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1 Applications

For water works, pressure boosting, sprinkling and irrigation installation, boiler feed duties, circulation of cooling water & hot water pumping of condensate, generation of power water etc.

2 Media Pumped

Clean liquid not containing any abrasive solid particles and not liable to attack the materials of construction of the pump either chemically.

3 Operating Data

Sizes	DN : 32 mm
Capacities	Q : 3.5 - 18 m ³ /hr
Total Head ¹⁾	H : up to 364 m
Operating Pressure ²⁾	p : up to 40 bar
Operating Temperature	t : from - 10 °C to + 140 °C

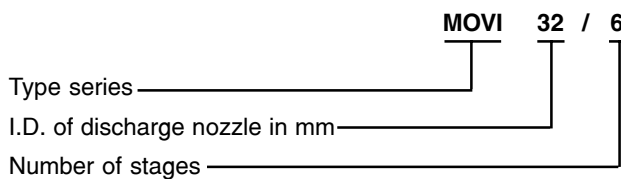
1) At Q = 0, ρ = 1

2) The sum of max. suction pressure plus total head at pump shut off point must not exceed the specified values.

4 Construction

Horizontal, multistage high pressure centrifugal pump of ring section type, with pump feet integrally cast to the bearing housing.

5 Designation



6 Total head / Pressure

Max. total head at pump shut off point (Q=0)	364 m
Max. Pump discharge pressure at pump shut off point	
Normal Design	< 30 bar
Hot Water Design	< 40 bar
Test Pressure (pump casing + Stage casings)	60 bar

Table no. 1

Note : The casing components are subject to an internal pressure test with water for leakproofness.

7 Temperature - Shaft seal

Liquid temperature in °C	Stuffing box
-10 to +110	Normal uncooled
> +110 up to +140	HWD Cooled

Table no. 2

Note : Cooling to cooling cover, Stuffing box, is necessary only when pumped media temperature is between 110 °C and 140 °C.

8 Bearings and lubrication

Grease lubricated antifriction bearings are fitted at both ends.

9 Direction of rotation

Clockwise viewed from suction end.

10 Flanges

DIN 2535 PN 40.

11 Coupling

Lovejoy Flexible coupling : Type L 095 to L 190.

12 NPSH

The plotted NPSH curve values are binding for all project calculations; they apply to degassed water and the NPSH available must on no account be lower than the plotted value in each case. The safety factor of approx.. 0.5 m included in the plotted NPSH values is intended to take measurement tolerances & scatter caused by manufacturing tolerance into account. The NPSH available must always exceed the NPSH required.

13 Type of Construction of Soft-packed Stuffing boxes

N/a - for clean liquids pumped under suction lift conditions, or under positive suction heads, not exceeding 1 bar upstream of the pump at extra cost.

N/b - for clean liquids pumped under positive suction heads exceeding 1 bar.

N/c - for clean liquids pumped out of vessels under vacuum (condensate execution) at extra cost.

As a guide line it can be considered that wherever clients don't specify the particular type of operation and it is difficult to get the same arrangement, N/b may be considered as standard one, which then can be converted if required just replacing the seal cage ring by gland packing.

13.1 Dimensions of Stuffing box packing compartment

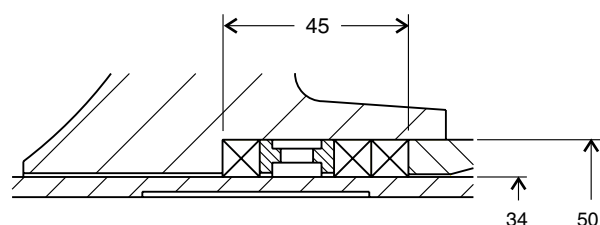


Fig. 1

Stuffing box type	Packing ring			Lantern ring nos.
	Nos.	Size	Length	
N/a	8	8	1120	Suc. end - 1 Dis. end - nil
N/b	10	8	1400	-
N/c	6	8	840	Suc. end - 1 Dis. end - 1

