INSTRUCTION MANUAL

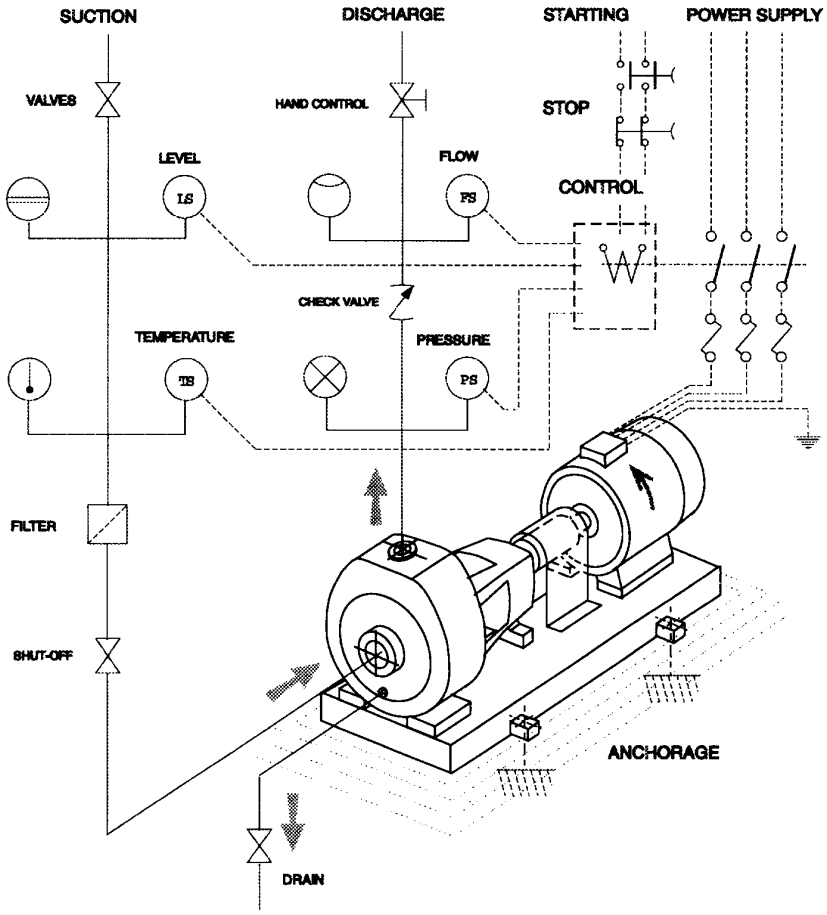
ARGAL s.r.l. *chemical pumps* — *Via Labirinto 159 - 25125 BRESCIA - ITALY* — CE

HORIZONTAL CENTRIFUGAL PUMP - ACCORDING TO ISO 2858

range	model		execution	impeller diameter mm	O-ring	mechanical seal (single - double)		base	power kW	year of manufacture
	32/125 ☐	50/125 ☐	WR ☐		V ☐	SE1 ☐	M2 ☐	N2 ☐	rpm	
	32/160 ☐	50/160 ☐	ER ☐	.....	E ☐	SE2 ☐	M3 ☐	N3 ☐	1450 ☐	.....
ZGE	40/125 ☐	50/200 ☐	QR ☐	var. type	F ☐	SE3 ☐	M4 ☐	N4 ☐	2900 ☐	part number
	40/160 ☐		WF ☐	X ☐		B1 ☐		N5 ☐	1740 ☐	
	40/200 ☐		FC ☐	Y ☐		TS2 ☐			3480 ☐	.....

ELECTRIC MOTOR							
	2 poles ☐	power	Hz 50 ☐	voltage			3 phase
	4 poles ☐	kW	Hz 60 ☐	Volt			

This manual contains rules and suggestions for making the most out of the pump you have purchased in total safety.



IDENTIFICATION CODE														
	pump data											motor data		
	32/125			closed impeller:		SE1 single								
	32/160			De mm		SE2								
	40/125					SE3								
	40/160	WR	(polypropylene PP)	other types:		B1								
	40/200	ER	(polyethylene PE)	open:		TS2		N2	1450					
	50/125	QR	(polyvinyl chloride PVC)	De_ X	V (FPM)	M2	double	N3	2900					
	50/160	WF	(casing in PP; impeller in PVDF)	recessed:	E (EPDM)	M3		N4	1740	2P		50 Hz		s.f.
ZGE	50/200	FC	(polyvinylidene fluoride PVDF)	De_Y	F (FEP)	M4		N5	3480	4P	kW	60 Hz	Volt	3 f.
range	model		execution (materials)	diameter (type) impeller	material of O-ring	mechanical seal		base	No. rpm	No. poles	power	frequency	voltage	No. phases

for Maintenance Dep.:
date of first service:

item/plant:

service:

