SHAKTI
PUMPING LIFE

SMTB PUMPS

CENTRIFUGAL MACHINE TOOL PUMPS
50 Hz

SHAKTI

THE POWER OF INNOVATION, EFFICIENCY & TECHNOLOGY.

Content

GENERAL DATA

INTRODUCTION

The SMTB machine tool pumps are single-stage centrifugal pumps with axial suction port and radial discharge port. The unique SuperVortex impeller is capable of handling solids and swarf up to 20 mm. The pump is directly coupled to a totally enclosed fan-cooled standard motor. Main dimensions are according to IEC and DIN standards.

APPLICATIONS

The SMTB pumps are designed specifically for industrial machine tool and cleaning applications, such as

- Machining Centres
- Cooling Systems
- Grinding Machines
- Lathes
- Parts-cleaning Systems.

FEATURES AND BENEFITS

SMTB pumps present these features and benefits:

- The pumps are single-stage, cen-trifugal volute pumps with axial suction port, radial discharge port and horizontal shaft.
- Suction and discharge flanges are PN 10 or PN 16 according to EN 1092-2.
- The SMTB pump is close-coupled with a totally enclosed fan-cooled standard motor with main dimensions to IEC and DIN standards
- The SMTB product range is available "Premium range" product have IE3 motors.
- The pumps are of the back pull-out design enabling removal and dismantling of the motor and impeller without disturbing the pump housing or pipework. Consequently, even the largest pumps can be serviced by a single person with a crane, see Fig. 1.

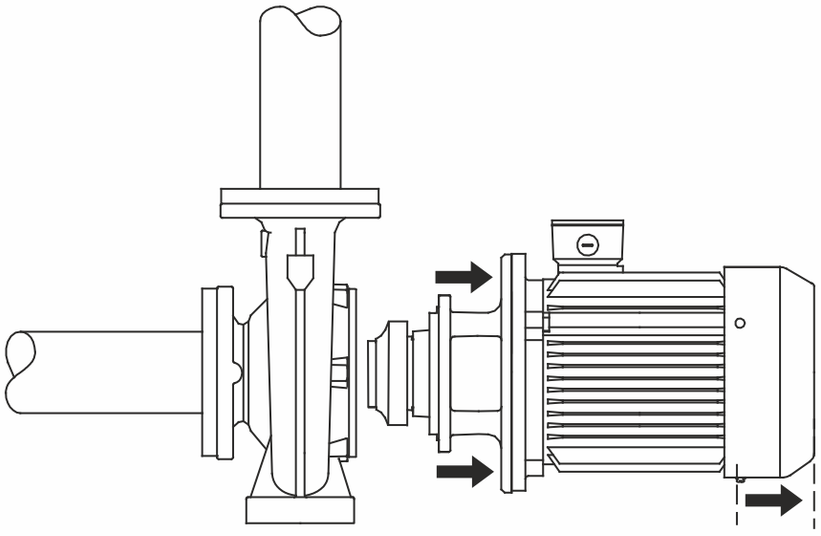


Fig. 1 Back pull-out design

PRODUCT RANGE

The tables on the following pages show the complete SMTB product range. The standard range has been combined on the basis of the following parameters:

- Pump housings have discharge flanges from DN 50 to DN 80.
- Pump housings and motor stools are made of electro-coated cast iron. Pump housing also have stain-less steel.
- Impellers are made of fabricated stainless steel or cast iron or bronze.
- Motors are 50 Hz.

To a great extent the pumps can be adapted to the requirements of the individual customer. For custom-ized solutions, please contact Shakti.

SMTB CI, 50 Hz, 2-pole

Pump type 50Hz, 2-pole	SMTB model	Pressure stage PN 16	P2 [HP/kW]
65-160	*	*	7.5/5.5
	*	*	10.0/7.5

Note :-
1. * mark is indicated to availability of Product range

TYPE KEY

SMTB

Example: SMTB 65 -160 /177 A -F -A -BQQE

- SMTB — Type range
- 65 — Nominal diameter of discharge port (DN)
- -160 — Nominal impeller diameter [mm]
- /177 — Actual impeller diameter [mm]
- A — Code for pump version (the codes may be combined): A = Basic version
- -F — Code for pipework connection: F = DIN flange
- -A — Code for materials: A = Cast iron
- -BQQE — Code for mechanical shaft seal and rubber pump parts

MECHANICAL SHAFT SEALS

SMTB pumps are available as standard with BQQE & BAQE shaft seals. Other shaft seal variants are available on request.

Codes for mechanical shaft seal

The positions (1) - (4) cover four pieces of information about the mechanical shaft seal:

Example: (1) (2) (3) (4)

- (1) — Shakti type designation
- (2) — Material, rotating seal face
- (3) — Material, stationary seat
- (4) — Material, secondary seal and other rubber and composite parts, except the wear ring

Position	Type	Short description of seal
(1)	A	O-ring seal with fixed driver
	B	Rubber bellows seal
	C	O-ring seal with spring as seal driver
	G	Bellows seal, type B, with reduced seal faces
	D	O-ring seal, balanced

Position	Type	Material
(2) and (3)		Synthetic carbons:
	A	A Carbon, metal-impregnated (antimony (not approved for potable water))
	B	Carbon, synthetic resin-impregnated Carbides:
	Q	Silicon carbide
	V	Ceramic

