

# Contents

# Identification

**LVI**

## Close-coupled vertical in-line pumps

### Identification

Type key 3

### Product data

Introduction 4

Applications 4

Features and benefits 4

### Performance range

2 pole 5

4 pole 6

6 pole 7

### Construction

Sectional drawing 8

Construction features 9

Test pressure 9

### Operating conditions

Sound/noise level 10

Ambient temperature and altitude 10

Pump location 10

Pumped liquids 10

Liquid temperature 10

Inlet pressure 10

### Motor electrical data

2 pole 11

4 pole 11

6 pole 11

### Technical data/

### Performance curves & Data

2 pole 12

4 pole 48

6 pole 96

### Accessories

Counter flanges 124

### Type key

The example shows a LVI 40-125 50 Hz 2 pole pump with a maximum impeller diameter & PN-16 flanges, with cast iron casing & bronze impeller and with a carbon/ceramic/NBR/S.S 304 shaft seal.

### LVI

**Example** LVI 40 -125 2 A 2A A 1

Type range

Nominal diameter of suction & discharge port (DN)

Nominal impeller diameter (mm)

Code for motor speed n [min<sup>-1</sup>]

2 = 2900 min<sup>-1</sup>

4 = 1450 min<sup>-1</sup>

6 = 960 min<sup>-1</sup>

Code for Impeller Diameter

A = Full diameter performance

B = Diameter 1 performance

C = Diameter 2 performance

D = Diameter 3 performance

E = Diameter 4 performance

Code for pipework connection

1 = ANSI-125 flange

2A = PN-16 flange\*

2B = PN-25 flange

3 = ANSI-250 flange

Code for materials

A = Cast iron pump housing with cast iron impeller\*

B = Cast iron pump housing with bronze impeller

C = Cast iron pump housing with CF-8 impeller

D = Cast iron pump housing with CF-8M impeller

Code for shaft seal material

1 = Carbon/Ceramic/NBR/S.S 304\*

2 = Sic/Sic/Viton/S.S 316

3 = Carbon/Sic/Viton/S.S 316

\* Standard construction.

# Product data

## Close-coupled vertical in-line pumps

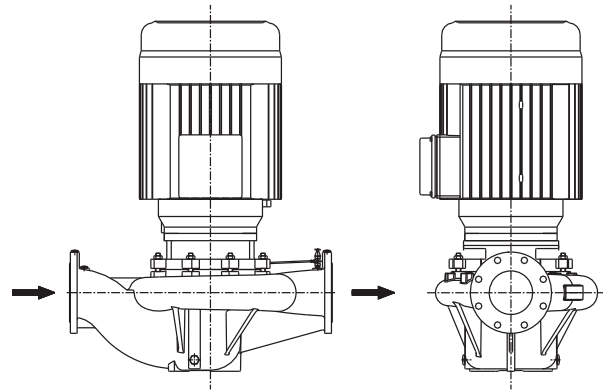
LVI

### Introduction

LVI are non-self priming, single-stage, vertical in-line, close-coupled type centrifugal pumps having radial suction and radial discharge port.

### Applications

- Cooling & heating systems.
- Pressure boosting systems.
- Industrial applications.
- Water supply.
- Fire protection systems.



