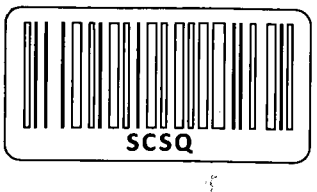
SP271 PADDINGTON CRES. SUB SEW PStn

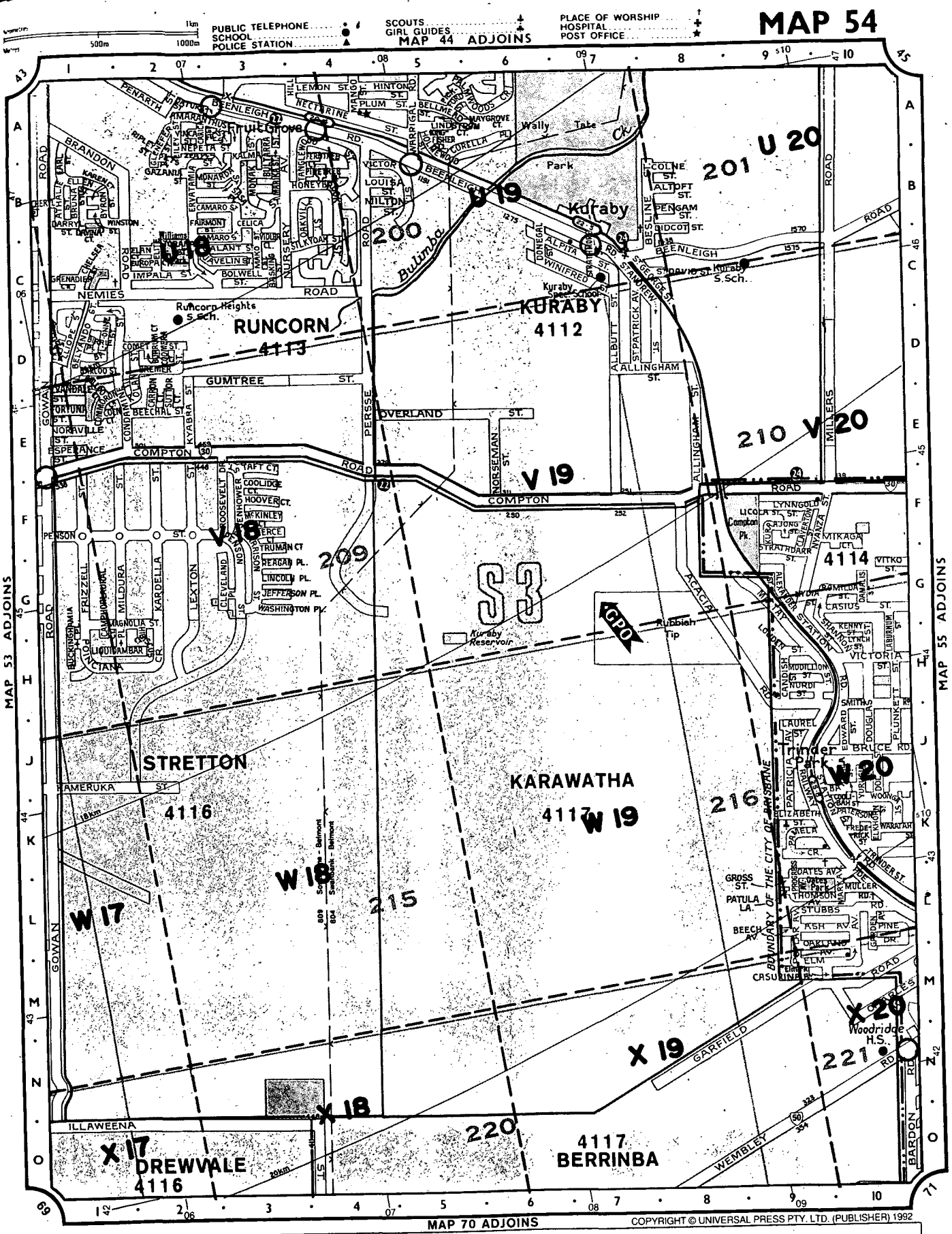
SUBMERSIBLE SEWAGE PUMPS



weir

EnviroTech

WEIR ENGINEERING PTY LTD
A.C.N. 000 373 339



PLEASE ENSURE THAT YOUR DRIVER'S LICENCE IS CURRENT. CHECK IT NOW.

PUMPING STATION DETAILS

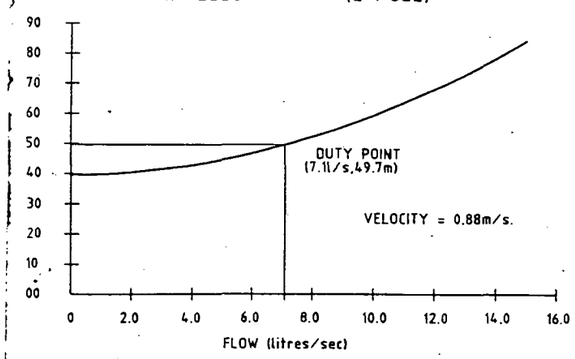
R.L. NO.	DESCRIPTION	LEVEL
R.L. 1	SURFACE LEVEL	57.600
R.L. 2	I.L. OF OUTLET OF GRIT COLLECTOR	54.190
R.L. 3	TOP OF BASE OF REFLUX VALVE PIT	56.745
R.L. 4	I.L OF INLET SEWER AT PUMP WELL	53.990
R.L. 5	TOP WATER LEVEL AT PUMP WELL	54.990
R.L. 6	BOTTOM WATER LEVEL AT PUMP WELL	53.890
R.L. 7	TOP OF BASE SLAB AT PUMP WELL	52.790
R.L. 8	BOTTOM OF BASE SLAB AT PUMP WELL	52.490
R.L. 9	TOP OF ROOF SLAB AT PUMP WELL	57.830
R.L. 10	I.L. OF RISING MAIN THROUGH VALVE PIT WALL	57.095
R.L. 11	TOP OF BASE OF GRIT COLLECTOR MANHOLE	53.680

OVERFLOW DETAILS

R.L. NO.	DESCRIPTION	LEVEL
1	OVERFLOW SIZE BETWEEN M.H. AND FLAP VALVE CHAMBER	460 x 230 R.C.B.C.
2	OVERFLOW SIZE LEAVING FLAP VALVE CHAMBER	460 x 230 R.C.B.C.
3	FLAP VALVE SIZE	1
R.L. 4	INVERT LEVEL OF OVERFLOW AT MANHOLE	55.475
R.L. 5	I.L. OF OVERFLOW AT INLET TO FLAP VALVE CHAMBER	55.550
R.L. 6	I.L. OF OVERFLOW AT OUTLET TO FLAP VALVE CHAMBER	55.400
R.L. 7	I.L. OF OVERFLOW AT DISCHARGE POINT	55.300
R.L. 8	SURFACE LEVEL	57.000

PUMP CURVE - 100Φ DICL PIPE

FLYGT PUMP
IMPELLER (2 POLE)

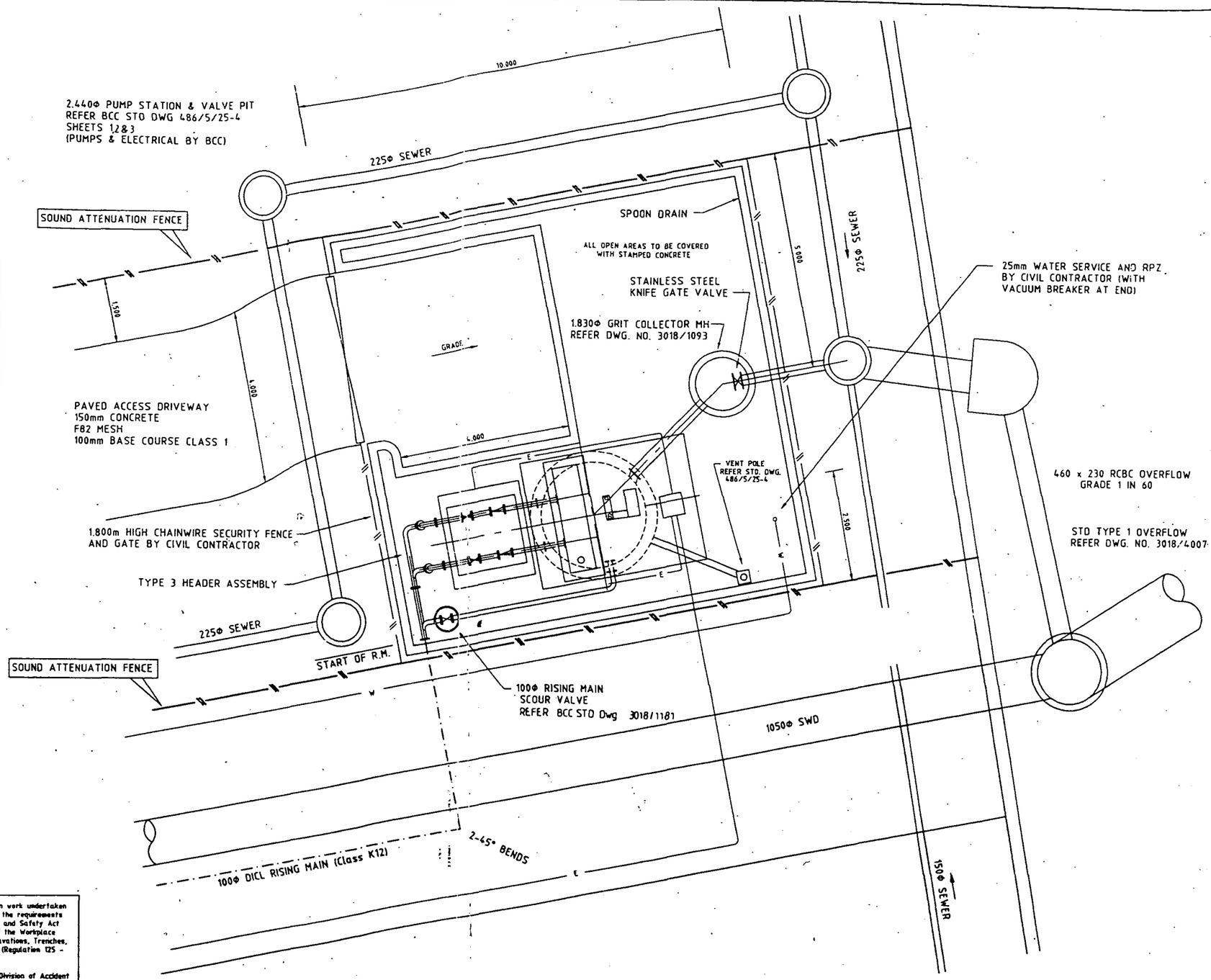


PUMP RESISTANCE CURVE
CALCULATED FROM MANNINGS FORMULA
$Q = 1/n\ AR^{2/3}\ S^{1/2}$

FOR 100Φ DICL CLASS K12 PIPE
n = 0.011
L = 564.000m.
H = 49.7m.

All Water and Sewerage construction work undertaken by the Contractor is to comply with the requirements of the Queensland Workplace Health and Safety Act 1989 and in particular to Part 13 of the Workplace Health and Safety Regulations "Excavations, Trenches, Caissons, Cofferdams and Tunnels" (Regulation 125 - Regulation 131 inclusive)

Contact your nearest office of the Division of Accident Prevention for information.
Telephone (07) 227 4898



Date 21.12.95
DIRECTOR OF PLANNING AND DESIGN (DEPT. OF W.S.& S.)
VALID FOR 12 MONTHS FROM THE ABOVE DATE

ISSUE	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
A	MS	HJS	GS	TC	05.04.95
B	MS	HJS	GS	TC	22.06.95 LINE 22 ADDED
C	MS	HJS	GS	TC	22.06.95 PUMP STATION LOCATION AMENDED
D	MS	HJS	GS	TC	20.09.95 PUMP STATION LEVELS AMENDED
E	MS	PF	GS	TC	23.11.95 ACCESS DRIVEWAY PAVEMENT REVISED

SCALE (METRES)
1:50 1 0.5 0 1 2 A1
1:100 A3

MICROFILM No.

PROJECT No. 93529

ASSOCIATED CONSULTANTS
SURVEYOR: Wilson Deller Walter
Lvl 14, 97 Creek St, Brisbane Q 4000
Ph (07) 211 3133 Fax (07) 211 3492

APPROVED
FOR W.P. BROWN & PARTNERS PTY LTD RPEQ2926

CLIENT: CHALTARA PTY. LTD.

PROJECT: STRETTON GARDENS ESTATE STAGE 1
COMPTON ROAD, STRETTON

W P BROWN & PARTNERS PTY LTD
CONSULTING CIVIL AND STRUCTURAL ENGINEERS
Level 1
33 Sanders St, Upper Mt. Gravatt Q 4122
Telephone (07) 849 1244
Facsimile (07) 849 1344
BRISBANE CANBERRA MELBOURNE SINGAPORE

DRAWING TITLE: SEWERAGE PUMPING STATION DETAILS

DRAWING NUMBER: 93529-51

ISSUED: D

JOINS SHEET 5

JOINS SHEET 4

JOINS SHEET 2

SR 39/87 (DECLARED)

ROAD NO. 1

PARK

3m DRAINAGE EMT

100ø RISING MAIN

EASEMENT BOUNDARY

COMPTON ROAD

PERSSE ROAD

All Water and Sewerage construction work undertaken by the Contractor is to comply with the requirements of the Queensland Workplace Health and Safety Act 1989 and in particular to Part 13 of the Workplace Health and Safety Regulations "Excavations, Trenches, Caissons, Cofferdams and Tunnels" (Regulation 125 - Regulation 131 inclusive)

Contact your nearest office of the Division of Accident Prevention for information.
Telephone: NORTH - (07) 857 9484
SOUTH - (07) 896 1500

HOUSE CONNECTIONS HAVE BEEN DESIGNED TO CONTROL ALL OF THE BLOCK AT A GRADE OF 1 IN 40 AT A MAXIMUM DEPTH OF PROPERTY CONNECTION OF 1.500M. UNLESS NOTED OTHERWISE.

NOTES

1. All lines are 150mm. diameter Class '4' V.C. to AS 1741-1991 u.n.o.
2. Contractor shall verify finished surface levels on site before construction of sewers and property connection branches.
3. All work shall be constructed in accordance with current B.C.C. Standard methods and drawings.
4. Each allotment shall be served by a 100mm. property connection. The Contractor is to have property boundaries pegged and location of property connections confirmed prior to commencing construction of property connection branches.
5. O.B.s shall be located 1.200m. from downstream alignment. If this is not possible, O.B.s must not be greater than 3.500m. from downstream alignment.
6. Property connection branches shall extend into the property a minimum of 100mm. and a maximum of 750mm.
7. Where pipes are laid in fill, the filling should be carried out in layers not exceeding 300mm.(loose) in depth and shall be compacted until the dry density is not less than 95% of the materials maximum dry density when tested in accordance with AS1289 (Modified Compaction). Testing shall be carried out after each alternate layer. In all such cases, approval of constructed sewers will not be issued by Council unless certificates are produced certifying that the required compaction has been achieved.
8. Where sewers have a grade of 1 in 20 or steeper, Bulkheads shall be constructed as detailed on Standard Drawing No. 486/S/25-6.
9. All work associated with live sewers or manholes to be carried out by B.C.C. at Developers cost.
10. The Contractor to verify locations of existing services with all relevant authorities before commencing construction.
11. The construction of sewerage work shown on this drawing must be supervised by a Consulting Engineer who has been approved by the Manager, Department of Water Supply and Sewerage to carry out sewerage work in the Greater Brisbane Area. Sewerage works not complying with this requirement will not be permitted to connect into the Councils sewerage system.
12. Property connections crossing U/G Electricity allocation to have a minimum of 1.100m. cover.
13. Bench Mark is as shown.
14. Finished surface levels shown on longitudinal sections are indicative only and manhole lids shall finish to the grade of the footpaths in roadways and 25mm. above the average levels in allotments.
15. Maximum depth of Property Connection is 1.500m unless shown otherwise.

LOCALITY PLAN

Scale: 1:2500
Grid Map No. V18
4 Chain Map No. 209

LEGEND

- Existing Sewerage
- Proposed Sewerage
- Future Sewerage
- Rising Main
- Water Main (W)
- Stormwater (SWD)

21.12.95
DIRECTOR OF PLANNING AND DESIGN — DEPT. OF W.S. & S.
VALID FOR 12 MONTHS FROM THE ABOVE DATE

	CALCS	DRAWN	CHECK	APPROVED	DATE	ASSESSMENT DETAILS
D	MIS	MIS	GS	TC	05.04.95	
A	MIS	MIS	GS	TC	22.06.95	LINE NUMBERING AMENDED
B	BP	BP	GS	TC	01.08.95	AMMENDED TO B.C.C REQUIREMENTS
C	MIS	MIS	GS	TC	20.09.95	LOT BOUNDARIES AMENDED

SCALE (METRES) 10 5 0 10 20
1 : 500 (UNREDUCED)

MICROFILE No.

PROJECT No. 93529

ASSOCIATED CONSULTANTS
SURVEYOR: Wilson Deller Wolter
Lvl 14, 97 Creek St, Brisbane Q 4000
Ph (07) 211 3133 Fax (07) 211 3492

APPROVED
FOR W.P. BROWN & PARTNERS PTY LTD RPEQ2026

CLIENT: CHALTARA PTY. LTD.

PROJECT: STRETTON GARDENS ESTATE STAGE 1
COMPTON ROAD, STRETTON

W P BROWN & PARTNERS PTY LTD
CONSULTING CIVIL AND STRUCTURAL ENGINEERS
Level 1
33 Sandere St, Upper Mt. Gravatt Q 4122
Telephone (07) 849 1244
Facsimile (07) 849 1344
BRISBANE CANBERRA MELBOURNE SINGAPORE
ACLA

DRAWING TITLE: SEWERAGE RETICULATION LAYOUT PLAN SHEET 3 of 6

DRAWING NUMBER: 93529-47

AMEND. C

3016/41582

EnviroTech AUSTRALIA
(A division of Weir Engineering Pty. Limited)

Unit 14/25 Frenchs Forest Road
FRENCHS FOREST N.S.W. 2086 AUSTRALIA

Phone (02) 9950 5100
Fax (02) 9950 5101

FAX TRANSMISSION COVER SHEET

Attn.	Andrew Sterritt	Fax.	07 3403 0205
Company.	Brisbane City Council	Date.	16 May 1996
City.	Brisbane	Ref.	E 13221
From.	**Charles Bunn**	Page.	1 of 13

Andrew

Submersible Sewage Pumps

Your Ref. Facsimile of 14/05/96

Our Ref. E 13221

We have pleasure in submitting our quotation for **HIDROSTAL** Screw Impeller Centrifugal Pumping equipment complete with ancillaries.

The **HIDROSTAL** Screw Centrifugal pumps offered are capable of pumping high solid concentration and fibrous materials without clogging, the impeller in the pumps offered have a free passage of 75 mm I.E. capable passing a sphere of 75 mm diameter.

The unique **HIDROSTAL** impeller which consists of a long spiral single vane semi open impeller and a suction cover with a spiral cleaning groove shows superior over a conventional single, multi vane or vortex impeller pumps when pumping textile laden sewage or sludges.

The **HIDROSTAL** pump has numerous installations throughout the municipal industry worldwide, specialising in non clog, high consistency pumping applications.

Innovative Engineering Solutions

***Enviro*Tech AUSTRALIA**
(A division of Weir Engineering Pty. Limited) A.C.N. No 000 373 339

Our Ref: E 13221 — **Page 2**

HIDROSTAL Pumps — 16 May 1996

The **HIDROSTAL** pump is the unit of choice for numerous Water Authorities and Councils through Australia.

Terms are net cash 30 days from invoice.

Deliver Point: F.O.T Ex works Somersby N.S.W.

Validity 60 days

Our offer is subject to our standard terms and conditions.

This tender represents what we believe is an economical choice of equipment required for the above service.

***Enviro*Tech Australia** extend an invitation to review any commercial or technical aspects of our proposal, and should you require any additional information please contact Mr Greg Mathews n our Brisbane office Phone (07) 390 6261 Fax. (07) 390 4503 the writer at the above address.

Yours faithfully,
***Enviro*Tech Australia**

Charles Bunn

Charles Bunn
Product Manager
HIDROSTAL Pumps

Innovative Engineering Solutions

EnviroTech AUSTRALIA
(A division of Weir Engineering Pty. Limited) A.C.N. No 000 373 339

Our Ref: E 13221 Page 3

HIDROSTAL Pumps 16 May 1996

EQUIPMENT OFFERED

Sewage Pumps

Pump Duty: Flow 7.1 Litres/second) at 49.2 metres

We offer **HIDROSTAL** model D0DQ-M01+DNXT2-MSEQ+ N1B1-10+A0 vertical screw impeller sewage pumps driven by a norm/max. 15/17.5 kW 2890 rpm submersible wet pit motors.

Pumps are complete with 100 mm 90 Deg. discharge bend, lowering device, top guide rail bracket, 10 metres of main power and control cable delivery ex works Somersby N.S.W..

 # Working Point

Flow	l/s	8.0
Head	m	50
$NPSH_R$	m	3.5
Pump efficiency	%	35
Duty	kW	11.20
Motor norm.max.	KW	15/17.5
Pump speed rpm	rpm	2890
Motor efficiency	%	83
Overall efficiency	%	29.05
Kwh/kl		0.4685
Solids Handling	mm	75
Suction Dia.	mm	100
OutLet Dia.	mm	100
Full load current	amps	31.5
Starting current D.O.L	amps	233.1
Pump efficiency %	Full	83
	3/4	84
	1/2	83
Power factor	Full	0.92
	3/4	0.90
	1/2	0.83
Pump Weight	kg	170

Innovative Engineering Solutions

COMMENTS ON PUMPS OFFERED

Submersible Pumps

(i) Pump casing test pressure 9 Bar

(ii) Impeller is single vane.

(iii) Because of the unique design of Hidrostal Semi open screw impeller casing and impeller wear ring cannot be fitted.

(iv) Top motor bearings are greased for life the bottom bearing are regreasable.

(v) Mechanical Seals are Tandem type with the product side mechanical seal is mounted behind the impeller and the motor side seal mounted in an oil filled chamber.

With this feature the pump are capable of running dry without damage.

The type "M" product side seals offered has the spring fully enclosed by means of a rubber sleeve.

The product side mechanical can be water flushed if required.

(vi) Mechanical Seal faces,

Motor side: Carbon/Ceramic.

Pump side : Silicon Carbide/Tungsten Carbide.

(vii) All components are spigoted and seal against the ingress of liquid by static nitrile "O" rings.

(viii) Pumps are offered in Material 1 Construction as follows.

Casings	Cast Iron
Suction Liner	Cast Iron
Impeller	S.G. Iron
Shaft	420 Stainless Steel
Fasteners	303 Stainless Steel
Motor Casings	Cast Iron
Discharge Bend	Cast Iron
Top guide rail bracket	Galvanised Mild Steel

(ix) Pump Flanges are drilled to DIN Standard DIN 16

(x) Casing is centre line outlet .

(xi) On the Pumps offered clearance between the suction casing and the impeller can be adjustable with shims between the pump casing and the back cover.

Electric Motors.

(i) The Hidrostal submersible motors offered are suitable of running continuously submerged to a depth of 20 Metres.

(ii) The motors would be supplied with cabling suitable for either D.O.L. or Star Delta starting.

Protection System.

Submersible motors offered are fitted with the following protection.

(1) Klixon temperature detection devices in motor winding.

(2) Moisture probes fitted in oil chamber.

EnviroTech AUSTRALIA
(A division of Weir Engineering Pty. Limited) A.C.N. No 000 373 339

Inspection and testing.

We have not allowed for any testing in our quotation:

Noise Emissions.

(i) Pumps sets offered above have a Total Sound Pressure Level dBA) 80 at 1 meter.

(ii) If you require us to tested the above pumpsets in accordance with AS 1217.7 to, verify the above Sound Pressure Level, we would employer an Acoustic Consultant to carry out the test and our **EXTRA** charge to you would be their fee Plus 10 %.

If extra testing is required the an extra charge would be applicable.

TESTING OPTIONS

Extra if required all pumps.

PUMP SET

Certified Hydrostatics and Performance testing
Aus $ 450:00 net/pump.