Position	Type	Material
(4)	E	EPDM
	V	FKM
	F	FXM
	P	NBR

SMTB SECTIONAL VIEW AND MATERIAL SPECIFICATION

SMTB CI Sectional view

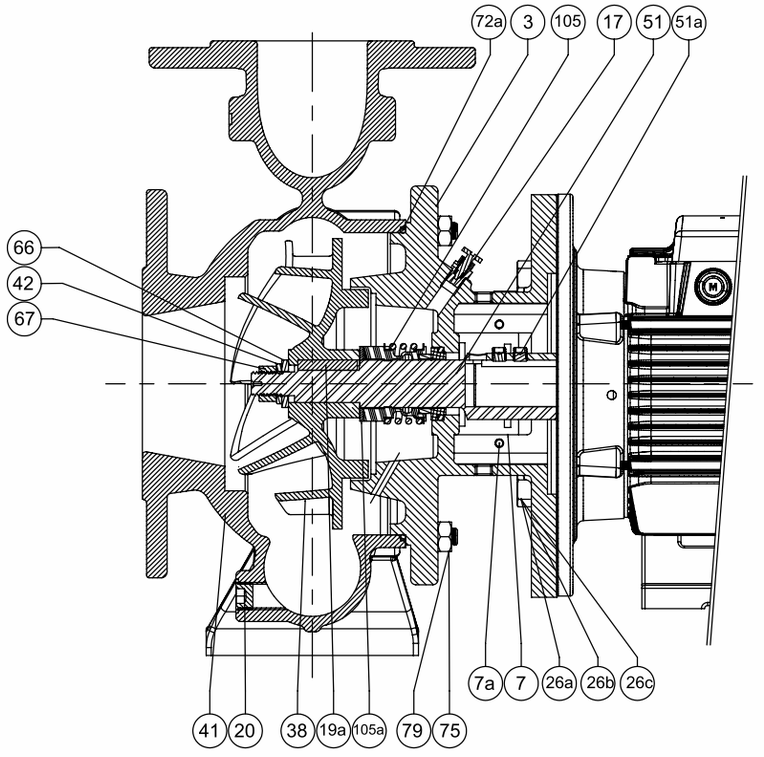


Fig.- 2 Sectional view

SMTB CI Material Specification

Pos.	Component	Materials
3	Motor Stool	CAST IRON
7	Cover	SS AISI 304
7a	Pan Head Screw	SS AISI 304
17	Air Vent Plug	BRONZE
19a	Impeller Key	SS AISI 304
20	Grub Screw	SS AISI 304
26a,26b,26c	Nut Bolt Washer	M.S (H.T.)
38	Impeller	CAST IRON
41	Pump Housing	CAST IRON
42	Spring Washer	SS AISI 304
51	Coupling shaft	AISI SS-304
51a	Grub Screw	M.S (H.T.)
66	Washer	SS AISI 304
67	Hex. Nut	SS AISI 304
72a	O Ring	NBR
75	Stud	M.S (H.T.)
79	Hex. Nut	M.S (H.T.)
105	Shaft Seal	BQQE
105a	Spacer for Shaft Seal	SS AISI 304

CONSTRUCTION

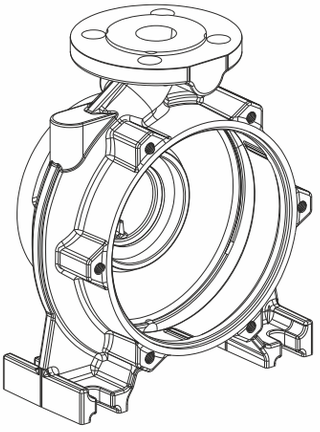
MECHANICAL CONSTRUCTION

Pump Housing

The volute type pump housing is made of cast iron and has axial suction port and radial discharge port.

Flange connection dimensions are in accordance with EN 1092-2.

The bottom of the pump housing incorporates a drain plug. The discharge port has a pressure gauge tapping.



Pump housing (cast iron)
Fig.- 3

SMTB MOTOR STOOL AND COVER

The cover is provided with a manual air vent screw for the venting of the pump housing and the shaft seal chamber.
An O-ring/gasket forms the seal between cover and pump housing.

Coupling guards are fitted to the motor stool.

The flange size of the motor stool is according to IEC 60034 for SMTB model.

SMTB Shaft/Coupling

The stainless steel shaft is ø28 , ø38 mm.

The coupling end of the shaft is cylindrical and has two drilled holes for the set screws of the coupling.

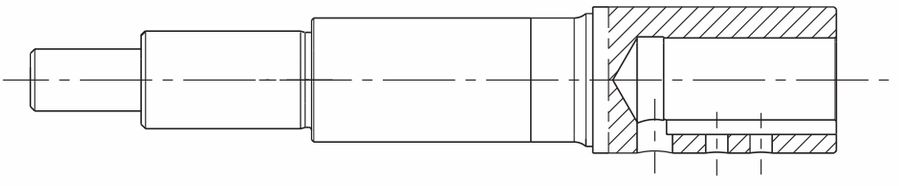


Fig.- 4 Shaft and coupling SMTB pump

CONSTRUCTION

IMPELLER

The semi-open impeller is made of cast iron.All SMTB pumps are dynamically balanced. The impeller is hydraulically balanced to compensate for axial thrust. The impeller is extremely suitable for handling solids and swarf. Spherical impeller clearance: Max. 20 mm. Note: When viewed from the motor fan, the impeller should rotate clockwise