### Features & benefits

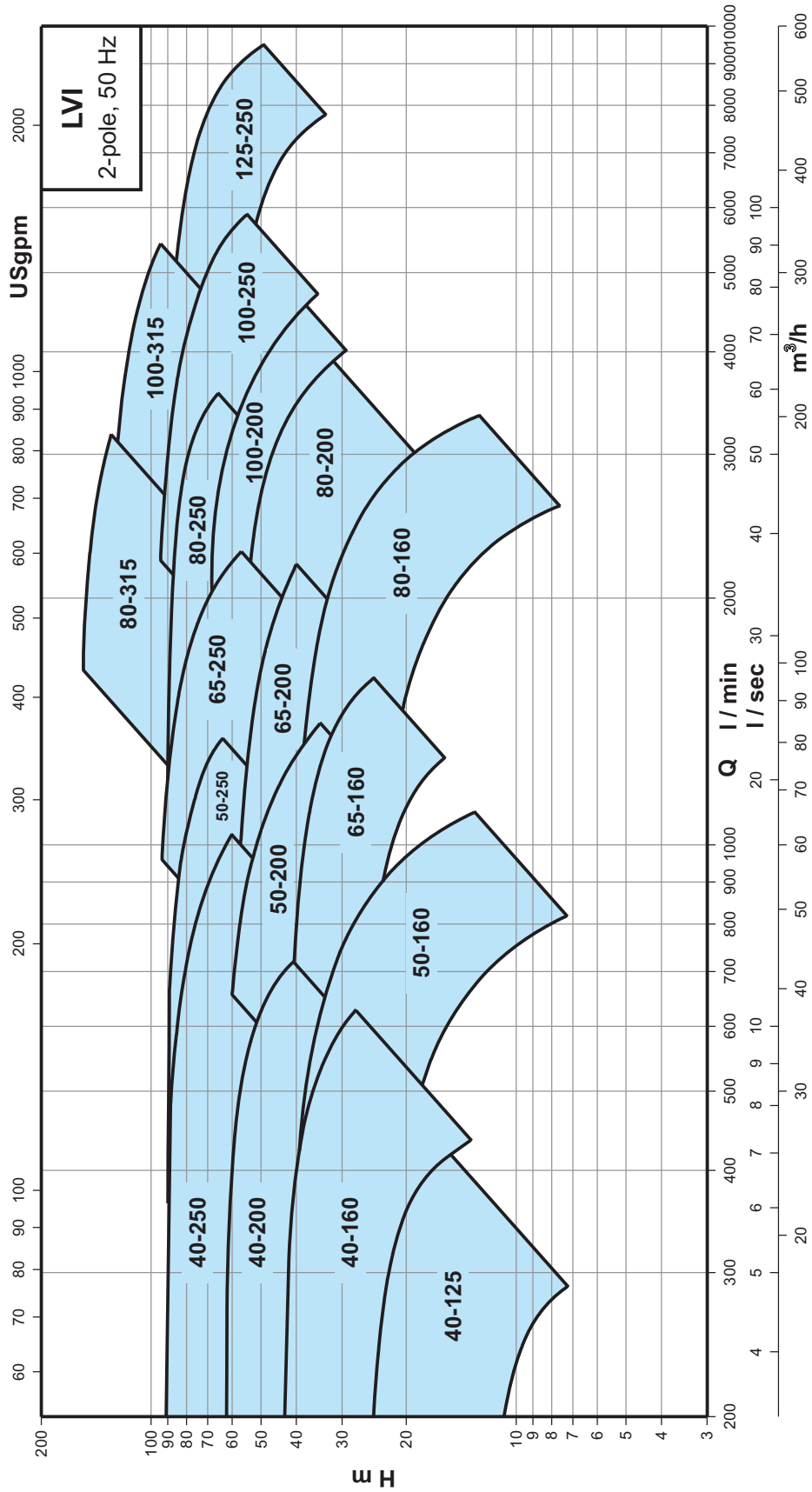
Following are the main features and benefits offered by the LVI pumps.

- Vertical in-line pumps offer largest floor space saving compared to End suction & Horizontal split case pumps.
- The in-line construction offers easy pipe work. Pipe hangers sized for the weight of the pump, piping & fittings offers adequate supports for most installations.
- The inlet passages of the volute casing are of liberal size & have flow straightening vanes to provide excellent suction performance and extremely quiet operation.
- Standard flanges for suction and discharge ports will be PN 16 as per DIN standard EN 1092-2 and PN 25 as per DIN standard EN 1092-2. ANSI 125 and ANSI 250 as per ASME B16.1 are available on request.
- These pumps are close coupled pumps with TEFC squirrel cage induction motors with main dimensions complying to IEC standards.
- These pumps are available with mechanical shaft seal only.
- These pumps have the discharge range up to 600 m<sup>3</sup>/hr and head range up to 150 metres. Motor ratings are up to 132 kW.
- The pump impellers are dynamically balanced to grade 6.3 of ISO 1940.
- These pumps are available with our standard range of motors complying to EFF2 motors. They can also be supplied with EFF1 motors on request

