Liquid ring vacuum pumps
in compact design

LEM 91, LEM 126, LEM 161
LEL 91, LEL 126, LEL 161
with flange connection

FLOWSERVE
SIHI® Pumps

Pressure range: **33 to 1013 mbar**
Suction volume flow: **24 to 195 m³/h**

CONSTRUCTION

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
- protection against cavitation as standard
- incorporated dirt drain
- incorporated central drain
- no metallic contact of the rotating parts

The 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		unit	LEM 91 LEL 91	LEM 126 LEL 126	LEM 161 LEL 161
Speed	50 Hz 60 Hz	rpm rpm	2900 3500		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	0.007	0.009	0.070
Noise level at 80 mbar suction pressure		dB (A)	72 (67)*		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	 80 10 4 1200 0.5	 0.6	 2.0
Maximum flow resistance of the heat exchanger		bar	0.2		

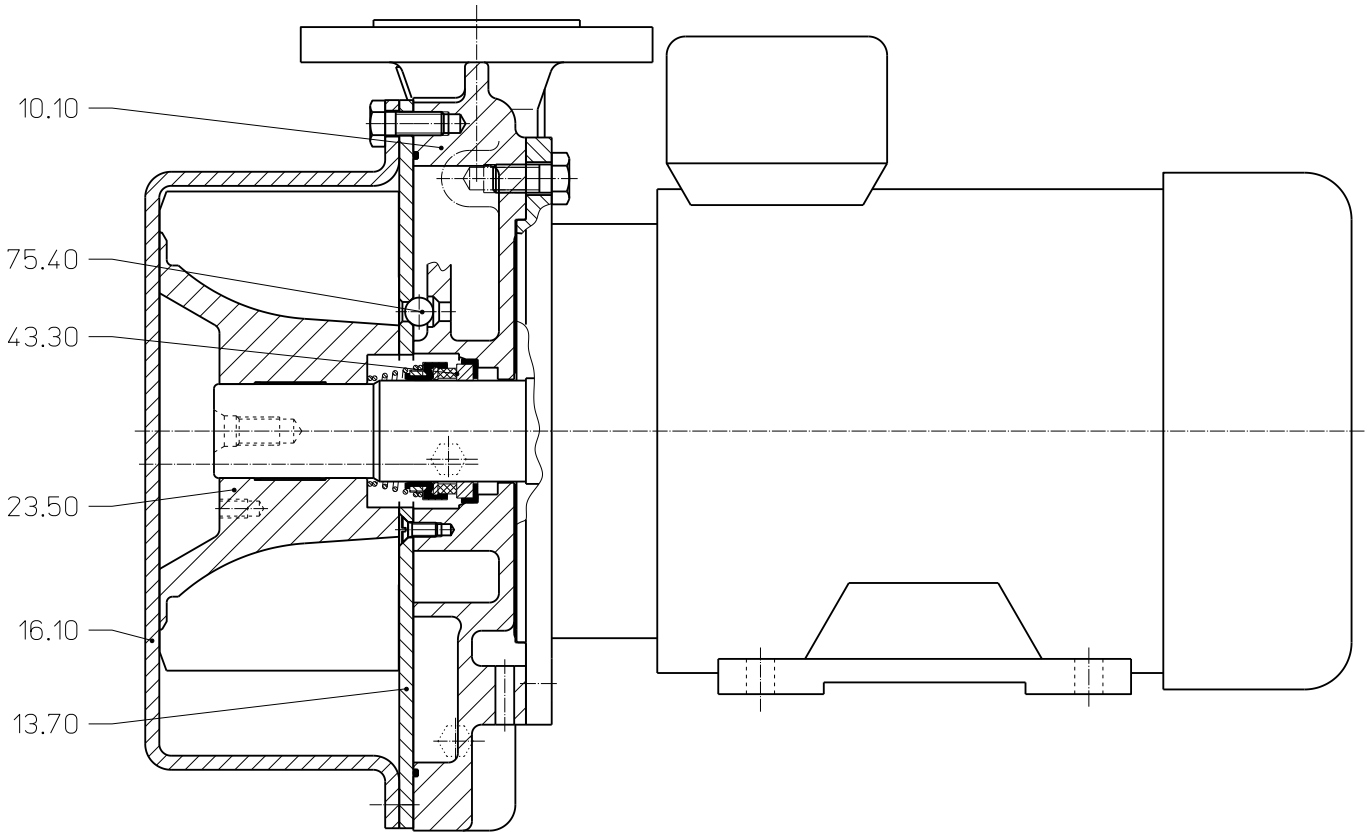
The combination of several limiting values is not admissible.
* value in parenthesis for measuring with sound insulation cup