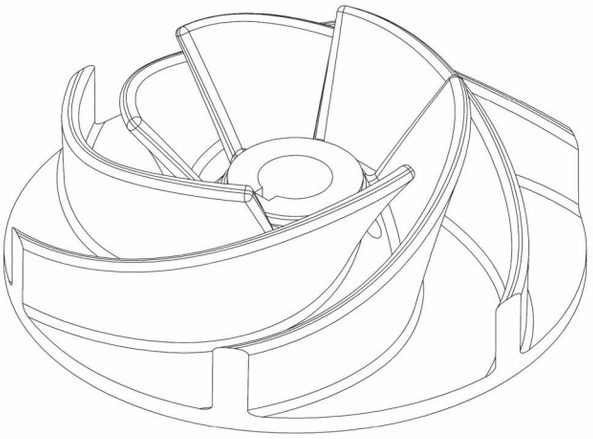
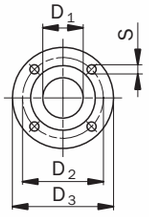


Fig . 5 Impeller

FLANGES

The suction and discharge flanges of SMTB pumps are according to EN 1092-2, PN 10 or PN 16. For size and number of holes, see the table below:



	Nominal Diameter (DN)								
	PN 16 (1.6 MPa)								PN 10(1.0MPa)
	32	40	50	65	80	100	125	150	200
D1	32	40	50	65	80	100	125	150	200
D2	100	110	125	145	160	180	210	240	295
D3	140	150	165	185	200	220	250	285	340
s	4x19	4x19	4x19	4x19	8x19	8x19	8x19	8x23	8x23

SURFACE TREATMENT

The cast iron parts of SMTB pumps are electro-coated.

Electro-coating includes:

1. Alkaline cleaning
2. Pre-treatment with zinc phosphate coating
3. Cathodic electro-coating (epoxy)
4. Curing of paint film at 200-250 °C.

The colour code of the finished product is NCS 9000/RAL 9005.

CONSTRUCTION

TEST PRESSURE

Pressure testing of the pump housing was made with +20 °C (~ +68 °F) water containing corrosion inhibitor.

Pressure Stage	Operating Pressure		Test pressure	
	Bar	Mpa	Bar	Mpa
PN 10	10	1.0	13	1.3
PN 16	16	1.6	24	2.4

MOTOR

The motor is a totally enclosed, fan-cooled standard motor with main dimensions according to IEC and DIN standards.
The tables on the following pages show the motors used for SMTB model.
As appears from the tables you can choose between

- premium range with IE3 motors for SMTB Pumps.

PREMIUM RANGE – INCLUDING IE3 MOTORS

2 pole motors 50 Hz

Frame size	Output P_2	
	HP	kW
100	4.0	3.0
100	5.5	4.0
132	7.5	5.5
132	10	7.5
160	15	11.0
160	20	15.0

PUMP LOCATION

The pump is designed for installation in a non-aggres-sive and non-explosive atmosphere. The relative air humidity must not exceed 95%.

AMBIENT TEMPERATURE AND ALTITUDE

The ambient temperature and the installation altitude are important factors for the motor life, as they affect the life of the bearings and the insulation system. The installation altitude is the height of the installation site above sea level. If the ambient temperature exceeds the recommended maximum ambient temperature or maximum altitude above sea level, see fig. 9, the motor must not be fully loaded due to the low density and consequently low cooling effect of the air. In such cases, it may be necessary to use a motor with a higher output.

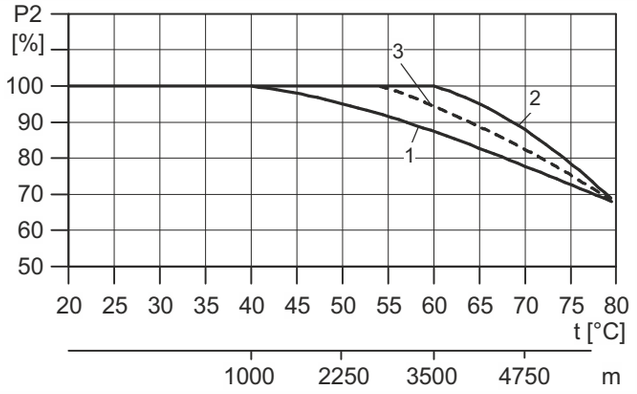


Fig.- 6 Maximum motor output in relation to ambient temperature and altitude

Example:

A pump with a 2.2 kW IE3 SMG motor: If the pump is installed 4750 m above sea level, the motor must not be loaded more than 88 % of rated output. At an ambient temperature of 70 °C, the motor must not be loaded more that 88 % of rated output. If the pump is installed 4750 m above sea level at an ambient temperature of 70°C, the motor must not be loaded more than 88 % x 88 % equal to 77.4 % of the rated output.

The effect of viscosity on centrifugal pump performance

A viscous liquid affects a centrifugal pump in several ways. • The power consumption will be increased, i. e. a larger motor is required. • Head, flow rate and pump efficiency will be reduced.

The effect of high density on centrifugal pump performance. A high density liquid only affects the power consumption of a centrifugal pump.

- The head, flow rate and pump efficiency will remain unchanged. • The power consumption will increase at a ratio corresponding to the increase in density. A liquid with a specific gravity of 1.2 will thus require a 20% larger power input.
- An oversize motor will often be required.

Shakti can help you select the right pump for liquids with viscosity/density different from those of water.

OPERATING CONDITIONS

LIQUID TEMPERATURES

The SMTB pump range covers the temperature range from –25°C (~ –13°F) to +140°C (~+284°F). The permissible liquid temperature depends on the mechanical shaft seal type and pump type. See also table below.