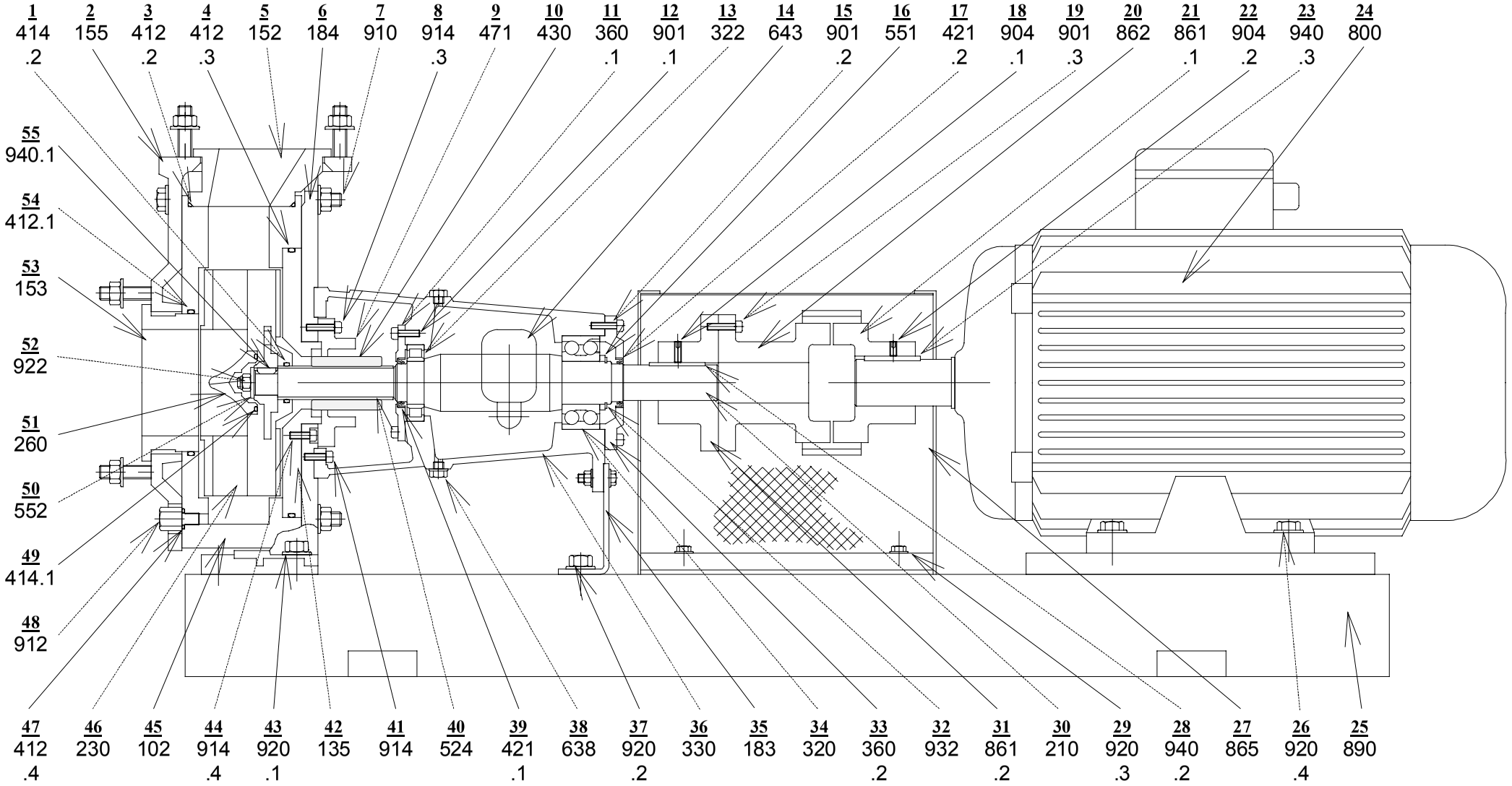
DISTRIBUTOR

legend

Ref.	Pos.	Part name	Q.ty	Disassembling steps sequence										Spare stock per working years	
			No	1	2	3	4	5	6	7	8	9	10	2	5
102	45	VOLUTE CASING	1									□			
135	42	INTERMEDIATE PLATE	1					□						1	1
152	5	DISCHARGE SECTION	1								□				
153	53	SUCTION SECTION	1								□				
155	2	FRONT FLANGE	1									□			
183	35	SUPPORT FOOT	1							□					
184	6	REAR FLANGE	1					□							
210	30	PUMP SHAFT	1							□					1
230	46	CENTRIFUGAL IMPELLER	1				□							1	1
260	51	OGIVE	1				□							1	1
320	34	BEARING (motor side)	1							□					1
322	13	BEARING (pump side)	1							□					1
330	36	SUPPORT	1							□					
360,1	11	BEARING COVER (pump side)	1						□						
360,2	33	BEARING COVER (motor side)	1						□						
412,1	54	O ring (suction section)	1									□		1	1
412,2	3	O ring (discharge section)	1									□		1	1
412,3	4	O ring (volute casing)	1					□						1	1
412,4	47	O ring (drain plug)	1		□									1	1
414,1	49	O ring (ogive)	1				□							1	1
414,2	1	O ring (impeller)	1				□							1	1
421,1	39	ELASTIC SEAL RING	1						□						1
421,2	17	ELASTIC SEAL RING	1						□						1
430	10	MECHANICAL SEAL (1)	1					□						1	1
471	9	SEAL CHAMBER	1					□						1	1
524	40	SHAFT SLEEVE	1					□						1	1
551	16	SPACE RING	1							□					
552	50	WASHER	1				□								1
638	38	CAP (oil drain)	1						□						
643	14	BULB LUBRICATOR	1						□						
800	24	ELECTRIC MOTOR	1										□		
861,1	21	SEMI-COUPLING (motor side)	1	□											
861,2	31	SEMI-COUPLING (pump side)	1	□											
862	20	SPACER	1	□											
865	27	COUPLING GUARD	1	□											
890	25	BASE	1										□		
901,1	12	SCREWS (bearing cover)	4						□						
901,2	15	SCREWS (bearing cover)	4						□						
901,3	19	SCREW (coupling)	6	□											
904,1	18	GRUB SCREW (coupling)	1	□											
904,2	22	GRUB SCREW (coupling)	1	□											
910	7	CASING SCREWS	6			□									
912	48	DRAIN PLUG	1		□										
914,2	41	SCREWS (flange/support)	4					□							
914,3	8	SCREWS (seal chamber)	4					□							
914,4	44	SCREWS (intermediate plate fixing)	4					□							
920,1	43	SCREWS (pump locking)	4									□			
920,2	37	SCREWS (support locking)	2			□									
920,3	29	SCREWS (coupling guard locking)	4	□											
920,4	26	SCREWS (motor locking)	4										□		
922	52	NUT (impeller locking)	1				□								1
932	32	SEEGER RING	1							□					1
940,1	55	FEATHER KEY	1				□								1
940,2	28	FEATHER KEY	1	□											
940,3	23	FEATHER KEY	1	□											

(1) Ref. 430: see specific instructions

pump rotor


1 414 .2
2 155
3 412 .2
4 412 .3
5 152
6 184
7 910
8 914 .3
9 471
10 430
11 360 .1
12 901 .1
13 322
14 643
15 901 .2
16 551
17 421 .2
18 904 .1
19 901 .3
20 862
21 861 .1
22 904 .2
23 940 .3
24 800
55 940.1
54 412.1
53 153
52 922
51 260
50 552
49 414.1
48 912
47 412 .4
46 230
45 102
44 914 .4
43 920 .1
42 135
41 914
40 524
39 421 .1
38 638
37 920 .2
36 330
35 183
34 320
33 360 .2
32 932
31 861 .2
30 210
29 920 .3
28 940 .2
27 865
26 920 .4
25 890

GENERAL HINTS

GENERAL NOTES

"ZGE" pumps are designed and built for the transfer of liquid chemical products having a specific weight, viscosity, temperature and stability of state appropriate for use with centrifugal pumps in a fixed installation, from a tank at a lower level to a tank or a pipe to a higher level. The characteristics of the liquid (pressure, temperature, chemical reactivity, specific weight, viscosity, vapour tension) and the enviromental conditions must be compatible with the characteristics of the pump and are defined upon ordering. Impeller and static casings, in contact with the liquid, are constructed from thermoplastic materials; other parts in high chemical-resistant materials.

The pump's performance (capacity, head, rpm) is defined upon ordering and specified on the identification plate.