Materials

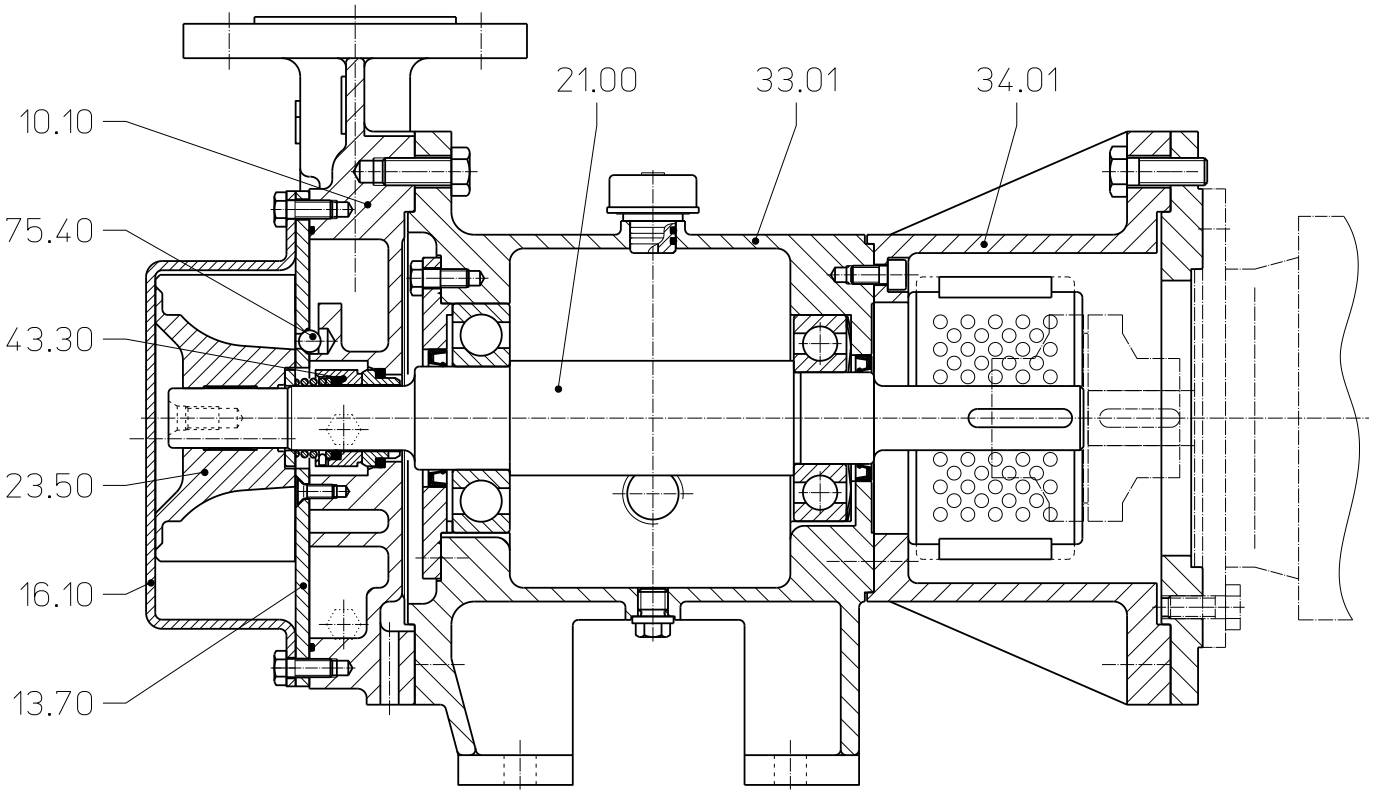
Item	COMPONENTS	MATERIALS 0K
10.10	Vacuum casing	0.6025
13.70	Guide disc	1.4301
16.10	Cover	
21.00 *	Shaft	1.4571
23.50	Vane wheel impeller	1.4308
33.01 *	Bearing bracket	0.6025
34.01 *	Motor carrier	
43.30	Mechanical seal	Carbon / ceramic / Viton
75.40	Valve balls	Polyamide A

* only for LEL 91, 126, 161

Cut-away diagram LEM 91, 126, 161



Cut-away diagram LEL 91, 126, 161



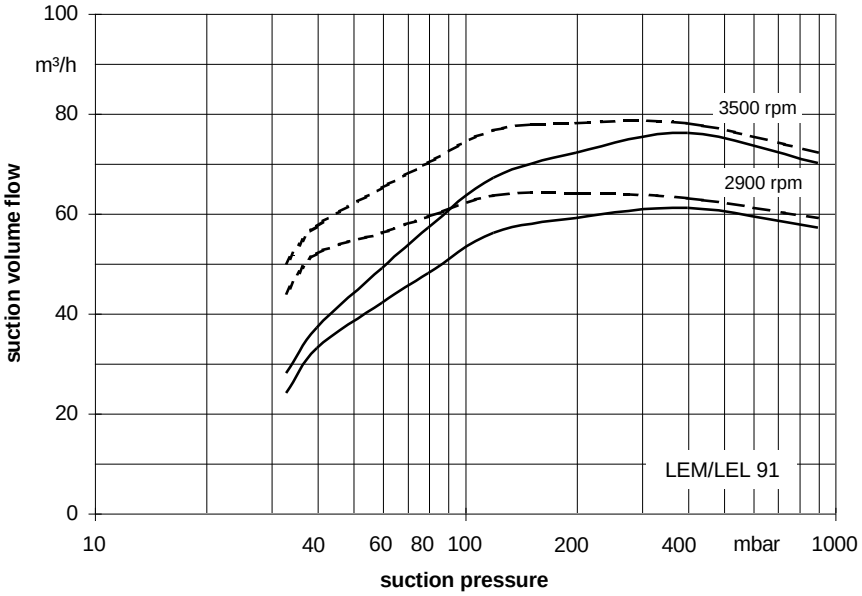
Make-up Liquid Consumption in [m³/h] dependent upon suction pressure, speed, drive type and temperature difference.

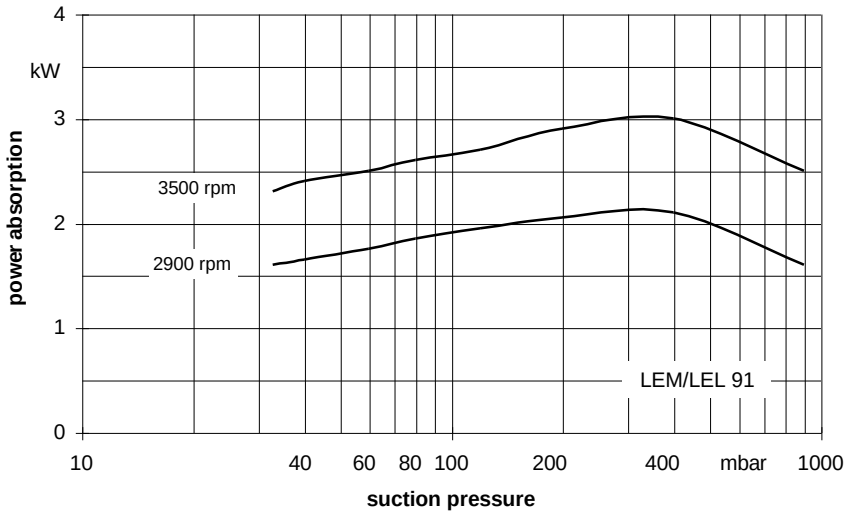
Suction Pressure in [mbar]		33				120				200				400			
Pump Type	Speed [rpm]	KB Temperature Difference [°C] 10	5	2	FB	KB Temperature Difference [°C] 10	5	2	FB	KB Temperature Difference [°C] 10	5	2	FB	KB Temperature Difference [°C] 10	5	2	FB
LEM/LEL 91	2900	0.11	0.19	0.34	0.66	0.13	0.22	0.36	0.62	0.14	0.22	0.36	0.6	0.14	0.22	0.34	0.54
	3500	0.15	0.25	0.40		0.17	0.27	0.40		0.18	0.27	0.40		0.17	0.26	0.38	
LEM/LEL 126	2900	0.15	0.24	0.39	0.66	0.16	0.26	0.40	0.62	0.17	0.27	0.40	0.6	0.17	0.26	0.38	0.54
	3500	0.19	0.29	0.44		0.21	0.31	0.44		0.21	0.31	0.44		0.21	0.31	0.41	
LEM/LEL 161	1460	0.20	0.34	0.61	1.3	0.23	0.39	0.66	1.2	0.25	0.41	0.66	1.14	0.24	0.39	0.60	0.96
	1750	0.26	0.43	0.72		0.30	0.48	0.75		0.31	0.49	0.74		0.31	0.47	0.68	