EnviroTech AUSTRALIA
(A division of Weir Engineering Pty. Limited) A.C.N. No 000 373 339

SCOPE OF SUPPLY

Sewage Pumps

NO. 1 Two (2) **HIDROSTAL** vertical submersible wet well pumps.

Model D0DQ-M01+DNXT2-MSEQ+ N1B1-10+A0

NO. 2 Each unit include the following:

- Pump passes 75 mm solids.
- Type "A0" Part No. A)-0D/04H 100 mm 90 deg pump discharge bend (drilled DIN 10) and slide away coupling.
- Galvanised top guide rail bracket.
- 10 metres of main power /control cable.
- Norm/Max. 11/12.2 kW 2850 rpm 400 volt, 3 phase, 50 Hz earthed neutral **HIDROSTAL** submersible electric motor, Class F installation, motor klixons temperature detection and moisture probes in oil chamber.
- Painting to **HIDROSTAL'S** standard.
- Our Standard Drawings and Manuals.
- Delivery F.O.T. Ex works Somersby N.S.W.

EnviroTech AUSTRALIA
(A division of Weir Engineering Pty. Limited) A.C.N. No 000 373 339

SCOPE OF SUPPLY PUMPS

Terminal limits are at the following points:

- Suction flange of pump.
- Discharge flange of pump lowering device.
- Underside of pump lowering device.
- Face of top guide rail bracket.
- Cable end of electric cable.

Exclusions

- All civil design, civil work, foundations, anchor bolts and drains.
- All interconnecting piping, pipe support, fittings and valves.
- All electrical switch gear, cabling except where specified above, controls/panels, wiring and connecting up.
- Site installation and erection.
- The costs of any quality assurance requirement beyond ***Enviro*Tech Australia** own quality standard.

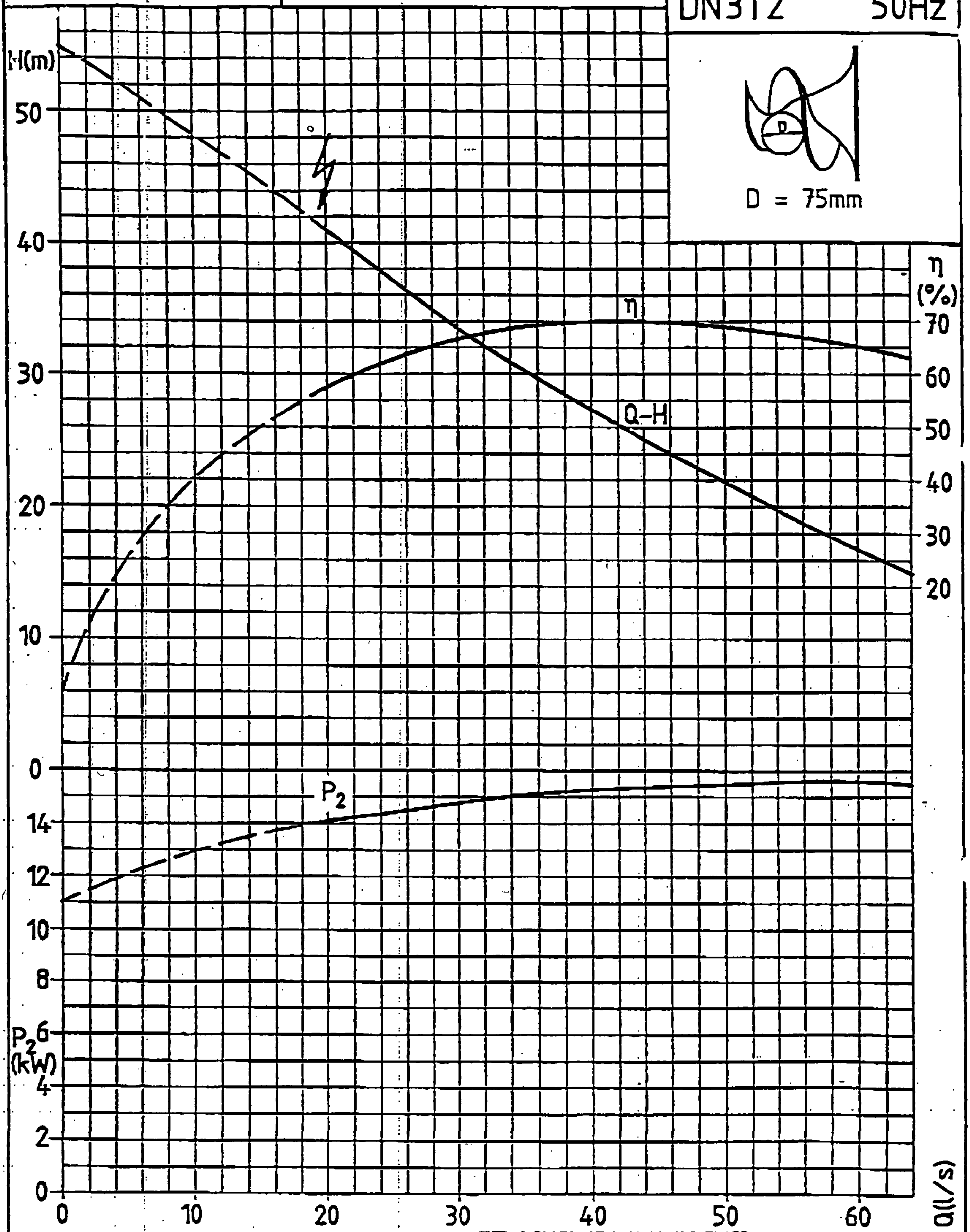
Innovative Engineering Solutions

Hidrostal

SUBMERSIBLE PUMPS
TAUCHPUMPEN

D0DQ-M/D100-M

DN3T2 50Hz



MAX. 32 AMP FOR QUICK THERMAL PROT. SETTING INCLUDES CONTINUANS OVERLOAD FACTOR. (INCLUDING MECH. SEAL FRICTION) STANDARDS.
40°C MAX. AMBIENT TEMP., TEMP. CONTROL, LEAKAGE CONTROL, 2886 RPM., 400V, 50 CYL. (ALSO SUITABLE FOR 380V TO 415V)
DATA OF CURVES ACCORDING ISO 2548 CLASS "C". ANNEX B.
MECH. SEALS FRICTION IS INCL. IN MOTOR EFFICENCY DATAS.

THERMO BLOCK AUF MAX. 32 AMP EINSTELLEN. DIESER WERT ENTHAELT UEBERLASTFAKTOR. (INKL. REIBUNGSVERLUST DER MECH. DICHTUNG) STANDARD.
40°C MAX. UMGEBUNGS TEMP., TEMP. WAECHTER, LECKAGE WAECHTER, 2886 UPM, 400 V, 50HZ.
KURVENDATEN GEMAESS ISO 2548 KLASSE "C" ANNEX B.
REIN HYDR. WIRKUNGSGRAD. REIBUNGSVERLUSTE DER MECH. DICHTUNG SIND IM WIRKUNGSGRAD DES MOTORS ENTHALTEN.

Aend. : 18.3.93 PK	Drawn by/Bearb. Dat.Vis. : 07.12.92 PK Approved by/Gepr. Dat.Vis. : 08.12.92 HF	No : 92-K 4492a

Hidrostal

PAINTING SPECIFICATION

Dat: 02.02.93	No: 78-TU 1908/e	File: ENDAT	

1. PRIMING (ALL PUMPS)

1.1 Pretreatment of underground

We require that the cast iron parts, delivered to us, have been prepared as follows:
- degreased
- sandblasted
- coated with a 2-component-primer, based on epoxy resin and polyamide accelerator (recommended product: Sigma cover primer), paint thickness: 60 µm, or another primer, applicable for a 2-component-coat, based on epoxy resin.

1.2 After machining, all components are degreased and second coat of primer is applied as a protection against corrosion during weathering.

Trade name: "COLTURIET SIGMA COVER PRIMER" (7413) from SIGMA COATINGS.
Average of paint thickness 50 - 100 µm.

2. FINAL COAT

2.1 Dry mounted pumps

A final coating of a two component epoxy resin paint, colour gentian blew, is applied prior to despatch.
Trade name: "SILFAPOX RAL 5010"

2.2 Submersible, immersible and wet well sump pumps

A final coating of a two component epoxy resin coal tar paint, colour black/brown, is applied prior to despatch.
Trade name: "COLTURIET TCN 300" from SIGMA COATINGS, paint thickness > 100 µm.

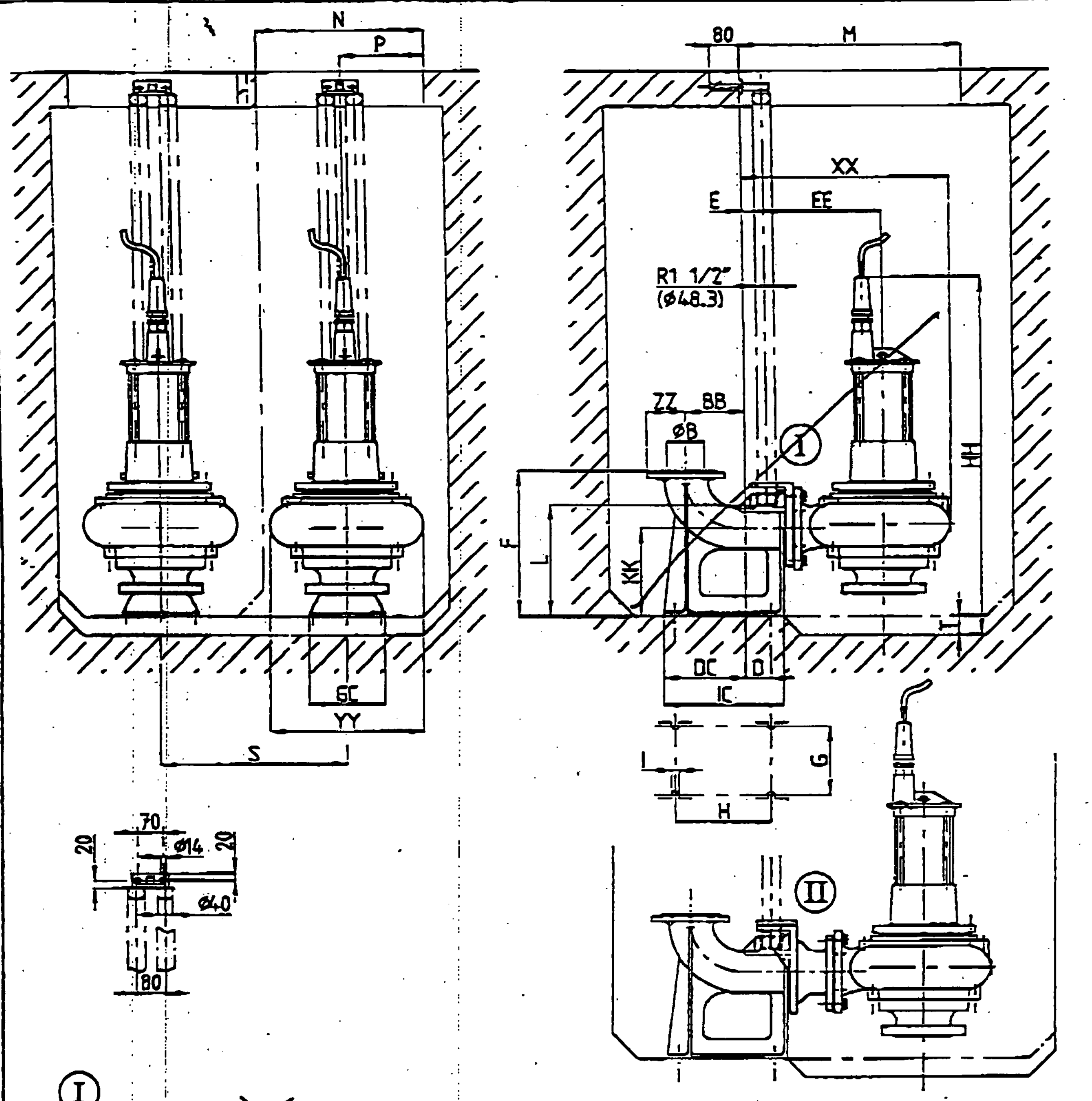
2.3 Special paint specifications

Special primers cannot be supplied. However, our standard primer has been specially selected to take a wide range or final coat paint systems.

Should a special finish be necessary, HIDROSTAL shall only supply a primed unit for the final finish to be applied by the client.

DIMENSIONES Q-PUMPS A0 - MOUNTING
MASSBILDER Q-PUMPEN A0 - AUFSTELLUNG
D0DQ/D04Q/D100

Hidrostal



(I)

TYP	B NW	BB	D	DC	E	EE	F	G	GC	H	HH max	I	IC	KK	L	M min	N min	P	S	T	XX	YY	ZZ
D0DQ	100	160	70	220	60	298	400	190	210	260	1200	20	325	240	305	600	400	200	450	0	543	360	105
D04Q D100						318											460	230	510	40	563	420	

(II) (Only vith motor size 3 and X, 2-pol., 3000rpm) / (Nur mit Motorgrösse 3 und X, 2-pol., 3000upm)

TYP	B NW	BB	D	DC	E	EE	F	G	GC	H	HH max	I	IC	KK	L	M min	N min	P	S	T	XX	YY	ZZ
D0DQ-H/-M	100	160	70	220	60	398	400	190	210	260	1200	20	325	240	305	700	400	200	450	0	643	360	105
D04Q D100 -H/-M						418											460	230	510	40	663	420	

Konstruktionsänderungen vorbehalten
Hidrostal reserve the right to make changes without giving prior notes
Hidrostal se reserve tous droits de changement de construction

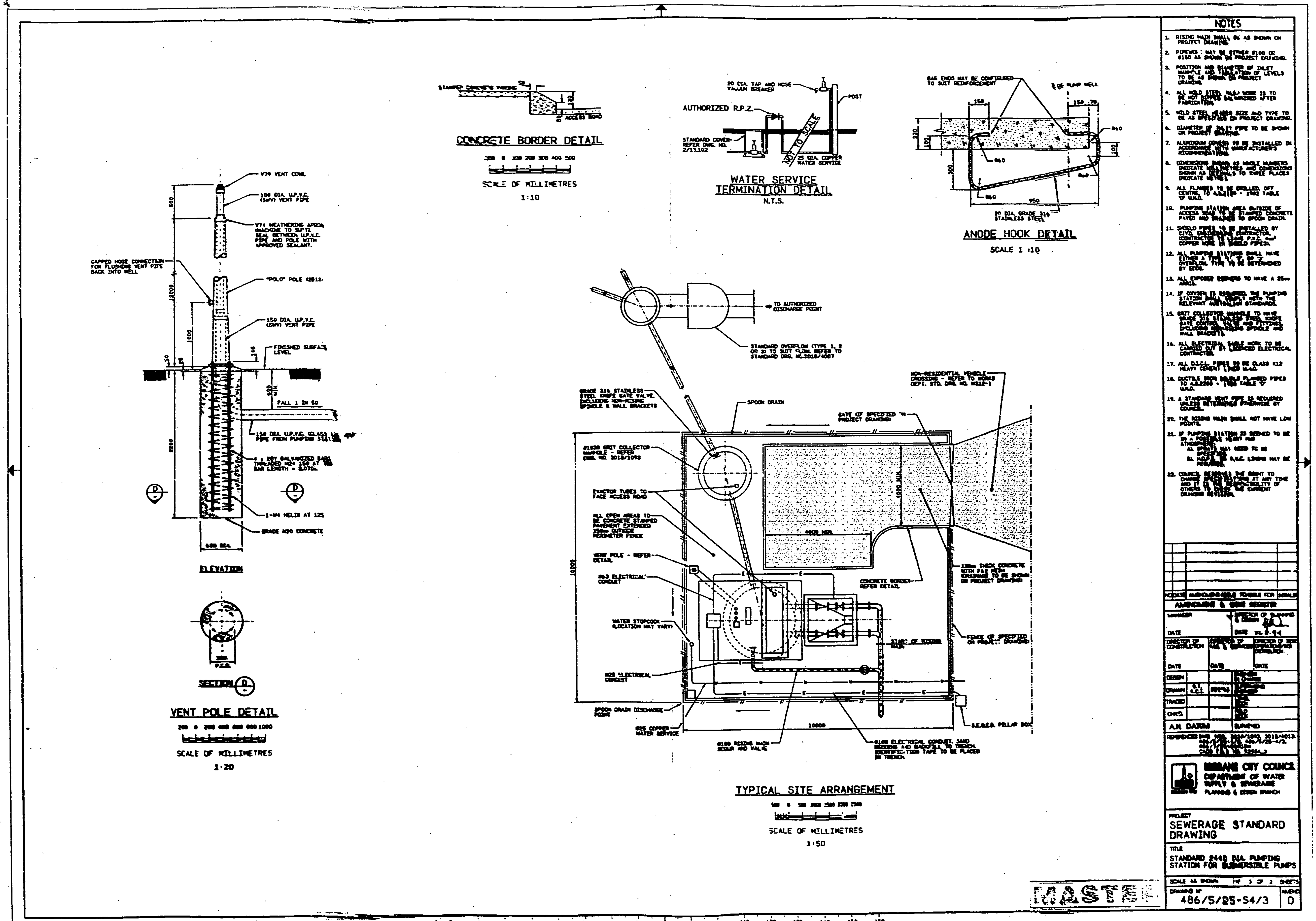
A,B ≤ NW150 = PN16 DIN2533
A,B ≥ NW200 = PN10 DIN2532

Aend. : d25.09.95pko

Drawn. by /Bearb. Dat. Vis. : 09.06.94 pk

Approved by/Gepr. Dat. Vis. :

No: 92-M4372d



NOTES
CONCRETE BORDER DETAIL
SCALE OF MILLIMETRES
1:10
AUTHORIZED R.P.Z.
NOT TO SCALE
WATER SERVICE
TERMINATION DETAIL
N.T.S.
ANODE HOOK DETAIL
SCALE 1 :10
ELEVATION
SECTION
VENT POLE DETAIL
SCALE OF MILLIMETRES
1:20
TYPICAL SITE ARRANGEMENT
SCALE OF MILLIMETRES
1:50
TO AUTHORIZED DISCHARGE POINT
SPOON DRAIN
FALL 1 IN 50
GRADE N20 CONCRETE
AMENDMENT & ISSUE REGISTER
A.N. DARM
BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY & SEWERAGE
PROJECT
SEWERAGE STANDARD DRAWING
TITLE
STANDARD Ø440 DIA. PUMPING STATION FOR SUBMERSIBLE PUMPS
486/5/25-S4/3
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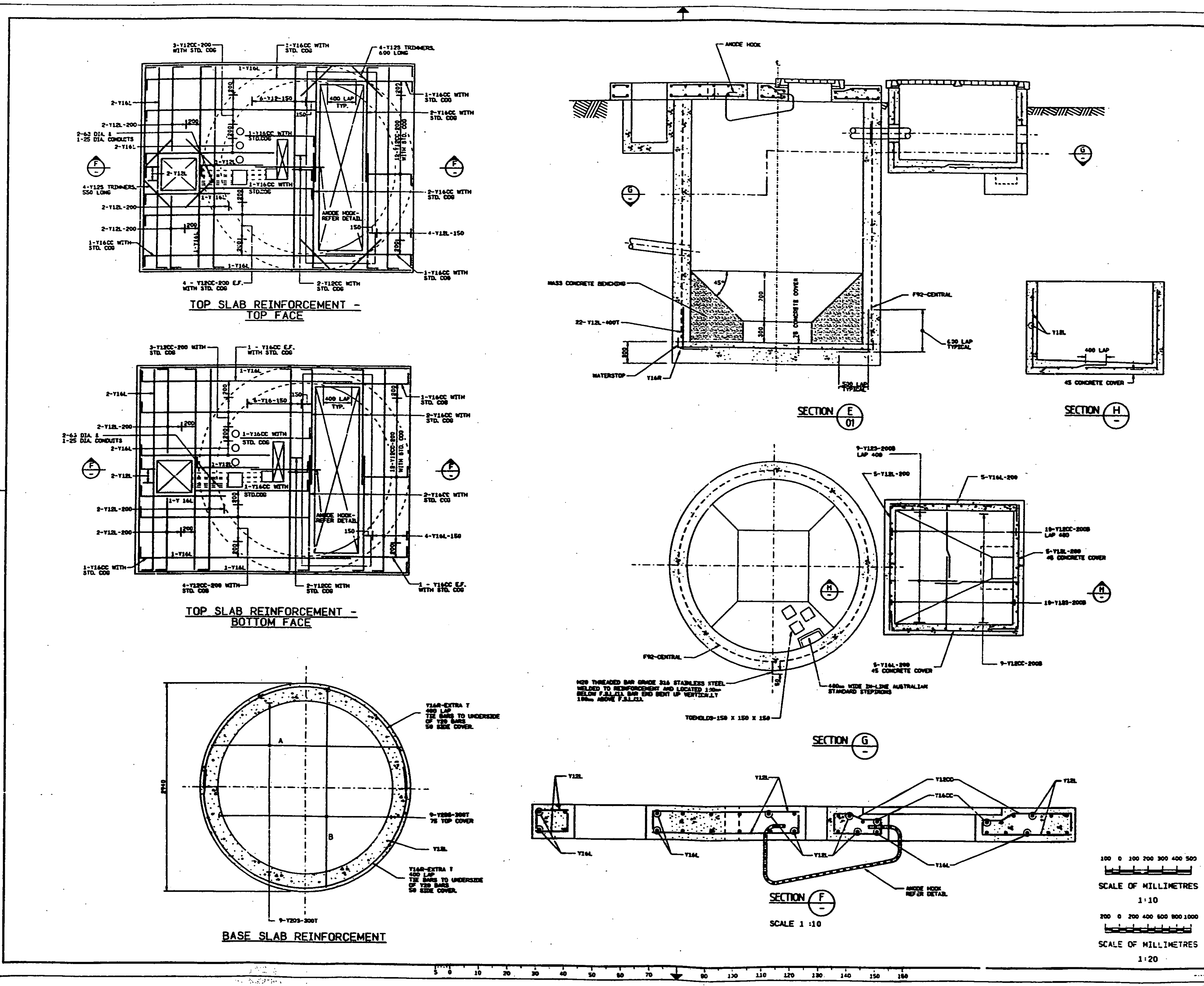


NOTES

REINFORCED CONCRETE NOTES

C1 ALL CONCRETE WORK SHALL COMPLY WITH STANDARDS AUSTRALIA CONCRETE STRUCTURES CODE A.S. 3600-1988 AND THE W.S.A 3 GENERAL SPECIFICATION FOR CONCRETE WORK.

C2 THE DURABILITY CLASSIFICATION OF THE CONCRETE SHALL BE
: EXTERNAL - B2
: INTERNAL - B1

C3 ALL CONCRETE SHALL HAVE A CHARACTERISTIC COMPRESSIVE STRENGTH AT 28 DAYS OF 340 MPa UNLESS OTHERWISE NOTED. MINIMUM CEMENT CONTENT TO BE 400 kg/m³

C4 THE CLEAR CONCRETE COVER TO THE OUTSIDE OF ANY REINFORCEMENT IS TO BE AS FOLLOWS UNLESS SHOWN OTHERWISE:
WALLS & BASE SLAB - PLACE CENTRAL.
SLAB TOP & BTM COVER - 30mm

C5 THE MAXIMUM SIZE OF AGGREGATE IN THE CONCRETE SHALL BE 20mm. THE SLUMP OF THE CONCRETE SHALL BE AS SPECIFIED BY THE SUPERINTENDENT.

C6 THE CONCRETE SIZES SHOWN DO NOT INCLUDE FINISHES AND MUST NOT BE REDUCED OR HOLED WITHOUT THE SUPERINTENDENT'S APPROVAL.

C7 ALL FORMWORK SHALL BE IN ACCORDANCE WITH A.S. 3610-1990. FORMWORK TO BE CLASS 2 UNLESS OTHERWISE NOTED.

C8 STEEL REINFORCEMENT TO BE 400Y GRADE DEFORMED BARS TO A.S. 1302-1982 AND FABRIC REINFORCEMENT TO BE IN ACCORDANCE WITH A.S. 1304-1984.