# Performance range

Close-coupled vertical in-line pumps

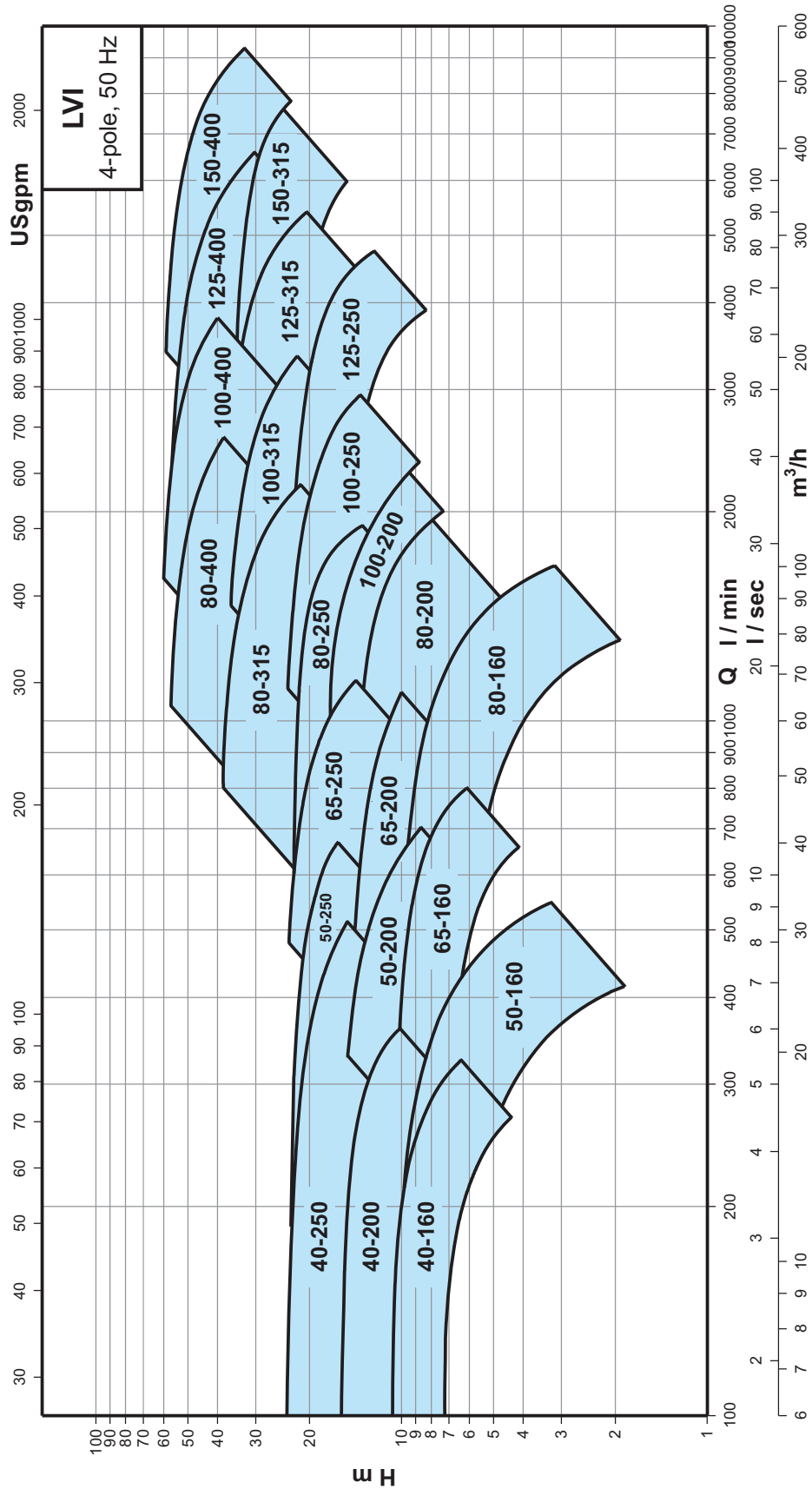
LVI 2-Pole



# Performance range

Close-coupled vertical in-line pumps

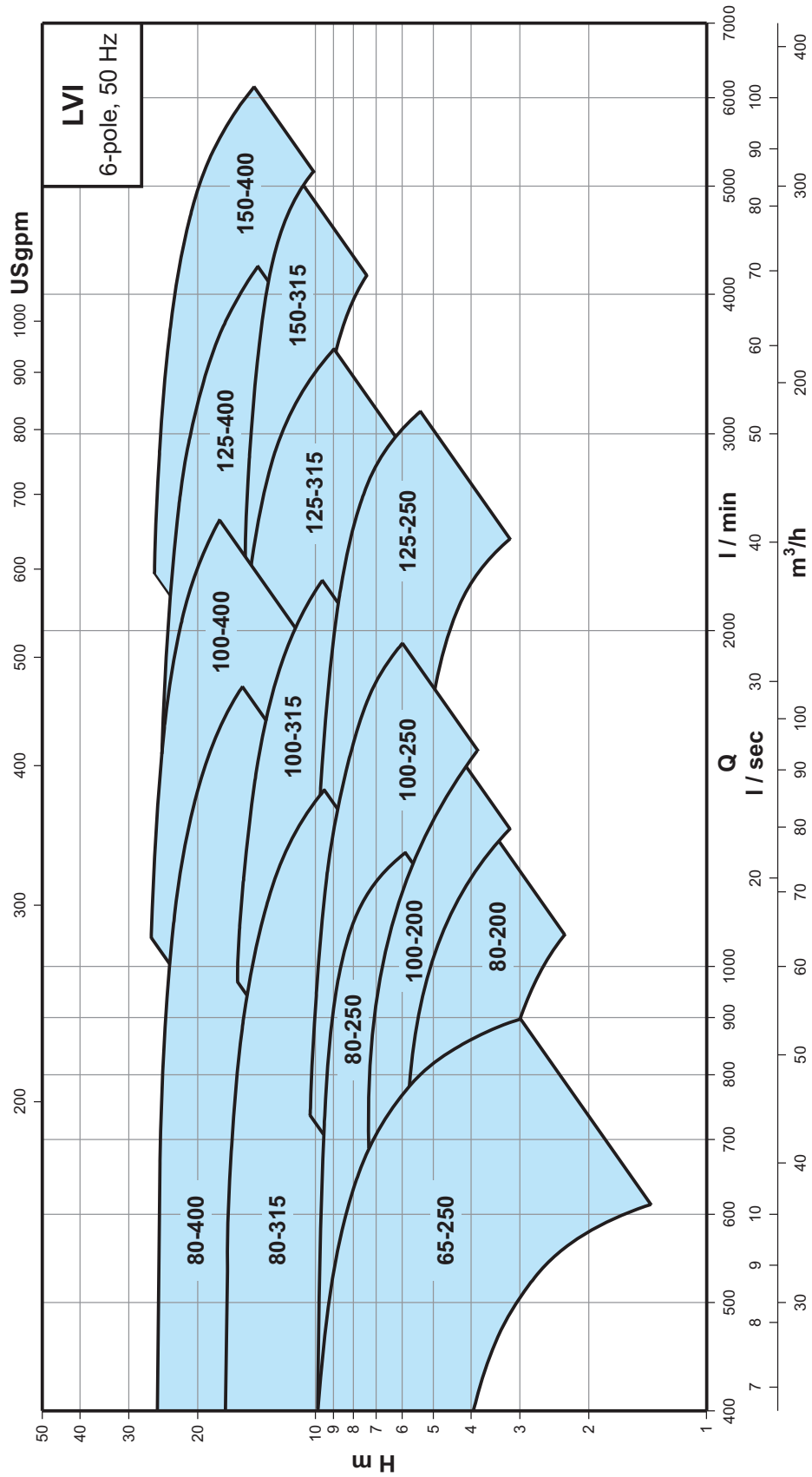
LVI 4-Pole



# Performance range

Close-coupled vertical in-line pumps

LVI 6-Pole



# Construction

## Close-coupled vertical in-line pumps

LVI

### Sectional drawing

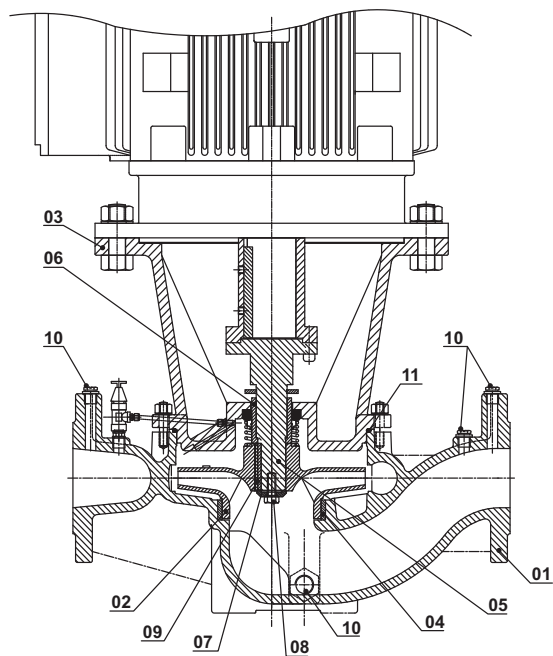


Fig. 2a 71 to 90 & 200 to 315 IEC frame sizes

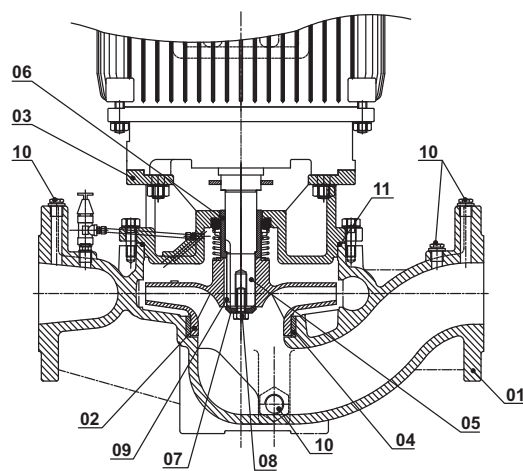


Fig. 2b 112 to 180 frame

### Materials

Pos.	Component	A-version	B-version	C-version	D-version
1	Volute casing	Cast iron	Cast iron	Cast iron	Cast iron
2	Impeller	Cast iron	Bronze	CF-8	CF-8M
3	Adaptor	Cast iron	Cast iron	Cast iron	Cast iron
5	Pump shaft	Carbon steel	Carbon steel	S.S.304	S.S.316