“ZGE” series pumps are manufactured in compliance with ISO 2858 standards. They are of the centrifugal, horizontal, single-stage type, with self-supporting shaft. ZGE pumps are coupled to a non-synchronous electric motor by means of flexible coupling and spacer; with axial inlet and radial outlet for connection to the hydraulic system. These pumps are of the foot-mounted type for fixing onto base-plate in compliance with ISO 3661.

"ZGE" pumps are not self priming.

"ZGE" pumps cannot run dry.

The liquid being pumped may contain a maximum 5% of solid non-abrasive particles not greater than 0,1 mm in size. The presence of fibrous, adhesive or abrasive bodies is not allowed. The maximum allowed size for bodies occasionally present is 0,5 mm.

Clockwise rotation seen from the motor side.

Make sure that the chemical and physical characteristics of the liquid have been carefully evaluated for pump suitability.

The specific weight which can be pumped at a temperature of 25°C (both of the liquid and the ambient) depends upon the diameter of the impeller (shown on the identification plate) and the installed motor power (shown on the motor identification plate) ans has to be defined upon ordering.

The level of kinematic viscosity must not exceed 40 cSt so as not to significantly modify the pump's performance. Higher values up to a maximum of 120 cSt are possible provided that the pump is equipped with suitable impeller and motor to be defined upon ordering.

The maximum continuous working temperature referred to water depends on the choice of materials (specified on the identification plate):

40°C execution QR
50°C execution ER
70°C execution WR
85°C execution WF 100°C execution FC

modifications may occour depending upon the operating pressure value.

The ambient temperature interval is related to the choice of materials (specified on the identification plate):

0 ÷ +40°C execution QR -30 ÷ +40°C execution ER
0 ÷ +40°C execution WR and WF -20 ÷ +40°C execution FC

The maximum pressure the pump may be subjected to is 1.5 times the head value developed with the outlet closed.

The vapour pressure value of the liquid to be pumped must exceed (by at least 1m w.c) to the difference between the absolute total head (suction side pressure added to the positive suction head, or subtracted by the suction lift) and the pressure drops in the suction side piping (including the inlet NPSHr drops shown on the specific tables).

In case of double mechanical seal, the value of the pressure in the seal chamber must be equal to half value of the operating pressure of the pump.

In case of double mechanical seal, the flushing liquid must be clean and must not lead to violent chemical reactions on contact with the liquid being pumped.

The pump shaft is supported by rolling bearings packed with grease (to be periodically recharged).

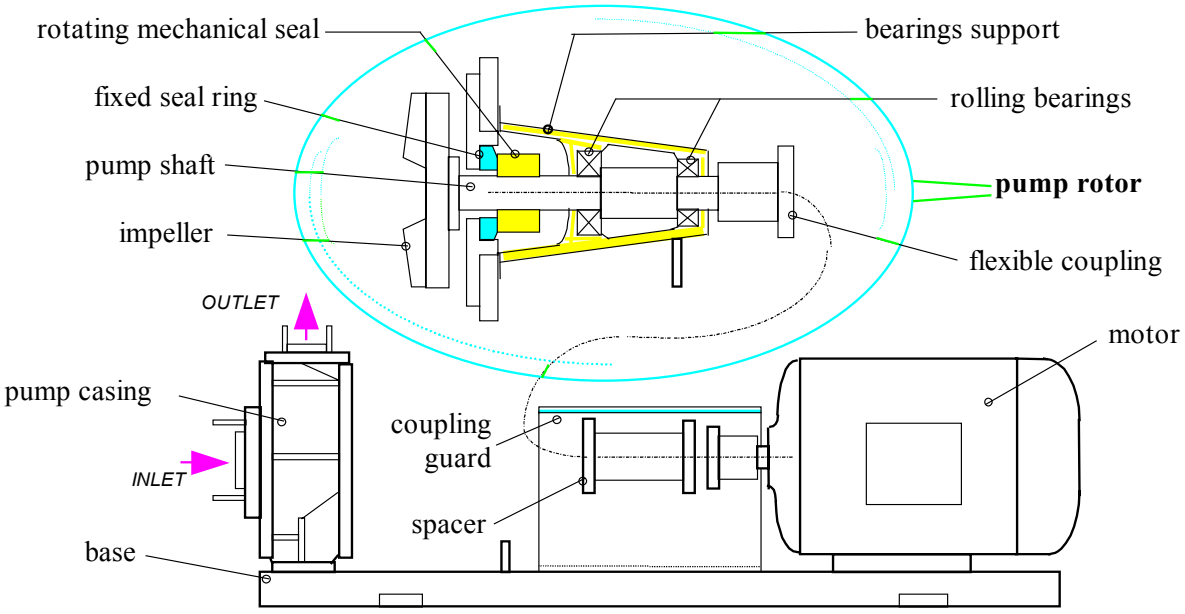
The pump does not include any non return valve nor any liquid flow control or motor stop device.

The coupling guard must be fitted before starting up the pump.

OPERATING PRINCIPLES OF THE PUMP

HYDRAULICALLY alike to all centrifugal pumps, it is equipped with a blade-type impeller rotating within a fixed housing. It has a radial outlet (facing the upper part of the pump, with an internal deflector) and, by creating a depression in the center, it allows the liquid to flow from the central suction side. Then, flowing through the impeller's blades the fluid acquires energy and is conveyed towards the outlet.

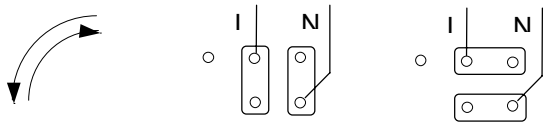
MECHANICALLY, the static stress caused by the piping is borne by the metal shields (front and rear flanges) on the pump body. Directly the pump shaft causes the impeller to rotate and is driven by rolling bearings that transfer all the mechanical impeller loads onto the support. The pump is connected to the electric motor (IEC, B3 frame, to be fixed onto a common base) by means of a flexible coupling and spacer. A guard (non-hermetically sealed) prevents unauthorised access. The spacer allows worn components (pump rotor) to be removed without having to disconnet the piping and remove the motor.



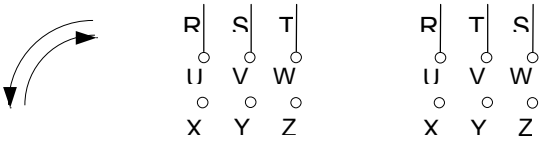
THE MECHANICAL SEAL, placed at the point where the shaft enters the pump body to drive the impeller, is made up of two main sections: a fixed section inserted in the pump body and a rotating section integral with the shaft. The tight contact between these two parts guarantees a seal against leakage whether the pump is rotating or not. The rubbing action that occurs between these two parts when the pump is operating generates heat by friction; this heat is absorbed by the liquid being pumped in the case of single mechanical seal and by the cooling liquid (generally water) in the case of double seal. The presence of the thin layer of liquid between the sealing surfaces, as well as its cooling action, is indispensable for the life of the seal.