Mechanical shaft seal	Operating temperature	Maximum operating pressure [bar]
BAQE	0°C to +120°C	16 bar
BQQE	- 25°C to +90°C	16 bar
BQQV[1])	0°C to +90°C	16 bar

Relationship between mechanical shaft seals and temperature

BQQE, BAQE AND BQQV ARE STANDARD SHAFT SEALS.
The remaining shaft seal combinations in the list are available for custom built pumps.
1) The maximum temperature for FKM rubber is 80°C (~176°F) in liquids containing water. For liquids not containing water, such as pure oil, the seal faces of the mechanical shaft seal are the temperature limiting factor.

EPDM : Mechanical shaft seals with EPDM are primarily suitable for water. If the water contains oil or if chemicals or other liquids than water are pumped, you may have to replace the rubber parts of the mechanical shaft seal.

FKM : Mechanical shaft seals with FKM (xxxV) rubber have excellent resistance against oil and a range of chemicals.

Carbon/silicon carbide : Mechanical shaft seals with carbon/silicon carbide (xAQx) seal faces have a wide range of applications and are especially suitable if there is risk of dry running and/or if the temperature is high. These mechanical shaft seals are not suitable for liquids containing abrasive particles as the carbon parts will be worn. At tem-peratures below 0°C (~+32°F) corrosion inhibitors containing abrasive particles will usually be added to the pumped liquid, and xAQx seals will thus not be suit-able.

Silicon carbide/silicon carbide : Mechanical shaft seals with silicon carbide/silicon car-bide (xQQx) seal faces also have a very wide range of applications. These seals are very resistant to abrasive particles and well suited at liquid temperatures up to +90°C (~+194°F). At higher temperatures the reduced lubricating properties of the pumped liquid may cause noise problems and limit the life of the seal faces.

Carbon/Ceramic : Mechanical Shaft seal with Carbon/ceramic (xVBx) seal faces is good all-round seal for not too demanding applications. These seal have relatively good dry-running properties. However, thermal cracks may occur in case of a sudden influx of water to a hot seal after a period of dry running or similar condition. Limited corrosion resistance, 5<ph<9, depending on ceramic type.

NBR : Widely used all-round application, NBR (nitrile) rubber covers a wide range of liquids at relatively low temperatures (below +100°C). Good mechanical properties at high and low temperatures. Heat resistant up to +100°C, for sort up to +120°C, depending on the ambient environment, Resistant to water up to +80°C. Resistant to weak acids and alkalis, Not resistant to polar solvents (alcohols, ketones and esters)

INLET PRESSURE

Maximum inlet pressure : The actual inlet pressure + pressure when the pump is running against a closed valve must always be lower than the maximum permissible operating pressure.

Minimum inlet pressure : The minimum inlet pressure must be according to the NPSH curve+ a safety margin of at least 0.5 m ~ 1.65 feet + correction for vapour pressure. It is, however, advisable to calculate the inlet pressure if:

- The liquid temperature is high
- The flow rate is considerably higher than the pump's rated flow rate
- The pump is operating in an open system with suction lift
- The liquid is sucked through long pipes
- The inlet conditions are poor
- The operating pressure is low.

Calculation of maximum suction lift for water in open systems to avoid cavitation, make sure that there is a minimum pressure on the suction side of the pump. The maximum suction lift "H" in metres head can be calculated as follows:

$H = PB \times 10.2 - NPSH - H_f - H_v - H_s$

PB = Barometric pressure in bar. (Barometric pressure can be set to 1 bar). In closed systems, p_b indicates the system pressure in bar.
NPSH = Net Positive Suction Head in metres head. (To be read from the NPSH curve at the highest flow the pump will be delivering).
H_f = Friction loss in suction pipe in metres head. (At the highest flow the pump will be delivering.)
H_v = Vapour pressure in metres head. (To be read from the vapour pressure scale."H_v" depends on the liquid temperature "T_m").
H_s = Safety margin = minimum 0.5 metres head. If the "H" calculated is positive, the pump can operate at a suction lift of maximum "H" metres head.
If the "H" calculated is negative, an inlet pressure of minimum "H" metres head is required.

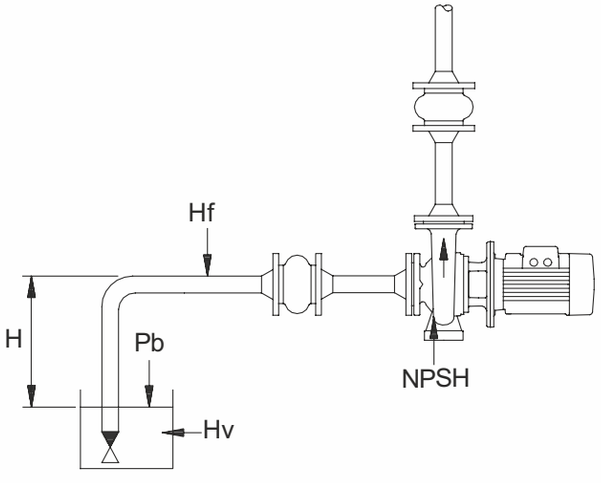


Fig.- 7 Schematic view of open system with SMTB pump

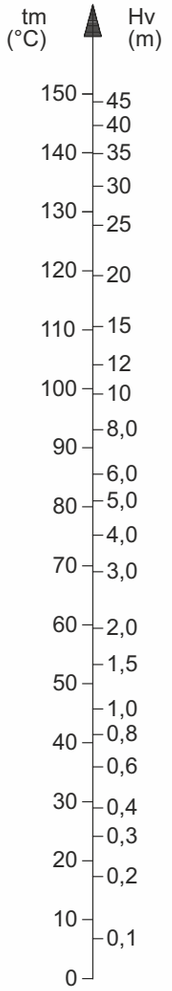


Fig.- 8 Relation between liquid temperature and vapour pressure

SELECTION OF PRODUCT

PUMP SIZE

Selection of pump size should be based on:

- Required flow and pressure at the draw-off point
- Pressure loss as a result of height differences
- Friction loss in the pipework
  It may be necessary to account for pressure loss in connection with long pipes, bends or valves, etc.
- Best efficiency at the estimated duty point.