C9 FABRIC REINFORCEMENT LAPS:
(A) SIDE LAPS TO FABRIC SHALL BE:- 25 MIN.
(B) END LAPS TO FABRIC SHALL BE:- 400 MIN. Y12 AT 200 TIED TO MESH

C10 CONDUITS, PIPES, ETC. MUST NOT BE PLACED WITHIN THE COVER OF THE CONCRETE.

C11 ALL FORMWORK AND REINFORCEMENT IS TO BE ACCURATELY POSITIONED, ADEQUATELY SUPPORTED, AND THEN INSPECTED AND APPROVED IN WRITING BY THE SUPERINTENDENT BEFORE CONCRETE IS PLACED.

C12 ALL EXPOSED EXTERNAL CORNERS TO HAVE 25mm ARRIS.

C13 NO REINFORCEMENT IS TO BE WELDED TO OR MAKE CONTACT WITH THE PIPEWORK.

NO	DATE	AMENDMENT/ABLE TO/ISSUE FOR	INITIALS

AMENDMENT & ISSUE REGISTER

MANAGER — DATE
DIRECTOR OF PLANNING & DESIGN — DATE 31.8-94
DIRECTOR OF CONSTRUCTION — DATE
DIRECTOR OF M& E SERVICES — DATE
DIRECTOR OF SEW OPERATIONS & DISTRIBUTION — DATE

DESIGN			ENGINEER IN CHARGE	
DRAWN	G.T. K.C.L.	DEC'93	SUPERVISING ENGINEER	
TRACED			LEVEL BOOK	
CHKD.			FIELD BOOK	
A.H. DATUM			SURVEYED	

REFERENCES DWG. NOS. 3018/1093, 3018/4013, 486/5/25-4/2, 486/5/25-4/3, 486/7/25-C08184
CADD FILE NO. S8584_2

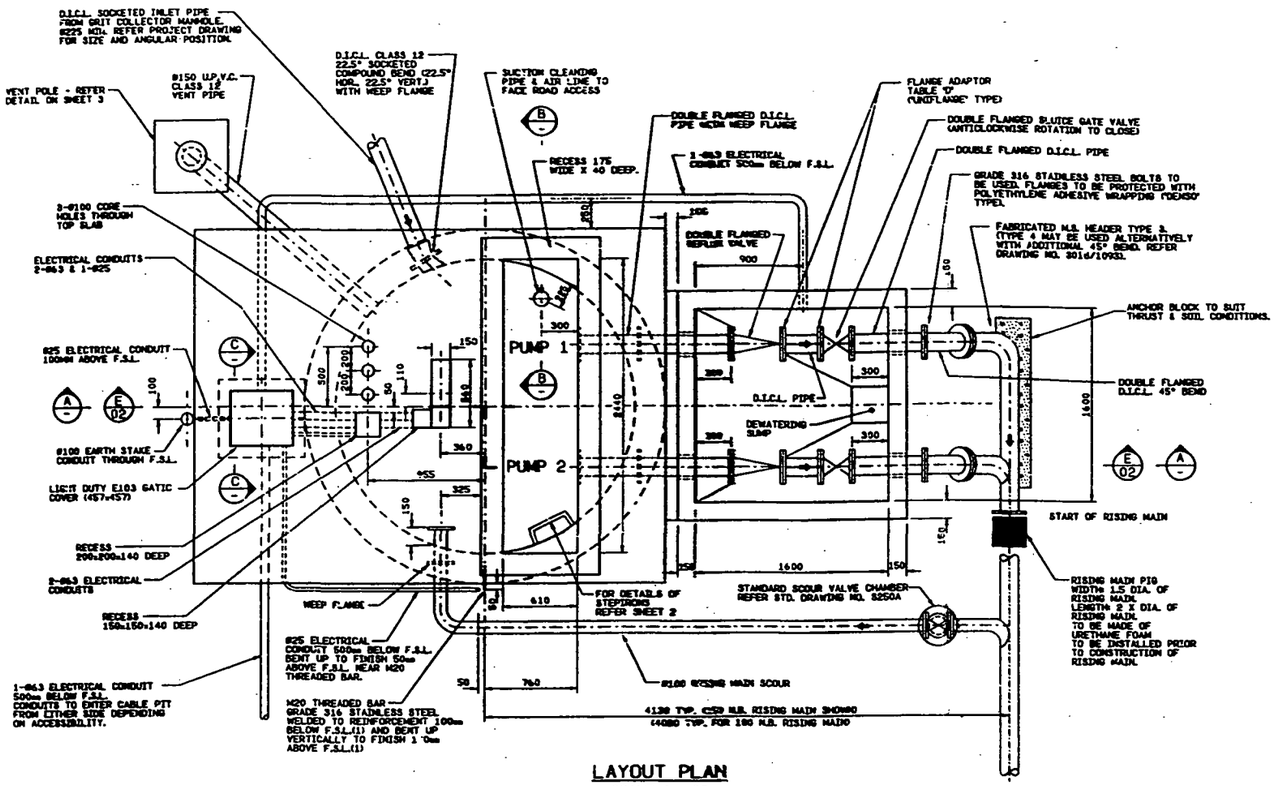
BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY & SEWERAGE
PLANNING & DESIGN BRANCH

PROJECT
SEWERAGE STANDARD DRAWING

TITLE
STANDARD 2440 DIA. PUMPING STATION FOR SUBMERSIBLE PUMPS

SCALE 1:20 E.A.S. — Nº 2 OF 3 SHEETS

DRAWING Nº 486/5/25-S4/2 — AMEND 0

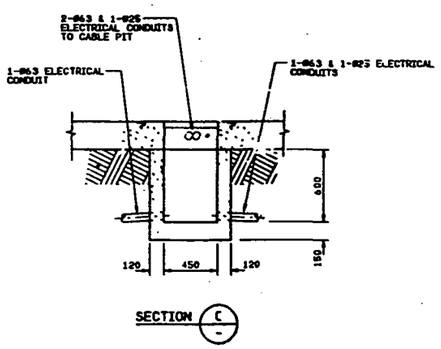


LAYOUT PLAN
SCALE 1 : 20

TABULATION OF PUMPING STATION LEVELS

REF.	DESCRIPTION	LEVEL
LEVEL 1	SURFACE LEVEL	
LEVEL 2	INVERT OF INLET AND OUTLET OF GRIT COLLECTOR MANHOLE	
LEVEL 3	TOP OF BASE OF REFLUX VALVE PIT	
LEVEL 4	INVERT OF INLET SEWER AT PUMP WELL	
LEVEL 5	TOP WATER LEVEL OF PUMP WELL	
LEVEL 6	BOTTOM WATER LEVEL OF PUMP WELL	
LEVEL 7	TOP OF BASE SLAB OF PUMP WELL	
LEVEL 8	BOTTOM OF BASE SLAB OF PUMP WELL	
LEVEL 9	TOP OF ROOF SLAB OF PUMP WELL	
LEVEL 10	INVERT LEVEL OF RISING MAIN THROUGH PIT WALL	
LEVEL 11	TOP OF BASE OF GRIT COLLECTOR MANHOLE	

NOTE:
FOR R.L.(2) AND R.L.(11) REFER TO GRIT COLLECTOR MANHOLE DRAWING NO. 3018/1093

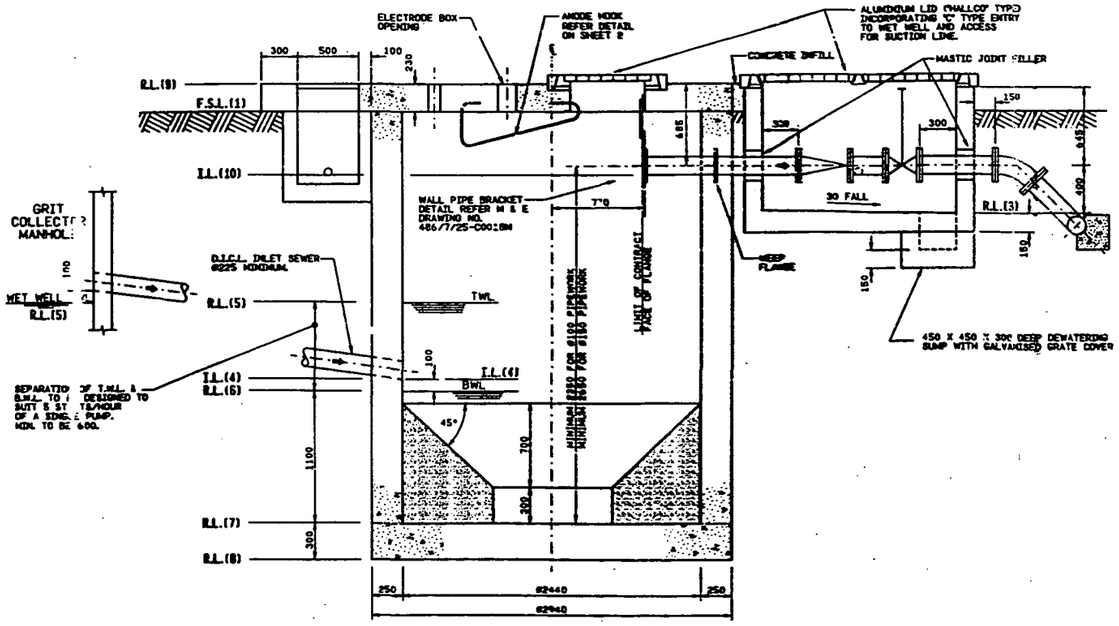


SECTION C

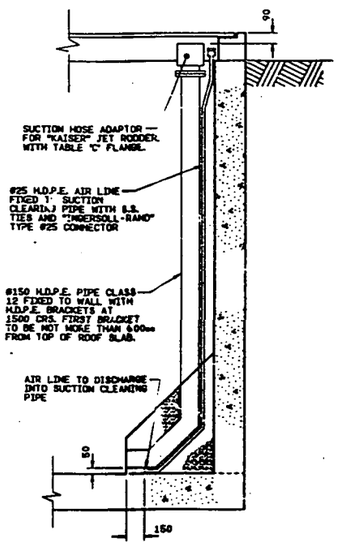
CABLE PIT DETAIL
SCALE 1 : 20

NOTES

1. RISING MAIN SHALL BE AS SHOWN ON PROJECT DRAWING.
2. PIPEWORK MAY BE EITHER Ø100 OR Ø150 AS SHOWN ON PROJECT DRAWING.
3. POSITION AND DIAMETER OF INLET MANHOLE AND TABULATION OF LEVELS TO BE AS SHOWN ON PROJECT DRAWING.
4. ALL MILD STEEL (M.S.) WORK IS TO BE HOT DIPPED GALVANISED AFTER FABRICATION.
5. MILD STEEL HEADER SIZE AND TYPE TO BE AS SPECIFIED ON PROJECT DRAWING.
6. DIAMETER OF INLET PIPE TO BE SHOWN ON PROJECT DRAWING.
7. ALUMINIUM COVERS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
8. DIMENSIONS SHOWN AS WHOLE NUMBERS INDICATE MILLIMETRES AND DIMENSIONS SHOWN AS DECIMALS TO THREE PLACES INDICATE METRES.
9. ALL FLANGES TO BE DRILLED, OFF CENTRE, TO A.S.2129 - 1982 TABLE 'D' U.N.O.
10. PUMPING STATION AREA OUTSIDE OF ACCESS ROAD TO BE LEVELLED AND STAMPED CONCRETE PAVED.
11. SHIELD PIPES TO BE INSTALLED BY CIVIL ENGINEERING CONTRACTOR. CONTRACTOR TO LEAVE P.V.C. 4mm² COPPER WIRE IN SHIELD PIPES).
12. ALL PUMPING STATIONS SHALL HAVE EITHER A TYPE 'A', 'B' OR 'C' OVERFLOW, TYPE TO BE DETERMINED BY E.C.D.S.
13. ALL EXPOSED CORNERS TO HAVE A 25mm ARRIS.
14. IF OXYGEN IS REQUIRED, THE PUMPING STATION SHALL COMPLY WITH THE RELEVANT AUSTRALIAN STANDARDS.
15. GRIT COLLECTOR MANHOLE TO HAVE GRADE 316 STAINLESS STEEL KNIFE GATE CONTROL VALVE AND FITTINGS, INCLUDING NON-RISING SPINDLE AND WALL BRACKETS.
16. ALL ELECTRICAL CABLE WORK TO BE CARRIED OUT BY LICENCED ELECTRICAL CONTRACTOR.
17. ALL D.I.C.L. PIPES TO BE CLASS K12 HEAVY CEMENT LINED U.N.O.
18. DUCTILE IRON DOUBLE FLANGED PIPES TO A.S.2280 - 1968 TABLE 'D' U.N.O.
19. A STANDARD VENT PIPE IS REQUIRED UNLESS DETERMINED OTHERWISE BY COUNCIL.
20. THE RISING MAIN SHALL NOT HAVE LOW POINTS.
21. IF PUMPING STATION IS DEEMED TO BE IN A POSSIBLE HEAVY H2S ATMOSPHERE:
    - A1. SPRAY9 MAY NEED TO BE SPECIFIED.
    - B1. H.D.P.E. OR P.V.C. LINING MAY BE REQUIRED.
22. COUNCIL RESERVES THE RIGHT TO CHANGE SPECIFICATIONS AT ANY TIME AND IT IS THE RESPONSIBILITY OF OTHERS TO CHECK THE CURRENT DRAWING REVISION.



SECTION A
SCALE 1 : 20



SECTION B

SUCTION CLEANING PIPE DETAIL
SCALE 1 : 20

200 0 200 400 600 800 1000
SCALE OF MILLIMETRES
1:20

NO.	DATE	AMENDMENT/ISSUE TO/BASIS FOR	INITIALS

AMENDMENT & ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE		DATE 31-8-94	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M&E SERVICES	DIRECTOR OF SEW OPERATIONS AND DISTRIBUTION
DATE		DATE	DATE
DESIGN			ENGINEER IN CHARGE
DRAWN	G.T. K.C.L.	DEC'93	SUPERVISING ENGINEER
TRACED			LEVEL BOOK
CHK'D.			FIELD BOOK
A.H. DATUM			SURVEYED

REFERENCES DWG. NOS. 3018/1093, 3018/4013, 486/S/25-4/2, 486/S/25-4/3, 486/7/25-C001:BM
CADD FILE NO. S2544_1

BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY & SEWERAGE
PLANNING & DESIGN BRANCH

PROJECT: SEWERAGE STANDARD DRAWING

TITLE: STANDARD 2440 DIA. PUMPING STATION FOR SUBMERSIBLE PUMPS

SCALE AS SHOWN | N° 1 OF 3 SHEETS

DRAWING N° 486/5/25-S4/1 | AMEND 0

BRISBANE CITY COUNCIL

WS&S DEPT. BILL OF MATERIALS

No

STORE S10

Account Code

SUBMERSIBLE SEW. PUMP STATION
STATION NO. _____
LOCATION _____

MATERIALS FOR "ELECTRICIAN"

NOTE: DUE FOR REVISION USE WHERE APPLICABLE

QTY REQ	DESCRIPTION	STORE GRP		CODE ITEM		QTY ISS	BAL AFTER ISS.	UNIT OF ISS	BIN NUMBER	TRADESMAN'S INFORMATION ONLY
1	SWITCHBOARD - 2 UNIT	12	A	7516	3			EA.	L/P	
1	BASE (SW.BD. SUPPORT) 2 UNIT TYPE	43						"		
1	5" G.I. PLUG DWG. JS52/133	43	A	0510	8				PP61	TOP SLAB CORE HOLE. (REQUIRED ONLY IF NOT ROADWAY INSTALLATION)
1	ELECTRODE BOX: TYPE - 6U7	43	A	0518	1			"	72B	
1	1" CABLE GLANDS: ALCO TYPE - UG3B	12	A	6214	6			"	HB16	ELECTRODE BOX
5	INSULATORS (ELECTRODE) TYPE - 3/4B	12	A	6551	1			"	KA21	FOR ABOVE
	CLAMP WASHERS (ELECTRODE) TYPE - B	43	A	0559	5			"	EE22	" "
	CLAMP WASHERS TYPE - B/1	43	A	0570	2			"	EE23	" "
11	RUBBER WASHERS: 2½"OD x 1½"ID	43	A	0563	7			"	EE34	" "
10	RUBBER WASHERS: 1.3/8"OD x 3/4"ID	43	A	0562	9			"	EE33	" "
1	1" CONDUIT LOCKNUT (GALV.)	12	A	1957	5			"	DC81	" "
1	1" PVC PLUG STOP	12	A	2092	0			"	EA85	" "
2	5/16" ANCHORS: PERFIX TYPE - P519 H	12	A	2258	7			"	KC21	" "
28	3/4" x 5/16" S.S. SET SCREWS-WHIT HEX HD	18	A	4826	6			"	AAA	ELECTRODE BOX LID
18	1" x 5/16" " " " " " "	18	A	4821	7			"	AAA42	" CLAMP WASHE
15	3/4" S.S. NUTS " " "	18	A	3058	7			"	BBB	ELECTRODES
10	3/4" S.S. WASHERS	18	A	5123	7			"	BBB	"
4	3/4" x 3/8" S.S. SET SCREWS-WHIT HEX HD	18	A	5519	6			"	AA61	HD. STUDS FOR S/BOARD
4	3½" x 3/8" S.S. " " " " "	18	A	2017	4			"	AA54	HD BOLTS FOR S/B BASE
4	3/8" S.S. NUTS " " "	18	A	3053	8			"	AAA	FOR ABOVE
4	3/8" S.S. WASHERS	18	A	5113	8			"	BBB	" "
1	"DANGER ELECTRICAL EQUIPMENT" SIGN (SIZE 7" x 6")	43	A	2907	4			"	HH53	FIT TO S/B DOOR
5	2" ALUMINIUM LETTERS & NUMERALS 1 EACH:	14	A	1474	7			"	LC	" " " "
1	ATUM 6/2 x 8" HEAT SHRINK TUBE	12	A	6397	9				FC33	MOTOR CABLE JOINTS
	TCS 220 x 12 " " "	12	A	6398	7				FC34	" " "
	1½" CONDUIT SADDLES	12	A	2004	5				GC14	
2	3/4" " "	12	A	2002	9				GC12	

NOTES: 1. Check that ampere rating of pump control circuit breakers suit that of unit being installed (15 amp. Curve 1 for 7½ HP & 10HP, 35 amp. Curve 1 for 25HP).

2. This list does not include: (a) U.G. 4 core supply cable
(b) U.G. electrode cable. (Use 6 core 2.5 mm^2 W/O ECC)
(c) Protective Hi Impact orange conduit.
(d) S.S. electrodes.
(e) U.G. Motor cable between Sw.Bd & pump well. (Use 3 core 4 mm^2 with ECC).

AUTHORIZED	ORDER MADE UP	3/4" DIA. ELECTRODES
By.....	By..... Date.....	

BRISBANE CITY COUNCIL

W S&S DEPT. BILL OF MATERIALS

Nº

STORE S10

Account Code

SUBMERSIBLE SEW. PUMP STATION
STATION NO. _____
LOCATION _____

MATERIALS FOR "MECH. FITTER"

NOTE: DUE FOR REVISION USE WHERE APPLICABLE

QTY REQ	DESCRIPTION	STORE GRP		CODE ITEM		QTY ISS	BAL AFTER	UNIT OF ISS	BIN NUMBER	TRADESMAN'S INFORMATION ONLY
	CLEAT (PUMP SUPPORT) SIZE 3" x ⅜" x 8" ø	43		0488				EA.		(The SS nuts for cleat should be onsite.)
	STRAP (" ") SIZE 2" x ⅜" x 25" ø	43		0504				"		
	FLANGE (PUMP SUPPORT) SIZE 6" ø	43		0494				"		
2	BENDS (HOSE CONNECTION) TYPE 66	43	A	0484	8			"	4.3	
2	1"G.I. HEX NIPPLE	13	C	0969	9			"	A-E42	
2	1" CHECK VALVE - JOHNS FIG. 4B	13	A	3462	2			"	A-I13	
12	½" SHACKLES (GALV.)	19	A	1587	5			"	R-A65	
	⅜" GALV. CHAIN. 5/8" MIN. INSIDE LINK WIDTH 1½" " " " LENGTH	16	A	3387	4			"		
2	LENGTHS EACH LONG 6"ID x 4PLY RUBBER DELIVERY HOSE	19	A	1061	1			"	C5.9	
2	TAILPIPES (HOSE CONNECTION) SIZE 6"	43	A	0501	7			"	6.3	
2	ADAPTORS (PUMP DELIVERY) TYPE 56/9	43	A	0476	2			"	2.4	
2	GASKETS 5" SPECIAL 6¾" OD x 4¾" ID x ⅛"	13	A	3196	6			"	A-M21	
2	GASKETS 6" SPECIAL 7.5/8"OD x 5¾" ID x ⅛"	13	A	3197	4			"	A-M22	for pump delivery adap
4	GASKETS 6" STANDARD	13	A	2968	9			"	A-M23	for pump support bends
8	2" x 5/8" SET SCREWS S.S. WHIT HEX	18	A	5516	2			"	C5.5	for pump deliv. adapto
26	5/8" S.S. NUTS " " "	18	A	3057	9			"	AAA-C71	for all abo e
	5/8" W. S.S. NUTS*	18	A	3057	9			"	" "	for S.S. "U" Bolts
34	1¾" x 5/8" SET SCREWS S.S. WHIT HEX HEAD	18	A	5515	4			"	C5.4	16 for pump deliv adap 2 for Bolting support to quick coupling P 16 for bolting pump su bend to quick coupl Part A
16	1½" x 5/8" " " " " "	18	A	5514	7			"	C5.3	for bolting quick coup Part B to wall pipe fl
2	6" SIZE QUICK COUPLING PART A	43	A	0527	2			"	2.10	
0	" " " " " B ø	43	A	0528	0			"	2.9	
2	" " " " RUBBERS	13	A	2940	8				A-M71	
2	SUBMERSIBLE SEW. PUMPS 25 H.P.	43	C	1137	9					

* 4 required if contract job.
0 required if B.C.C. job

ø 2 off required if pump support assemblies not previously issued to Civil Contractor

NOTE: This list does n include:-
(a) Pump Units
(b) "BANDIT" type 201 wide SS strapping and buckles
(c) 1" OD copper tube water service connecti

AUTHORIZED

By.....

ORDER MADE UP

By.....Date.....