MOTOR

Electrical connectionsThe electrical connection to the motor terminal determines the direction of rotation of the motor and can be verified by looking at the cooling fan at the rear of the motor (for the Argal pump this has to rotate clockwise looking at the front end).
With single phase motors the direction of rotation may be reversed by changing the position of the connection plates:

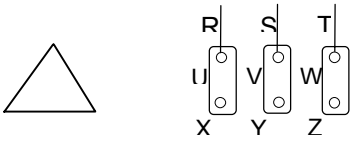


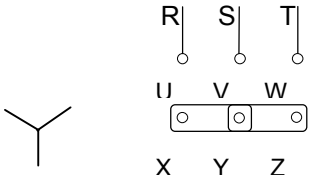
With three-phase motors the direction of rotation may be changed by swapping any two of the three conductors independently of the type of connection to the windings:



The windings of three-phase motors (e.g. with (a) 230-400 V; (b) 400-690 V) require a delta-connection for lower voltage (230 volts for a ; 400 volts for b).

They require a star-connection for higher voltage (400 volts for a; 690 volts for b).





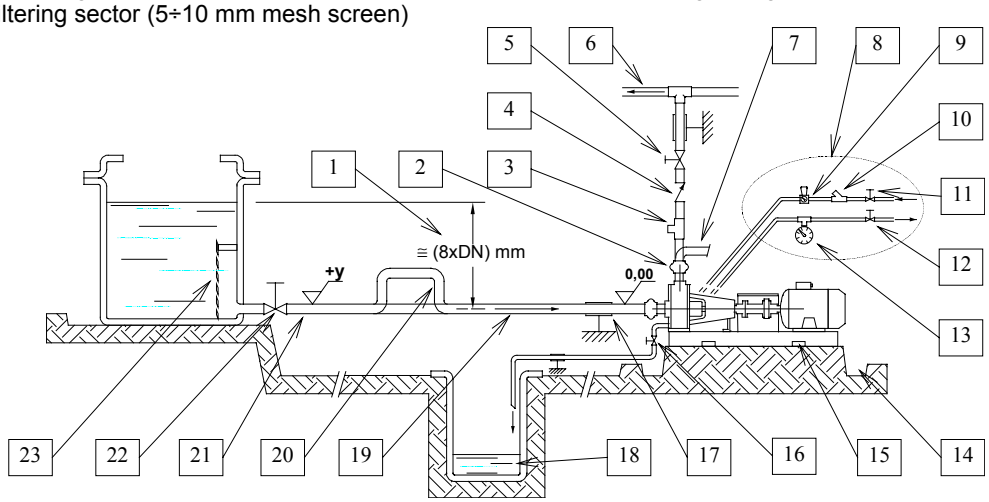
Star/Delta starting is used when the motor power is above 7.5 kW (10 HP) only in case of frequent starts and short running times, but always when the motor power is above 15kW (20 HP). All this is also to safeguard the structure of the pump.
Protection level
The initials IP are followed by two numbers :
The first number indicates the level of protection against penetration of solid objects and in particular :4 for solids whose dimension is greater than 1mm 5 for dust (eventual internal deposits will not harm operation) 6 for dust (no pentetration)
The second number indicates the protection against the penetration of liquids. In particular:
4 for water sprays from all directions 5 for jets of water from all directions 6 for tidal and sea waves.
According to the IP protection indicated on the identification plate of the motor and to the environmental conditions, arrange for opportune extra protections allowing in any case correct ventilation and rapid drainage of rainwater.

DIRECTIONS FOR USE

TRANSPORT INSTRUCTIONS
- cover the hydraulic connections
- when lifting the unit do not exert force on the plastic fittings
- lay the pump on its base or fixing plate during transport
- if the road is particularly rough, protect the pump by means of adequate shock absorbing supports
- bumps and shocks may damage important working parts vital for safety and functionality of the machine

INSTALLATION INSTRUCTIONS
- clean the plant before connecting the pump
- make sure that no foreign bodies are left in the pump. Remove safety caps on the hydraulic connections.
- follow the instructions indicated in the following diagram:

1) Suction head adapts to delivery rate in order to prevent winage
2) YES: expansion joint (indispensable with long piping or hot liquids) and/or vibration damping system at inlet and outlet; anchor system near the pump
03) YES: connection point for pressure gauge or safety pressure switch
04) YES: non-return valve (particularly with long vertical or horizontal pipe runs; mandatory with pumps in parallel)
05) YES: flow control valve on the discharge side
06) Maximum fluid speed on the discharge side: 3.5 m/sec
07) NO: bends (or other fittings) close to the pump (both at inlet and outlet)
8) Auxiliary piping for double mechanical seal (only for M type seals):
9) pressure reducer
10) inlet filter
11) inlet shut-off valve
12) delivery hand control valve
13) pressure gauge for checking seal chamber pressure
14) YES: drain channel around the base plate
15) The pump must be installed using all of the fixing holes provided; the fixing points must be kept at the same level
16) YES: pipe drain (perfectly airtight); drain valve must be closed when the system is working
17) YES: firmly fix all piping by suitable brackets, close to the pump
18) YES: drain collecting sump (leak proof)
19) Maximum fluid speed on suction side: 2.5 m/sec
20) NO: air pockets. The circuit must be linear and short
21) Incline the piping towards the pump
22) YES: shut off gate valve (one is also fitted near the pump in case of long piping)
23) YES: filtering sector (5÷10 mm mesh screen)



- anchor the pump to an adequate base plate having a mass at least 5 times that of the pump
- do not use anti-vibration mounts to fix the pump
- anti-vibration joints are recommended on the pipe connections; mandatory over DN 100
- we suggest to use the by-pass piping when pumping at reduced capacity
- with viscous liquids reduce the fluid speed in the pipes
- manually verify that all rotating parts are free to turn without abnormal friction by turning the motor cooling fan
- make sure that the power supply is compatible with the data shown on the pump motor identification plate
- connect the motor to the power supply via a magnetic/thermal control switch
- ensure that star-delta starting is implemented for motors whose power is more than 15kW
- install emergency stop devices to switch off the pump in case of low liquid level (floating, magnetic, electronic, pressure-sensitive)
- ambient temperature as a function of the physical-chemical characteristics of the liquid to be pumped and in any case not greater or lower than the interval indicated in the GENERAL NOTES
- other environmental conditions in accordance with the IP protection of the motor
- install a drainage pit to collect any liquid overflow from the base drainage channel due to normal maintenance work
- leave enough free space around the pump for a person to move
- leave free space above the pump for lifting operations