EFFICIENCY

If you expect the pump to always operate in the same duty point, select a pump which is operating in a duty point corresponding to the best efficiency of the pump.

In case of controlled operation or varying consumption, select a pump whose best efficiency falls within the duty range covering the greater part of the duty time.

MATERIAL

The material variant should be selected on the basis of the liquid to be pumped, see List of pumped liquids page 12.

PUMPED LIQUIDS

Liquid temperature: 0 °C to +90 °C.

Dirty, thin, non-explosive liquids containing solids or swarf up to 20 mm. The liquid must not attack the pump mechanically or chemically. If you pump liquids with a density and/or viscosity higher than that of water, use motors with correspondingly higher outputs, see “Pumped liquids” page 13. The mechanical shaft seal must be suitable for the liquid. Water in heating and ventilating systems often contains additives to prevent negative effects such as system corrosion or calcareous deposits. If you want to use the pump for such liquids and if the temperature is above 80 °C, use special shaft seals to avoid crystallization/precipitation between the seal faces.

LIST OF PUMPED LIQUIDS

The list on the following pages gives an over view of liq-uids which may typically be pumped by SMTB pumps.

The list states the recommended shaft seals. Other shaft seals may be applicable, but we consider those stated in the list to be the best choices. The list is intended as a general guide only, and it can-not replace actual testing of pumped liquids and pump materials under specific working conditions. However, use the list with some caution as factors such as:

- Concentration of the pumped liquid
- liquid temperature
- Pressure may affect the chemical resistance of a specific pump version.

Pumped liquid	Note	Additional information	Shaft seal
Coolant in machine tool			
Calcium chloride	b, d, e, g	< 5 °C, 30 %	BQQE
Ethylene glycol	b, d	< 50 °C	BQQE
Glycerine (glycerol)	b, d	< 50 °C	BQQE
Hydrocarbon-based coolant	d, f	50 °C	BQQV
Potassium acetate (inhibited)	b, d, e, g	< 20 °C	BQQE
Potassium formate (inhibited)	b, d, e, g	< 20 °C	BQQE
Propylene glycol	b, d	< 50 °C	BQQE
Sodium chloride	b, d, e, g	< 5 °C, 30 %	BQQE
Cleaning			
Soap (salts of fatty acids)	b	< 80 °C	BQQV
Alkaline degreasing agent	b, h	< 80 °C	BQQE
Mineral oils			
Crude oil	b, d, f	< 20 °C	BQQV
Mineral lubricating oil	d, f		BQQV
Mineral motor oil	d, f		BQQV

Legend for notes in the above list

a	To minimise the risk of corrosion, the pump must run almost continuously, i.e. standstills must not exceed 6-8 hours.
b	The pumped liquid may contain additives or impurities which can cause shaft seal problems.
c	The pump should run continuously to prevent discolouration of pool tiles. For intermittent operation, use the N version.
d	Density and viscosity may differ from those of water. Consider this when calculating motor and pump performance.
e	In order to avoid corrosion, the liquid must be free of oxygen.
f	Flammable or combustible liquid.
g	Risk of crystallisation/precipitation at the shaft seal.

ELECTRICAL DATA

ELECTRICAL DATA, MAINS-OPERATED MOTORS

SMTB Standard motor range, 2-pole

2-pole motors 50Hz, 3X 415V

FRAME SIZE	OUTPUT P_2		RATED CURRENT	POWER FACTOR COS Ø AT % LOAD			EFFICIENCY [IE3]			RATED SPEED
	HP	kW	A	50%	75%	100%	50%	75%	100%	n
SMG 90	2	1.5	3.6	0.67	0.69	0.71	77	79	81	2915
SMG 90	3	2.2	4.5	0.77	0.79	0.81	82	84	86	2915
SMG 100	4	3	5.7	0.83	0.85	0.87	83	85	87	2905
SMG 100	5.5	4	7.6	0.82	0.84	0.86	83	85	87	2941
SMG 132	7.5	5.5	10.8	0.76	0.78	0.80	84	86	88	2938
SMG 132	10	7.5	14.7	0.76	0.78	0.80	85	87	89	2931
SMG 160	15	11	20.5	0.78	0.80	0.82	87	89	91	2960
SMG 160	20	15	27.2	0.80	0.82	0.84	88	90	92	2960
SMG 160	25	18.5	32.3	0.82	0.84	0.86	89	91	93	2946
SMG 180	30	22	40	0.86	0.88	0.90	89	91	93	2935
SMG 200	40	30	49	0.87	0.89	0.91	89	91	93	2950
SMG 200	50	37	60.5	0.87	0.89	0.91	90	92	94	2955

CURVE CHARTS

The following many pages are divided into sections:
pages 15-16 A brief explanation of curve conditions and how to read the curve charts, etc.