ORIGINAL

2 x 5" Units 6" Hose 6" Wall Pipes

Form No. 11F

hidrostal PUMPS

BRISBANE CITY COUNCIL

SUBMERSIBLE SEWAGE PUMP

ORDER No: A45001H3

WEIR/ENVIROTECH JOB No: 15355

SALES AND TECHNICAL SERVICE

WEIR ENGINEERING PTY LTD-TINGALPA QLD

TELEPHONE (07) 3390 6322
FACSIMILE (07) 3390 4503

PARTS SERVICE AND SALES

ENVIROTECH AUSTRALIA-SOMERSBY
A division of Weir Engineering Pty Ltd
Stephen Lenton

TELEPHONE (043) 49 2999
FACSIMILE (043) 49 2900

PRODUCT MANAGER

WEIR ENGINEERING PTY LTD-FRENCHS FOREST
Charles Bunn

TELEPHONE (02) 950 5100
FACSIMILE (02) 950 5101

weir

EnviroTech AUSTRALIA
A division of WEIR ENGINEERING PTY LTD
A.C.N. 000 373 339

HIDROSTAL PUMPS

D0DQ-M01+DNXT2-MSGO+N1B1-10+A0

SERIAL No.	TAG No.
H 1577	----------
H 1578	----------

LOCATION: _____

SR: _____ STATION N° _____

ELECTRICAL 5G

ELECTRICAL FITTERS INFORMATION

Return yellow card indicating Serial N° of Switchboard installed

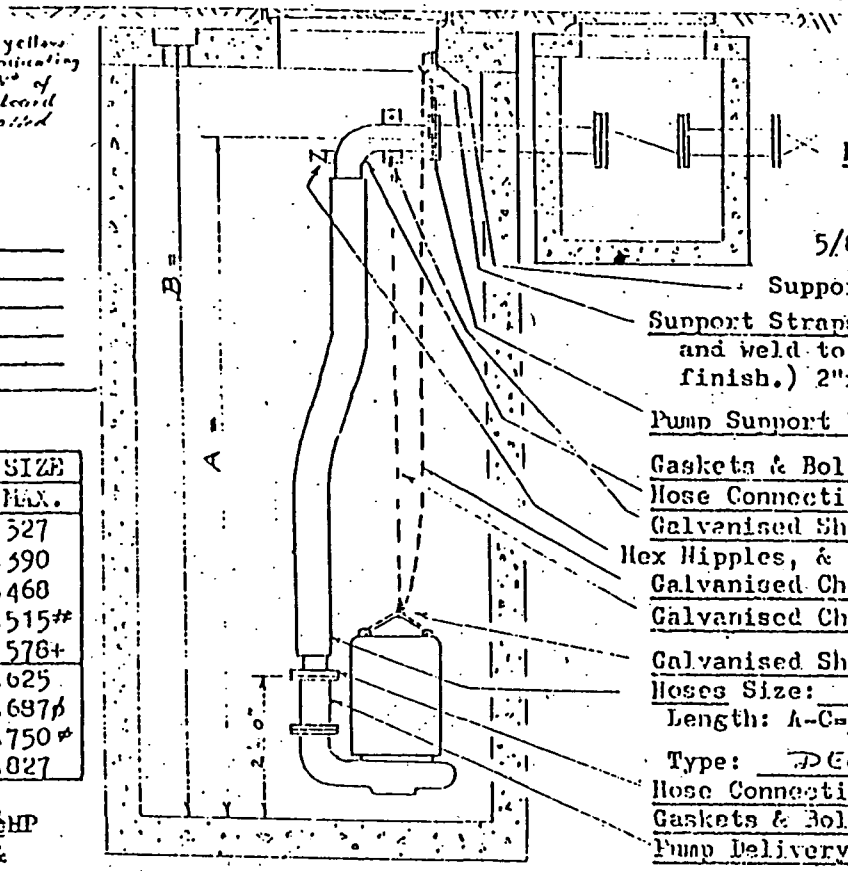
Electrode Box:
Type 6U7

Electrode Length:
No.1 Start B-1070 _____
No.1 Stop B-470 _____
Aux. Start B-1170 _____
No.2 Start B-1120 _____
No.2 Stop B-520 _____
Electrode Diameter: _____

ALCO CABLE GLANDS

TYPE	SIZE	CABLE SIZE MIN.	CABLE SIZE MAX.
UG1A	¾"	.265	.327
UG1B*	¾"	.327	.390
UG1C	¾"	.390	.468
UG2A*	1"	.468	.515#
UG2B*	1"	.515	.576+
UG3A*	1"	.579	.625
UG3B*	1"	.625	.687ϕ
UG3C*	1"	.687	.750#
UG3D	1"	.750	.827

*Stock Item
+Usual size } 7½HP
#Alternative size } &
#if rubber cable } 10HP
ϕUsual size for 25HP



Return yellow card indicating Serial N° of pump ends installed

MECHANICAL FITTERS INFORMATION

5/8" S.S. Nuts

Support Cleat :3"x⅜"x8"

Support Straps: bend, cut to length and weld to cleat on site (paint finish.) 2"x⅜"x25" Long.

Pump Support Flanges: Size: _____

Gaskets & Bolts to suit

Hose Connection Bends: Type: _____

Galvanised Shackles: Size

Hex Nipples, & 1" Johns Fig.43 Swing Checks

Galvanised Chain (lifting)

Galvanised Chain (load)

Galvanised Shackles: Size

Hoses Size: _____" I.D.

Length: A-C= _____

Type: DELIVERY

Hose Connection Tailpipes: Size: _____

Gaskets & Bolts to Suit

Pump Delivery Adaptors: Type: _____

Incoming mains cable 4 core
Electrode cable 6 core 7/029
Switchboard base type:-

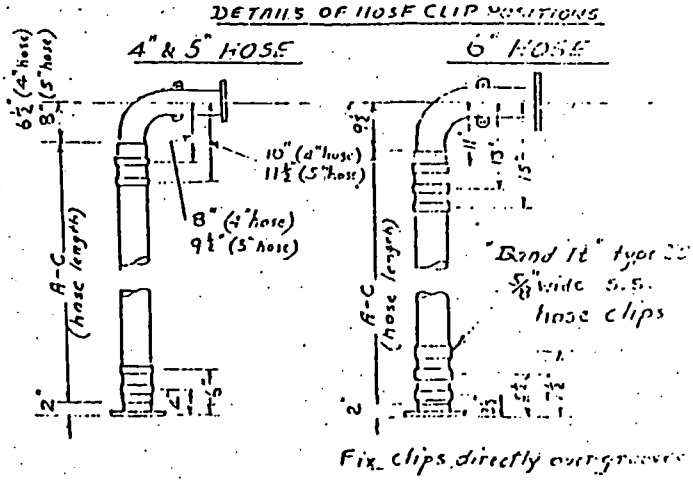
	NO.1 PUMP	NO.2 PUMP
SIZE:	_____	_____
HP :	_____	_____
MAKE:	_____	_____
SERIAL NO:	_____	_____

GENERAL INFORMATION

Switchboard mounted on top slab _____
Separate block _____
Pump Wells: ON /OFF Roadway
Pump Well Type: _____
Gatic Cover on Pump Well: Type _____
Inlet manhole type: 4'dia. 'E"rect. /Nil
Grit collection type: _____ recess depth: _____
Screens installed: _____

HOSE SIZE	C
4"	925
5"	563
6"	901

DETAILS OF HOSE CLIP POSITIONS



Pump connection arrangement No: _____

(refer to Dwg. JS53/121A)

Electrical Installation to Dwg. JS04/116
JS04/117
(Tick whichever applicable) JS04/118
JS04/119

Bill of Materials (Fitters List) Form No: _____
" " " (Elect. List) Form No: _____

Civil Works: Contract job:
(or) D.C.C. job :

Electrodes ordered: D.O. N°:

408 504

5 702236 210059

Bantex STRONG LINE

6210

Bantex
DENMARK

SERVICE MANUAL FOR INSTALLATION AND OPERATION FOR Q-TYPE SUBMERSIBLE PUMPS

TABLE OF CONTENTS

SERVICE MANUAL FOR INSTALLATION AND OPERATION FOR Q-TYPE SUBMERSIBLE PUMPS

Table of Contents Cont.

SERVICE MANUAL FOR INSTALLATION AND OPERATION FOR Q-TYPE SUBMERSIBLE PUMPS

1. INSTALLATION AND OPERATION

1.1 INTRODUCTION

Each pump unit is equipped with a nameplate (Fig. 1) attached to the motor, containing all motor and pump data (see section 1.4). It is essential to give the complete data on the nameplate for any inquiry about parts or service.

On motors approved for explosion-proof application, an additional approval plate will be attached (See Fig. 2).

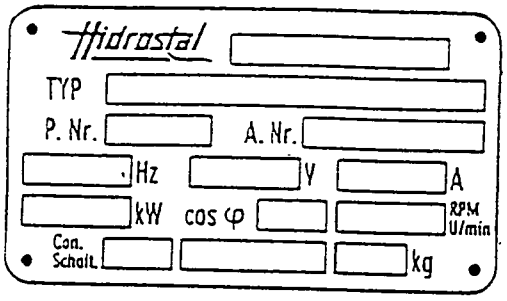


Fig. 1

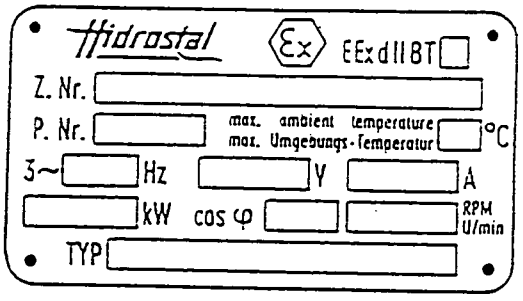


Fig. 2

The HIDROSTAL warranty is void unless the following requirements are met:

1. Temperature protection circuit is wired so as to positively disconnect power to the motor when excessive winding temperatures are sensed. See section 1.6.1.2f for wiring instructions.

2. Proper extra-quick-trip overload protectors, as described in Section 1.6.1.2e, must be used on all three phases of each motor.

3. Optional conductivity probe circuit (if used) is wired to a relay specifically approved by HIDROSTAL for use with these motors. See section 1.6.1.3g for wiring instructions and a list of approved relays.

4. Any repairs must be made exactly as per instructions in this manual, and using only genuine HIDROSTAL replacement parts furnished through the HIDROSTAL distribution organisation. Use of any other parts (even - and especially - O-rings) will void the HIDROSTAL warranty.

   Prior to shipment, each pump has been tested by the factory for proper mechanical and electrical operation as well as absolute water-tightness of the motor housing (by pressure tests). Disassembly of the pump by other than official HIDROSTAL service centers may cause loss of any remaining warranty.

   HIDROSTAL will not assume responsibility for damages to the pump that have been caused due to not following instructions in this manual, nor for consequential damages of any kind.

SERVICE MANUAL FOR INSTALLATION AND OPERATION FOR Q-TYPE SUBMERSIBLE PUMPS

1.2 DELIVERY AND RECEPTION OF PUMP UNIT

Prior to signing and shipping documents, inspect the shipment for shortages or damages. Special attention should be given to the power cables and cable entry assemblies to make sure that they are not damaged. Report any discrepancies to the carrier. Use the lifting eyes to transport the pump. DO NOT lift pumps or pull them by the power cable. Doing so may break the hermetic seal at the entry assembly, possibly allowing moisture to penetrate into the motor, causing damage at start-up.

1.3 STORAGE

If the unit is not to be installed immediately, store in a dry and clean place without extreme changes in temperature. Make sure that storage room temperature stays within motor ambient limits of -10 to +40° C (14 to 104°F). The shaft must be rotated by turning the impeller once every two weeks to ensure positive coating on the lubricated surfaces and to prevent sticking of surfaces due to rust or oxidation. Do not store in a location where the pump would be subject to vibrations, otherwise brinelling of the bearings could occur.

SERVICE MANUAL FOR INSTALLATION AND OPERATION FOR Q-TYPE SUBMERSIBLE PUMPS

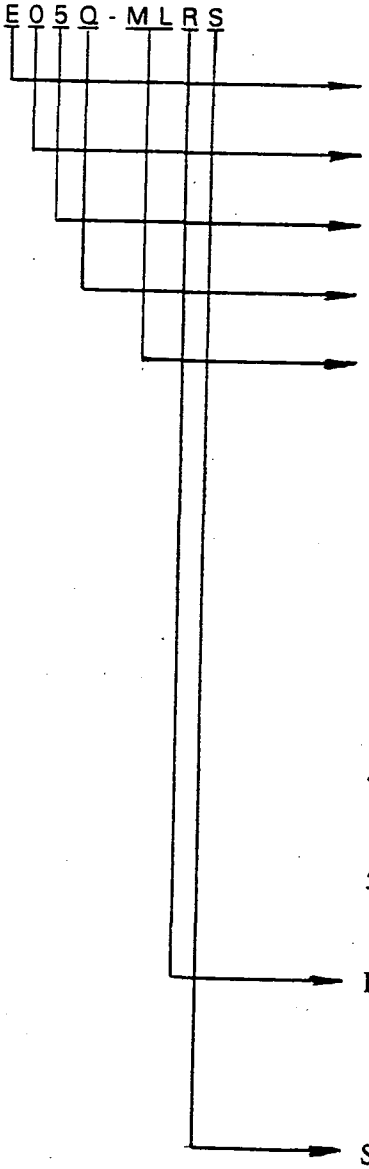
1.4 TYPE CODE EXPLANATION

The type code is found on the first lien of the pump name plate.

Example:

E05Q-ML1	+	**ENYP6-MNGQ**	+	**NYA1-10**
hydraulic code		motor code		cable code

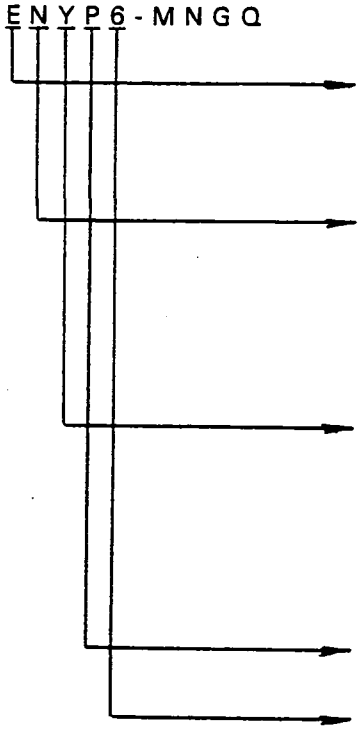
Hydraulic Code:



- hydraulic size (B,C,D,E)
- discharge flange size (in inches)
- impeller type (Q)
- impeller size
- material:
  - 1 = standard pump: all castings of grey iron (GG20), except impeller of nodular iron (GGG60).
  - 2 = Advanced wear resistance: liner of hi-chrome, other parts as 1.
  - 3 = for improved wear resistance: casing and suction casing same as 1, impeller of stainless steel (AISI 316), liner and wear-ring of Hi-chrome.
  - 4 = for improved wear and corrosion resistance: same as 3, except with hi-chrome impeller.
  - 5 = corrosion resistance: all wetted parts of stainless steel.
- R = "regulable" construction: impeller clearance adjustable by three external screws (Absence of "R" in code implies impeller clearance is adjustable by shims).
- S = special execution

SERVICE MANUAL FOR INSTALLATION AND OPERATION FOR Q-TYPE SUBMERSIBLE PUMPS

Motor Code:



Identification letter of the hydraulic size to which this motor can be assembled.
Sizes are : B,C,D,E

Identification letter of the **cooling type** of this motor.

N = Submersible: cooled by direct transfer of heat from submerged stator housing to surrounding ambient liquid.

motor size, according IEC norms:

Size:	Z	Y
IEC:	80	100

motor construction classification

motor speed

	Nominal Speed	
	50 Hz	60 Hz
2 - 2 pole motor	3000	3600
4 - 4 pole motor	1500	1800
6 - 6 pole motor	1000	1200
8 - 8 pole motor	750	900

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Motor Code Continued:

E N Y P 6 - M N G Q

Lower Mechanical Seal Pos. 515 (Pump Side) Type

C	=	Fitted with carbon-ceramic seal faces. Recommended for handling water, activated sludge and non-abrasive liquids.
M	=	Tungsten carbide - silicon carbide seal faces, rubber boot around springs. For sludges, slurries and abrasive liquids.
V	=	Fitted with converted carbon faces, for moderately abrasive liquids only.
U	=	Fitted with converted carbon faces against ceramic, for moderately abrasive liquids only.
X	=	Tungsten carbide - silicon carbide seal faces, stainless steel shell for higher pump pressures and/or higher motor speeds.

Electrical Classification:

N	=	Normal, per IEC IP68 norm, with moisture probes in seal chamber.
X	=	Explosion proof, per IEC: EEx d 11, B T3 (T4).

Voltage of Winding (see also voltage stamped on nameplate):

A	=	230/460 V	60 Hz
E	=	400 V	50 Hz
G	=	415 V	50 Hz
K	=	575 V	60 Hz
1	=	220/230/240 V	50/60 Hz single phase
2	=	220 V	50 Hz
3	=	380/415 V	50 Hz
S	=	special voltage	

Q	=	Q-hydraulic
K	=	K-hydraulic

Cable Code

N Y A I - 1 0

factory code (not important for instruction)

length in metres

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1.5 INSTALLATION

Wet Pit Pumps

All building and technical construction work must be finished before the pump can be installed. The overall dimensions of the pump unit can be obtained from the corresponding dimension sheets. Before beginning to install the pump make sure that length of motor cable supplied is sufficient for local conditions.

For installation and servicing it is recommended a block and tackle or chain hoist is installed over the pump sump (or at least make sure there is the possibility to install one later on). Furthermore there should be a water supply of about 70 psi (4 bar) pressure to wash down the pump when removed from the sump. During the installation of the pump make sure that the free ends of the cables **NEVER CONTACT WATER.**

1.5.1 Installation of Pump Guide System (see fig. 3)

a) Fasten the upper guiderail bracket to the sump hatch structure. Be sure to leave enough space between guide pins and hatch structure so pump shoe can clear the structure.

b) Check that the sump floor where the discharge stand is to be placed is even and level; smoothout if needed. Fasten the discharge stand to the sump floor with cast-in-place or expansion-type bolts and nuts so that the guide rail pins or recesses on the discharge stand are vertically in line with (i.e. directly below) the guide rail pins on the upper bracket.

c) The guide rails should be made from galvanised standard (or stainless steel) pipe. Cut pipe to the correct length. Put lower pipe ends in discharge stand guiderail pins or recesses. Unbolt upper guide rail bracket. Insert pins into upper pipe ends and re-bolt it. Check to see that the guide rails are exactly vertical and parallel.

d) The discharge pipe must be connected without stress or misalignment to the discharge stand. If a check valve is installed close to the pump, air must be vented from the pump casing or discharge piping (before the check valve) during first start-up and at any other time that the pump may run dry, to ensure priming. See Section 1.8 for one convenient connection on the pump for venting air.

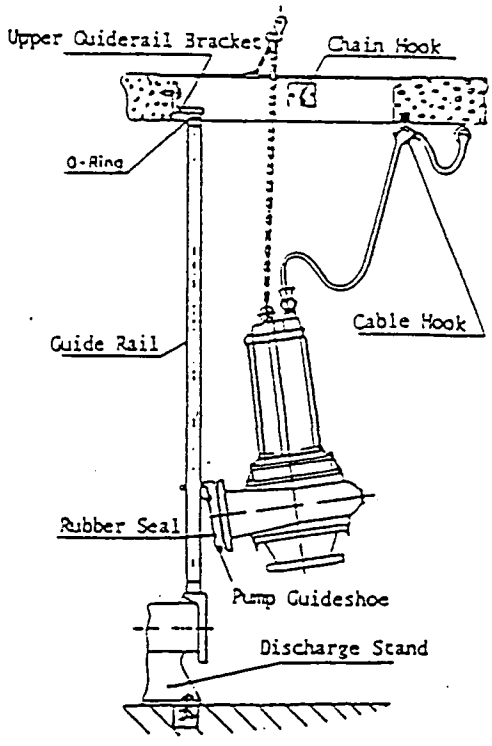

Fig. 3

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1.6 ELECTRICAL CONNECTION

The motor winding leads will be factory-connected inside the motor to the cable, to match customer specifications regarding electrical current characteristics. These characteristics are marked on the nameplate.

Make sure that the power supply to the control panel is the same as on the pump nameplates. These motors can tolerate a voltage of +/- 5% from nameplate voltage with no adverse effects. From 5% to 10% lower voltage, there may be a slight diminishing of hydraulic performance and a slight increase in amperage, but no harm to the motor. For voltages lower than 10% of rating, severe performance drop and excessive draw (with motor overheating and nuisance trip-outs) can be expected. Since this will cause considerable operating problems this situation should not be allowed to exist. The motor ratings shown on the nameplate are for ambient temperature (liquid and air) of up to 40°C. For higher temperatures, contact factory.

All electrical connections are made according to diagrams shown at the end of this manual.

1.6.1 Panel Controls

1.6.1.1 Operator Safety

Prior to any work on the pump or motor, the power supply to the unit must be disconnected in a safe manner either by means of a locked isolator or by removing the fuses from the panel. It is not safe enough to just switch off the control switch because a wiring mistake or a control system malfunction could put the motor back into operation.

1.6.1.2 Minimum Requirements

For proper operation and protection of the pump, the control panel must contain the following components:

a) **Isolation switch,** preferably lockable.

b) **Slow trip fuses or circuit breakers,** in each incoming phase.

c) **Lightning protection,** lightning arrester on each incoming phase, if there is any possibility of lightning damage.

d) **Motor Starter,** full-voltage magnetic-contact starter should be sized according to local electrical code requirements based on motor power rating.

e) **Extra quick trip overload protectors,** the overload protectors must be selected according to the amperage indicated on the nameplate of the motor. The protectors must be trip within 6 seconds or less on locked rotor condition (approximately 6 time full load amps) in order to adequately protect the motor windings; consult "trip curve" of overload protectors to ensure they meet this requirement.

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CAUTION

Warranty on submersible pump motor is void unless proper extra quick trip overload protectors are used on all three motor phases as specified above. Claims for warranty repairs of motors must include documentation that proper overload protectors have been installed.

f) **Temperature sensor circuit**, each motor is manufactured with temperature limit switches in the winding-head (connected to control leads 1 and 2).

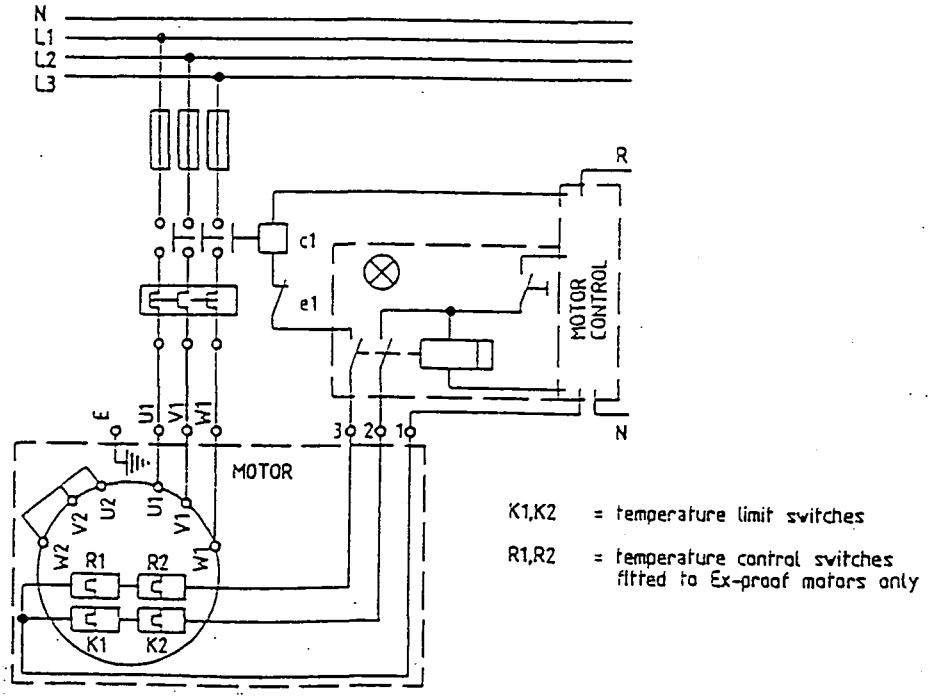
The temperature limit and control switches are Bimetal type (similar to "Klixon"). They can be connected directly into the motor control circuit, as long as this circuit does not exceed 220/240 volts, 2,5 amps.

In addition, explosion-proof submersible motors have a second set of temperature control switches (connected to control leads 1 and 3). This explosion-proof temperature control will disconnect 12 to 15° C before the temperature limit switches will disconnect.

CAUTION

Warranty is void if these leads are not connected to immediately de-energise the motor when the circuit is opened due to motor overheating.

For all submersible motors, the control leads 1 and 2 can be connected in such a way that the pump can automatically re-start after the motor cools down and the circuit is re-closed. Thus, a motor temporarily overheated due to emergence from its cooling water can resume operation as soon as the cooling water returns to submerge the motor. For explosion-proof submersible motors, the temperature controller circuit leads 1 and 3 can be connected in the same manner, but the temperature limit circuit leads 1 and 2 must be connected in such a way that the pump cannot automatically restart, even after these temperature limit sensors have cooled and re-closed the circuit, because the reason for the failure of the temperature controller circuit to disconnect first must be determined and corrected before the motor is put back into service.



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NOTE: Note that the temperature sensors will only de-energise the motor when gradually overheated due to electrical malfunction. These devices are not a protection for quick temperature rise due to overload such as a locked rotor condition and thus are not a sufficient substitute for the overload protectors specified in (e) above. The motor control circuit leads 1 and 2 (and 1 and 3 for ex-proof) must be connected, to ensure that power to the motor is immediately disconnected when any of the devices in this circuit sense abnormal conditions.

1.6.1.3 **Recommended Additional Controls**

a) "Hand - off - automatic" switches

b) Low voltage terminals for level switch

c) Pump-on and pump-failure lamps

d) Hours run meter, important to schedule service

e) Change-over switch, for multiple-pump stations.

f) **Alarm-System for high sump-level:** Preferably on a separate power supply, to ensure continued protection in the event of a main power supply failure.

g) **Moisture probe in seal chamber:** When connected to a suitable resistance-sensitive relay, the moisture probe in the oil chamber between the lower and upper mechanical seal can detect moisture in the oil, which could indicate failure of the lower seal. The relay should activate a suitable alarm to bring seal failure to the attention of the operator, who should then repair the lower seal as soon as possible. The pump will continue to operate even after failure of the lower seal (because the upper seal keeps water out of the motor); therefore, it is not necessary to have this relay shut the pump off.