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 91 / LEL 91



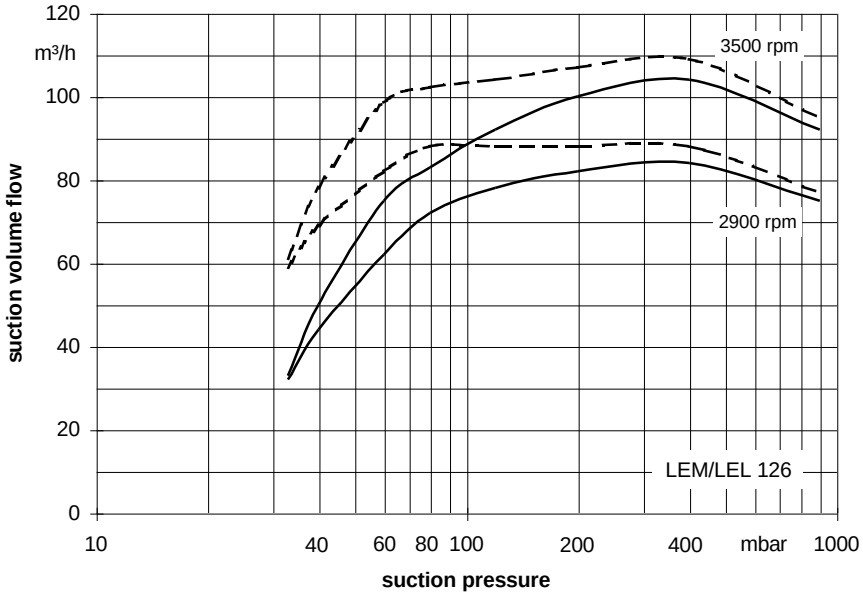


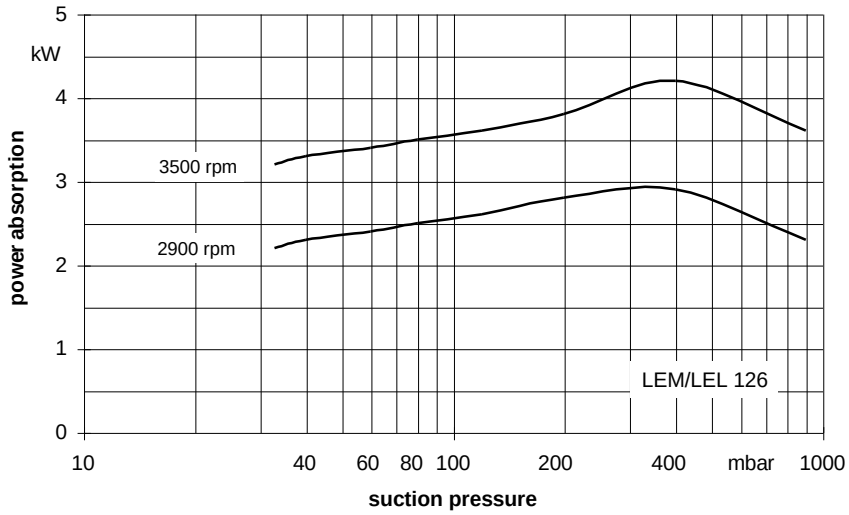
The operating data is valid under the following conditions:

- 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 126 / LEL 126



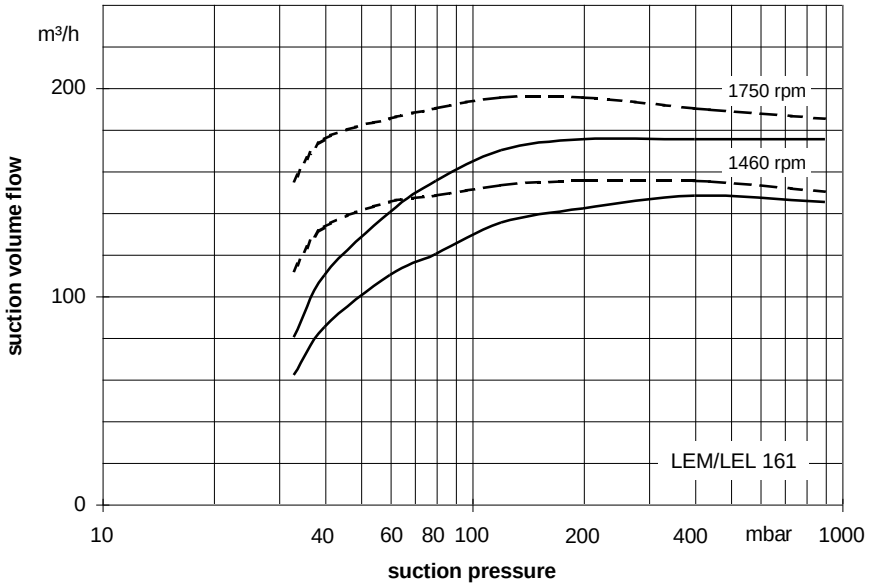


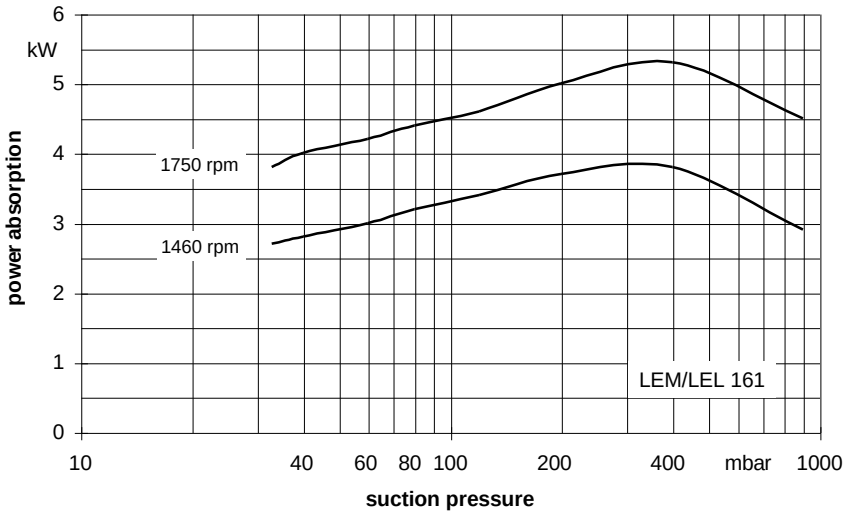
The operating data is valid under the following conditions:

- 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 161 / LEL 161



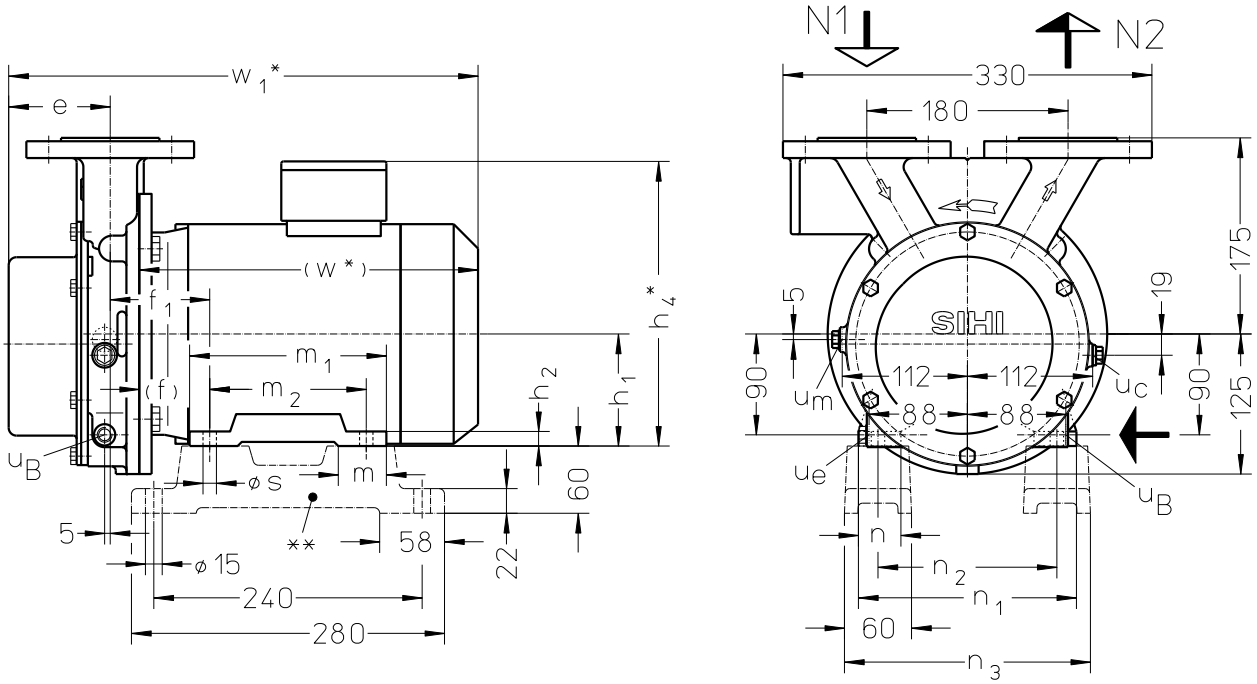


The operating data is valid under the following conditions:

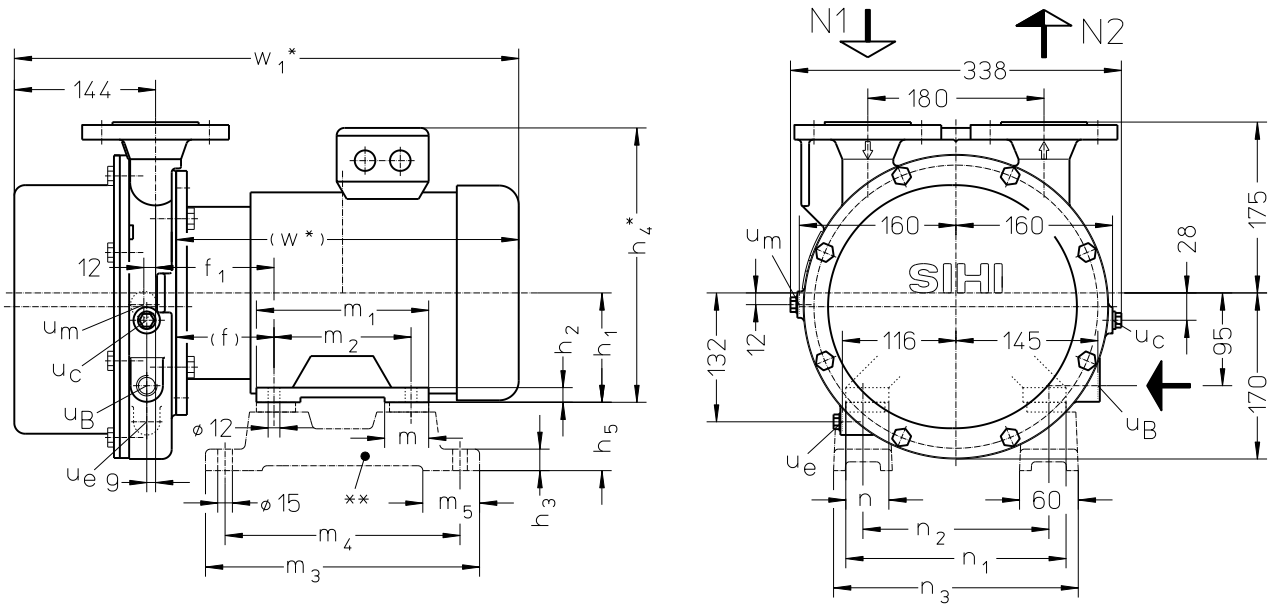
- process media: - dry air: 20°C
  - steam saturated air: 20°C
- service liquid: - water: 15°C

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 91, 126, 161



	size	electric motor IP 55 kW 50 Hz	kW 60 Hz	e [mm]	f [mm]	f 1 [mm]	h 1 [mm]	h 2 [mm]	h 4* [mm]	m [mm]	m 1 [mm]	m 2 [mm]	n [mm]	n 1 [mm]	n 2 [mm]	n 3 [mm]	s [mm]	w * [mm]	w 1* [mm]	approx. weight [kg]
LEM 91	90 L	2.2	-	91	56	82	90	11	229	36	155	125	35	170	140	200	9	283	399	34
	100 L	-	3.3		63	89	100	13	256	43	176	140	38	195	160	220	12	303	420	39
LEM 126	100 L	3.0	-	95															424	
	112 M	-	4.8		70	96	112	15	278	45			44	225	190	250		340	461	44