Performance curves and technical data:

Page 17 SMTB 50 Hz 2-pole pumps

Curve Conditions

Selection of pumps

The guidelines below apply to the curves shown in the performance charts.

- Tolerances according to: ISO 9906, Annex A.
- The curves show pump performance with different impeller diameters at the nominal speed.
- The bold part of the curves show the recommended operating range.
- The thin parts are not recommended as possible op-erating range here might suggest the selection of a smaller/larger pump type.
- Do not use the pumps at minimum flows below 0.1 x Q at an optimum efficiency because of the danger of overheating of the pump.
- The curves apply to the pumping of water at a tem-perature of +20°C and a kinematic viscosity of1mm2/s (1 cSt).
- NPSH : The curves show average values measured under the same conditions as the performance curves. When dimensioning the pump, add a safety margin of at least 0.5 m.
- In case of other densities than 1000 kg/m^3 the dis-charge pressure is proportional to the density.
- When pumping liquids with a density higher than 1000 kg/$m^{3,}$ motors with correspondingly higher outputs must be used.

Calculation of total head

The total pump head consists of the height difference between the measuring points + the differential head + the dynamic head.

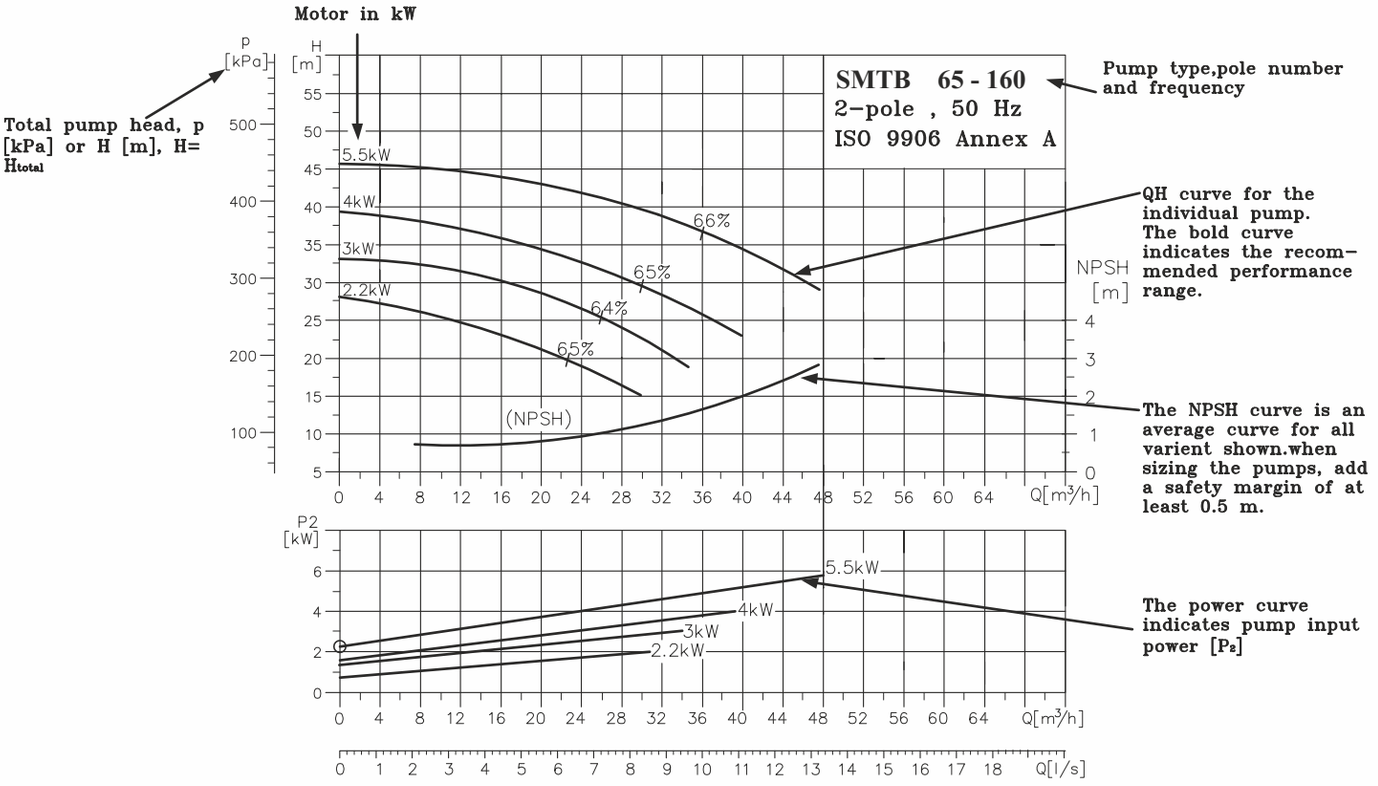
$H_{total} = H_{geo} + H_{start} + H_{dyn}$

H_{geo} : Height difference between measuring points.

H_{start} : Differential head between suction and the discharge side of the pump.