CAUTION

The "Q"-series of submersible pumps are fitted with a moisture probe as standard. If client chooses not to connect probe to a suitable relay, Hidrostal will not accept warranty for additional motor repairs resulting from seal failure.

The following relays have been approved for use with HIDROSTAL motors:

1. Ziehl NS1
2. Fanal TR003 (NW)
3. Schiele ENN
4. Warrick 6B1FO or 6B2FO (USA)
5. Chromalock-LCA.

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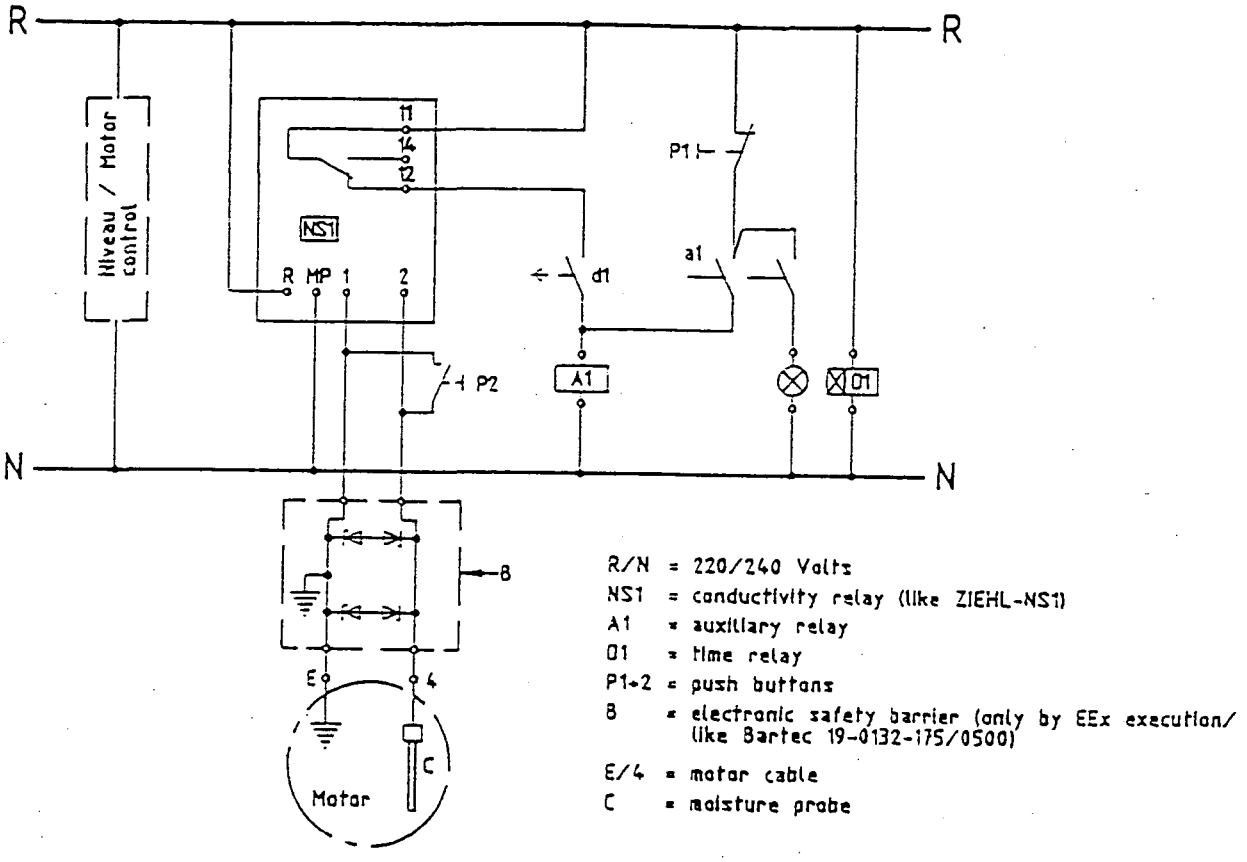
Suggested wiring diagram for moisture probe in seal chamber.



Description of Operation

The relay should be used to provide a visual indication only, there is no need to trip-out the motor. Experience has shown that motor-side seal alone will protect the motor against the ingress of moisture for a significant period of time. Once the failure light has switched-on, arrangements should be made for a service engineer to inspect the pump as soon as possible, say within one week.

The moisture detection system works by having a probe in the oil chamber. A voltage, not exceeding 24 V, is applied across the probe and the motor body (earth). When the chamber is full of clean oil, the oil acts as an insulator and no current flows.

In the event of a seal failure water will enter the oil chamber and mix with the oil until a point is reached whereby the insulation properties of the oil are reduced to a level which permits current to flow between E and 4. This condition should then produce an electrical pulse which will switch on the failure light. The electronic relay should ensure the light stays on independent of conditions in the oil chamber until reset button P1 is pressed. This is a necessary feature, otherwise the light could be switched on and off as water settles/mixes in the chamber.

In order to avoid getting a false reading on the indicator light at the instant the power is switched-on, we recommend a time delay D1 be incorporated in the indicator light circuit.

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NOTES: If P1 is pressed when the motor is stopped and the light goes out, it indicates only a small amount of water is present in the chamber and has probably settled to the bottom, however if the light stays on the water quantity is significant and the pump should be attended to as soon as possible.

Reset button P2 is purely to check if the system is operative and should illuminate the indicator light if everything is in order.

WARNING

This moisture detection system normally operates on an open-circuit and requires closure of the circuit to indicate a failure of the seal system, as a consequence it is NOT A FAIL-SAFE SYSTEM. Should one of the connections become loose or a cable is broken the system would still be an open circuit indicating no water was present in the oil chamber when the opposite could be the case.

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1.6.2 Connection Tabulation

Each cable set provides three or six power leads per speed, one earth lead and additional leads for temperature protection and seal failure circuits.

To connect the motors to the power supply it is not necessary to open the motor. This should be avoided in order to retain the original factory-hermetic seal. If the sealing of the motor cover is disturbed, tightness tests must be performed as per section 2.4 in this manual.

Power and control leads are marked according to the following table:

MOTORTYPE	number of speeds	number of conductors (a)	winding connection	old VDE 0570 denomination	markings on cable end, according new DIN 42-401 norms
up to 4 kW direct start	1	3+C	Y	U V W	U V W
over 4 kW star/delta start	1	6+C	Δ	U V W Z X Y	U1 V1 W1 W2 U2 V2

NOTES:

a) C = control leads and earth

for normal motors:

temperature protection circuit	1 to 2
seal failure circuit (optional)	E to 4
earth	E (yellow-green)

for EEx (explosion proof) motors, with two-level temperature protection circuits:

lowest temperature (warning)	1 to 3
highest temperature (shutdown)	1 to 2
seal failure circuit (optional)	see note
earth	E (yellow-green)

NOTE: on EEx, seal failure circuit will always be in a separate cable originating near bottom of motor. Cable set code (S01-10) for 10m cable length.

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1.6.3 Level Switches

It is recommended to use an intrinsically safe circuit for the level controls, for explosion-proof installations.

For the on and off levels, use control systems that are appropriate for the pumped liquid.

Use a floating-ball type switch for the high-level alarm, even when there is another type used for the pump control (this has proven to be the most fail-safe type).

The floating ball for the alarm should be placed at a reasonable distance above the highest pump start level to avoid false alarms.

1.6.4 Level Control

"ON" and "OFF" levels must be set in such a way as to provide sufficient sump capacity between ON and OFF so that in the most unfavourable case (feed 50% of pump output) the pump cannot be switched on more than 10 times per hour. Higher starting frequency may damage the motor control devices in the panel and will cause excessive power consumption. The following formula will calculate the required minimum sump capacity:

$$V = \frac{0.9\ Qp}{Z}$$

where V = sump capacity or volume, between on and off levels (in cubic meters)
QP = pump flow (one pump), in litres/second
Z = number of starts per hour (recommended Z = 10, maximum)

1.6.5 Required Submergence

Hidrostal submersible motors are rated to operate continuously at maximum output kW, when fully submerged in liquid of 40°C or less (if pump design or other installation conditions require the motor to operate without full submergence for long periods of time, a Hidrostal "IMMERSIBLE" motor – with self-contained cooling – is a better choice). However, with a Hidrostal "SUBMERSIBLE" motor, it is permissible to place the shut off level below the top of the motor – to reduce sump depth and associated construction cost – if the following points are considered:

1) The exact time that a submersible pump will run without being submerged in cooling liquid – before the temperature control circuit trips out – is very difficult to predict (factors include ambient air and liquid temperatures, how much the particular impeller loads the motor, and even where on the pump-curve the pump is operating). However, the following times are approximate maximum run times for a fully-loaded motor previously running fully submerged in 15°C liquid, and suddenly running in 40°C air:

motor size Y: 5 minutes dry run time
motor size Z: 7 minutes dry run time

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Therefore, the sump should be designed to ensure the pumps will not run dry longer than above, under normal conditions.

(If, as is typical, the motor is not fully loaded by the pump impeller, the actual dry-run times may be somewhat longer.)

2) Under unusual conditions, where the motor does run in air for a longer time (for example where sump inflow exactly matches pump discharge), the motor will be shutoff by its temperature control circuit with absolutely no harm to the motor. The most important part of sizing the sump, is to ensure there is sufficient volume to contain the incoming liquid during the time that the pump takes to cool down enough to re-start. Approximate cooling down times for various size motors are as follows (assuming typical sewage conditions: maximum liquid temperature of 15°C):

Motor size Y: 3 minutes to re-start
Motor size Z: 4 minutes to re-start

1.7 FLUSHING WATER CONNECTION

Pumps are supplied with a flushing water connection (service connection "F", Fig. 6).
For normal sewage application this connection is not used. However, in special cases when pumping high concentrations of solids with a tendency to dehydration or sedimentation, such as high concentrations of sludge or mud, there should be a connection to cleaning water. This connection will conduct cleaning water between the impeller and the lower mechanical seal (515), providing periodic removal of accumulated solids.

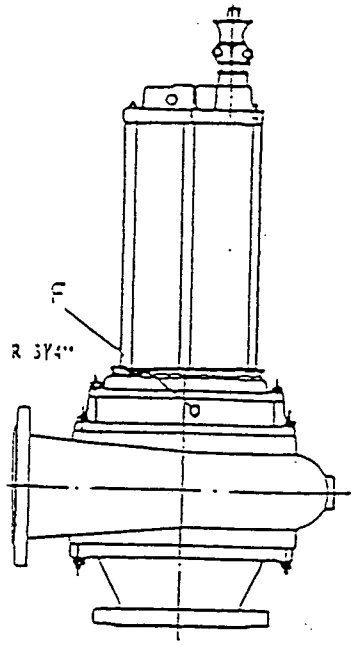

Fig. 6

Flushing water must be pressure-regulated between 7 and 14 psi (½ to 1 bar) above pump discharge pressure. Typically, water is controlled by a solenoid valve on a time clock. Adequate duration of each flushing is 60 seconds; frequently of flushing must be established for each different installation, starting with once per day.
The quantity of flushing water varies according to pumpsize and application: in most cases, flowrates of 6-8 l/min. will be sufficient.

Alternatively or even in addition to the above function, connection "F" may be used to manually bleed the air from the casing prior to start-up, as per Section 1.5.1d, if there is no other place for air to escape through the discharge piping.

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1.8 OPERATING TROUBLES

1.8.1 Possible Reasons

	No flow	Flow not sufficient	Head not sufficient	Reduction of flow or head after start up	Vibrations	Motor overload	Motor does not start
1. RPM too low	X		X				
2. RPM too high					X	X	
3. Air entrance into suction line (flanges not tight)	X	X		X	X		
4. Discharge line clogged / Valve closed	X				X	X	
5. Air or gas in pumped liquid	X	X	X	X	X		
6. TDH too high	X	X			X		
7. Suction head too high				X	X		
8. Not sufficient suction head on hot liquids		X			X		
9. Insufficient submergence of suction	X	X	X	X	X		
10. Sludge concentration higher than assumed		X	X			X	
11. Specific weight of medium higher than assumed						X	
12. Impeller or suction line clogged	X	X			X		
13. Wrong direction of rotation	X	X	X		X	X	
14. Impeller clearances too high		X	X				
15. Damaged impeller		X	X		X		
16. Thermal overloads tripped; control switch off							X
17. Motor damage					X	X	X
18. Low voltage		X	X			X	X
19. Humidity switch tripped							X
20. Attachments loose					X		
21. Coolant loss							X
22. Bearings worn out					X		
23. Impeller out of balance					X		
24. On-level switch not overflowed, or damaged							X
25. Impeller too small			X				
26. Impeller dragging against suction cover					X	X	
27. Thick sludge and tight impeller clearance						X	
28. Air or gas on impeller backside	X		X				
29. Pump is not vented	X						

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2. MAINTENANCE AND SERVICE

2.1 GENERAL

Before doing any work on the pump unit, switch off main isolator switch (making sure that it cannot be switched back on) or remove fuses from panel.

The following checks in Section 2.2 can be done in the field. When a repair is indicated as a result of these checks, send the pump unit to your nearest authorised Hidrostal service station.

CAUTION

When disconnecting the power cable at the control panel, take care that the cable ends CANNOT come in contact with water. Replace the plastic cable-end originally shipped with the pump – (or if these are no longer available, wrap the cable ends inside a plastic bag, and seal with tape) for water-tightness during handling and shipping

2.1.1 Cooling Types

HIDROSTAL submersible motors must be operated submerged in the liquid for continuous duty. (Second digit of motor code gives the cooling type, see section 1.4).

SUBMERSIBLE COOLING - CODE "N"

This type (Fig. 7) transfers motor heat directly through the stator housing to the surrounding ambient liquid.

KEY FOR SYMBOLS ON FIG. 7:

MOT	=	Stator housing plug
OIL	=	Oil drain plug
F	=	Flushing connection (see section 1.7)

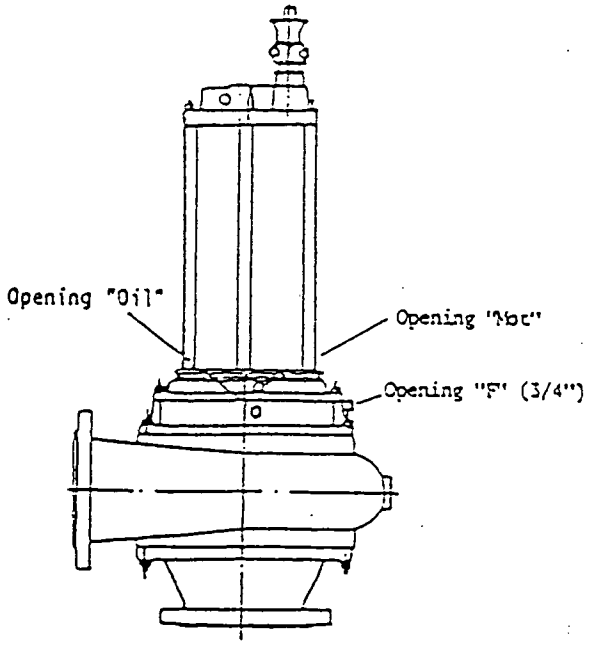

Fig. 7

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2.2 FIELD TESTS

2.2.1 Visual checks after pulling pump unit from sump

a) Check pump and motor for possible mechanical damage. Paying particular attention to the cable.

b) If pump volume or pressure are not acceptable, check factory-set impeller clearance, according to Section 3.1.

c) Check overload relay, contactors, fuses and time relays (if any) for correct setting.

d) Check correct function and condition of level control.

e) Check insulation resistance of motor windings and cables with a high-voltage ohm-meter ("megger"). This initial test should be made from the point where the cables attach to the motor starter. Check from each winding lead to the other two winding leads and to the ground lead.

INSULATION CHART		
CONDITION OF MOTOR AND CABLES	OHM VALUE	MEGOHM VALUE
A new motor.	2,000,000 (or more)	2
A used motor which can be re-installed in the well.	1,000,000 (or more)	1
MOTOR IN PIT. Ohm readings are for cable plus motor. A motor in the pit in reasonable good condition.	500,000-1,000,000	0.5-1.0
A motor which may have been damaged by lightning or with damaged leads. Do not pull the pump for this reason.	20,000-500,000	0.02-0.5
A motor which definitely has wet or damaged cable or windings. The pump should be pulled soon and repairs made to the cable or the motor dried and replaced. The motor will not fail for this reason alone, but it will probably not operate for long.	10,000-20,000	0.01-0.02
A motor which has failed or with completely destroyed cable insulation. The pump must be pulled and the cable repaired or the motor replaced. The motor will probably not operate for long.	Less than 10,000	0-0.01
A motor which has failed or with completely destroyed cable insulation. The pump must be pulled and the cable repaired or the motor replaced. The motor will not run in this condition	0	0

Any reading less than 1.0 Megohm could indicate failure of cable or winding insulation (See "Insulation chart"). If failure is indicated, remove pump with cable and proceed to section 2.4 of this manual for further tests.

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2.2.2 Stator Housing Test

This test consists of a check on the condition of the upper mechanical seal and/or stator housing "O"-rings.

Stand pump vertically on its suction flange. Remove plug "MOT" (see Fig. 7,8 or 9) with copper washer (536) from stator housing so that any liquid can run out. Do the following repairs according to what comes out of the stator housings:

WATER	=	General overhaul with change of bearings and seals
MIXTURE WATER/OIL	=	General overhaul with change of bearings and seals
OIL	=	Change upper mechanical seal, part (516)
NO LIQUID (DRY)	=	Stator housing is OK. No Defect.

CAUTION

It is critical to ensure that this plug is completely watertight. Sealing surfaces must be clean and smooth before assembly. Heat new copper ring to dull red and immediately quench in water to soften copper ring for best seal. All copper rings supplied as new spare parts by Hidrostal are pre-softened.

2.2.3 Oil Checking on Submersible Motors

This is a check on the condition of the lower mechanical seal. For pump units supplied with a moisture probe, total failure of the lower seal will be indicated by activation of the resistance relay. However, even with this circuit, a slow failure can be detected earlier by the following oil check.

For pump units without the conductivity probe circuit, the following check is the only way to determine condition of the lower seal.

Oil checking must be done after the first 1,000 hours of operation and once a year thereafter.

Immediately before checking, run the pump for a few minutes to distribute any impurities throughout the oil. Raise the pump out of the sump and clean it with a water hose. Perform the following:

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Level Check

Stand pump with shaft vertical, and remove plug marked "oil". Coolant level should be close to level of plug "oil".

If coolant is far below this level, the lower mechanical seal may have leaked and may require replacement. Proceed to Section 3.1.4 and 3.2.1 of this manual. If oil level is only a small amount below these levels, proceed with oil quality test described below and if oil is clean top-up with new oil and re-check in 200-500 hours. See Fig. 10 for levels and actions.

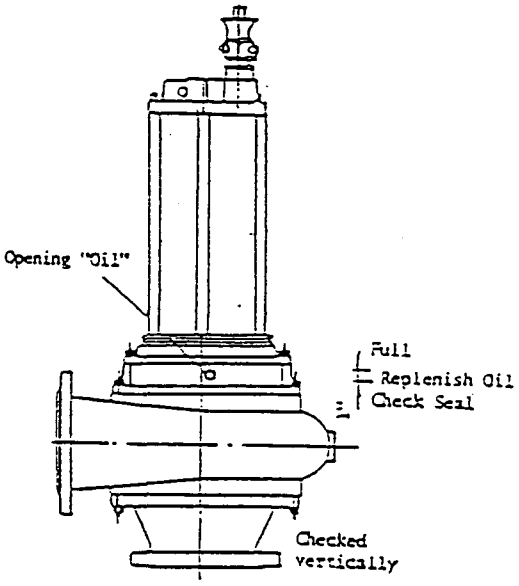

Fig. 10

Oil Condition Check

Lay pump down horizontally with plug "oil" (536) upwards. Remove plug "oil". Insert a tube or rubber hose, place a finger over top of tube and remove it with a small sample. Deposit sample in a glass and repeat this procedure until a sufficient quality has been collected for observation. Evaluation will show one of three conditions:

a) If oil is clear there are no problems with the lower seal. Fill oil back in again to level of plug with pump vertical, and close opening "oil" with plug and a new copper seal. The copper sealing washer must be softened as follows: heat to dull red and quench immediately in cold water. Note: all copper seals supplied by Hidrostal are pre-softened.

b) If there is just a little water in the oil but the oil is clean, repair of the pump is not necessary. The oil is re-usable after the water has been separated from the oil. Remove all oil as per Section 2.2.3.1 in this manual, and separate water from oil.

Pour back the clean oil into the mechanical seal housing to level of plug with pump vertical and close opening with plug "Oil" with copper seal (536), softened as in point (a), above. However, check oil quality again after 500 hours of operation.

With a new mechanical seal (515) it is possible that during the run-in period a small amount of water could enter into the oil chamber. Thus, if at the first check after start-up a small quantity of water is detected, it can be neglected.

Oil with a small amount of water will be milky in appearance, but will still be of very low viscosity, that is, it will still run much more freely than motor oil, almost as thin as kerosene.

c) If too much water has entered the oil, the viscosity will be much higher, then oil will be as thick as motor oil or even thicker. In this case, or when sludge or sewage smell are detected in the oil, the lower mechanical seal (515) must be repaired or replaced as per Section 3.1.4 and 3.2.1 in this manual.
For oil removal as indicated in (b) above or for oil removal prior to a major repair, refer to Section 2.2.3.1.

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Replace oil with new oil only if strongly contaminated, otherwise separate water from oil and re-use oil. Required oil must be extremely low viscosity. Factory uses the following oil:

Specific gravity at 20°C	0.812 g/ml
Viscosity at 20°C	6.75 mm2/s (cst)
Viscosity at 40°C	3.52 mm2/s (cst)
Solidification point	-38.0°C
Flash point	132.0°C
Burning point	142.0°C
Evaporation energy	251.0 kJ/kg
Solubility in water	none

Other recommended oils:

Shell Pella A or S5585, Gulf mineral seal oil 896 or others with equal specification as above: The specified low viscosity is very important for proper cooling.

2.2.3.1 Oil Change

Remove plug "oil" (536) and drain oil chamber housing (504) completely, by turning the pump around slowly until plug "oil" is upside down (see Fig. 12). On motor sizes 3, 4 and 5 there may be another plug directly below the "oil" plug on the backplate (507) close to the flange that attaches the pump casing to the motor; opening this plug will help remove the last bit of oil (see Fig. 12).

When the oil chamber housing is completely empty stand pump vertically or on suction flange and refill with separated oil or new oil of correct specification. The correct level is reached when the oil is at the bottom of plug "oil" with motor vertical.

Re-install plug "oil" with copper ring.

NOTE: Whenever installing new copper ring, first heat dull red and quench to soften.

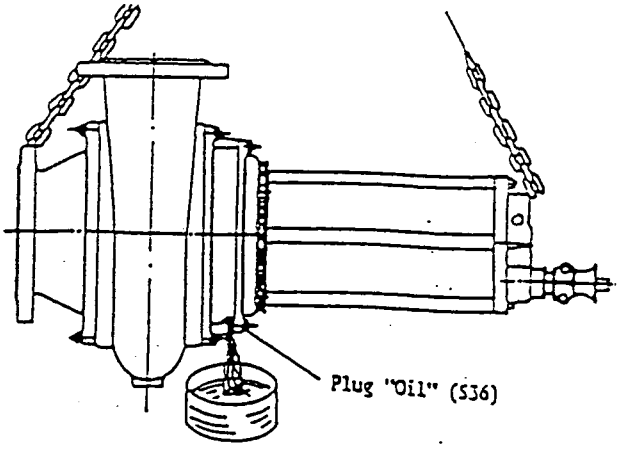

Fig. 12

SERVICE MANUAL FOR INSTALLATION AND OPERATION FOR Q-TYPE SUBMERSIBLE PUMPS

2.3 LUBRICATION

Hidrostal motors use bearings which are grease lubricated. For re-lubrication, grease is handpacked into the bearings when the motor is disassembled during a major overhaul. Sufficient grease is provided initially and at each overhaul to allow for the number of operating hours between overhauls specified in the "Overhaul Chart", Figure 14. We suggest the overhaul should be done by an authorised Hidrostal service centre.