- highlight the presence of aggressive liquids with coloured tags following the local safety regulations
- do not install the pump (made in thermoplastic material) in close proximity to heating apparatus
- do not install the pump in areas subject to solid or liquid matter falling
- do not install the pump in an explosive atmosphere unless the motor and its coupling have been adequately pre-arranged
- do not install the pump in close proximity to workplaces or crowded areas
- install extra protection guards for the pump or persons as the need arises
- install a spare equivalent pump in parallel

STARTUP

- verify that the instructions outlined in the INSTALLATION have been followed
- verify the correct direction of rotation (clockwise from the motor side) supplying the motor with short impulses
- ensure that the NPSH available is greater than that required by the pump (in particular for hot liquids, liquids with high vapour pressure, very long suction pipes)
- close the drain valve (pos. 17); totally flood the suction pipe and the pump
- start the pump with the suction valve completely open and the discharge valve partially closed
- slowly regulate the flow by opening or closing the discharge valve (never the suction valve). Make sure that the power absorbed by the motor does not exceed the rated one indicated on the motor identification plate
- do not operate the pump at the limit values of its performance curve: maximum head (discharge valve excessively closed) or maximum capacity (total absence of drops and geodetic head on the discharge side)
- set the operating point to that for which the pump was requested
- ensure that there are no abnormal vibrations or noise due to inadequate mounting or cavitation
- avoid short and/or frequent starts by properly setting the control devices

Motor Power	; kW	0,75÷5,5	7,5÷30	37÷110	132÷200	250÷315
Max. starts per hour	; 2 - 4 poles	20 - 40	10 - 20	6 - 12	2 - 4	1 - 2

- ensure that the temperature, pressure and liquid characteristics are as those specified at the time of order.

OPERATING INSTRUCTIONS
- switch automatic control on
- do not activate valves whilst the pump is in operation
- risks of dangerous water hammer effects in case of sudden or improper valve actuation (only trained personnel should operate valves)
- completely empty and wash the pump before using a different liquid
- isolate or empty the pump if the crystallization temperature of the liquid is the same or lower than the ambient temperature
- stop the pump if the liquid temperature exceeds the maximum allowed temperature indicated in the GENERAL NOTES; if the increase is of approximately 20%, check internal parts
- close the valves in case of leaks
- wash with water only if compatible from the chemical point of view. As alternative use an appropriate solvent that will not generate dangerous exothermal reactions
- contact the liquid supplier for information on the appropriate fire precautions
- empty the pump in case of long periods of inactivity (in particular with liquids which would easily crystallize)

DISASSEMBLY
- all these maintenance operations must be performed under supervision of qualified personnel
- cut off the power supply from the motor and disconnect the electrical wiring; pull the wires out from the terminal box and isolate their extremities accordingly
- close the suction and discharge valves and open the drain valve
- use gloves, safety glasses and acid-proof overalls when disconnecting and washing the pump
- disconnect the piping and leave enough time for the residual liquid to exit the pump body and atmospheric air to fill the empty volume
- wash the pump before carrying out any maintenance work
- do not scatter the liquid in the environment
- before attempting to dismantle the pump ensure that its motor is disconnected and that it may not be started accidentallly
- now open the pump following the sequence indicated in the respective table of the LEGEND
- for the disassembly of the rotating parts follow the suggestions outlined in the RECOMMENDATIONS section

MAINTENANCE
- all these maintenance operations must be performed under the supervision of qualified personnel
- make periodic inspections (2 to 30 days depending on the type of liquid and the operating conditions) clening filtering sections
- make periodic inspections (1 to 6 months depending on the type of liquid and the operating conditions) on the rotating parts of the pump (pump rotor); clean or replace or lubricate as necessary (see RECOMMENDATIONS)
- make periodic inspections (3 to 5 months depending on the type of liquid and the operating conditions) on the functionality of the motor control system; efficiency must be guaranteed
- the presence of liquid below the pump could be a clue to pump problems
- excessive current consumption could be an indication of impeller problems
- unusual vibrations could be due to unbalanced impeller (due to damage or presence of foreign material obstructing its blades)
- reduced pump performance could be due to an obstruction of the impeller or damages to the motor
- motor damages could be due to abnormal friction within the pump
- damaged parts must be replaced with new original parts
- the replacement of damaged parts must be carried out in a clean dry area

SAFETY RISKS

Safety risks for personnel mainly arise from improper use or accidental damages.

These risks may be of an electrical nature as far as the non-synchronous motor is concerned and may cause injury to hands if working on an open pump. Risks may also arise due to the nature of the liquids pumped. It is therefore of utmost importance to closely follow all the instructions contained in this manual so as to eliminate the causes that may lead to pump failure and the consequent leakage of liquid dangerous for both personnel and the environment.

Risks may also arise from improper maintenance or dismantling practices.

In any case five general rules are important:

A - all services must be carried out by specialised personnel or supervised by qualified personnel depending on the type of maintenance required

B - install protection guards against eventual liquid sprays (when the pump is not installed in remote areas) due to an accidental pipe rupture. Arrange for safety basins to collect possible leakage

C - when working on the pump always wear acid-proof protective clothing

D - arrange for proper conditions for suction and discharge valve closing during disassembly

E - make sure that the motor is completely disconnected during disassembly.

Proper design and building of the plants, with well positioned and well marked piping fitted with shut-off valves, adequate passages and work areas for maintenance and inspections are extremely important (should the plant be faulty constructed or present wear-and-tear defects, the pressure developed by the pump could lead to failure).

It must be stressed that the major cause of pump failures leading to a consequent need to intervene is due to the pump running dry in manually operated plants. This is generally due to:

- the suction valve being open at start-up or
- the suction tank being emptied without stopping

INSTALLATION AND START-UP PERSONNEL

Interventions allowed only to specialised personnel who may eventually delegate to others some operations depending on specific evaluations (technical capability required: specialisation in industrial plumbing or electric systems as needed).

MAINTENANCE AND OPERATIONAL PERSONNEL

Interventions allowed to general operators (after training on the correct use of the plant):

- pump starting and stopping
- opening and closing of valves with the pump at rest
- emptying and washing of the pump body via special valves and piping
- cleaning of filtering elements

Interventions allowed to qualified personnel (technical capacities required: general knowledge of the mechanical, electrical and chemical features of the plant being fed by the pump and of the pump itself):

- verification of environmental conditions
- verification of the condition of the liquid being pumped
- inspections of the control/stop devices of the pump
- inspections of the rotating parts of the pump
- trouble shooting

PERSONNEL RESPONSIBLE FOR REPAIRS

Interventions allowed to general operators under the supervision of qualified personnel:

- stopping of the pump
- closing of the valve
- emptying of pump body
- disconnection of piping from fittings
- removal of anchoring bolts
- washing with water or suitable solvent as needed
- transport (after removal of electrical connections by qualified personnel)

Interventions by qualified personnel (technical capacities required: general knowledge of machining operations, awareness of possible damage to parts due to abrasion or shocks during handling, know-how of required bolt and screw tightening required on different materials such as plastics and metals, use of precision measuring instruments):

- opening and closing of the pump body
- removal and replacement of rotating parts

WASTE DISPOSAL

Materials: separate plastic from metal parts. Dispose of by authorized companies.

