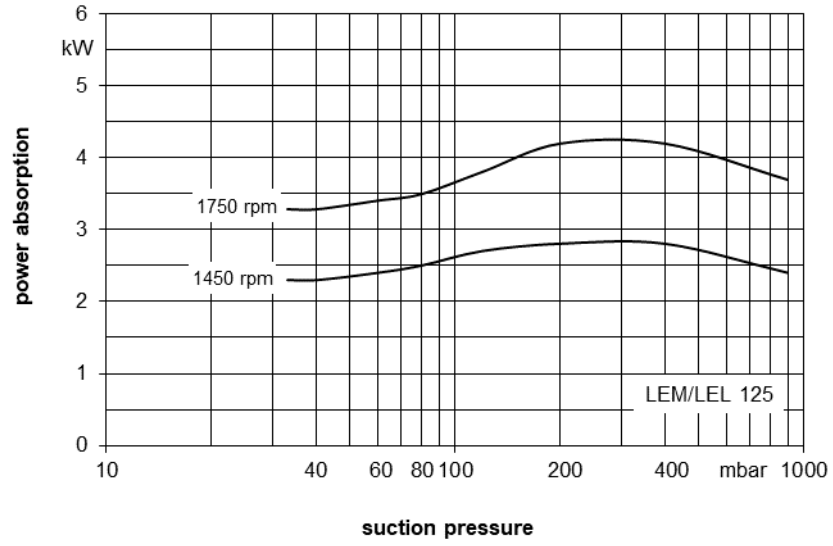
The operating data is valid under the following conditions:

- Process media: - dry air: 20°C
  - steam saturated air: 20°C
- Service liquid: - water: 15°C

Pressure of gas to be evacuated: 1013 mbar (atmospheric pressure)
The suction volume is related to the suction pressure.
Tolerance on operating data is 10%.
The maximum consumption of make-up water occurs at the lowest suction pressure.