CAUTION

The overhaul of ex-motors must be done in factory or in an authorised Hidrostal service centre, otherwise the ex-certification will be invalidated.

No other lubrication service is required between overhauls for these motors.

For regreasing we recommend:

STABURAGS NBU 8 EP by Kluber-Lubrication.

This grease is of a mineral oil base containing a barium complex as thickener.

Typical characteristics:

Colour	beige	
Apparent dynamic visco. (approx.)	6000	mPas
Operating temperature range	-30..150	°C
Max. temperature (short time)	170	°C
Consistency class (NLGI)	2	
Penetration DIN ISO 2137 (0.1 mm)	280	
Dropping point DIN ISO 2176	> 220	°C
Corrosion protection DIN 51802	0	
RPM-parameter (n x d m)	5×10^5	

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2.4 MOTOR CABLES

NOTE: Whenever opening motor housing, it is imperative that all O-rings have to be replaced with new items supplied from HIDROSTAL. In particular, we have found that O-rings glued-up from bulk stock are totally unsatisfactory for this critical application; the glued joint will inevitably leak water into the motor after a few weeks.

If "megger" tests conducted through the cables in the field per Section 2.2.1 showed insufficient insulation resistance, and if humidity relay has not tripped (continuity exists between lead 1 and 2), it can be assumed that the insulation failure is in the cable rather than in the stator. Remove fasteners (509) and carefully lift off cable cover.

Cut the leads between cable and winding and now make a separate "megger" test on cable and winding. If windings are at fault, send the entire motor to the nearest authorised Hidrostal service station. If cable is at fault, a new cable set can be installed.

2.4.1 Re-connection of Cable

Place a new O-ring (525) into position around the seal face on cover (500). Cables should be re-connected to the winding leads, using new insulated splices. Take care that this insulation is rated for 110°C.

2.4.2 Test for Leaks

Before putting the pump back into operation after opening of the motor (as when changing cables), a test for leaks in the motor should be carried out as follows:

Connect source of dry air (from air compressor or bicycle hand pump) to opening left by removal of plug "Mot.". (Fig. 7). Air pressure should be a maximum of 0.5 bar (7 psi). Motor should then be totally submerged in a test tank.

CAUTION
Do not immerse loose end of cables.

If any continuously escaping bubbles are detected, motor cover is not water-tight. The preceding procedure for cable installation should be repeated to eliminate leaks.

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2.5 OVERHAUL CHART 50/60 HZ MOTORS

Submersible Motors

Motor type	Motor side seal	Pump side seal	seal oil lit.	Impeller bolt size	Hours between regreasing
BNZA2	25 mm	20 mm	0,7	M10	20'000
BNZA4	25 mm	20 mm	0,7	M10	30'000
BNZP2	25 mm	20 mm	0,7	M10	20'000
BNZV2	25 mm	20 mm	0,7	M10	30'000
CNZA4	25 mm	20 mm	1	M10	30'000
CNZP2	25 mm	20 mm	1	M10	20'000
CNZP4	25 mm	20 mm	1	M10	30'000
CNZV2	25 mm	20 mm	1	M10	20'000
CNZV4	25 mm	20 mm	1	M10	30'000
CNYA2	1 1/2"	1 1/8"	1	M12	20'000
CNYP2	1 1/2"	1 1/8"	1	M12	20'000
CNYV2	1 1/2"	1 1/8"	1	M12	30'000
CNYW2	1 1/2"	1 1/8"	1	M12	30'000
CNYV4	1 1/2"	1 1/8"	1	M12	35'000
CTYA2	25 mm	20 mm	1	M10	20'000
CTYP2	25 mm	20 mm	1	M10	20'000
DNYA4	1 1/2"	1 1/8"	1	M12	30'000
DNYA6	1 1/2"	1 1/8"	1	M12	35'000
DNYP2	1 1/2"	1 1/8"	1	M12	20'000
DNYP4	1 1/2"	1 1/8"	1	M12	30'000
DNYP6	1 1/2"	1 1/8"	1	M12	35'000
DNYV2	1 1/2"	1 1/8"	1	M12	20'000
DNYV4	1 1/2"	1 1/8"	1	M12	35'000
ENYA8	1 1/2"	1 1/8"	1	M12	35'000
ENYP6	1 1/2"	1 1/8"	1	M12	35'000
ENYP8	1 1/2"	1 1/8"	1	M12	35'000
ENYV4	1 1/2"	1 1/8"	1	M12	35'000
ENYV6	1 1/2"	1 1/8"	1	M12	35'000
ENYV8	1 1/2"	1 1/8	1	M12	35'000

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3. MAINTENANCE OF HYDRAULIC PARTS

3.1 IMPELLER CLEARANCE ADJUSTMENT FOR WEAR

After some time of operation, the impeller and suction cover (or liner) may have worn, increasing the impeller gap. The impeller gap should be checked and readjusted whenever a significant decrease in pump performance is noticed, or at least once every year (until a history is developed at each different application to indicate how often adjustment will be required).

Excessive clearance is not desirable especially in the smaller pump sizes, as a greater percentage of total flow can thus re-circulate causing a drop in performance. Conversely, less clearance than the minimum listed can overload the motor and/or cause vibration due to too a great friction between the impeller and the suction cover.

When pumping thick sludges or viscous material, larger clearances may be necessary to avoid friction; larger clearances may actually increase flow capability. Therefore, for thick sludges and high consistency materials, double the clearances in Figure 14 should be used.

Some pumps are easily adjusted by means of a movable liner (421); its position is regulated by three external regulator nuts (422) found on the suction casing (416), volute or casing (400). These pumps are designated "regulable", and include the letter "R" in the pump code on the nameplate. Other pumps have a one-piece suction cover (402) (or in pumps C080, D100 a fixed liner (421)): these pumps are adjusted by changing the thickness of the shims (411) between the motor and the volute casing (400).

Examine your pump for presence or absence of the regulator nuts, and proceed to the corresponding section of these adjustment instructions.

3.1.1 Impeller Clearance Adjustment of "Regulable" Pumps

Loosen and back off hex nuts (413) on end of each regulator nut (422). Now slowly and evenly screw in each large threaded regulator nut just until pump shaft cannot be turned (this will eliminate all clearance between the impeller and the liner). Be sure to take the same number of turns on each threaded regulator nut; this keeps the liner concentric to the impeller.

NOTE: If impeller tip is binding, see section 3.3.6.

Now back off the threaded regulator nut exactly the number of turns specified in the last column of Figure 14 (according to pump size). Holding each threaded regulator nut from tuning, tighten the three hex nuts (413) (this pulls liner (421) away from impeller (401) the required clearance, and also locks the regulator nut in place).

With a feeler gauge, check the actual clearance between impeller and liner (reaching in through the suction of the pump). If the clearance is significantly different than clearance "C" shown in column 2 of Figure 14, it is possible that the wear is excessive or not uniform: disassembly and inspection is recommended.

SERVICE MANUAL FOR INSTALLATION AND OPERATION FOR Q-TYPE SUBMERSIBLE PUMPS

3.1.2 Impeller Clearance Adjustment for Non-"Regulable" Pumps

Adjustment is accomplished by moving the motor inward toward the volute casing. For the following steps it has proven easiest that the casing-suction cover assembly be placed with the suction flange flat on the floor or workbench, and the motor-impeller assembly be removed or lowered into place from above by a suitable hoist.

Loosen all fasteners (419) between motor and volute casing. Remove shims or shim wire.

To estimate correct shim thickness, lower motor into casing just until impeller cannot be turned. Measure gap between motor and volute casing at several places around motor flange and take average. Now add the distance "B" shown in column 3 of Figure 14 to the average gap measured; this will be approximate shim thickness required to obtain correct clearance "C" shown in column 2 of Figure 14.

NOTE: If impeller tip is binding, see section 3.3.6.

Loosen fasteners (419), and place shims of calculated thickness between motor and volute casing. (Shims may be washers of uniform thickness, or U-shaped shimstock - these must be placed under each fastener (419). Thin shims may be a single piece of steel wire - diameter equal to calculated thickness - wrapped all the way around motor, under the studs (419); ends can be bent outward around last studs (419), to avoid overlapping.

Tighten fasteners (419) again, and with a feeler gauge, check the actual clearance between impeller and liner (reaching in through the suction of the pump). If the clearance is significantly different than "C" shown in column 2 of Figure 14, it is possible that the wear is excessive or not uniform: disassembly and inspection is recommended.

If this adjustment procedure does not restore original pump performance, disassemble hydraulic end per following section to examine for uneven or excessive wear on impeller or suction cover/liner, and replace worn parts as necessary.

Pump code	Clearance "C" mm	"B" mm
B08Q/B065	0.2	0.2 - 1.0
C080	0.3	0.2 - 1.0
D03Q/D080	0.3	0.2 - 1.2
D04Q/D100	0.3	0.2 - 1.2
E03Q	0.4	0.2 - 1.5
E0EQ/E05Q/ E125	0.4	0.2 - 1.5
E08Q/E200	0.4	0.2 - 1.5

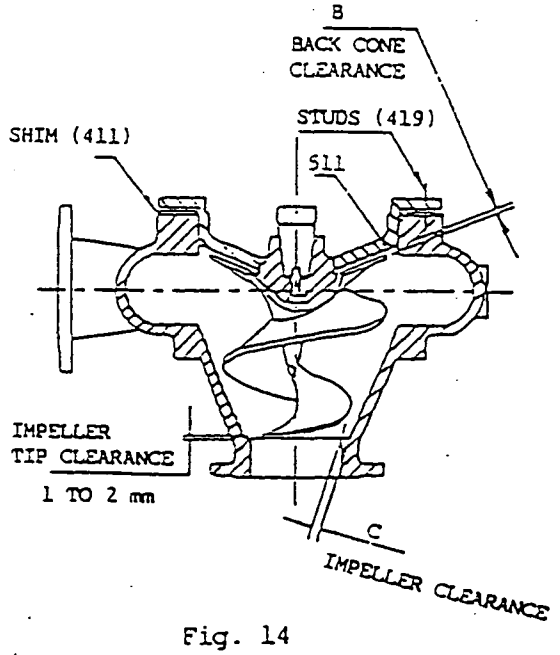

Fig. 14

Note: Clearance "C" should be checked along entire impeller edge, and again after rotating impeller 1/4, 1/2 and 3/4 turns.

SERVICE MANUAL FOR INSTALLATION AND OPERATION FOR Q-TYPE SUBMERSIBLE PUMPS

3.2 DISASSEMBLY OF HYDRAULIC PARTS

3.2.1 Disassembly for Inspection

For the following steps the casing-suction cover assembly should be placed with the suction flange flat on the floor or workbench, and the motor-impeller assembly removed or lowered into place from above by a suitable hoist.

The rotating assembly including impeller and motor can be lifted from the pump casing after removing nuts (419) around the motor flange. Areas to be examined for wear will be the impeller surface (especially the edges) and the conical machined surface in the liner or suction cover. Uniform wear on any of these surfaces can, up to a point, be compensated for by re-shimming or adjusting according to section 3.1. of this manual. However, excessive or uneven wear will require replacement of the worn parts.

3.2.2 Removal of Impeller

Hold the impeller (401) from turning by hand, or by a strap wrench, or by locking pliers clamped to the impeller. Inset a hexagonal key wrench (allen-head wrench) into the impeller bolt (415) and with a hammer, tap the wrench counterclockwise to loosen the bolt.

FACTORY FITTED IMPELLER BOLTS		
SIZE	HEXAGON	TORQUE N - M
M8	6	7,7
M10	8	35,5
M12	10	61,3
M16	14	147,1

NOTE: If torque wrench not available, correct tightness can be approximated by hitting long end of standard "L"-shaped allen-wrench with several sharp hammer blows.

SERVICE MANUAL FOR INSTALLATION AND OPERATION FOR Q-TYPE SUBMERSIBLE PUMPS

3.2.3 Removal of Liner or Suction Cover

a) For C080/D100

These pumps have a non-adjustable liner (421) held in a fixed position inside a one-piece volute casing. This liner can be pressed out of the casing. See Figure 15.

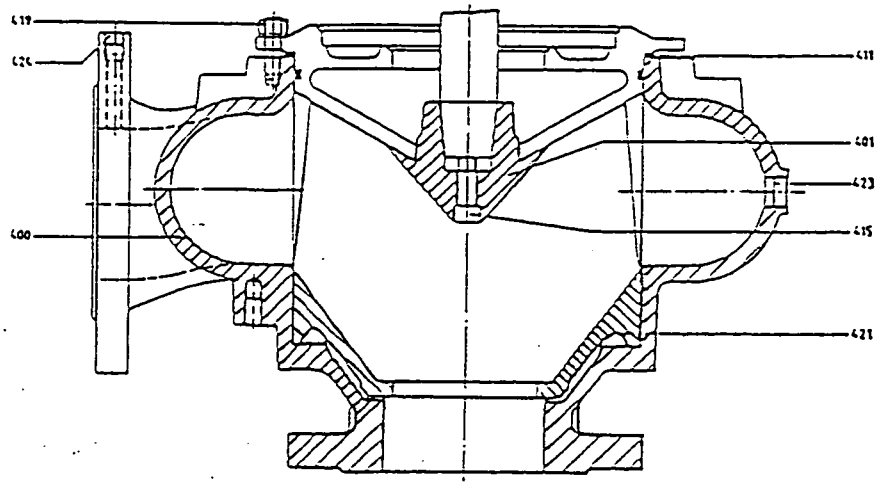

FIGURE 15: C080/D100

b) For all other pumps without "regulable" feature

These pump have a one-piece suction cover (402) which is bolted to the volute casing (400) by studs and nuts (417). Adjustment of clearance is by shims (411) between the volute casing and the motor. Note that on certain models there may be a spacer ring (414) between mating surfaces of the suction cover and the volute casing. When there is excessive wear on the conical surface, the suction cover (402) should be replaced. See Figure 16.

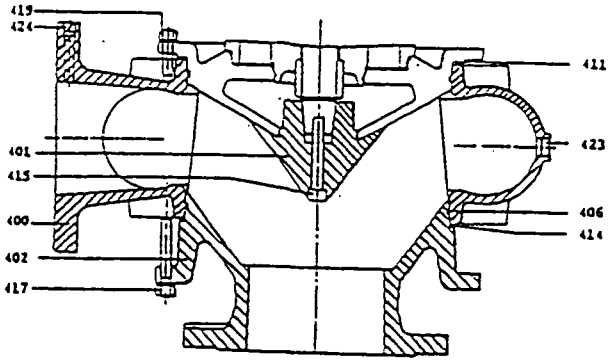

FIGURE 16a: E05Q/E08Q

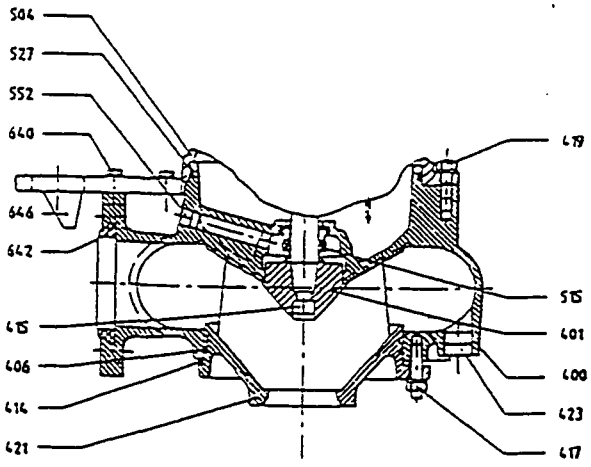

FIGURE 16b: B0BQ/B06S

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c) **For all other pumps with "regulable" feature**

These pumps have an externally-adjustable liner (421), held in place by a suction casing (416) which is bolted to the volute casing (400) by studs and nuts (417). This construction can be recognised by the presence of three large regulator nuts (422) threaded into the suction casing just behind the suction flange.

If the conical surface is worn, only the liner need be replaced. The liner can be removed while the volute casing and suction casing remain attached to the piping, if desired. Alternately, the suction casing may be removed from the volute casing by removing nuts (417), if more convenient.

To remove liner, completely remove small nuts (413) on end of regulator nuts (422), then push the three studs through the holes in the large regulator nuts. If stubborn, the large regulator nuts can be turned all the way into the casing to force the liner out. No attempt should be made to disassemble the regulator studs (413) from the liner until the liner is removed from the pump: they are loctite in place, and must be heated with a torch to break the loctite bond.

The wear ring (408) should not typically require disassembly; remove from suction casing only if badly damaged by unusual circumstances. (It will be necessary to heat the mating surfaces with a torch to destroy the special adhesive between these two parts. Then press out suction ring with a hydraulic press.) See Figure 17.

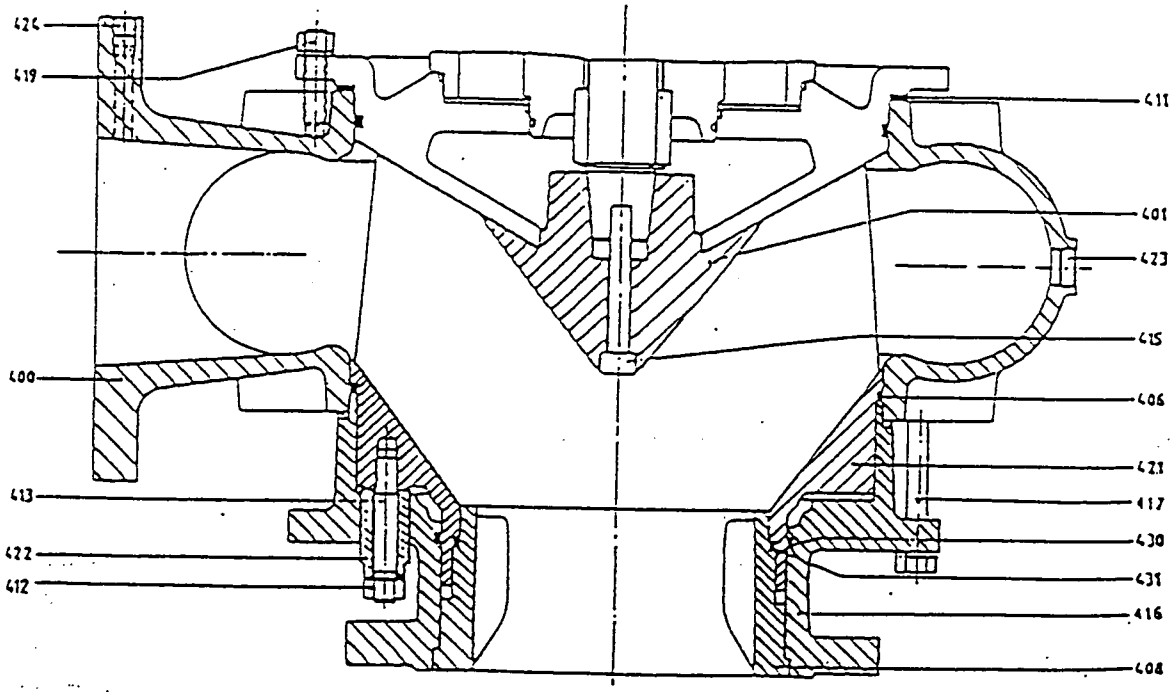

FIGURE 17: E080 Regulable.

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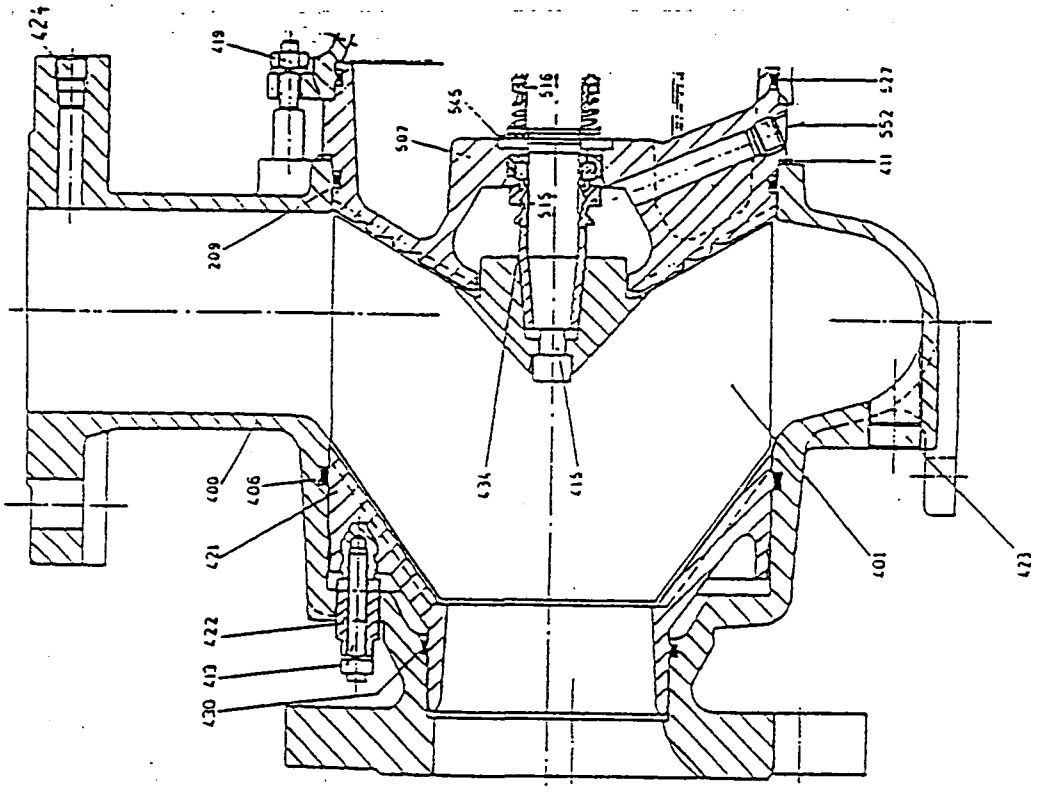

FIGURE 18: C 080 Regulable.

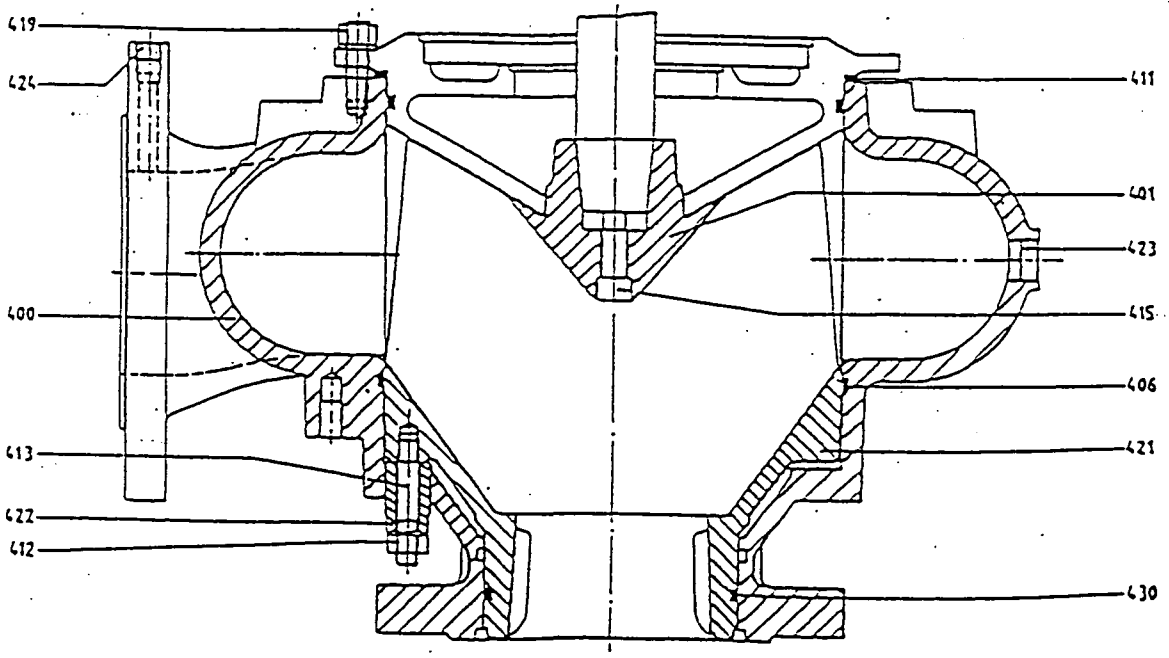

FIGURE 19: D 080 , D 100 Regulable.