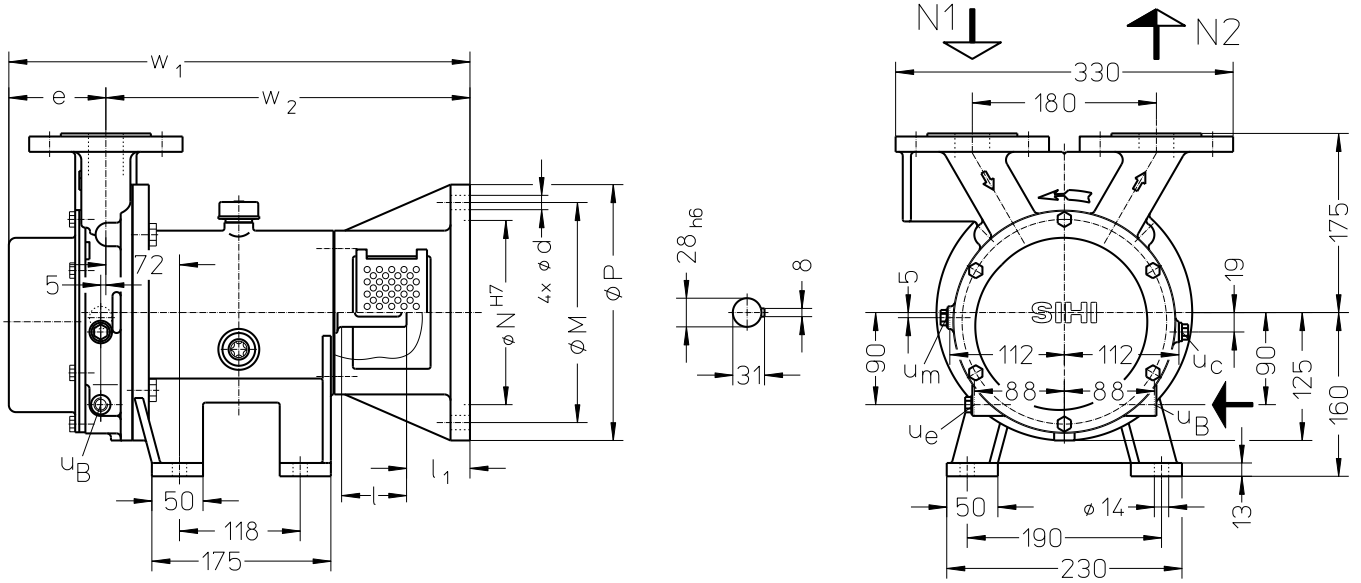


N 1 = gas inlet DN 40
N 2 = gas outlet DN 40
u_B = connection for service liquid G ¼ (LEM 91/126) G ½ (LEM 161)
u_c = connection for cavitation protection G ¼
u_e = connection for drain G ¼
u_m = connection for pressure gauge G ¼

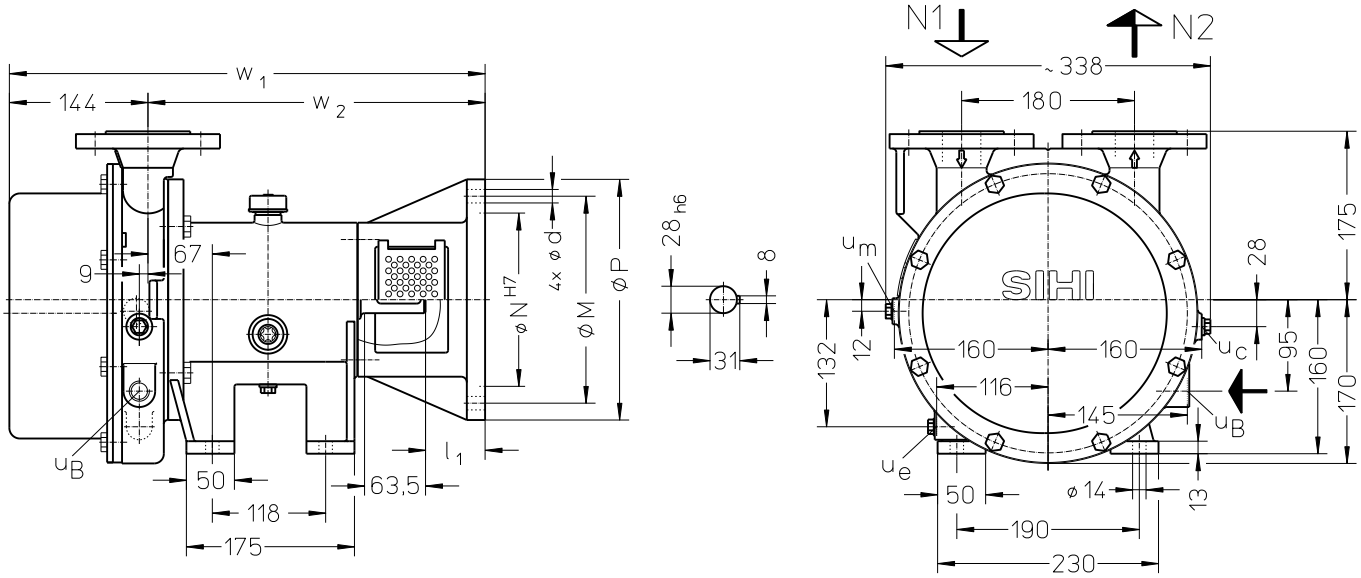
	size	electric motor IP 55 kW 50 Hz	kW 60 Hz	f [mm]	f 1 [mm]	h 1 [mm]	h 2 [mm]	h 4* [mm]	h 5 [mm]	m [mm]	m 1 [mm]	m 2 [mm]	m 3 [mm]	m 4 [mm]	m 5 [mm]	n [mm]	n 1 [mm]	n 2 [mm]	n 3 [mm]	w * [mm]	w 1* [mm]	approx. weight [kg]
LEM 161	112 M	4.0	-	100	121	112	15	281	70	45	176	140	280	240	58	44	225	190	250	390	555	68
	132 M	-	6.0	110	131	132	18	320	60	88	218	178	320	278	-	55	256	216	276	426	591	96

other motors on request
* dimensions dependent upon motor supplier
** see list of accessories
flange connections see page 11

Dimensions LEL 91, 126, 161



	size	electric motor 50 Hz kW IP 55	kW EEx e II T3	d [mm]	e [mm]	l [mm]	l_1 [mm]	M [mm]	N [mm]	P [mm]	w_1 [mm]	w_2 [mm]	approx. weight [kg]
LEL 91	90 L	2.2	-	M10	91	87.5	52	165	130	200	461	370	53
	100 L	-	2.5	14		63.5	62	215	180	250	446	356	49
LEL 126	100 L	3.0	-		95						451		
	112 M	-	3.3										