Performance Characteristics LEM 125 / LEL 125



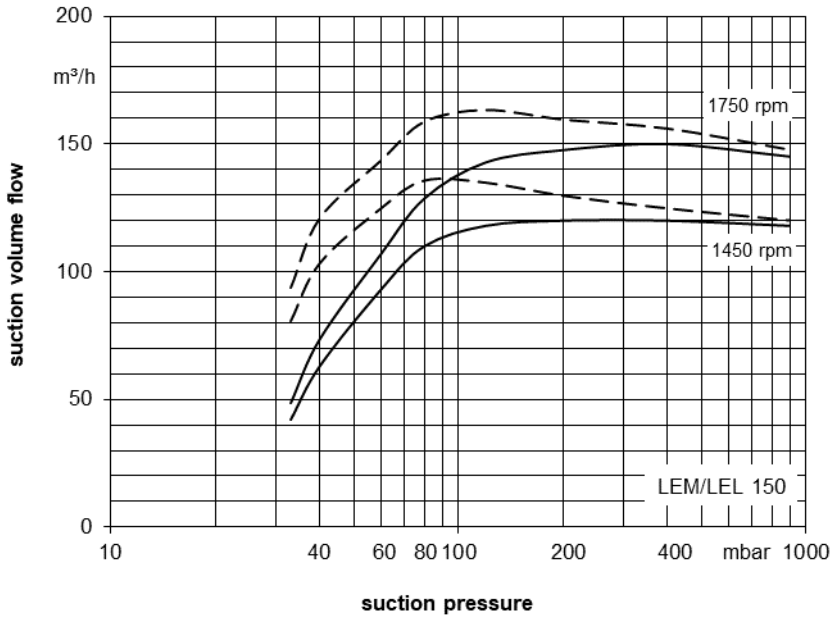


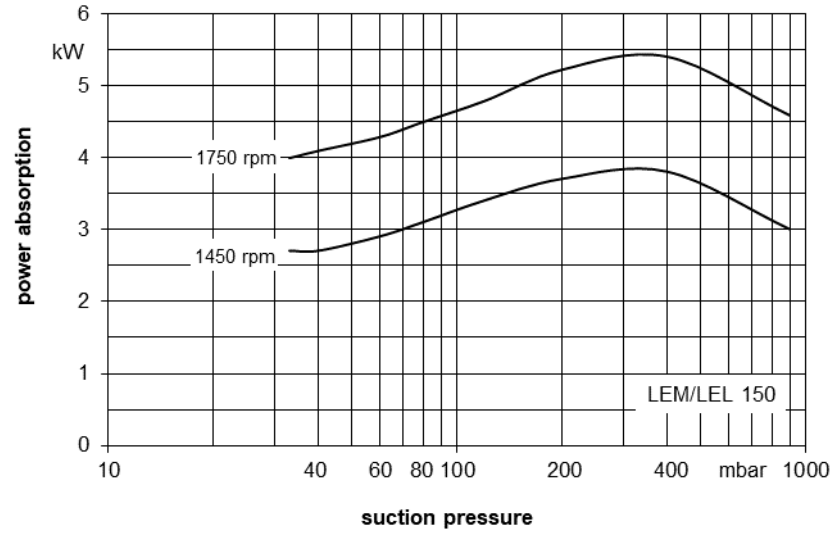
The operating data is valid under the following conditions:

- Process media: - dry air: 20°C
  - steam saturated air: 20°C
- Service liquid: - water: 15°C

Pressure of gas to be evacuated: 1013 mbar (atmospheric pressure)