6	Shaft sleeve	S.S.410	S.S.410	S.S.304	S.S.316
7	Impeller washer	S.S.410	S.S.410	S.S.304	S.S.316
8	Impeller lock pin	S.S.410	S.S.410	S.S.304	S.S.316
9	Impeller key	S.S.410	S.S.410	S.S.304	S.S.316
10	Plugs	Carbon steel	Carbon steel	Carbon steel	Carbon steel
11	O-ring	NBR	NBR	NBR	NBR
4	Wear ring*	CastIron	Bronze	S.S.304	S.S.316

\* Wear ring is available on request only.

# Construction

## Close-coupled vertical in-line pumps

LVI

### Construction features

#### Volute casing

The volute casing of the pumps are designed to be robust in construction to take the undue stresses offered by the pipe work. They have a radial suction port and radial discharge port. Standard flanges are PN 16 as per EN 1092-2 and PN 25 as per DIN standard EN 1092-2. ANSI 125 and ANSI 250 as per ASME B16.1 are available on request.

The volute casing are provided with a priming & drain hole closed by plugs.

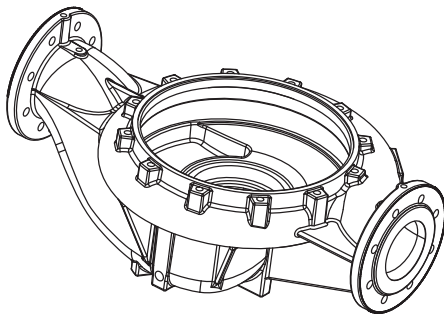


Fig. 1 Volute casing

#### Shaft

As shown in the figure an integral single shaft is provided for all pumps from 112 to 180 frame (see fig. 2). Remaining pumps are provided with stub shaft as shown below (see fig. 3) which has two drilled holes for set screws in the coupling.

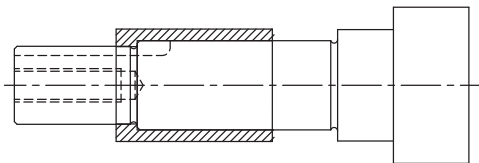


Fig. 2 Integral shaft pump

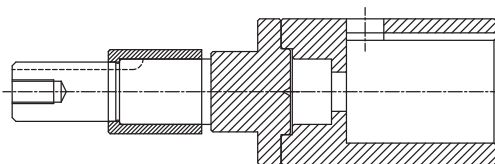


Fig. 3 Stub shaft pump

#### Impeller

The impellers are closed impellers with extra smooth surface finish and machined completely from outside to ensure high efficiency.

The direction of rotation of impeller is clock wise when viewed from the motor driving end.

They are dynamically balanced to grade 6.3 of ISO 1940.