Table no. 3

13.2 Sealing liquid line

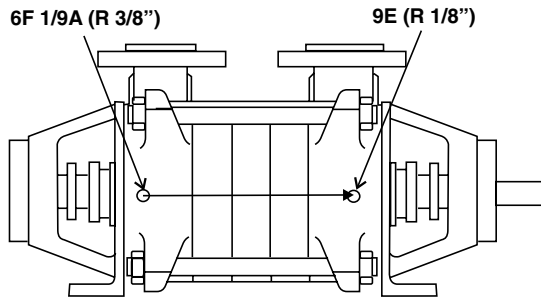


Fig. 2 : Sealing liquid from discharge to suction casing

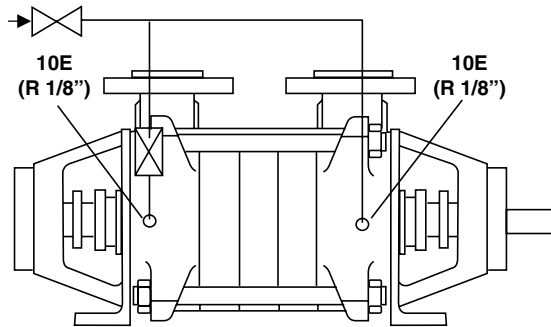


Fig. 3 : External sealing liquid connection

13.3 Connectins

Application / situation	Pump end pressure	Sealing liquid line
Suction lift or positive suction head operation / Suction pressure < 1 bar (N/a)	≤ 30 bar	Integral as per fig. 3
Positive suc. head operation Suction pressure > 1 bar (N/b)	≤ 30 bar	--
Vacuum operation / (condensate construction) (N/c)	≤ 30 bar	External as per fig. 4

Table no. 4

Note : KSB Supply - Plugged connection

14 Power reserve

The following power reserve must be considered.

Power kW	Power reserve (%)
Up to 1.5	Approx. 20
1.5 - 15	Approx. 15
Above 15	Approx. 10

Table no. 5

15 Max. Permissible p/n Values in kW/rpm

	Material	
	Shaft	45 C 8
p/n value	0.019	0.029

Table no. 6

16 Water filling, weight of Pumps & Moment of Inertia : GD²

No. of stages	Water filling	Approx. weight	Moment of inertia GD ²
1	1.6	42	0.0086
2	1.95	47	0.0166
3	2.3	52	0.02472
4	2.65	57	0.03264
5	3	62	0.0408
6	3.35	67	0.0488
7	3.7	72	0.05692
8	4.05	87	0.06492
9	4.4	92	0.07292
10	4.75	97	0.081
11	5.1	102	0.0892
12	5.45	107	0.0972
13	5.8	112	0.1052
14	6.15	117	0.1132

Table no. 7

17 By-pass

To regulate the minimum flow, an orifice plate will be fitted in the by-pass line. The dimension of the orifice plate can be taken from the figure given below.

The minimum flow depends on the permissible temperature of the pumped medium and hence the 15% of Q optimum mentioned above is an approximate quantity. In case the exact quantity is required, the case may be referred to H.O.

In case the rated capacity is more than the minimum flow, however, there is a possibility of reducing this capacity below minimum flow, an automatic minimum flow control valve can be used. At present, we are using this minimum flow control valve of M/s Schroedhal / Schroeder make.

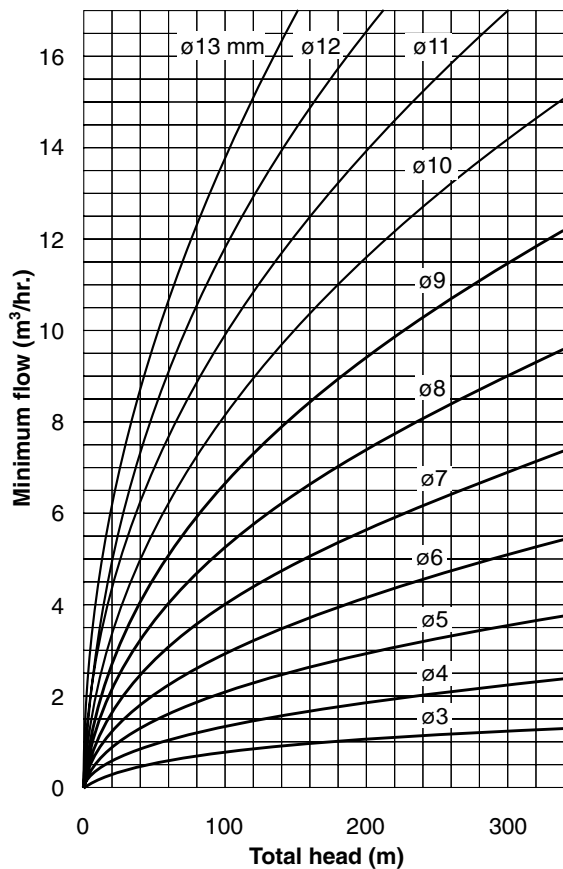
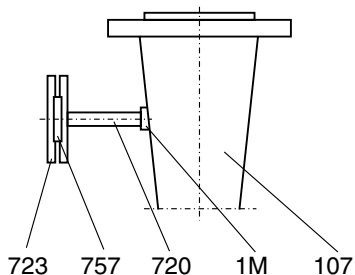