The suction volume is related to the suction pressure.
Tolerance on operating data is 10%.
The maximum consumption of make-up water occurs at the lowest suction pressure.

Performance Characteristics LEM 150 / LEL 150



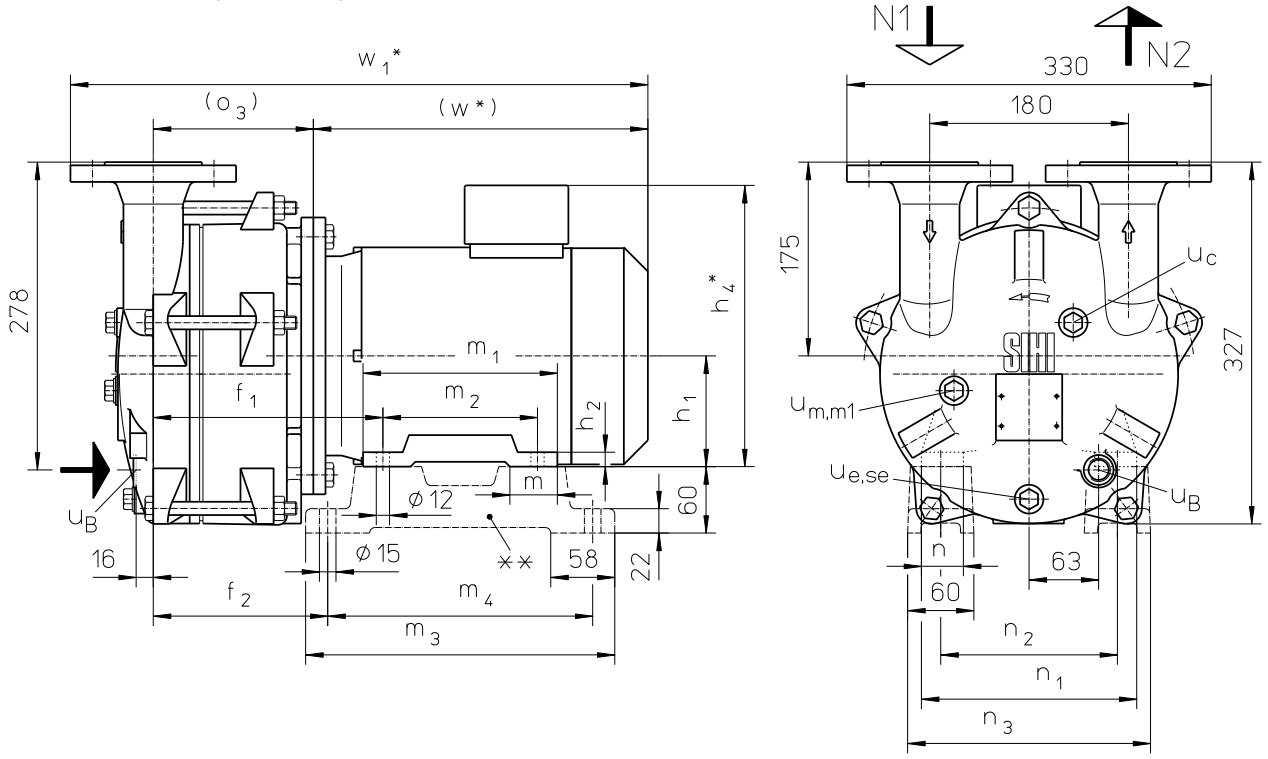


The operating data is valid under the following conditions:

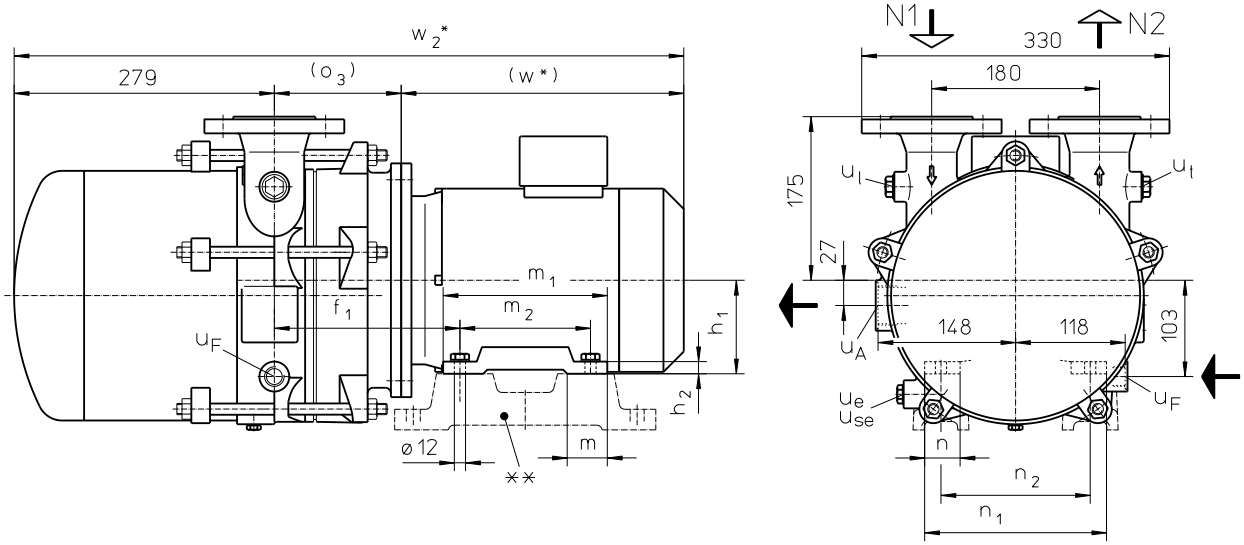
- Process media: - dry air: 20°C
  - steam saturated air: 20°C
- Service liquid: - water: 15°C

Pressure of gas to be evacuated: 1013 mbar (atmospheric pressure)
The suction volume is related to the suction pressure.
Tolerance on operating data is 10%.
The maximum consumption of make-up water occurs at the lowest suction pressure.