RECOMMENDATIONS

Disassembly:
All threads are right handed
The impeller, once the pump rotor is disconnected, must be removed by blocking the opposite end of the shaft (removing the half coupling if necessary); unscrew the protection cap (ogive) and locking nut (right hand thread), then remove the impeller axially.
Follow the specific attached instructions when working on the mechanical seal.
Remove the shaft from its support (with the bearing on the motor side) by sliding it in direction of the coupling side; the bearing on the pump side must be in position before refitting the shaft (see Table 5: bearings and oil seal rings).
Replace the parts that was: broken, cracky, smelt.
Clean all surfaces before reassembly; in particular seal rings (risk of leakage or premature wear), O-RING seats (risk of leakage). bearings rings and seats of the support.
Shaft run-out on the impeller side must not exceed 30 μm.
Check alignment and end play among the flexible components of the coupling after reassembling:
Max. radial deviation <0,5 mm; max. angular displacement <1°; end play: 2÷4 mm

Screw fastening torque		M4	M6	M8	M10	M12	M16	M20	M24
to be reduced by 25 % clamping plastic components	Nm	4	14	24	48	60	75	120	175

greasing:
The pump is supplied without oil (bearing housing is empty); fill with lubricating oil as per ISO 6743.
kinematics viscosity : ref. to 50 °C (125°F): 2,8÷3,3 °E (≅ 20 cSt)
operating conditions: temperature increment 40 °C; max. temperature 100 °C; max. rpm 4000.
Add oil in the bulb lubricator (100 cc) approximately every 300 hours of working.
Completely drain and replace oil after 2000 operating hours (from 600 cc to 1200 cc, according to the pump size).

Improper use:
The pump must not be used for purposes other than the transfer of liquids.
The pump cannot be used to generate isostatic or counter pressures.
The pump cannot be used to mix liquids generating an exothermal reaction
The pump must be installed horizontally on a firm base.
The pump must be installed on a suitable hydraulic plant with inlet and outlet connections to proper suction and discharge pipes.
The plant must be able to shut off the liquid flow independently from the pump.
Handling of aggressive liquids requires specific technical knowledge

tolerance of tech. data: dimensions =± 7 %; weights and gravity-centre =± 14 %; performance: according to ISO 2548

MALFUNCTIONS AND POSSIBLE CAUSES

<u>The pump does not deliver:</u>
01- wrong sense of rotation
02- suction piping is too long or has too many bends
03- not enough suction head on the pump
04- air intake from suction and secondary piping
05- pump or suction piping not completely flooded
06- impeller blades obstructed by impurities
07- non-return valve on the discharge pipe blocked
08- the geodetic head of the plant is greater than the maximum head developed by the pump
09- impeller blocked by a considerable layer of crystals or by melting due to dry running

<u>The pump has reduced capacity or insufficient pressure:</u>
see 01, 02, 03, 04, 05, 06
10- the head required by the plant is greater than that expected
11- insufficient nominal diameter of suction piping, shut-off valve or other suction parts
12- insufficient geodetic suction head on the pump
13- damaged or worn impeller
14- viscosity of liquid greater than that expected
15- excessive quantities of air or gases in the liquid
16- bends, non-return valve or other parts close to the outlet
17- liquid (especially if hot) liable to change to gaseous state

<u>The pump is overloaded:</u>
see 14
18- capacity is higher delivery than expected
19- the specific weight of the liquid is greater than expected
20- impurities inside the pump generate abnormal friction
21- the power supply voltage is not the one on the motor identification plate

<u>The pump vibrates and is noisy</u>
see 20
22- the pump is working at free capacity (zero head)
23- the pump or piping are not firmly fixed
24- damaged or dry central support bearings
25- wrong alignment of the flexible coupling

<u>The pump shows signs of premature wear of internal parts:</u>
see 20
26- liquid is excessively abrasive
27- frequent recurrence of cavitation (see 02, 11, 15, 17)
28- high tendency of the liquid to crystallize or polymerize in stand-by
29- pump execution with materials not suitable for the liquid being pumped
30- operation at much reduced capacity

<u>The seal leaks drops of liquid:</u>
31- scratched or incorrectly installed seal rings
32- high run-out of pump shaft

outlet connection
(tab. 2)

datum axis
(external forces on branches)
(tab.4)

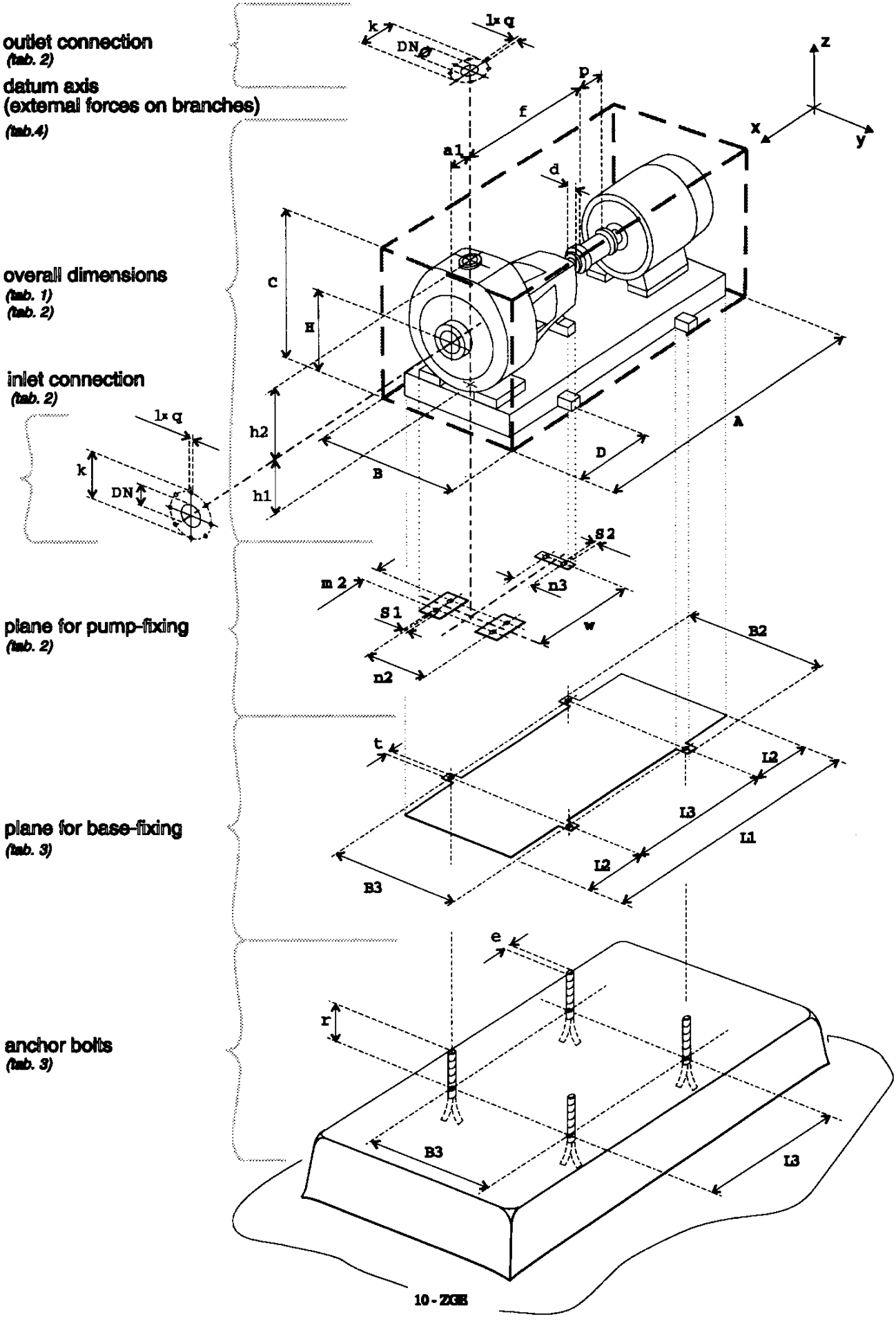
overall dimensions
(tab. 1)
(tab. 2)