Fig. no. 4 : Bore for Orifice



Part no.	Description	Materials
71-1	Flange	M.S.
107	Discharge Casing	C.I.
720	Double nipple with flange	M.S.
757	Orifice	AISI 316
1M	Mannometer connection R 1/2"	AISI 316

Fig. no. 8 : Bore of Orifice in mm

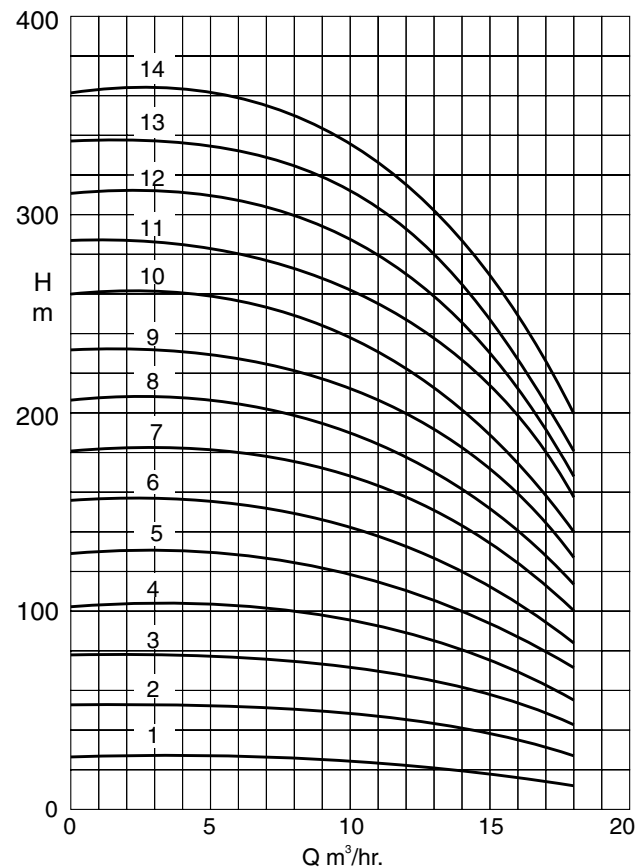
18 Material of construction

Part name	Material Execution	
	0	1
Suction casing	C.I.	C.I.
Discharge casing	C.I.	C.I.
Stage Casing	C.I.	C.I.
Impeller	C.I.	LG2
Shaft	45 C 8	45 C 8
Shaft prot. sleeve	C.I.	AISI 410
Spacer Sleeve	C.I.	Bz15
Tie Rod	45 C 8	45 C 8
Casing studs & nuts	45 C 8	45 C 8