Dimensions LEM 90, LEM 125, LEM 150



Dimensions LEM 90, LEM 125, LEM 150 with integrated pre-arranged separator

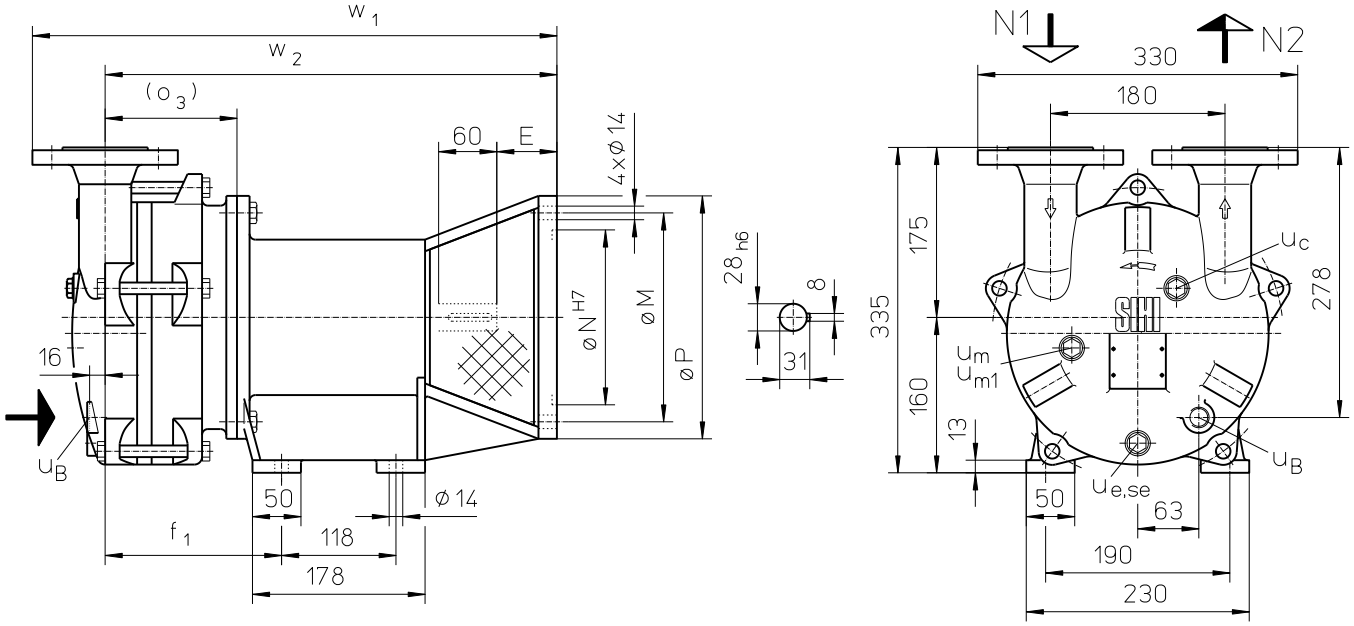


N 1 = gas inlet DN 40
N 2 = gas outlet DN 40
u_A = liquid drain G 1 ¼
u_B = connection for service liquid G ½
u_F = connection for make-up liquid G ½
u_c = connection for protection against cavitation G 3/8
$u_{e, se}$ = connection for drain, dirt drain G 3/8
u_l = connection for air cock G ½
$u_{m, m1}$ = connection for pressure gauge, drainage valve G 3/8
u_t = connection for thermometer G ½

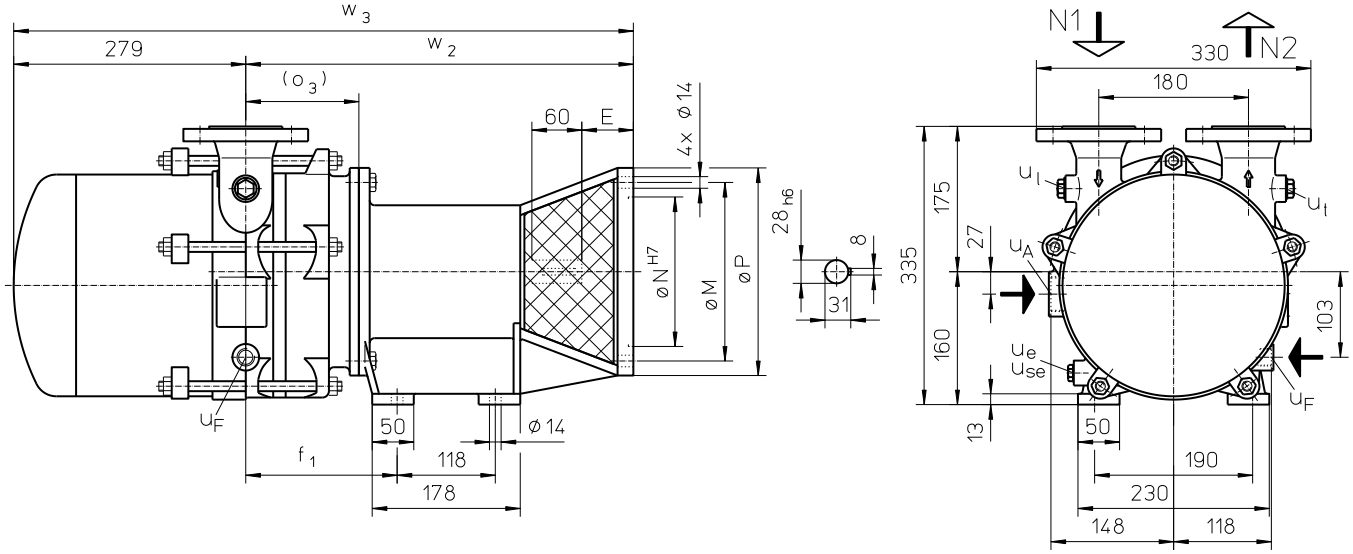
	electric motor IP 55			f_1	f_2	h_1	h_2	h_4*	m	m_1	m_2	m_3	m_4	n	n_1	n_2	n_3	o_3	w*	w_1*	w_2*	approx. weight [kg]	
	size	kW 50 Hz	kW 60 Hz	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	LEM	+ integr. pre-arranged separator
LEM 90	100 L	2.2	-	199	149	100	13	253	43	176	140	280	240	38	195	160	220	136	303	514	718	59	68
		-	3.3					255											343	554	758	71	80
LEM 125	100 L	3.0	-	208	158													145		563	767	73	82
	112 M	-	4.8	215	165	112	15	279	45					44	225	190	250		380	600	784	101	110
LEM 150	112 M	4.0	-	232	182													162	340	577	781	77	86
	132 M	-	6.0	272	222	132	18	320	88	218	178	320	278	55	256	216	276		426	663	867	102	111