inlet connection
(tab. 2)

plane for pump-fixing
(tab. 2)

plane for base-fixing
(tab. 3)

anchor bolts
(tab. 3)



M. 3f B3 ZGE: 32/125; 40/125

2900 rpm

type	kW	A	B	C	D	H	base
80	1,1	845	360	332	150	192	N2
90S	1,5	895	360	332	150	192	N2
90L	2,2	920	390	332	170	192	N3
100L	3	935	390	332	170	192	N3
112M	4	955	390	332	170	192	N3
132S	5,5	1035	450	372	190	232	N4
132S	7,5	1035	450	372	190	232	N4
160M	11	1165	490	400	210	260	N5

1450 rpm

type	kW	A	B	C	D	H	base
63	0,18	820	360	332	150	192	N2
71	0,25	820	360	332	150	192	N2
71	0,37	820	360	332	150	192	N2
80	0,55	845	360	332	150	192	N2
80	0,75	845	360	332	150	192	N2
90S	1,1	895	360	332	150	192	N2

M. 3f B3 ZGE: 32/160; 40/160

2900 rpm

type	kW	A	B	C	D	H	base
100L	3	935	390	372	170	212	N3
112M	4	955	390	372	170	212	N3
132S	5,5	1035	450	392	190	232	N4
132S	7,5	1035	450	392	190	232	N4
160M	11	1165	490	420	210	260	N5
160M	15	1165	490	420	210	260	N5

1450 rpm

type	kW	A	B	C	D	H	base
71	0,37	820	360	372	150	212	N2
80	0,55	845	360	372	150	212	N2
80	0,75	845	360	372	150	212	N2
90S	1,1	895	360	372	150	212	N2
90L	1,5	920	390	372	170	212	N3

M. 3f B3 ZGE: 50/125

2900 rpm

type	kW	A	B	C	D	H	base
112M	4	975	390	372	190	212	N3
132S	5,5	1055	450	392	210	232	N4
132S	7,5	1055	450	392	210	232	N4
160M	11	1185	490	420	230	260	N5
160M	15	1185	490	420	230	260	N5

1450 rpm

type	kW	A	B	C	D	H	base
80	0,55	865	360	372	170	212	N2
80	0,75	865	360	372	170	212	N2
90S	1,1	915	360	372	170	212	N2
90L	1,5	940	390	372	190	212	N3

M. 3f B3 ZGE: 40/200; 50/160

2900 rpm

type	kW	A	B	C	D	H	base
132S	7,5	1055	450	440	210	260	N4
160M	11	1185	490	440	230	260	N5
160M	15	1185	490	440	230	260	N5
160L	18,5	1235	490	440	230	260	N5
180M	22	1285	490	460	230	280	N5

1450 rpm

type	kW	A	B	C	50/200	H	base
90S	1,1	940	390	420	190	240	N3
90L	1,5	940	390	420	190	240	N3
100L	2,2	955	390	420	190	240	N3
100L	3	955	390	420	190	240	N3
112M	4	975	390	420	190	240	N3

M. 3f B3 ZGE: 50/200

2900 rpm

type	kW	A	B	C	D	H	base
160M	11	1185	490	460	230	260	N5
160M	15	1185	490	460	230	260	N5
160L	18,5	1235	490	460	230	260	N5
180M	22	1285	490	480	230	280	N5

1450 rpm

type	kW	A	B	C	D	H	base
90S	1,1	940	390	440	190	240	N3
90L	1,5	940	390	440	190	240	N3
100L	2,2	955	390	440	190	240	N3
100L	3	955	390	440	190	240	N3
112M	4	975	390	440	190	240	N3

TAB.5

pumps			
	32/125	40/160	32/125
	32/160	40/200	32/160
	40/125	50/125	40/125
		50/160	40/160
		50/200	40/200
			50/125
			50/160
			50/200
side:	coupling		impeller
pos.	34		13
bearings	3208	3307	NU 306
pos.	17		39
el. seal ring	28 - 40 - 7		28 - 40 - 7

TAB. 2

pump model	flanged connections DIN 2501 - PN 16 OUTLET				INLET				pump dimensions				shaft	spacer		pump fixing				
	DN	k	l	q	DN	k	l	q	a1	f	h1	h2	d	p	m2	n2	n3	s1	s2	w
32/125	32	100	M16	4	50	125	M16	4	80	385	112	140	24	100	70	140	110	M12	M12	285
32/160	32	100	M16	4	50	125	M16	4	80	385	132	160	24	100	70	190	110	M12	M12	285
40/125	40	110	M16	4	65	145	M16	4	80	385	112	140	24	100	70	160	110	M12	M12	285
40/160	40	110	M16	4	65	145	M16	4	80	385	132	160	24	100	70	190	110	M12	M12	285
40/200	40	110	M16	4	65	145	M16	4	100	385	160	180	24	100	70	212	110	M12	M12	285
50/125	50	125	M16	4	80	160	M16	8	80	385	132	160	24	100	70	190	110	M12	M12	285
50/160	50	125	M16	4	80	160	M16	8	100	385	160	180	24	100	70	212	110	M12	M12	285
50/200	50	125	M16	4	80	160	M16	8	100	385	160	200	24	100	70	212	110	M12	M12	285