Table no. 8

19 Selection chart

19.1 2900 rpm



19.2 1450 rpm

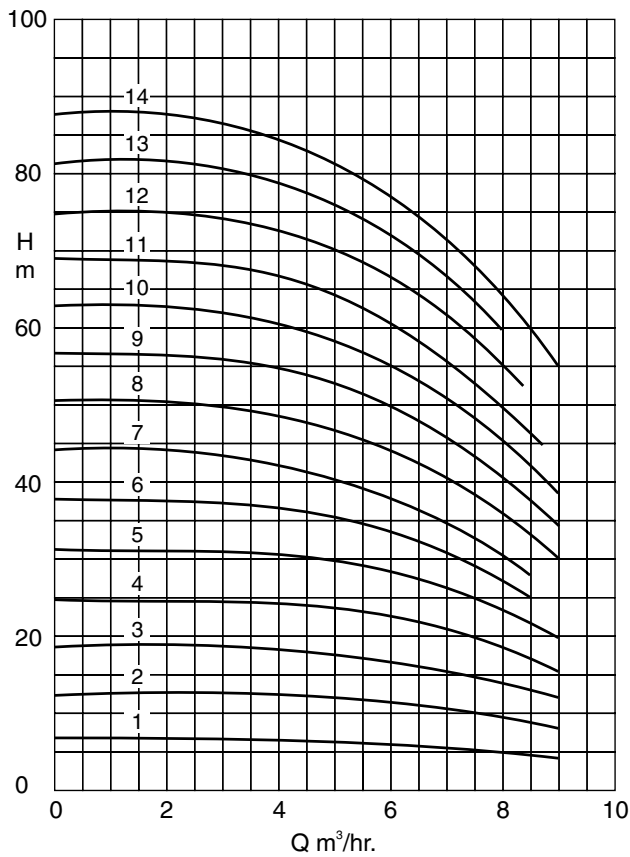


Fig. no. 5 : Family curves

20 Orientation of suction and discharge branch

The standard nozzle orientation is suction horizontal to right, seen from drive end with discharge vertically up. Other nozzle orientations are also possible, however, both nozzles can be arranged in the same direction only on pumps with 3 or more stages.

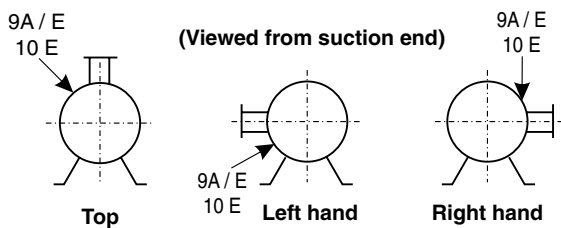


Fig. no. 6 : Nozzle orientation

21 Impeller Combinations

Impeller Combination	Details of Impeller Diameter
A	X impellers of 135 mm diameter
B	X impellers of 135 mm diameter + 1 impeller trimmed to 120 mm diameter vane tips cut back
C	X impellers of 135 mm diameter + 1 impeller trimmed to 110 mm diameter
D	X impellers of 135 mm diameter + 1 impeller of 120 mm diameter vane tips cut back + 1 impeller trimmed to 110 mm diameter
E	X impellers of 135 mm diameter + 2 impeller trimmed to 110 mm diameter

The no. "X" of impellers of 135 mm diameter amounts to for the combinations.