All impellers can be trimmed to adopt them for the duty point requested by the customer.

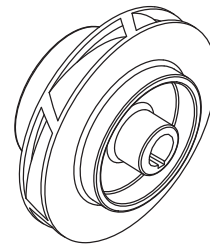


Fig. 4 Impeller

#### Test pressure

All pumps are hydrostatic tested for leakage as per the following test pressure using water containing corrosion inhibitor at room temperature.

Pressure rating	Operating pressure	Test pressure
PN 16	16 bar	24 bar
PN 25	25 bar	37.5 bar
ANSI 125	125 psi	188 psi
ANSI 250	250 psi	375 psi

#### Motors

The motors are totally enclosed fan cooled squirrel cage induction motors.

The standard motors with the pumps are all as per EFF2 efficiency. EFF1 efficiency motors can be available on request.

Motors with frame sizes from 71 to 160 are with aluminum construction. The remaining are cast iron construction.

#### Motor data

Ratings: up to 132 kW

Rated speed: 2900, 1450, 960 rpm

Enclosure class: IP 55

Insulation class: F

Nominal voltage (tolerance +5% / -10%): 50 Hz, 3 phase, 400 V.

# Operating conditions

## Close-coupled vertical in-line pumps

LVI

### Sound/Noise Levels

As shown in the table below the motor noise levels will not exceed the maximum sound pressure level [db(A)] as per ISO 3743.

Motor kW	Maximum sound pressure level [db(A)]-ISO 3743		
	Three-phase motors		
	2-pole	4-pole	6-pole
0.37	56	45	-
0.55	57	42	40
0.75	56	42	43
1.10	59	50	43
1.50	58	50	47
2.20	60	52	52
3.00	59	52	63
4.00	63	54	63
5.50	63	62	63
7.50	68	62	66
11.0	70	66	66
15.0	70	66	66
18.5	70	63	66
22.0	70	63	66
30.0	71	65	59
37.0	71	66	60
45.0	71	66	58
55.0	71	67	58
75.0	73	70	61
90.0	73	70	61
110.0	76	70	61
132.0	76	70	61

### Ambient temperature and altitude

The ambient temperature for proper motor operation must not exceed.

- + 45°C for EFF2 motors
- + 60°C for EFF1 motors.

In case of ambient temperature exceeding 45°C (or 60°C for EFF1) or if motor is to be installed more than 1000 metres above sea level then a higher output motor should be selected due to low cooling effect. Please refer the chart as shown in fig. 5 for selection of the motors at higher temperature or altitude.

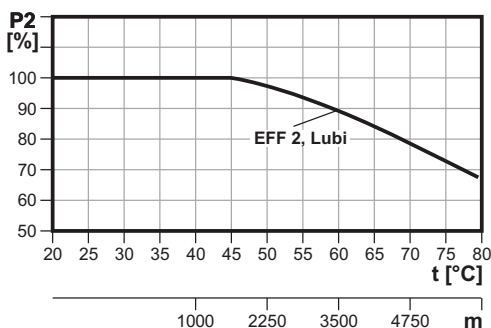


Fig. 5 Motor P2 depend on temperature/altitude

### Example

A 15 kw motors has to be increased in output to 18.5 kw if ambient temperature is 60°C.

A 15 kw motors has to be increased in output to 18.5 kw if it has to operate at 3500 meters above mean sea level.

### Pump location

The pumps have been designed to operate in non aggressive and non explosive atmosphere.

The relative humidity should not exceed 95%.

### Pumped liquids

LVI pumps are designed for non explosive liquids which are clean, and thin without any solid particles.

A viscous liquid affects the pump performance in the following ways.

- The power consumption of the pump will increase with increase in viscosity. This will require a larger motor for the pump.
- Head, discharge & pump efficiency will reduce.

A liquid with high density will also affect the performance as follows.

- The power consumption will increase at a ratio corresponding to increase in density. For example a liquid with a specific gravity of 1.30 will require 30% larger motor to drive the pump.
- The head discharge and pump efficiency will not change with change in density.

### Liquid temperature

The LVI pump range covers the temperature range from 0°C to +140°C.

The permissible liquid temperature depends on the type of mechanical shaft seal furnished on the pump.

Please refer the table showing relationship between mechanical shaft seal & temperature.

The maximum liquid temperature is stamped on the nameplate of the pump.