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3.2.5 Removal of Lower Mechanical Seal

a) **Exposed-spring type seal - "C"**
(Figure 22)

Remove snap ring (546). Make sure the Woodruff key groove has no sharp edges so that the rubber parts of the seal cannot be damaged as they are removed. Oil the shaft for ease of disassembly. Now the seal rotating parts can be pulled off the shaft by hand.

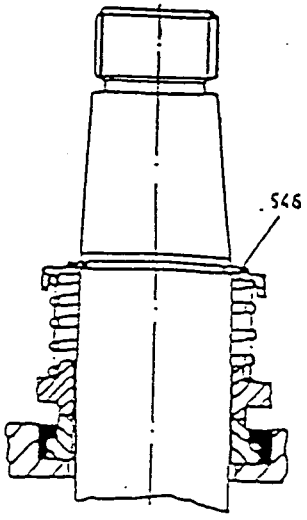

Fig. 22

b) **Rubber-boot type seal - "M"**
(Figure 23)

Remove retaining ring "A" from the rubber boot of the seal by gently prying with two dull-edged screwdrivers on opposite sides, between the rubber boot and the retaining ring (See Figure 24).

CAUTION
Use only dull-edged screwdrivers since sharp edges could cut the rubber boot. Do not twist screwdriver, as this can puncture rubber boot. Rather, lay some convenient object onto backplate, to act as a fulcrum for each screwdriver, and pry ring directly up away from rubber boot. (See Figure 24).

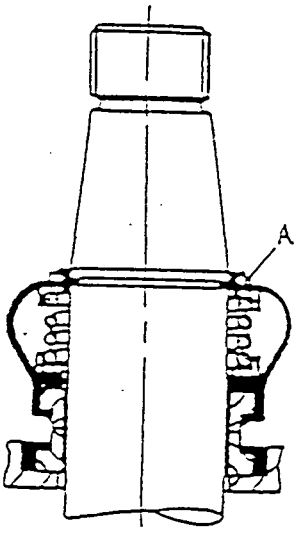

Fig. 23

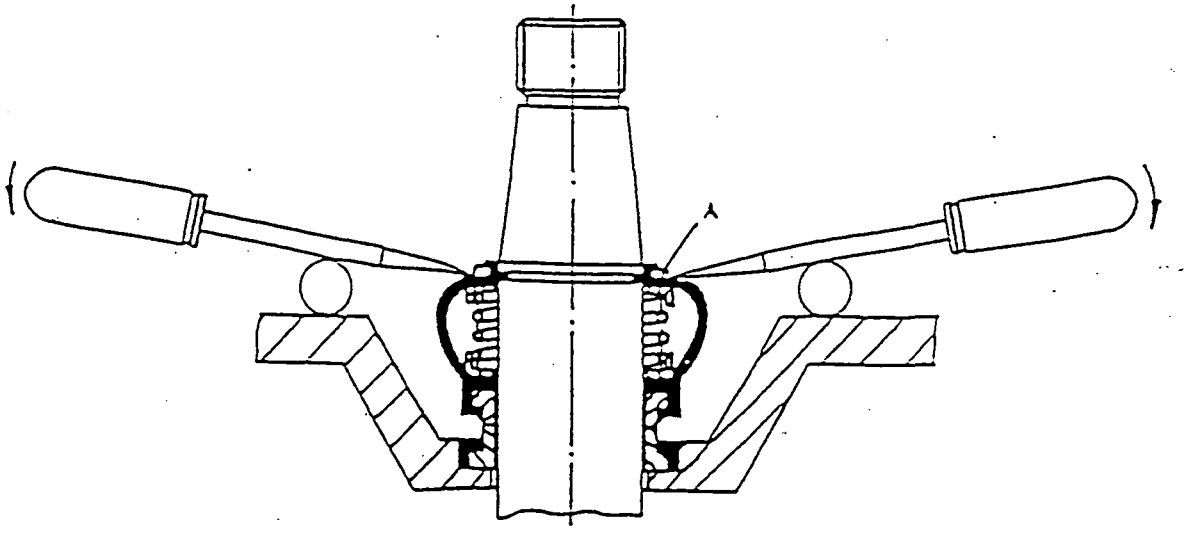

Fig. 24

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Make sure the Woodruff key groove has no sharp edges so that the rubber parts cannot be damaged as they are removed. Gently insert a small dull screwdriver between the shaft and the rubber boot.

By lifting and turning the screwdriver around the shaft, the lip of the rubber boot can be lifted out of the shaft groove. Lubrication of the shaft and the boot helps this disassembly. Once the boot is free of the groove, the entire rotating part of the seal with boot can be pulled off the shaft. If necessary, use two screwdrivers deep into the seal to pry the seal face loose. See Figure 25.

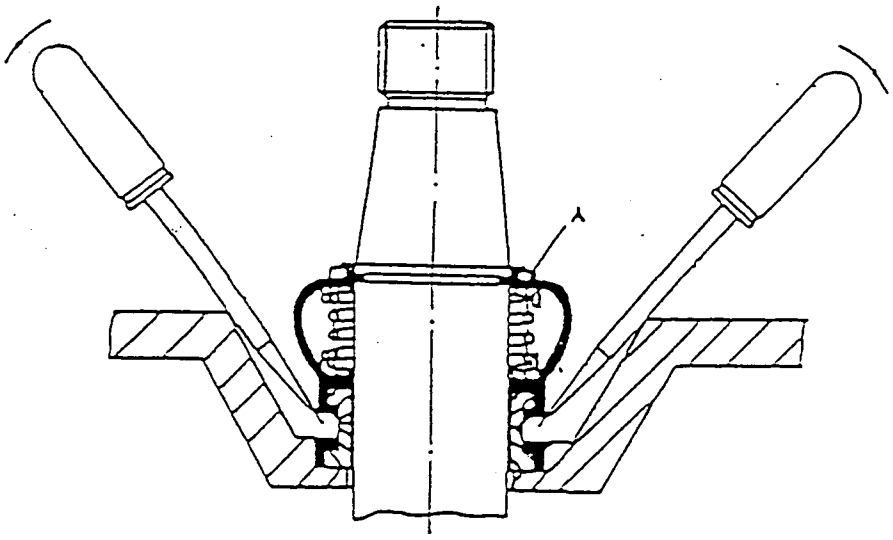

Fig. 25

c) Rubber-boot type seal - "U"

Pull out the removable part (A) by hand.

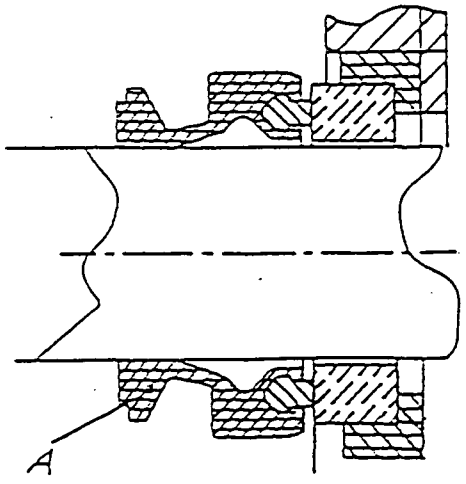

Fig. 26

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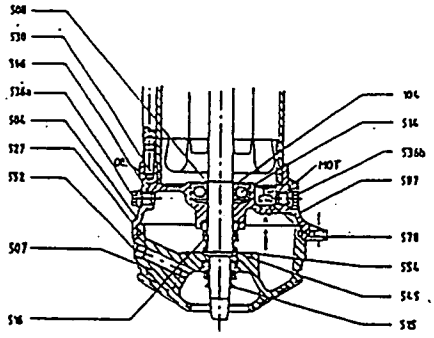
d) **For removal of stationary seat (all types)**

Refer to Figure 27. Remove static part of the mechanical seal as follows:

Unfasten nuts (534) and carefully remove back cover or mechanical seal plate (507) from motor housing. Make sure that the static part of the seal (515) does not hit the shaft so that it is not damaged as the back cover or the mechanical seal plate is pulled off.

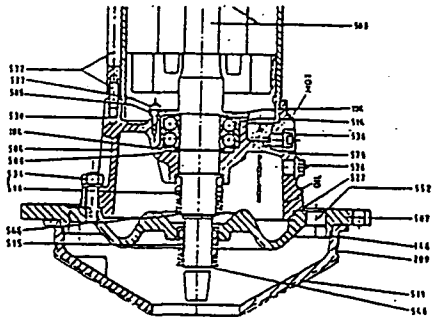
Now the static part of the seal can be carefully pushed out of the chamber from the back side.

Sometimes an old seal can be repolished or repaired by HIDROSTAL. Consult nearest service centre for this service. When sending a seal for inspection or repair, it is important to thoroughly protect the seal faces to prevent damage during transportation.



Motor size Z

Fig. 27 a



Motor size Y

Fig. 27 b

3.2.6 Upper Mechanical Seal (516)

It is IMPORTANT to note that removal of this seal should not be attempted in the field. If leakage of this seal has been detected from the stator housing test as described in Section 2.2.2, the entire motor should be sent to the nearest authorised HIDROSTAL service centre for a complete inspection.

3.3 RE-ASSEMBLY OF SEAL CHAMBER AND HYDRAULIC PARTS

Cleanliness is of utmost importance for this assembly work. All parts must be washed in solvent prior to assembly. Pay particular attention that all machined mating surfaces are clean and are free from burrs. All grooves and landings for "O"-rings and other static seals must be cleaned of all sealants and inspected for nicks or scratches. All threads must be clean especially those in holes for studs. All "O"-rings MUST be replaced with new ones and they should be lubricated with light oil prior to assembly.

WARNING

For "O"-rings in the motor (that is "O"-rings with 500 series numbers), never use "O"-rings glued from "O"-ring stock. Our experience is that this glue joint will inevitably leak. Glued "O"-rings may be used in the hydraulic end (that is "O"-rings with 400 series numbers) if a slight leakage from the pump is not a problem.

SERVICE MANUAL FOR INSTALLATION AND OPERATION FOR Q-TYPE SUBMERSIBLE PUMPS

3.3.1 Replacement of Lower Mechanical Seal

a) Replacement of stationary seat (all types)

Place a new "O"-ring on the oil chamber casing (504). Carefully assemble back cover or mechanical seal plate (507) to the oil chamber casing and fasten with fastening set (534).

Lubricate with oil the rubber circumference of the static mechanical seal part and carefully press all the way into its seat in the back cover or mechanical seal plate (507). The ring must fit tightly in place. Protect the seal face during this operation. Examine gap between shaft and inner diameter of seal face; when face is correctly installed, gap will be uniform all the way around.

WARNING

The seal face is very brittle, and can easily snap unless pressure is uniform during installation. We suggest pushing in with special tool (Figure 28).

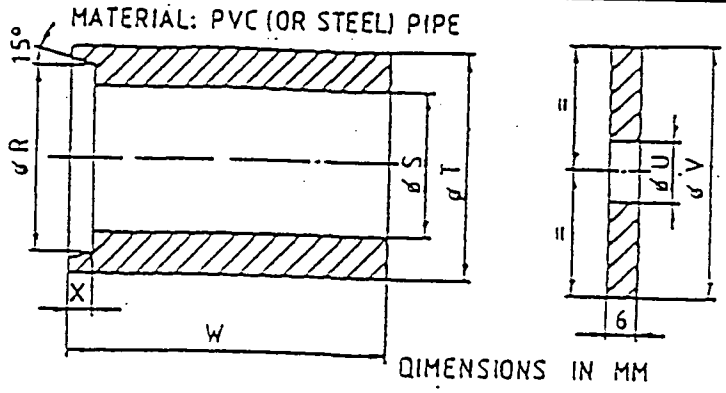


Fig. 28

Motor size	ϕ R	ϕ S	ϕ T	ϕ U	ϕ V	W	X	Bolt size
Y	40 +/-1	29 +1/-0	45 +/-1	14	50	65	5	M12

b) Replacement of exposed-spring type seal - "C"

Remove spring and spring retaining ring of mechanical seal. Seal surfaces must be absolutely clean. (Make sure there is not even a speck of dust on the surfaces). Place a few drops of light oil on the rotating (carbon) face of the mechanical seal, then lubricate inner bore of rubber part of the seal with oil and put a small amount of oil onto shaft. Install rotating face (with its rubber part) over shaft, and press gently down length of exposed shaft until carbon face touches stationary face. It may help to use a small wood "pusher", or better, a plastic pipe mandrel only slightly larger than shaft diameter, to push directly on the rubber part of the seal to slide it along the shaft (suitable dimensions for such a mandrel are shown in Figure 28). Be sure rubber part sits uniformly on shaft, and has NOT rolled out from under the metal part of the seal. Put on seal spring, and spring retaining ring.

Install snap ring (546) and turn shaft by hand to check for free running.

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c) **Replacement of rubber-bellows type seal - "M"**

Lubricate with oil the rotating part of the mechanical seal, put the retaining ring "A" on the rubber boot with rounded edge towards the rubber boot (see Figure 29). Push the whole assembly by hand over the shaft as far as possible. Mount the special tool over the shaft tip (see Figure 30) and compress the mechanical seal until the lip of the rubber boot is engaged in the shaft groove. Remove special tool. Turn the shaft by hand and watch that the retaining ring turns perfectly in line with the rubber boot and that it is not cocked. Then try to pull the rubber boot off shaft by hand to make sure that the lip has reliably engaged in the shaft groove.

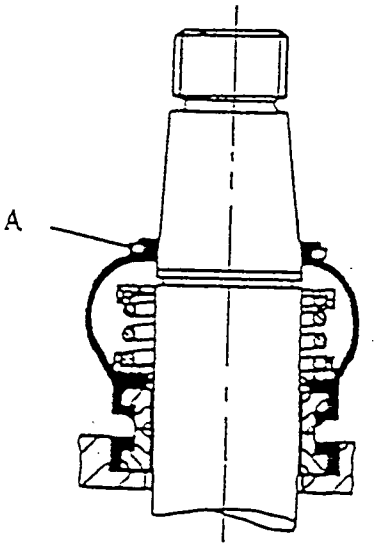

Fig. 29

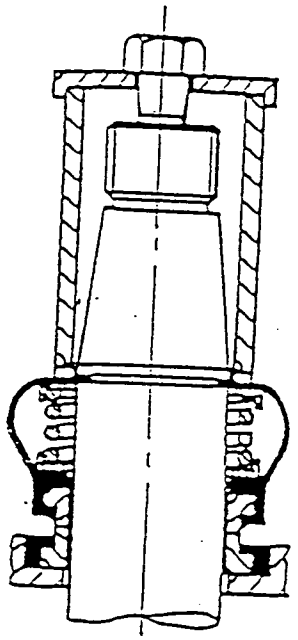

Fig. 30

3.3.2 **Tightness Test for Lower Mechanical Seal (All Types)**

Remove plug "oil" (536). This test assumes that oil has been previously drained from the motor. Connect dry compressed air source such as bicycle tyre pump to the opening. Use a pressure reducing valve and relief valve set to 0.5 bar (7 psi).

WARNING

Make sure that the pressure never exceeds 1 bar. This could displace the seal. Do not immerse end of cable. Immerse the motor into a test tank full of water and watch for continuously escaping bubbles. This would indicate leakage past the seal or associated "O"-ring. Correct failure if leakage has been found. After finishing tightness test remove pressure connection hose and fill with oil according to Section 2.2.3.1 or 2.2.3.2.

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3.3.4 Assembly of Impeller

Before fitting a new impeller (or a new impeller bolt), the length of the impeller bolt should be checked as follows:

1) Place impeller onto shaft taper and using a thin rod measure distance from end of shaft to the step in the impeller bolt-hole. Remove impeller.

2) Now measure impeller bolt length, from tip to underside of head, and subtract 1 1/4 times the bolt diameter. If remaining distance is shorter than (1) above, a longer impeller bolt is needed, to ensure adequate engagement of threads.

3) Now screw impeller bolt into shaft end as far as it will go without excessive force, and measure distance from shaft end to underside of bolt head. If this distance is longer than 1) above the bolt must be shortened (to ensure that the bolt pulls the impeller tight against the impeller flange before the bolt "bottoms out" in the shaft threads). If the impeller bolt must be shortened a significant amount, check if the threads on the bolt also must be re-cut to permit the required assembled length.

NOTE: Coat shaft taper with a light oil ONLY (do NOT use grease or anti-size compound here), then install impeller directly onto shaft.

Coat the impeller bolt with grease or anti-size compound. Install and tighten to following torque:

For Hi-chrome steel bolt (used with cast iron impeller) see 3.2.2.

NOTE: If torque wrench not available, correct tightness can be approximated by hitting long end of standard L-shaped allen wrench with several sharp hammer blows.

3.3.5 Replacement of Liner or Suction Cover

a) **For C080/D100** (see Figure 15)

Carefully position liner (421) into one-piece casing (400); tap into place with lead hammer, or use hydraulic press (No O-rings are used between liner and casing).

b) **For all other pumps without "regulable" feature** (see Figure 16)

Place spacer ring (414) over spigot of suction cover (402), then grease and install O-ring (406) into groove on suction cover.

Install suction cover into down side of the casing.

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c) **For all other pumps with "regulable" feature** (see Figure 17,18,19)

Install three regulation screws (413) into liner, using loctite "stud-mount".

Thoroughly grease O-ring (430) and install into groove in suction casing (416) or casing (400, C080/D100) – this groove is nearly hidden by the wear ring in some pump models.

If wear ring (408) was removed, glue it firmly back into place with loctite activator type "T" followed by loctite glue "307"; tap wear ring into suction casing with a lead hammer, until wear ring is flush with flange surface.

Grease and install O-ring (406) onto large end of liner.

Coat the external threaded portion of large regulator nuts (422) with anti-size compound, and install these into the suction casing (416) or pump casing (400, C080/D100) – hex-side toward the outside (toward the suction flange). Screw these into the casing until they are flush with the inside of the casing.

Now place liner into suction casing or pump casing, engaging the three studs into the holes through the three regulator nuts. (Note: the three studs are not spaced evenly around the liner, so there is only one orientation of the liner where the studs will correctly fit through the regulator nuts).

Now grease O-ring (431) and install in groove on edge of suction casing (Note: this o-ring is not used on some models).

Install suction casing into volute casing opening, on side of the volute casing where the cast-in arrow points counter-clockwise.

CAUTION

Since both sides of the volute casing are machined identically in some models, it is potentially possible to assemble the pump with the volute casing backwards. Pay particular attention to the arrow direction as described above.

Fasten suction casing to volute casing with fastening set (417).

3.3.6 Final Assembly

NOTE: Whenever a new impeller is fitted, without also replacing the liner or suction cover at the same time, the following clearance check must be done: install impeller-motor assembly into volute casing assembly. If the tip of the impeller touches the wear ring (408) or the lip in the liner (or suction cover) – or if there is less than 1 mm clearance between the tip and the lip when the spiral edge of the impeller is firmly seated against the conical taper inside the liner (or suction cover), then the impeller tip must be ground off – parallel to the suction flange – until 1 to 2 mm clearance is obtained. See Figure 32.

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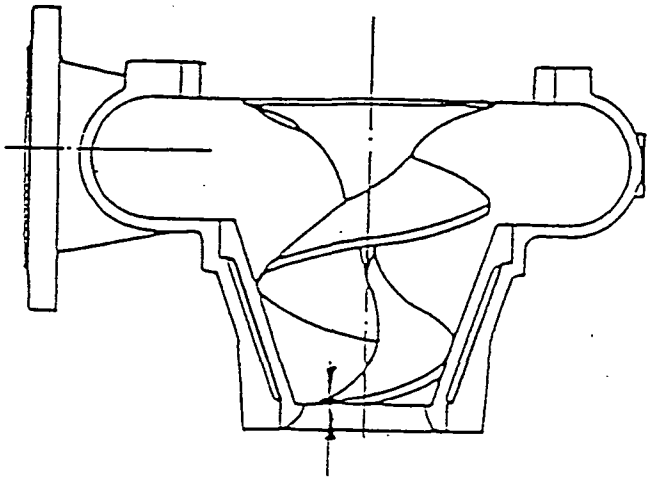

Fig. 32

If (411) is a spacer ring in lieu of shims place this ring over the spigot of the motor.

Grease O-Ring (209) and place into groove on spigot of motor (see Figure 18).

Now install motor-impeller assembly into volute casing. Install and tighten nuts (419) (See Figure 18).

Proceed to Section 3.1 of these instructions for correct setting of regulator nuts -- or for placement of shims (411) – for final adjustment of impeller clearance.

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REPAIR

4. GENERAL NOTES ON REPAIR

4.1 Sections 5 and 6 include steps for complete disassembly and assembly of the motor, presented in the exact order we would suggest if COMPLETE overhaul is necessary. However, diagnosis may indicate only one area of the motor needs repair: in this case, disassemble only as far as necessary to solve the problem. See chart "typical repairs" for suggested steps, in the order they should be performed, for minimum work necessary to solve certain typical problems.

4.2 All replacement parts must be obtained from HIDROSTAL. Failure to do this will void explosion - proof rating as well product warranty.

Inspect all parts, especially new one. They should be free from burrs and thoroughly clean. Ensure that threads are not damaged. Studs to be refitted must be locked in place with Loctite "Stud-mount".

4.3 Use new O-rings, obtained from HIDROSTAL whenever the motor has been opened. Coat all O-rings with oil (not grease!) prior to installation. O-rings taken out during disassembly can in emergencies be re-used, but they must be completely free of even tiny cuts or nicks, and should not exhibit a flattened cross - section.

NOTE: NEVER use glued or vulcanised O-rings in the motor: The joint is seldom the same diameter and resiliency as the original material, and will inevitably leak. (At the owner's option, glued O-rings are permissible in hydraulic end assembly if minor leakage of pumped fluid is not critical).

4.4 The cable (518) and the junction box cover must be ordered as an assembly. Cables are not available separately because the epoxy sealing to the junction box cover must be tested at the factory (or at authorised service centers) to ensure hermetic and explosion - proof tightness.

4.5 For plugs with copper washer seals, use new seals if possible; always re-anneal copper washer seals before tightening plugs. To anneal, heat copper dull red and quench (cool) immediately in water. Plug 552 (for seal flushing) does not use copper sealing washers and must be sealed with Teflon tape.

4.6 Plugs leading to the explosion-proof area (the stator housing) have a tamper-proof seal, consisting of a steel half-moon piece inserted between one flat of the hex plug and the recessed bore in the housing. This piece is tack-welded in place to ensure the explosion-proof area is not inadvertently opened while the motor is in service. For repairs, the tack-welds should be ground off and the half-moon piece can be removed, to provide access for a socket wrench. After repairs are complete, the half-moon piece must be re-welded into place. Failure to do this will void explosion-proof rating.

NOTE: Not all motors manufactured by HIDROSTAL are rated "explosion-proof". If the motor does not include an explosion-proof label affixed to the motor, these sections of the instructions can be ignored.

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4.7 Bake out residual moisture from stator and from rotor in oven at 110°C - 120°C for 8 - 10 hours just prior to assembly. We also strongly recommend that all castings surrounding the dry motor housing (501, 504, 505, 557) also be baked to remove any absorbed moisture.

4.8 Rotor and shaft must be ordered as an assembly from the factory; these parts are not available individually, because special procedures are necessary for mounting rotor to shaft.

4.9 Follow instructions exactly on pressure testing each of the motor cavities (stator housing and seal housing/cooling jacket). This is your final check that you have completely watertight motor; all critical O-rings, as well as all other sealing components, are checked by the pressure tests.

Use only dry gas for pressure tests. A welding - type pressure regulator is convenient for bottled gases. Compressed Nitrogen is recommended; use plant air only if it has passed through a refrigerated or desiccant dryer. One-half bar (7 psi) is best test pressure. Do not exceed one bar (15 psi) in any case, because at this pressure, mechanical seals will lift. We recommend a pressure relief valve set to 25 psi in the gas system, so that the motor is never subjected to high pressures (potentially dangerous to personnel) even if the pressure regulator fails.