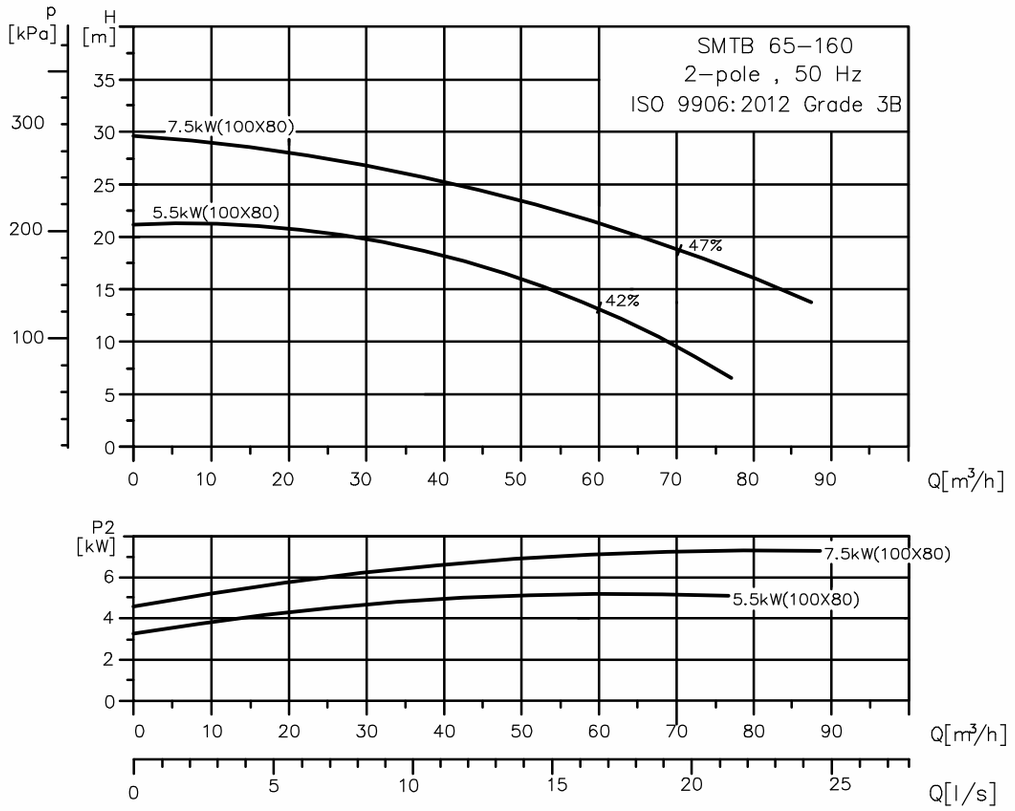
H_{dyn} : Calculated values based on the velocity of the pumped liquid on the suction and the discharge side of the pump.

HOW TO READ THE CURVE CHARTS



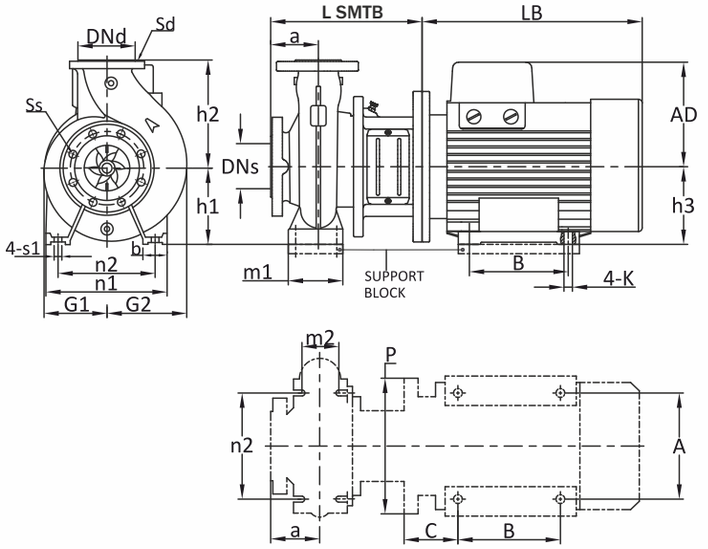
PERFORMANCE CURVE

SMTB CI 65-160 (2 POLE)



[Kw/ HP]		Suc. X Del.	Material Code
5.5 / 7.5	:	100 X 80 mm	9000031509
7.5 / 10.0	:	100 X 80 mm	9000031510

SMTB CI



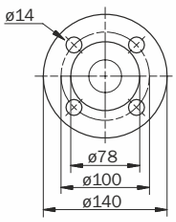
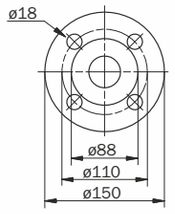
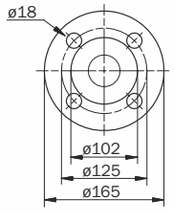
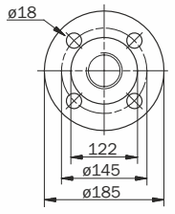
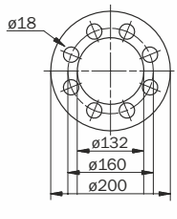
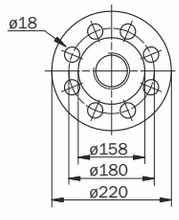
PERFORMANCE TABLE