TAB. 3

	Base fixing						Anchor bolts fixing		Max loads	
BASE	L1	L2	L3	B2	B3	t	e	r	BASE	daN (~=kg)
N2	800	130	540	360	320	18	M16	50	N2	13
N3	900	150	600	390	350	18	M16	50	N3	42
N4	1000	170	660	450	400	22	M20	55	N4	56
N5	1120	190	740	490	440	22	M20	55	N5	126
N6	1250	205	840	540	490	23	M20	60	N6	146

TAB.4

MANDATA	Max loads on port sections: direction & sense ±x ; ±y ; +z - z		ΣF	direction & sense ±x ; ±y ; ±z	ΣM
	force (daN; ~=kg)			Moment (daNm; ~=kgm)	
DN 32	40	25	75	8	14
DN 40	50	30	105	8	14
DN 50	60	35	115	9	15
DN 65	70	35	135	11	18
DN 80	80	40	150	11	18

dimension in mm

TAB. 6 — NOMINAL DUTY POINT

pump model	2 poles capacity	2 poles head	2 poles efficiency	4 poles capacity	4 poles head	4 poles efficiency
ZGE	m^3/h	m	%	m^3/h	m	%
32/125	13	22	51	6	6	45
32/160	15	32	50	8	8	50
40/125	22	24	45	11	6	45
40/160	34	36	53	17	9	52
40/200	38	56	60	18	14	60
50/125	50	24	64	24	6	65
50/160	60	40	68	30	9,5	65
50/200	50	60	67	25	14	63

Minimum capacity ~= 25 % of nominal capacity

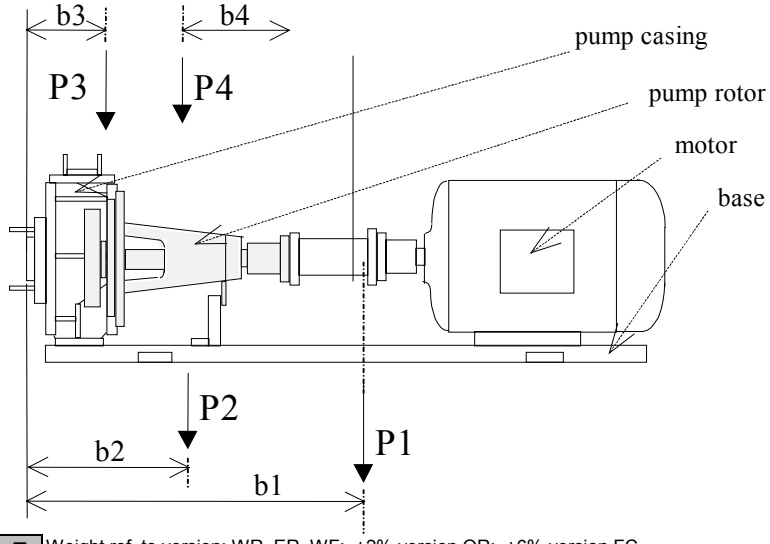
CONTRACTUAL DATA

mediu m _____

conc. % _____ temp. °C _____

capacity m³/h _____ head m c.l. _____

w.order _____



P1 = pump + base + motor

P2 = pump + base

P3 = pump (= pump casing + pump rotor)

P4 = pump rotor

TAB. 7 — Weight ref. to version: WR, ER, WF; +2% version QR; +6% version FC

Centre of gravity along the rotation axis

Centre of gravity: location				Centre of gravity: location				Centre of gravity: location				Centre of gravity: location				Centre of gravity: location			
Weights				Weights				Weights				Weights				Weights			
pump model		daN; (~=kg)	mm	pump model		daN; (~=kg)	mm	pump model		daN; (~=kg)	mm	pump model		daN; (~=kg)	mm	pump model		daN; (~=kg)	mm
		P3	b3			P3	b3			P3	b3			P3	b3			P3	b3
32/125		40	231	32/160		45	216	50/125		46	230	40/200		58	220	50/200		62	230
40/125		P4	b4	40/160		P4	b4			P4	b4	50/160		P4	b4			P4	b4
		28	218			29	218			29	218			31	218			32	218
base		P2	b2	base		P2	b2	base		P2	b2	base		P2	b2	base		P2	b2
N2		65	304	N2		70	289	N2		71	306	N3		88	310	N3		92	314
N3		70	333	N3		75	318	N3		76	334	N4		98	350	N4		102	351
N4		80	375	N4		85	359	N4		86	376	N5		113	405	N5		117	404
N5		95	433	N5		100	416	N5		101	433								
motor		P1	b1	motor		P1	b1	motor		P1	b1	motor		P1	b1	motor		P1	b1
N° poles	kW			N° poles	kW			N° poles	kW			N° poles	kW			N° poles	kW		
2	1,1	75	358	2	3	98	421	2	4	106	462	2	7,5	162	538	2	11	207	623
	1,5	78	373		4	105	445		5,5	141	550		11	203	627		15	227	648
	2,2	86	408		5,5	140	533		7,5	150	567		15	223	652		18,5	247	669
	3	93	438		7,5	149	550		11	191	657		18,5	243	673		22	282	715
	4	100	463		11	190	639		15	211	680		22	278	720				
	5,5	135	550		15	210	663												
	7,5	144	566																
	11	185	655																
4	0,18	69,5	327	4	0,37	77	324	4	0,55	81	356	4	1,1	101	366	4	1,1	105	367
	0,25	71,5	338		0,55	80	341		0,75	82	362		1,5	105	383		1,5	109	383
	0,37	72	341		0,75	81	345		1,1	84	373		2,2	110	405		2,2	114	404
	0,55	75	357		1,1	83	356		1,5	93	411		3	113	415		3	117	413
	0,75	76	362		1,5	92	394						4	121	440		4	125	439
	1,1	78	373																

Functioning (average values)			Functioning (average values)			Functioning (average values)			Functioning (average values)			Functioning (average values)		
Sound pressure level	dB	65	Sound pressure level	dB	67	Sound pressure level	dB	66	Sound pressure level	dB	67	Sound pressure level	dB	68
Vibration velocity	mm/s	1	Vibration velocity mm/s		1,2	Vibration velocity mm/s		1	Vibration velocity mm/s		1,3	Vibration velocity mm/s		1,7
Temperature of support	°C	70	Temperature of support	°C	70	Temperature of support	°C	70	Temperature of support	°C	70	Temperature of support	°C	70

The INSTRUCTION MANUAL must be delivered to the pump-user, who takes diligent note of it, fills in data for Maintenance Department (page keeps the file for subsequent
Possible modifications do not imply updating of the existing