B & C : No. of stages of pump less one

D & E : No. of stages of pump less two

22 Dimensions

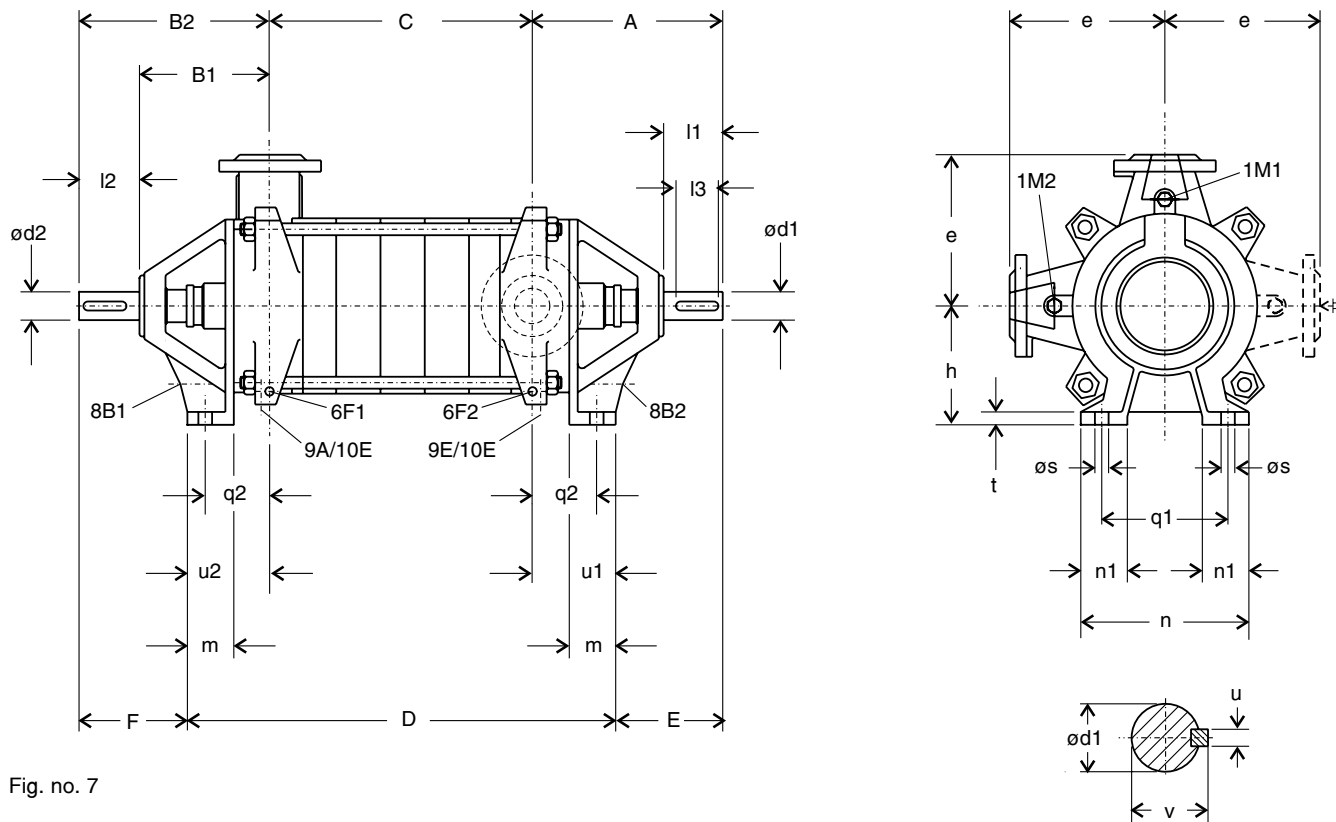


Fig. no. 7

Pump Size	Dimensions															Stub shaft					
	A	B1	D	E	F	e	h	m	n	n1	q1	q2	s	t	u1	u2	Ød1	l1	l3	v	u
32 (N)	239	168	C+220	139	139	152	132	60	186	65	136	75	14	14	100	100	25	71	45	28	8
32 (HWD)	294	223	C+310	139	139	152	132	60	186	65	136	130	14	14	155	155	25	71	45	28	8

Pump size	Pump dimension C for no. of stages of													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
32	71	114	157	200	243	286	329	372	415	458	501	544	587	630