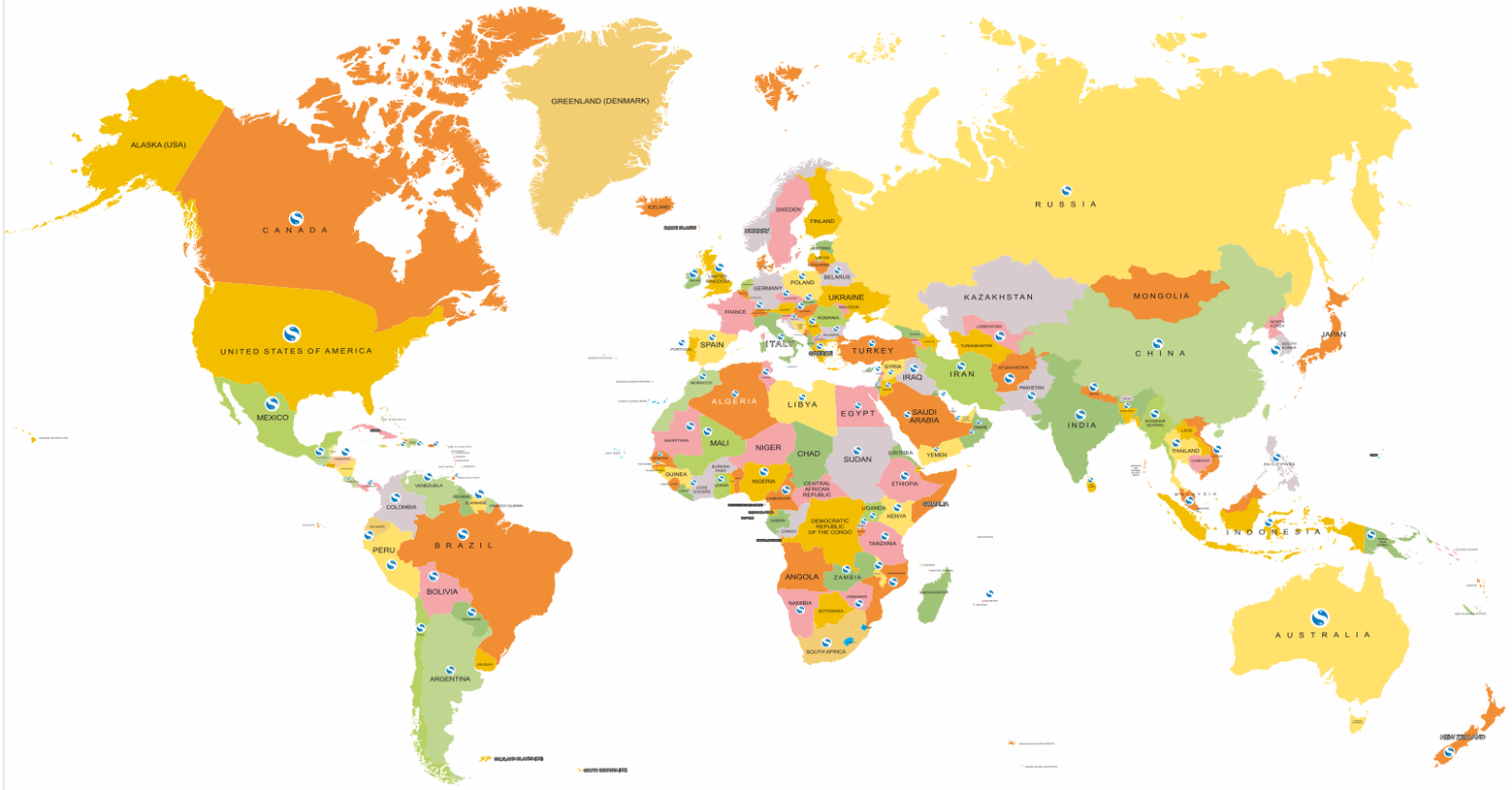
SMTB CI 65-160 (2 POLE)

Pump type			65-160	
Motor type	High Eff. Motor		SMG 132	SMG 132
SMTB CI DATA	P_2	[kW/HP]	5.5/7.5	7.5/10
	PN	[bar]	16	16
	DNs	[mm]	95	95
	DNd	[mm]	65	65
	a	[mm]	100	100
	h2	[mm]	200	200
	h1	[mm]	160	160
	Ss		8x19	8x19
	Sd		4x19	4x19
	G1	[mm]	128	128
	G2	[mm]	166	166
	m1	[mm]	125	125
	m2	[mm]	95	95
	n1	[mm]	280	280
	n2	[mm]	212	212
	b	[mm]	65	65
	s1	[mm]	M12	M12
	AD	[mm]	138	138
	h3	[mm]	160	160
	A	[mm]	195	195
	B	[mm]	120	120
	K	[mm]	M12	M12
	L SMTB	[mm]	311	311
	LB	[mm]	410	410
	C	[mm]	136	136
	P	[mm]	300	300
	NET WT. (APX.)	[kg]	92	94

COUNTER FLANGES

Counter flange kits consist of one steel flange, one gasket of asbestos-free material, and the requisite number of screws.

Counter fla	Flange s	Description	Rated pressure	Pipework connection
	DN 32	Threaded	16 bar, EN 1092-2	Rp 1¼
		For welding	16 bar, EN 1092-2	32 mm
	DN40	Threaded	16 bar, EN 1092-2	Rp 1½
		For welding	16 bar, EN 1092-2	40 mm
	DN 50	Threaded	16 bar, EN 1092-2	Rp 2
	DN 65	Threaded	16 bar, EN 1092-2	Rp 2½
		For welding	16 bar, EN 1092-2	65 mm
	DN 80	Threaded	16 bar, EN 1092-2	Rp 3
		For welding	16 bar, EN 1092-2	80 mm
	DN 100	Threaded	16 bar, EN 1092-2	Rp 4
		For welding	16 bar, EN 1092-2	100 mm



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