N 1 = gas inlet DN 40

N 2 = gas outlet DN 40

u_B = connection for service liquid G ¼ (LEL 91/126), G ½ (LEL 161)

u_c = connection for cavitation protection G ¼

u_e = connection for drain G ¼

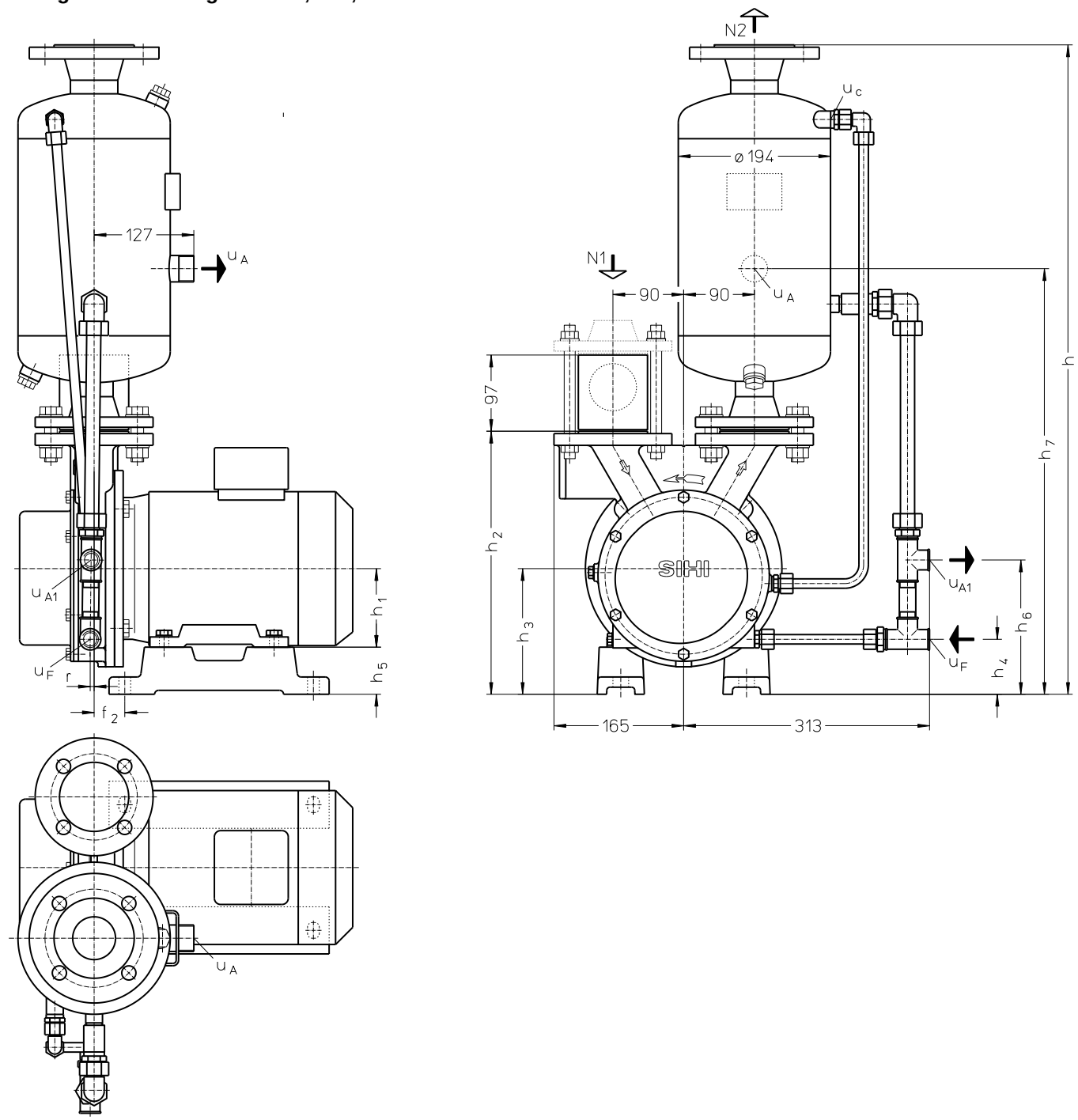
u_m = connection for pressure gauge G ¼

	size	electric motor 50 Hz kW IP 55	kW EEx e II T3	d [mm]	l_1 [mm]	M [mm]	N [mm]	P [mm]	w_1 [mm]	w_2 [mm]	approx. weight [kg]
LEL 161	112 M	4.0	-	14	62	215	180	250	495	351	71
	132 S	-	5.0	M12	82	265	230	300	515	371	78