### Relationship between shaft seals and temperature

Seal type	Code	Temperature range
Carbon/Ceramic/NBR/S.S.304	1	0°C to +90°C
Sic/Sic/Viton/S.S.316	2	0°C to +90°C
Carbon/Sic/Viton/S.S.316	3	0°C to +140°C

### Inlet pressure

- The inlet pressure + shut off pressure (pressure of pump against closed valve) should not exceed the maximum operating pressure of the pump.
- The minimum inlet pressure must be according to the NPSH curve + 0.5 meters safety margin + correction of vapour pressure.



# Motor electrical data

## Close-coupled vertical in-line pumps

LVI

### Eff 2/standard efficiency, 2-pole

P2 [kW]	P2 [H.P]	Frame size	Voltage	I <sub>1/1</sub> [A] at				η [%]	Cos Ø <sup>1/1</sup>	n [min <sup>-1</sup> ]	I <sub>start</sub> I <sub>1/1</sub>
				415 V	380 V	240 V	220 V				
0.75	1.00	80L	3x220-240Δ/380-415Y	1.65	1.80	2.90	3.20	77.0	0.820	2820	6.0
1.10	1.50	80L	3x220-240Δ/380-415Y	2.30	2.50	4.00	4.50	82.5	0.810	2820	6.0
1.50	2.00	90L	3x220-240Δ/380-415Y	3.00	3.30	5.20	5.70	84.0	0.827	2830	6.0
2.20	3.00	112M	3x220-240Δ/380-415Y	4.40	4.80	7.60	8.20	85.5	0.820	2830	6.5
3.00	4.00	112M	3x220-240Δ/380-415Y	5.90	6.40	10.15	11.00	86.0	0.830	2840	6.5
4.00	5.50	112M	3x380-415Δ	7.70	8.40	-	-	87.5	0.826	2845	6.5
5.50	7.50	112M	3x380-415Δ	9.70	10.61	-	-	88.5	0.890	2865	6.0
7.50	10.0	132M	3x380-415Δ	13.70	15.00	-	-	89.5	0.851	2880	6.5
9.30	12.5	132M	3x380-415Δ	16.00	17.60	-	-	90.0	0.890	2920	6.5
11.0	15.0	132M	3x380-415Δ	19.00	20.80	-	-	90.5	0.890	2920	6.5
15.0	20.0	160M	3x380-415Δ	26.00	28.50	-	-	91.0	0.880	2920	6.5
18.5	25.0	160L	3x380-415Δ	32.00	35.00	-	-	92.0	0.880	2920	6.5
22.0	30.0	160L	3x380-415Δ	40.00	44.00	-	-	92.0	0.830	2930	6.5
30.0	40.0	200L	3x380-415Δ	50.00	54.50	-	-	93.0	0.900	2950	6.5
37.0	50.0	200L	3x380-415Δ	61.00	67.00	-	-	93.0	0.904	2950	6.5
45.0	60.0	225M	3x380-415Δ	71.00	78.00	-	-	93.5	0.941	2955	6.5
55.0	75.0	250M	3x380-415Δ	87.00	94.50	-	-	94.0	0.940	2960	6.5
75.0	100.0	280S	3x380-415Δ	123.00	134.00	-	-	94.5	0.900	2965	6.5
90.0	120.0	280M	3x380-415Δ	146.00	160.00	-	-	95.0	0.903	2965	6.5
110.0	150.0	315S	3x380-415Δ	171.00	187.00	-	-	95.0	0.942	2965	6.5
132.0	180.0	315M	3x380-415Δ	205.00	224.00	-	-	95.0	0.940	2965	6.5