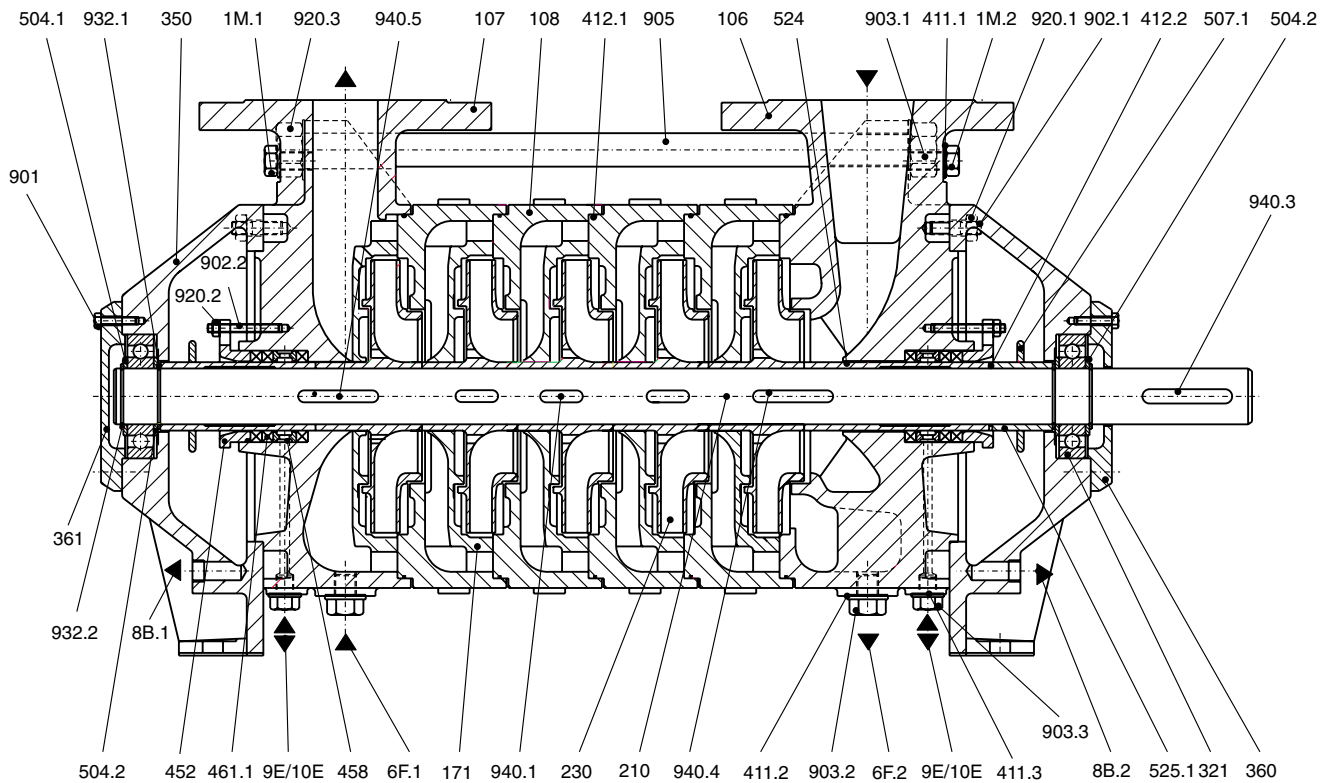
Table no. 9
All dimensions are in mm

Connections	Part designation	Size
1M.1 / 1M.2	Pressure guage	G 1/2"
6F.1 / 6F.2	Priming & draining of pumped liquid	G 3/8"
8B1 / 8B2	Leakage drain	G 3/8"
9A	Sealing liquid outlet (Sealing by product pumped)	G 1/8"
9E	Sealing liquid inlet (Sealing by product pumped)	G 1/8"
10E	Inlet of sealing liquid (from outside)	G 1/8"
7A	Cooling liquid outlet	G 1/4"
7E	Cooling liquid outlet	G 1/4"

Table no. 10

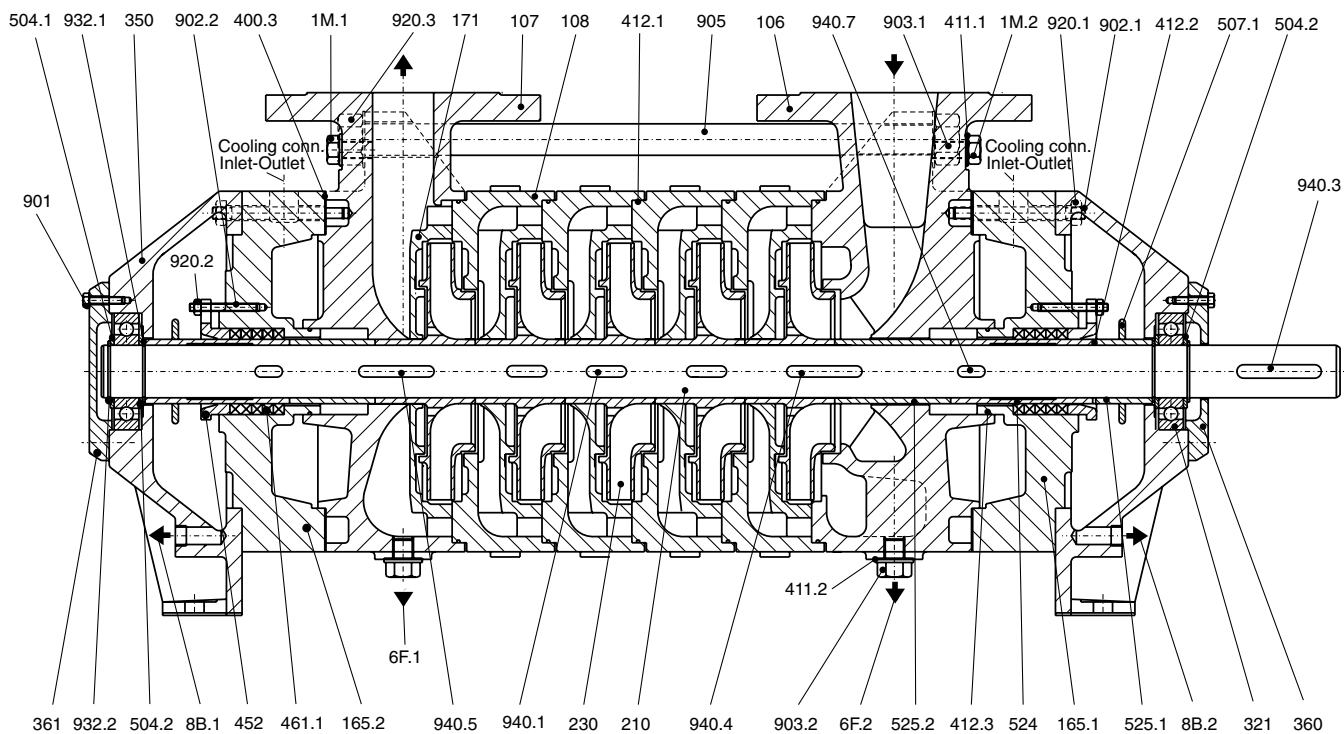
23 Sectional Drawings & List of components