other motors on request

flange connections see page 11

Arrangement drawing LEM 91, 126, 161



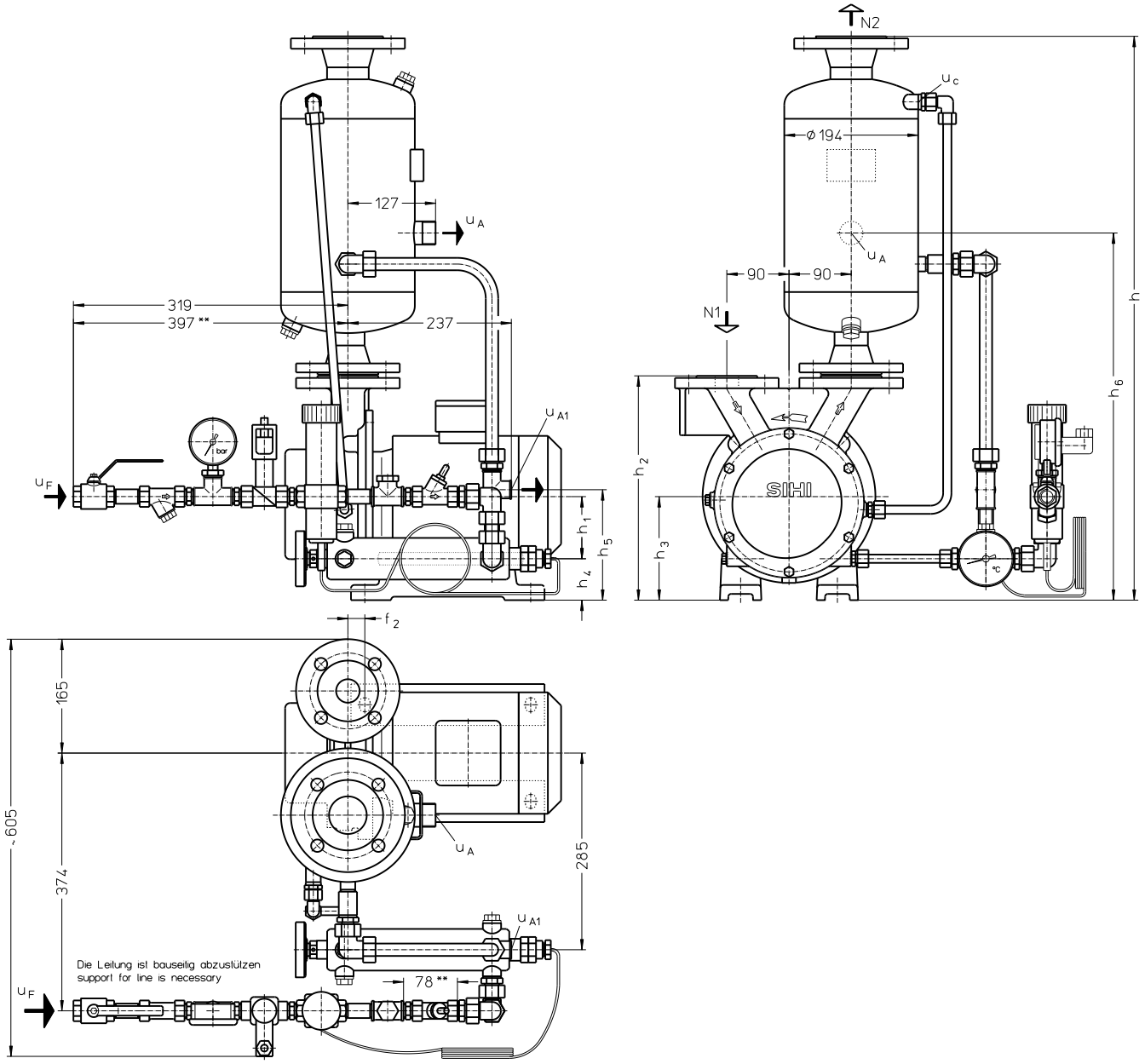
N 1 = gas inlet DN 40
N 2 = gas outlet DN 50
u_c = connection for cavitation protection G $^3/_8$
u_A = liquid drain G 1
u_{A1} = liquid drain G ½
u_F = connection for make-up liquid G ½

	electric motor IP 55 size	kW 50 Hz	kW 60 Hz	f_2 [mm]	h [mm]	h_1 [mm]	h_2 [mm]	h_3 [mm]	h_4 [mm]	h_5 [mm]	h_6 [mm]	h_7 [mm]	r [mm]	approx. weight [kg]
LEM 91	90 L	2.2	-	25	817	90	325	150	60		161	532		46
	100 L	-	3.3	39	827	100	335	160	70	60	171	542	5	51
LEM 126	100 L	3.0	-											
	112 M	-	4.8	46	839	112	347	172	82		183	554		56
LEM 161	112 M	4.0	-	71	849		357	182	87	70	193	564	9	82
	132 M	-	6.0	81	859	132	367	192	97	60	203	574		110

other motors on request

flange connections see page 11

Arrangement drawing LEM 91, 126, 161 with thermostatic control



N 1 = gas inlet DN 40

N 2 = gas outlet DN 50

u_A = liquid drain G 1

u_{A1} = liquid drain G ½

u_c = connection for cavitation protection G $^3/_8$

u_F = connection for make-up liquid G ½

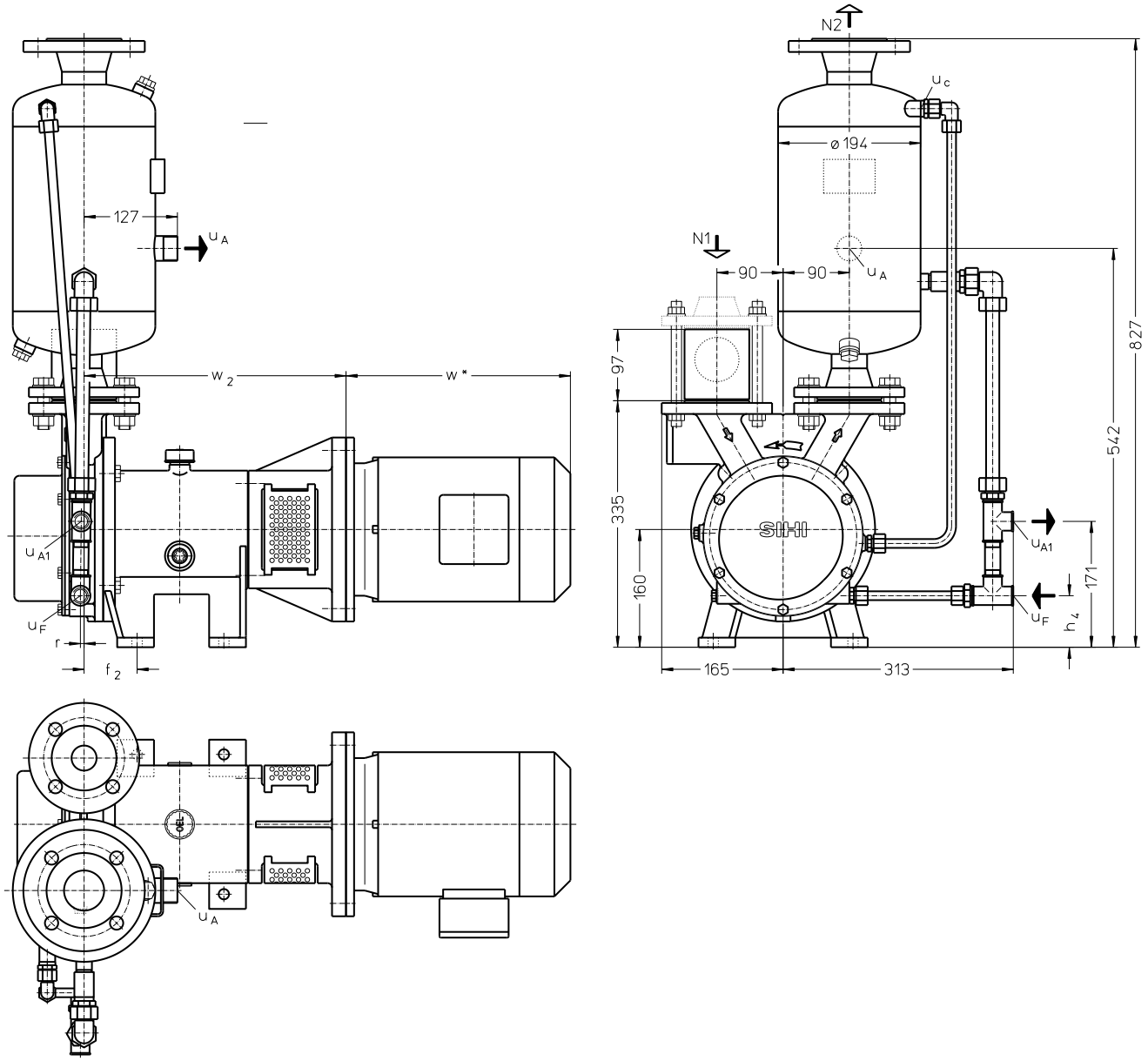
	electric motor IP 55 size	kW 50 Hz	kW 60 Hz	f_2 [mm]	h [mm]	h_1 [mm]	h_2 [mm]	h_3 [mm]	h_4 [mm]	h_5 [mm]	h_6 [mm]	approx. weight [kg]
LEM 91	90 L	2.2	-	25	817	90	325	150		160	532	51
	100 L	-	3.3	39	827	100	335	160	60	170	542	56
LEM 126	100 L	3.0	-									
	112 M	-	4.8	46	839	112	347	172		182	554	61
LEM 161	112 M	4.0	-	71	849		357	182	70	192	564	87
	132 M	-	6.0	81	859	132	367	192	60	202	574	115