### Eff 2/standard efficiency, 4-pole

P2 [kW]	P2 [H.P]	Frame size	Voltage	I <sub>1/1</sub> [A] at				η [%]	Cos Ø <sup>1/1</sup>	n [min <sup>-1</sup> ]	I <sub>start</sub> I <sub>1/1</sub>
				415 V	380 V	240 V	220 V				
0.37	0.50	71L	3x220-240Δ/380-415Y	1.00	1.10	1.75	1.90	73.0	0.705	1400	6.0
0.55	0.75	80L	3x220-240Δ/380-415Y	1.30	1.40	2.20	2.40	78.0	0.785	1410	5.5
0.75	1.00	80L	3x220-240Δ/380-415Y	1.70	1.80	2.80	3.10	82.5	0.780	1410	5.5
1.10	1.50	90L	3x220-240Δ/380-415Y	2.40	2.60	4.10	4.50	83.5	0.780	1415	5.5
1.50	2.00	90L	3x220-240Δ/380-415Y	3.00	3.30	5.20	5.70	85.0	0.818	1415	6.0
2.20	3.00	112M	3x220-240Δ/380-415Y	4.50	4.80	7.50	8.20	86.0	0.824	1440	6.0
3.00	4.00	112M	3x220-240Δ/380-415Y	5.80	6.40	10.20	11.00	86.0	0.825	1445	6.0
4.00	5.50	112M	3x380-415Δ	7.80	8.50	-	-	86.5	0.830	1445	6.0
5.50	7.50	132M	3x380-415Δ	10.60	11.60	-	-	89.0	0.810	1450	6.0
7.50	10.0	132M	3x380-415Δ	13.80	15.0	-	-	90.0	0.840	1455	6.5
9.30	12.5	160M	3x380-415Δ	17.00	18.60	-	-	90.5	0.840	1460	6.5
11.0	15.0	160M	3x380-415Δ	21.00	22.50	-	-	91.0	0.820	1460	6.5
15.0	20.0	160L	3x380-415Δ	27.00	29.50	-	-	91.5	0.850	1460	6.5
18.5	25.0	180M	3x380-415Δ	33.00	36.00	-	-	92.0	0.846	1475	6.5
22.0	30.0	180L	3x380-415Δ	39.00	43.00	-	-	92.5	0.848	1475	6.5
30.0	40.0	200L	3x380-415Δ	50.00	55.00	-	-	93.0	0.896	1475	6.5
37.0	50.0	225S	3x380-415Δ	62.00	68.00	-	-	93.5	0.890	1475	6.5
45.0	60.0	225M	3x380-415Δ	75.00	82.00	-	-	94.0	0.890	1480	7.0
55.0	75.0	250M	3x380-415Δ	91.00	100.00	-	-	94.0	0.893	1475	7.0
75.0	100.0	280S	3x380-415Δ	122.00	133.00	-	-	94.5	0.903	1480	7.0
90.0	120.0	280M	3x380-415Δ	146.00	160.00	-	-	95.0	0.903	1480	7.0

### Eff 2/standard efficiency, 6-pole

P2 [kW]	P2 [H.P]	Frame size	Voltage	I <sub>1/1</sub> [A] at				η [%]	Cos Ø <sup>1/1</sup>	n [min <sup>-1</sup> ]	I <sub>start</sub> I <sub>1/1</sub>
				415 V	380 V	240 V	220 V				
0.75	1.00	90L	3x220-240Δ/380-415Y	1.94	2.12	3.36	3.66	74.6	0.720	900	6.0
1.10	1.50	90L	3x220-240Δ/380-415Y	2.54	2.77	4.39	4.79	77.3	0.780	910	6.0
1.50	2.00	112M	3x220-240Δ/380-415Y	3.32	3.62	5.74	6.26	79.6	0.790	910	6.0
2.20	3.00	112M	3x220-240Δ/380-415Y	4.65	5.08	8.05	8.78	82.2	0.800	915	7.0
3.00	4.00	132M	3x220-240Δ/380-415Y	6.10	6.66	10.54	11.50	84	0.815	915	7.0
4.00	5.50	132M	3x380-415Δ	7.97	8.71	-	-	85.1	0.820	920	7.0
5.50	7.50	132M	3x380-415Δ	10.75	11.74	-	-	86.8	0.820	925	7.0
7.50	10.0	160M	3x380-415Δ	14.36	15.68	-	-	88.1	0.825	935	7.0
9.30	12.5	160M	3x380-415Δ	17.46	19.06	-	-	89.3	0.830	940	7.0
11.0	15.0	160L	3x380-415Δ	20.31	22.18	-	-	89.7	0.840	940	7.0
15.0	20.0	180L	3x380-415Δ	27.45	29.98	-	-	90.5	0.840	945	7.0
18.5	25.0	200L	3x380-415Δ	33.32	36.39	-	-	91.3	0.846	945	7.0
22.0	30.0	200L	3x380-415Δ	38.77	42.34	-	-	91.8	0.860	950	7.0
30.0	40.0	225M	3x380-415Δ	51.22	55.94	-	-	92.6	0.880	950	7.0