23.1 Normal execution



List of components

Part no.	Description	Part no.	Description
106	Suction casing	458	Seal cage ring
107	Discharge casing	461	Stuffing box packing
108	Stage casing	504.1-2	Spacer ring
171	Diffuser last stage	507.1	Splash ring
210	Shaft	524	Shaft protection sleeve
230	Impeller	525.1	Spacer sleeve
321	Ball bearing	901	Hex. Bolt
350	Bearing housing	902.1-2	Stud
360	Bearing cover - motor side	903.1-3	Plug
361	Bearing cover - end side	905	Connection rod
411.1-3	Gasket	920.1-3	Hex. Nut
412.1-2	O-ring	932.1-2	Circlip
452	Stuffing box gland	940.1-5	Fitting key

23.2 Hot Water execution

List of components

Part no.	Description	Part no.	Description
106	Suction casing	452	Stuffing box gland
107	Discharge casing	461	Stuffing box packing
108	Stage casing	504.1-2	Spacer ring
165.1 - 2	Stuffing box housing	507.1	Splash ring
171	Diffuser last stage	524	Shaft protection sleeve
210	Shaft	525.1 - 2	Spacer sleeve
230	Impeller	901	Hex. Bolt
321	Ball bearing	902.1-2	Stud
350	Bearing housing	903.1- 2	Plug
360	Bearing cover - motor side	905	Connection rod
361	Bearing cover - end side	920.1-3	Hex. Nut
400.1 - 3	Gasket	932.1-2	Circlip
411.1- 2	Gasket	940.1-5	Fitting key
412.1- 3	O-ring		

24 Selection procedure

24.1 Enquiry

Enquiry must clearly include the following minimum information.

- Client :
- Client's enquiry No. & date :
- Plant / Project :
- KSB Project Ref. No. :
- Liquid handled :
- Required capacity :
- Required differential head :
- Suction pressure :
- Discharge pressure :
- Temperature :
- Specific gravity :
- Viscosity :
- NPSH available :
- Vapour pressure of the liquid at pumping temperature :
- Performance test standard :

24.2 Selection Procedure

Operating Conditions

Liquid		
Capacity (m ³ /hr.)	Q	
Total head (m)	H	
Liquid temperature (°C)	t	
Specific gravity	ρ	
NPSHa (m)		

To determine no. of stages

Select material of construction
Check whether
Hot water design is required
Operating point is between 3.5 - 22 m ³ /hr.
No. of stages allowed
NPSH is sufficient (NPSHr < NPSHa)

24.3 Computation of performance

1. Determine head per stage (m) = $\frac{\text{Total Head}}{\text{No. of stages}}$

2. Impeller diameter in mm

3. Efficiency (%)

4. BkW = $\frac{Q \times H \times \rho}{367 \times \eta}$

5. BkW x Power margin

6. Select motor rating rounded off to the nearest kW available