other motors on request

** only at material 1.4571 the line

flange connections see page 11

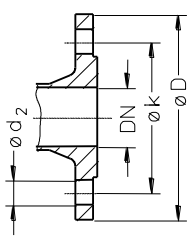
Arrangement drawing LEL 91, 126, 161



N 1 = gas inlet DN 40
N 2 = gas outlet DN 50
u_C = connection for cavitation protection G $^3/_8$
u_A = liquid drain G 1
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	f_2 [mm]	h_4 [mm]	r [mm]	w * [mm]	w_2 [mm]	approx. weight [kg]
LEL 91	90 L	2.2	-	72	70	5	269	370	82
	100 L	-	2.5				303	356	87
LEL 126	100 L	3.0	-						83
	112 M	-	3.3				320		93
LEL 161	112 M	4.0	-	67	65	9		351	114
	132 M	-	5.0				405	371	158

flange connections according to DIN 2501 PN 10 [mm]		
DN	40	50
k	110	125
D	150	165
number x d_2	4 x 18	4 x 18



other motors on request
* dimension dependent upon motor supplier

Data regarding the pump size - order notes

range + size		hydraulic + bearings	shaft seal	materials	casing sealing	*code of motor connection*
		C• hydraulic A, 9• with flange connection •Z two grease lubricated antifriction bearings arranged in the motor •B similar to •Z, but arranged in the motor carrier	B3N mechanical seal, o-rings Viton	0K main parts out of cast iron, impeller in low alloyed steel	7 o-rings, Teflon cord	ES for IMB5 motor 90L flange ø200 FS for IMB5 motor 100L resp. 112M flange ø250 GS for IMB5 motor 132S flange ø300
LEM	91	CZ	B3N	0K	0	
	126					
	161	9Z				
LEL	91	CB				ES, FS
	126					FS
	161	9B				FS, GS

* = only LEL

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 126 CZ B3N 0K 7 **with** 3.0 kW AC motor 50 Hz, 230 V∆, IP55

Example for ordering LEL:

LEL 161 9B B3N 0K 7 **for** 4.0 kW AC motor 50 Hz, 230 V∆, IP55 (motor size 112) has the complete designation:

LEL 161 9B B3N 0K 7 **FS**

Accessories LEM 91, 126, 161; LEL 91, 126, 161 with flange connection

Recommended Accessory	Material Execution		LEM 91 LEL 91	LEM 126 LEL 126	LEM 161 LEL 161
Top Mounted Liquid Separator		Type / weight	XBa 1042 / 9.7 kg		
Top mounted separator	Steel, galvanised	SIHI-Part No.	35 000 396		
Service liquid pipework, standard execution	Steel, galvanised	SIHI-Part No.	20 055 588		20 055 587
Service liquid pipework, thermostatic control 24V	1.0254 + Brass	SIHI-Part No.	20 048 239		20 048 241
Cavitation protection pipework	Steel, galvanised	SIHI-Part No.	20 055 586		20 055 585
Side Mounted Liquid Separator		Type / weight	XBp 0413 / 28 kg		
Side mounted separator	Steel, galvanised	SIHI-Part No.	35 000 502		
Pressure pipework (bend)	1.0254	SIHI-Part No.	35 003 172		
service liquid pipework, standard execution	1.0254	SIHI-Part No.	35 012 172		20 061 807
Cavitation protection pipework	1.0254	SIHI-Part No.	20 045 648		20 045 647
Sterling SIHI – Gas Ejector see Technical Catalogue – Gas Ejector					
at service liquid temperature 15 °C		Type weight	GEV 91 E 7 kg	GEV 90 A 9 kg	GEV 150 A 12 kg
at service liquid temperature 30 °C		Type weight	GEV 91 F 7 kg	GEV 90 B 9 kg	GEV 150 B 12 kg
Sterling SIHI – Non Return Ball Valve					
Intermediate flange execution XCk 40	0.6025 + butadiene rubber 0.6025 + Teflon	SIHI-Part No. weight	20 072 746 / 2.8 kg 20 072 745 / 2.8 kg		
Flange execution with glass cylinder XCk 406	0.6025 + butadiene rubber 0.6025 + Teflon	SIHI-Part No. weight	20 072 835 / 7.0 kg 20 072 836 / 7.0 kg		
Support foot	only for LEM				
for motor size 90 L		SIHI-Part No.	20 047 009	-	-
for motor size 100 L, 112 M			20 047 010	20 047 010	20 047 011
for motor size 132 M			-	-	20 047 012
Motor standard execution IP 55	only for LEL	Size Power Weight	90 L 2.2 kW 15 kg	100 L 3.0 kW 20 kg	112 M 4.0 kW 28 kg
Coupling for motor IP 55 pump side motor side		Type / weight SIHI-Part No.	B 68 / 1.5 kg 43 028 149 43 021 405	B 80 / 1.5 kg 43 021 414 43 021 417	
Motor in EEx e ll T3 execution	only for LEL	Size Power Weight	100 L 2.5 kW 22 kg	112 M 3.3 kW 28 kg	132 S 5.0 kW 65 kg
Coupling for motor EEx e ll 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

Designs subject to change without prior notice.

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