other motors on request
* dimensions dependent upon motor supplier
** see list of accessories
Flange connections see page 10

Dimensions LEL 90, LEL 125, LEL 150



Dimensions LEL 90, LEL 125, LEL 150 with integrated pre-arranged separator

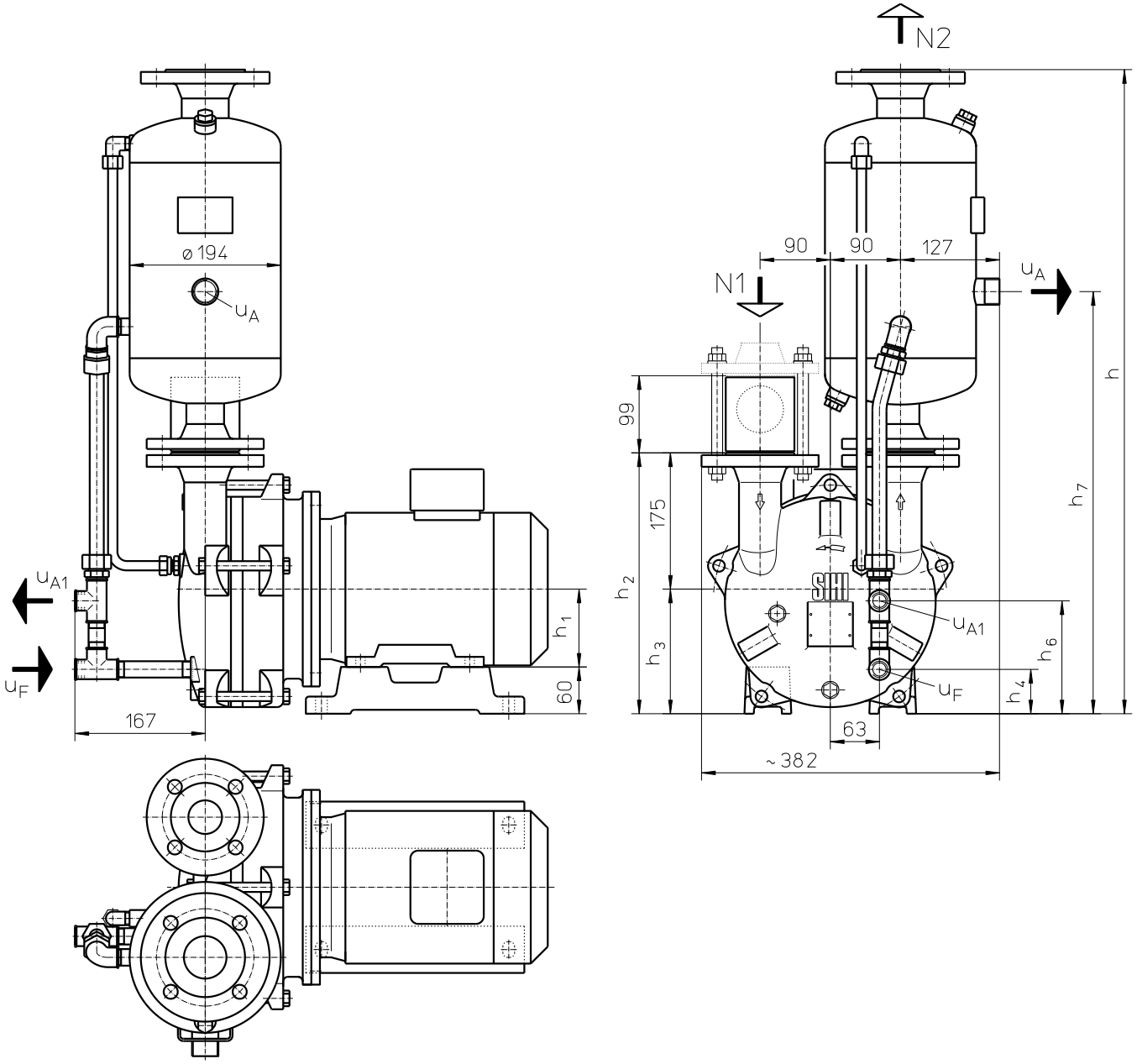


N 1 = gas inlet DN 40
N 2 = gas outlet DN 40
u_A = liquid drain G 1¼
u_B = connection for service liquid G ½
u_F = connection for make-up liquid G ½
u_c = connection for protection against cavitation G $^3/_8$
u_e = connection for drain G $^3/_8$
u_{se} = connection for dirt drain G $^3/_8$
u_l = connection for air cock G ½
u_m = connection for pressure gauge G $^3/_8$
u_{m1} = connection for drainage valve G $^3/_8$
u_t = connection for thermometer G ½

	electric motor 50 Hz			f_1	o_3	w_1	w_2	w_3	E	M	N	P	approx. weight [kg]	
	size	kW IP 55	kW EEx e II T3	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	LEL	+ integr. pre-arranged separator
LEL 90	100 L	2.2	2.5	182	136	541	466	745	62	215	180	250	60	72
LEL 125	100 L	3.0	-	191	145	550	475	754					63	75
	112 M	-	3.6											
LEL 150	112 M	4.0	-	208	162	567	492	771					67	79
	132 S	-	5.0			587	512	791	82	265	230	300		

other motors on request
flange connections see page 10

Arrangement drawing LEM 90, LEM 125, LEM 150

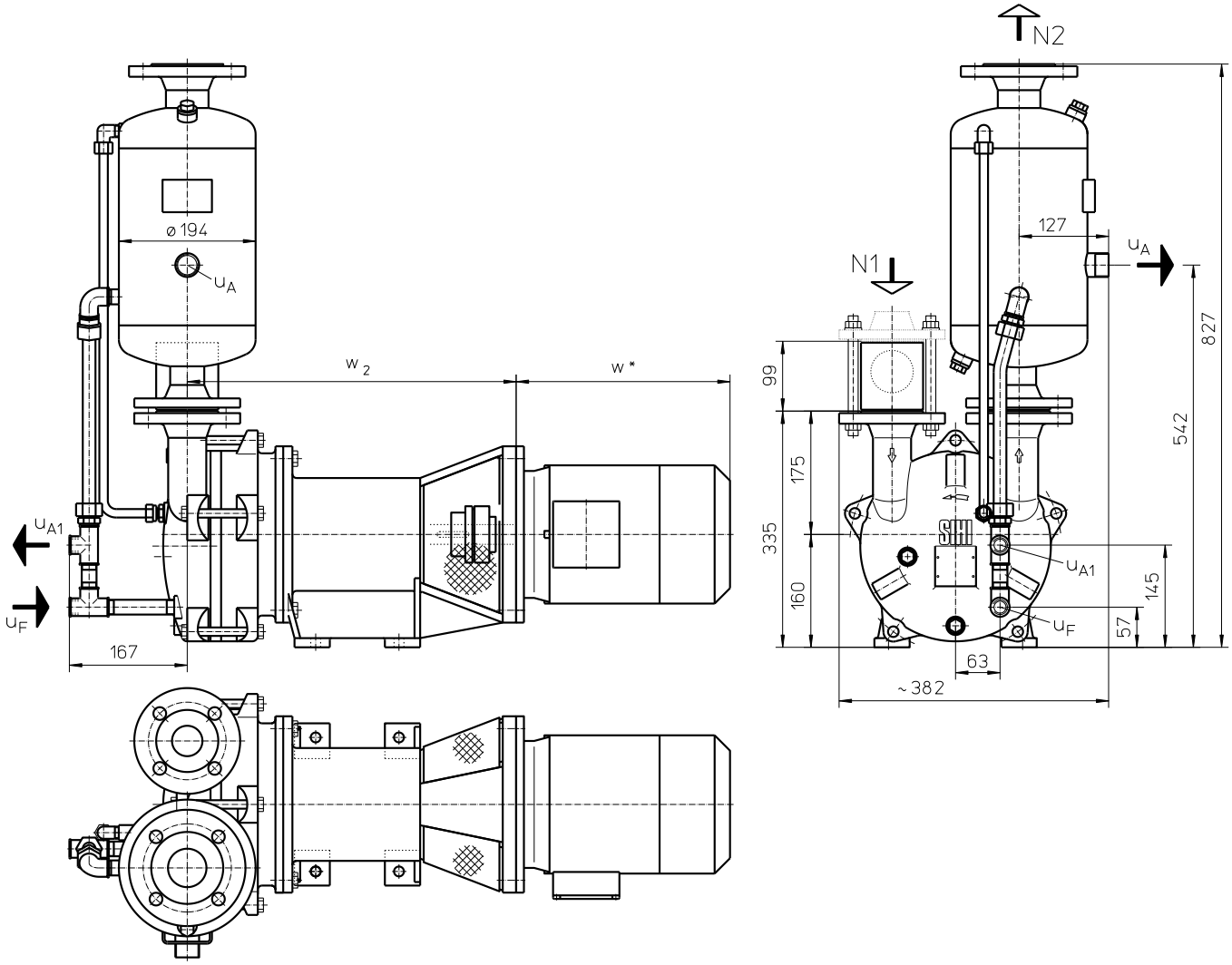


N 1 = gas inlet DN 40
N 2 = gas outlet DN 50
u_A = liquid drain G 1 A
u_{A1} = liquid drain G ½
u_F = connection for make-up liquid G ½

	electric motor IP 55			h	h_1	h_2	h_3	h_4	h_6	h_7	approx. weight
	size	kW 50 Hz	kW 60 Hz	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]
LEM 90	100 L	2.2	-	827	100	335	160	57	145	542	69
		-	3.3								81
LEM 125	100 L	3.0	-								83
	112 M	-	4.8	839	112	347	172	69	157	554	111
LEM 150	112 M	4.0	-								87
	132 M	-	6.0	859	132	367	192	89	177	574	112

other motors on request
flange connections see page 10

Arrangement drawing LEL 90, LEL 125, LEL 150



N 1 = gas inlet DN 40

N 2 = gas outlet DN 50

u_A = liquid drain G 1 A

u_{A1} = liquid drain G ½

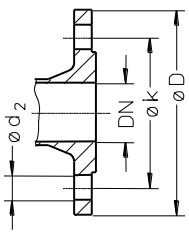
u_F = connection for make-up liquid G ½

	electric motor 50 Hz size	kW IP 55	kW EEx e II T3	w *	w_2	approx. weight [kg]
LEL 90	100 L	2.2	2.5	303	466	91
LEL 125	100 L	3.0	-		475	98
	112 M	-	3.6	320		104
LEL 150	112 M	4.0	-		492	106
	132 S	-	5.0	405	512	141

other motors on request

* dimensions dependent upon motor supplier

flange connections according to DIN EN 1092 PN 10 [mm]		
DN	40	50
k	110	125
D	150	165
number x d_2	4 x 18	4 x 18



Data regarding the pump size - order notes

<table>
<tr><th colspan="2">Range + Size</th><th>Hydraulic + Bearings</th><th>Shaft Seal</th><th>Materials</th><th>Casing Sealing</th></tr>
<tr><td colspan="2"></td><td>A• hydraulic A
R• with integrated pre-arranged separator
•Z two grease lubricated antifriction bearings arranged in the motor
•B similar to •Z, but arranged in the motor carrier</td><td>AAE mechanical seal, o-rings butadiene rubber</td><td>0K main parts out of cast iron, impeller in low alloyed steel</td><td>0 liquid seal</td></tr>
<tr><td rowspan="3">LEM</td><td>90</td><td rowspan="3">AZ, RZ</td><td rowspan="6">AAE</td><td rowspan="6">0K</td><td rowspan="6">0</td></tr>
<tr><td>125</td></tr>
<tr><td>150</td></tr>
<tr><td rowspan="3">LEL</td><td>90</td><td rowspan="3">AB, RB</td></tr>
<tr><td>125</td></tr>
<tr><td>150</td></tr>
</table>

Motor Selection

For our products we offer a lot of different motor types.
To identify the right motor please specify frequency, voltage and protection class.

Example for ordering LEM:

LEM 125 AZ AAE 0K 0 **with** 3 kW AC motor 50 Hz, 230 V∆, IP55

Example for ordering LEL:

LEL 125 AB AAE 0K 0 **for** 3 kW AC motor 50 Hz, 230 V∆, IP55 has the complete designation:

LEL 125 AB AAE 0K 0

Accessories LEM 90, LEM 125, LEM 150

Recommended Accessory	Material Execution		LEM 90 LEL 90	LEM 125 LEL 125	LEM 150 LEL 150
Top Mounted Liquid Separator		Type weight	XBa 1042 9.7 kg		
Top mounted separator	1.4571	SIHI-Part No.	43 133 504		
Service liquid pipework, standard execution	Steel, galvanised 1.4571	SIHI-Part No.	20 098 538 35 007 969		
Service liquid pipework, thermostatic control 24V	1.0254 + Brass 1.4571 + Brass	SIHI-Part No.	20 075 142 20 053 908		
Cavitation protection pipework	Steel, galvanised 1.4571	SIHI-Part No.	20 054 959 20 054 960		
Side Mounted Liquid Separator		Type weight	XBp 0413 28 kg		
Side mounted separator	1.4571	SIHI-Part No.	43 132 218		
Pressure pipework (bend)	1.0254 1.4571	SIHI-Part No.	35 003 172 35 005 535		
Service liquid pipework, standard execution	1.0254 1.4571	SIHI-Part No.	20 054 572 20 054 573		
Cavitation protection pipework	1.0254 1.4571	SIHI-Part No.	20 041 543 20 041 544		
SIHI – Gas Ejector see Technical Catalogue – Gas Ejector					
at service liquid temperature 15 °C		Type / weight	GEV 90A / 9 kg	GEV 125A / 9 kg	GEV 150A / 9 kg
at service liquid temperature 30 °C		Type / weight	GEV 90B / 9 kg	GEV 125B / 9 kg	GEV 150B / 9 kg
SIHI – Non Return Ball Valve					
Intermediate flange execution XCk 40	0.6025 + Butadiene rubber 0.6025 + Teflon 1.4571 + Teflon	SIHI-Part No. weight	20 072 746 / 2.8 kg 20 072 745 / 2.8 kg 20 029 494 / 5.2 kg		
Flange execution with glass cylinder XCk 406	0.6025 + Butadiene rubber 0.6025 + Teflon 1.4408 + Teflon	SIHI-Part No. weight	20 072 835 / 7 kg 20 072 836 / 7 kg 20 072 834 / 7 kg		
Support foot	only for LEM				
for motor size 100 L, 112 M for motor size 132 M		SIHI-Part No.	20 047 010 -		20 047 010 20 047 012
Motor standard execution IP 55	only for LEL	Size Power Weight	100 L 2.2 kW 21 kg	100 L 3.0 kW 24 kg	112 M 4.0 kW 31 kg
Coupling for motor IP 55 pump side motor side		Type / weight SIHI-Part No.	B 80 / 1.5 kg 43 021 414 43 021 417		
Motor in EEx e II T3 execution	only for LEL	Size Power Weight	100 L 2.5 kW 23 kg	112 M 3.6 kW 29 kg	132 S 5.0 kW 42 kg
Coupling for motor EEx e II T3 pump side motor side		Type / weight SIHI-Part No.	BDS 88 / 1.9 kg 43 111 058 43 111 029		BDS 103 / 3.1 kg 43 111 051 43 111 040
Intermediate flange	only for LEL				
for motor flange Ø 300mm	1.0553 1.0553, stove enamelling	SIHI-Part No.	20 043 024 20 045 646		

Any changes in the interest of the technical development are reserved.

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