Pressurise the motor cavity, then submerge the motor. Observe for escaping bubbles with motor completely submerged in horizontal position. Vertical submergence (as in a barrel) will not allow adequate viewing of the mating surfaces to be examined. Experience has shown that air trapped between flanges or under fastening rings or bolts may cause unnecessary concern during these tests: wait several minutes for trapped air to bubble out. Typically, a bubble stream from trapped air will diminish, while a bubble stream from a leak will continue at the same rate. Occasionally, a small leaks from between the faces of the mechanical seals can be eliminated by turning the shaft a few times (allowing the seal faces to sit fully against each other).

4.10 Seal off cable ends before shipping, as moisture could otherwise be picked up during shipment and could migrate into the cable. If cables have absorbed moisture through nicks and cuts, or by accidental immersion of free end, the best procedure is to replace them.

4.11 Refer to "mechanical seal and bearing chart" for correct bearing types and seal sizes. Bearing substitutions should never be allowed, especially with regard to letter suffixes.

The mechanical seal in position 516 is a standard John Crane Type 21 carbon - ceramic seal. Also, in an emergency, a standard John Crane type 21 mechanical seal (of the inch size down) may replace the HIDROSTAL rubber-booted seal in position 515– an additional snapring (same size as 546 will be required to hold the John Crane Seal in place. These John Crane Seals are typically in stock at local John Crane Warehouses around the country. It should be noted, however, that the HIDROSTAL seal will provide longer life at position 515 in abrasive service (especially sludge), and will also eliminate the possibility of stringy materials fouling the seal spring.

NOTE: Not all motors manufacture by HIDROSTAL are rated "explosion-proof". If the motor does not include an explosion-proof label affixed to the motor, these sections of the instructions can be ignored.

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MECHANICAL SEAL AND BEARING CHART

Poles	Type	Bearing		Seal		Weight	Oil amount
		M.S 513	P.S 514	M.S 516	P.S 515	kg	liters
2	BNZA2	6005 - Z	6305- 2 RS	25 mm	16 mm	22	0.7
	BNZP2	6005 - Z	3305A - 2RS1	25 mm	20 mm	24.5	0.7
	BNZV2	6005 - Z	3305A - 2RS1	25 mm	20 mm	29.8	0.7
	CNZP2	6005 - Z	3305A - 2RS1	25 mm	20 mm	24.5	1.0
	CNZV2	6005 - Z	3305A - 2RS1	25 mm	20 mm	29.8	1.0
	CNYA2	6205 - Z	6208 - 2R	1 1/2"	1 1/8"	36.5	1.0
	CNYP2	6305 - Z C3	3208	1 1/2"	1 1/8"	43.5	1.0
	CNYV2	6305 - Z C3	7208 BG	1 1/2"	1 1/8"	50	1.0
	CTYA2	6205 - Z	3206	25 mm	20 mm	36.5	1.0
	DNYP2	6305 - Z C3	3208	1 1/2"	1 1/8"	43.5	1.0
	DNYV2	6305 - Z C3	7208 BG	1 1/2"	1 1/8"	50	1.0
4	BNZA4	6005 - Z	6305 - 2RS	25 mm	16 mm	22	0.7
	CNZA4	6005 - Z	6305 - 2RS	25 mm	20 mm	22	1.0
	CNZP4	6005 - Z	6305 - 2RS	25 mm	20 mm	24.5	1.0
	CNZV4	6005 - Z	3305A - 2RS1	25 mm	20 mm	29.8	1.0
	CNYV4	6305 - Z C3	7208 BG	1 1/2"	1 1/8"	50	1.0
	DNYA4	6305 - Z C3	6208 - 2R	1 1/2"	1 1/8"	36.5	1.0
	DNYP4	6305 - Z C3	3208	1 1/2"	1 1/8"	43.5	1.0
	DNYV4	6305 - Z C3	7208 - BG	1 1/2"	1 1/8"	50	1.0
	ENYV4	6305 - Z C3	7208 - BG	1 1/2"	1 1/8"	50	1.0

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MECHANICAL SEAL AND BEARING CHART

Poles	Type	Bearing		Seal		Weight	Oil amount
		M.S 513	P.S 514	M.S 516	P.S 515	kg	liters
6	DNYA6	6305 - Z C3	6208 - 2R	11/2"	11/8"	36.5	1.0
	DNYP6	6305 - Z C3	3208	11/2"	11/8"	43.5	1.0
	ENYP6	6305 - Z C3	3208	11/2"	11/8"	43.5	1.0
	ENYV6	6305 - Z C3	7208 - BG	11/2"	11/8"	50	1.0
8	ENYA8	6305 - Z C3	6208 - 2R	11/2"	11/8"	36.5	1.0
	ENYP8	6305 - Z C3	3208	11/2"	11/8"	43.5	1.0
	ENYV8	6305 - Z C3	7208 - BG	11/2"	11/8"	50	1.0

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Typical Repairs

Replacement of cable	-5.2, 6.6
Replacement of lower seal	-5.1a, b, 6.10a, b, 6.11 (see also 3.2.5, 3.3.1 Instruction Manual)
Replacement of lower and upper seals	-recommend COMPLETE disassembly and cleaning, baking of stator and rotor, regreasing or replacement of bearings, and complete re-assembly
Regreasing of bearings (NOTE: replacement of bearings is recommended - especially in smaller motors, where cost of new bearing is minor.)	-5.1a, b, 5.3, 5.4, 5.6, 5.7, 6.2, 6.3, 6.4, 6.5, 6.8., 6.9, 6.10a, b, 6.11, 6.12, 6.13, 6,14 (not necessary to disassemble upper motor cover (501) from stator housing; not necessary to disconnect cable connections).
Rewind of stator	-5.2, 5.3, 5.4, 5.5, 6.1, 6.5, 6.6, 6.7, 6.9, (not necessary to disassemble hydraulic end, seals of any part of shaft/bearing assembly -- unless bearings are contaminated, then complete disassembly is required).

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5. COMPLETE DISASSEMBLY STEPS, MOTOR SIZE CNY..

5.1 Remove hydraulic parts per instruction manual Section 3.2.1.
Now remove plug "oil" (536) and drain out oil per Section 2.2.3.1.

Remove lower seal rotating part per Section 3.2.5., but do not remove seal chamber (507) at this time, as it is a convenient and stable base to support the motor for further disassembly steps.

Place motor vertically, resting the back cover on wood blocks to allow clearance for shaft tip.

5.2 Remove cable set as follows:

Place motor with shaft in vertical position, cable end up. Remove screws (532) and slowly lift cable cover (501) from the motor. If stuck, lift the motor approx. 10 mm by the upper bearing holder (501). Rap the upper bearing holder (501) with a rubber mallet until remainder of motor falls away, thus loosening holder. (Pry with screw driver to assist, if necessary).
NOTE: Do not pull cable cover so far away as to pull power cables or control wires out of winding head!

Disconnect ground lead from cable clamp (520). Cut away or push aside insulating sleeves from each junction in leads, so junctions are exposed. If cable junction is screwed together, remove screws. If junction is by crimp connectors, cut wires as close to crimp connectors as possible. Now cable cover (with cables attached) can be removed. Remove O-ring (524).

5.3 Remove seal chamber (507) now.
NOTE: Be careful not to damage stationary face of lower mechanical seal (it can chip if the shaft knocks against it hard).

Remove upper (motorside) mechanical seal (516) as follows:

After unfastening the snap ring (545), put oil on the shaft and carefully pull the rotating part of the seal (516) from the shaft (503).

5.4 Remove stator with stator housing, as follows:

Carefully and slowly lift stator housing (557) straight up, until wire connections to the two conductivity probes (578) can be reached. Undo these wire connections, then lift the stator housing the rest of the way off the motor.
NOTE: Be very careful to not damage winding heads (especially against rotor fins). Once the stator is removed from the motor, always keep the motor VERTICAL until the shaft is removed. DO NOT lay the motor horizontal or at an angle, because without the stator in place to limit the angular deflection of the shaft, it is possible that the weight of the rotor could apply excessive bending moment through the bearings – and then the bearing balls could indent the bearing races. Now turn tie-rods (532) off from oil chamber casing (504).

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5.5 If necessary to rewind motor, we recommend to replace. Is no possibility therefore, see Section 6.1.

5.6 Remove shaft with all bearings as follows:

Unfasten nuts (533). Lift entire assembly by shaft. Then rap on part 504 with lead hammer until it falls away.

5.7 Disassemble bearings from shaft as follows:

Remove snapring (508) and spacer ring (104).

Use a 3 - arm bearing puller to pull entire bearing stack, including lower bearing cap (505) and upper spacer ring (104), (at one time) off the shaft. If available, remove bearing (513) from opposite end of shaft.

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6. COMPLETE ASSEMBLY STEPS; MOTOR SIZE CY

6.1 Press stator into housing as follows:

Heat stator housing (557) in oven to expand inner bore. (Temperature: 250°C). Then lower the stator (502) into stator housing.

Take care of the measure 67mm on top end of the stator housing to the upper plain of the stator packet.

IMPORTANT: You will find one "V" slot the entire length of the stator, on the outside circumference of the stator.

In case stator does not go down, press stator in with hydraulic press, but do not press directly against winding head: Use large diameter pipe sleeve pressing against the steel stampings of the stator core inserted between upper winding head and stator housing.

6.2 Mount lower bearings to shaft as follows:

Refer to cutaway drawings for proper location and orientation of spacers and bearings on lower end of shaft.

First, prepare the shaft as follows: examine the two snapring grooves on the shaft lower end: if there are any sharp edges, slightly round them off with a fine file.

Place bearing cap (505) onto shaft. Now install a snapring (508) into the groove closest to the rotor. Place spacer ring (104) onto shaft.

Now greasing of bearings will be done. Hidrostal recommends to use the following specifications: Staburags NBU 8 EP by Kluber-Lubrication. This grease is of a mineral oil base containing a barium complex as thickener.

Typical characteristics:

Colour	beige	
Apparent dynamic visco. (approx.)	6000	mPas
Operating temperature range	-30..150	° C
Max. temperature (short time)	170	° C
Consistency class (NLGI)	2	
Penetration DIN ISO 2137 (0.1 mm)	280	
Dropping point DIN ISO 2176	>220	° C
Corrosion protection DIN 51802	0	
RPM-parameter (n x d m)	5 x 10	

Heat inner race only of bearing (514) with induction heater. Place bearing onto shaft. **NOTE:** The side of bearing with reliefs in the outer and inner races (where the balls were inserted) MUST be toward the shaft tapered end! Ensure that bearing and spacer are bottomed solidly against shaft shoulder (or snapring): If necessary (not typical) use pipe mandrel on INNER race and tap until solid.

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Install another spacer ring (104), then snapring (508). If ring (104) can be rotated by hand after snapring is in place, then there is too much clearance; add shims under snapring until spacer ring (104) is firmly clamped from rotating by hand. To be absolutely sure snapring is fully seated in groove, lightly tap snapring into groove, all around.

6.3 Install shaft assembly into oil chamber housing as follows:
If bearings are still warm from assembly to shaft, wait until they are cold before proceeding. Heat region of oil chamber housing (504) outside the bearing bore with a "soft" propane torch. Carefully lower shaft through bore; be sure to engage holes in bearing cap (505) onto studs (533). Install lockwashers and nuts on studs (533) and tighten nuts to seat bearings in bore. It is essential that the bearings are fully bottomed in the bore.

6.4 Install upper bearing holder to stator housing as follows:

Push conductivity probe leads through "V" slot between stator and stator housing (if possible, FIRST cover entire length of leads with fibre insulating sleeve).

If the stator is new or rewound, place fibre insulating sleeves 240 mm long over each stator lead and moisture probe lead. (If necessary) cut leads about 16mm longer than insulating sleeves, and strip each lead back about 12mm. Now tighten a small nylon cable - binding strap tightly around the base of all the wires (close to where they come from the winding head) to firmly fix the insulating sleeves in place.

If the upper bearing holder is new, be sure to install a new grounding connection (520): the post is hammered into place.

Blow off any dirt from top and bottom winding heads with clean, DRY compressed air.

Handpack upper bearing (513) with grease (same specifications as before). Heat inner race only of bearing with induction heater. Place bearing onto shaft. Side of bearing with grease - seal goes toward the rotor fins.

6.5 Install stator housing as follows:

Place O-ring (530) into oil chamber housing (504). Then lower stator housing into bore until it bottoms on locating shoulder. When stator housing is about 2-3 inches from oil chamber casing, hold stator housing at this height, and reach in to connect moisture probe leads to the probes. Now lower stator housing the rest of the way down onto the oil chamber casing.

6.6 Install upper motor cover/cable assembly as follows:

Install insulating sleeves over each wire inside cable cover (should be about 220 mm long); leave 16 mm of each wire outside insulating sleeve and strip 12 mm of insulation off each wire.

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If butt-splice connectors are used, first install a short length of larger diameter fiber insulating sleeve, and over that a short length of heat - shrink tubing (large enough to cover the butt - splice connectors) - slide these down over the smaller diameter insulating sleeves.

Reconnect ground lead directly to ground clamp (520). Reconnect power and control leads using crimp - type connectors.

Now slide the fiber sleeve over the butt - splice connector, and then slide the heat shrink tubing over the fiber sleeve, and shrink the tubing. Or if cap - type connector or screwed connections are used, cover each connector with a length of fiber sleeve, to insure connectors are completely covered. Bundle all these splices together with nylon cable - ties, and/or firmly stuff any excess length of leads up inside the cable cover, to ensure the leads will not fall down and foul the rotor.

NOTE: On motors with a single 7 - conductor cable and moisture conductivity probes, one probe lead is connected directly to the ground clamp (520). With all other cables, each probe lead is connected to a separate cable lead.

On motors with a control cable of 3 x 1.5 mm with one lead shielded, the shield is connected to one probe wire, and the center lead is connected to the other probe wire.

NOTE: Typical small connectors may be locally available with integral nylon insulation. Do NOT use this type unless manufacturer can guarantee the integral insulation is rated for insulation Class "B" (125°C operating temperature) – some commercially available types are NOT. Therefore, we recommend you use bare connectors, covered after installation with heat-shrink insulation rated Class "B". Use Figlass sleeves.

After securing cable cover to upper motor cover (501) following verification of electrical connections must be made:

a) Using a 500 Volt DC megger, measure the insulation in each motor and control lead to ground (by meggering conductor to ground).

b) Measure the insulation between each motor lead (by meggering conductor to conductor) by using a megger as above. Refer to insulation chart Figure 8 for reference values. Do NOT megger between high and low speed conductors of 2 speed motors.

6.7 Mount upper motor cover.

Place O-Ring (524) into upper motor cover (501). Re-install plastic insulating bushing into holes and fix with loctite. Route all stator leads and conductivity probe leads through holes inside upper motor cover; keep light tension on these leads as upper motor cover is lowered toward stator, to ensure no leads are pinched between stator and upper motor cover. Press upper motor cover onto stator housing. Place lockwashers, then install and tighten fastening screws (532).

IMPORTANT: On motor type Y nuts 532 MUST be tightened with a torque - wrench to 20 ft-lb. Failure to torque to this value will void any explosion-proof rating, if such rating was originally issued with this motor.

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6.8 Install upper mechanical seal (516) "C" - type as follows:

Lay motor down on its side, in order to work on pump - end shaft. Lubricate rubber ring around the static (ceramic) face of upper mechanical seal (516) with oil. With a wood pusher, carefully press static face into upper seal bore of oil chamber casing (504) – protect polished surface of seal with cardboard ring supplied as part of packaging of seal. Examine gap between shaft and inner diameter of seal face; when face is correctly installed, gap will be uniform all the way around.

Remove spring from upper mechanical seal. Seal surfaces must be absolutely clean!

Place a few drops of light oil on the rotating (carbon) face of the upper mechanical seal, then lubricate inner bore of rubber part of the seal with oil and put a small amount of oil onto shaft. Also squirt a small amount of oil (about .1 ml) through the gap between the shaft and the static face of seal. (when motor is vertical, this will lubricate seal faces at start-up).

Install rotating face (with its rubber part) over shaft, and press gently down length of exposed shaft until carbon face touches ceramic face. It may help to use a small wood "pusher", or better, a plastic pipe mandrel only slightly larger than shaft diameter, to push directly on the RUBBER part of the seal to slide it along the shaft. (Suitable dimensions for such a mandrel are shown in Fig. 26, Section 3).
NOTE: Be sure rubber part lay smoothly on shaft, and has NOT rolled out from under the metal part of the seal.

Put on seal spring, and then put on spring centring ring (these parts come packaged with the mechanical seal). Now compress seal spring and install snapring (545).

6.9 Test for water - tight motor assembly as follows:

Keep motor horizontal at all times: do not raise to vertical until test is done (so oil squirted past the seal in previous step will not make a false "seal" and invalidate this test procedure).

Remove plug "MOT" (536) on oil chamber casing: See general note 6 to open tamper - proof seal, if used. Connect this opening (threads: British Standard Parallel, 1/4") to a source of dry nitrogen regulated to 0.5 bar (7 psi).

CAUTION

DO NOT use shop compressed air (unless refrigerant - or desiccant - dried) because of humidity in this source. Then immerse the entire motor (with shaft horizontal) into a test tank filled with clean water and observe all joints for escaping bubbles, which would indicate defective sealing.

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NOTE 1: Pressure over 1 bar (14 psi) will lift the faces of the mechanical seal and cause a "false" leak.

NOTE 2: Sometimes air trapped between flanges or in screw threads can give bubbles even though the O-ring seals are perfect. To determine if this is the case – bubbles from trapped air will become fewer, while a true leak will continue to bubble at the same rate. Watch leak for three to five minutes to determine.

Reassemble any areas with defective sealing. Soften copper washer by annealing and replace plug "MOT". See section 4.6 to correctly replace tamper - proof seal.

Thoroughly dry all surfaces of the motor with shop compressed air. Pay special attention to area around the mechanical seal.

6.10 Install seal chamber (507) as follows:

Install O-ring (527) into the groove of the seal chamber (507). Carefully assemble the seal chamber (507) to the oil chamber casing (504).

6.11 Install lower seal "C" - type (515) as follows:

Lubricate rubber around static face of lower mechanical seal (515) with oil. Carefully press static face into machined landing of seal chamber (507) – protect polished surface of seal with cardboard ring supplied as part of packaging of lower seal. Examine gap between shaft and inner diameter of seal face. When face is correctly installed, gap will be uniform all the way around.

NOTE: Solid silicon carbide is brittle; pressure should be uniform over entire face, not concentrated at one or two points. Suggest pushing in by hand, using special tool (Figure 26) to provide uniform pressure. A rubber washer between this tool and seal face is recommended, to further avoid damage to seal face.

File groove edges if necessary. Place a few drops of light oil on the rotating face of the lower seal, then lubricate inner bore of rubber part of the seal with oil and put a small amount of oil onto shaft.

Also squirt a small amount of oil (about 1ml) through the gap between the shaft and the static face of the seal. (When motor is vertical, this will lubricate seal faces at start-up). Install rotating face (with its rubber part) over shaft, and press gently down length of exposed shaft until carbon face touches ceramic face. It may help to use a small wood "pusher", or better, a plastic pipe mandrel only slightly larger than shaft diameter, to push directly on the RUBBER part of the seal to slide it along the shaft. (Suitable dimensions for such a mandrel are shown in Fig. 26, Section 3). Be sure rubber part lay smoothly on shaft, and has NOT rolled out from under the metal part of the seal. Put on seal spring, then put on spring centring ring (these parts come packaged with the mechanical seal). Now compress seal spring and install snapring (546).

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6.12 Test for water - tight seal chamber assembly as follows:

In a similar manner to step 9 above, connect source of dry nitrogen to plug "OIL", (ensuring all other plugs are closed tight) and test, as before.

Reassemble any areas with defective sealing. Soften all copper sealing washers by annealing, prior to final tightening of all plugs.

NOTE: Plug "OIL" does not require tamper - proof seal.

6.13 Refill oil as per Section 2.2.3.2 of instruction manual.

NOTE: Required oil is of extremely low viscosity. Recommended oil from U.S. suppliers is Shell Pella A or Gulf Mineral Seal Oil 896.

Specific gravity at 20° C	0.812	g/ml
Viscosity at 20° C	6.75	mm2/s (cst)
Viscosity at 40° C	3.52	mm2/s (cst)
Solidification point	-38.0°	C
Flash point	132.0°	C
Burning point	142.0°	C
Evaporation energy	251.0	kJ/kg
Solubility in water	none	

6.14 Reassemble hydraulic parts per Section 3.2.2 of instruction manual.

6.15 Clean surfaces with solvent, and repaint assembled pump with 2 part epoxy.

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5. COMPLETE DISASSEMBLY STEPS, MOTOR SIZE DNY../ENY..

5.1 Remove hydraulic parts per instruction manual Section 3.2.1.
Now remove plug "oil" (536) and drain out oil per Section 2.2.3.1.

Place motor vertically, resting the back cone on wood blocks to allow clearance for shaft tip.

5.2 Remove cable set as follows:

Place motor with shaft in vertical position, cable end up. Remove screws (532) and slowly lift cable cover (501) from the motor. If stuck, lift the motor approx. 10mm by the upper bearing holder (501). Rap the upper bearing holder (501) with a rubber mallet until remainder of motor falls away, thus loosening holder. (Pry with screw driver to assist, if necessary).
NOTE: Do not pull cable cover so far away as to pull power cables or control wires out of winding head!

Disconnect ground lead from cable clamp (520). Cut away or push aside insulating sleeves from each junction in leads, so junctions are exposed. If cable junction is screwed together, remove screws. If junction is by crimp connectors, cut wires as close to crimp connectors as possible. Now cable cover (with cables attached) can be removed. Remove O-ring (524).

5.3 Remove back cone (511) now and replace, if necessary, O-ring (209). Unfasten snap ring (546), put oil on the shaft (503) and carefully pull the rotating part of the seal (515) from the shaft. Detach fastening set (534), containing flat washers, lockwashers, nuts and pull mechanical sealplate (507) from shaft.
NOTE: Be careful to not damage stationary face of lower mechanical seal (it can chip if the shaft knocks against it hard).

Remove upper (motorside) mechanical seal (516) as follows:

After unfastening the snap ring (545), put oil on the shaft and carefully pull the rotating part of the seal (516) from the shaft (503).

5.4 Remove stator with stator housing, as follows:

Carefully and slowly lift stator housing (557) straight up, until wire connections to the two conductivity probes (578) can be reached. Undo these wire connections, then lift the stator housing the rest of the way off the motor.
NOTE: Be very careful to not damage winding heads (especially against rotor fins). Once the stator is removed from the motor, always keep the motor VERTICAL until the shaft is removed. DO NOT lay the motor horizontal or at an angel, because without the stator in place to limit the angular deflection of the shaft, it is possible that the weight of the rotor could apply excessive bending moment through the bearings – and then the bearing balls could indent the bearing races. Now turn tie - rods (532) off from oil chamber casing (504).

5.5 If necessary to rewind motor, we recommend to replace. Is no possibility therefore, see section 6.1.

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5.6 Remove shaft with all bearings as follows:

Unfasten nuts (533). Lift entire assembly by shaft. Then rap on part 504 with lead hammer until it falls away.

5.7 Disassemble bearings from shaft as follows:

Remove snapring (508) and spacer ring (104).

Use a 3 - arm bearing puller to pull entire bearing stack, including lower bearing cap (505) and upper spacer ring (104), (at one time) off the shaft. If available, remove bearing (513) from opposite end of shaft.

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6. COMPLETE ASSEMBLY STEPS; MOTOR SIZE D-E Y

6.1 Press stator into housing as follows:

Heat stator housing (557) in oven to expand inner bore. (Temperature: 250°C). Then lower the stator (502) into stator housing.
Take care of the measure-67 mm on top end of the stator housing to the upper plain of the stator packet.

IMPORTANT: You will find one "V" slot the entire length of the stator, on the outside circumference of the stator.
In case stator does not go down, press stator in with hydraulic press, but do not press directly against winding head. Use large diameter pipe sleeve pressing against the steel stampings of the stator core inserted between windings head and stator housing.

6.2 Mount lower bearings to shaft as follows:

Refer to cutaway drawings for proper location and orientation of spacers and bearings on lower end of shaft.

First, prepare the shaft as follows: examine the two snapring grooves on the shaft lower end: if there are any sharp edges, slightly round them off with a fine file. Place bearing cap (505) onto shaft. Now install a snapring (508) into the groove closest to the rotor. Place spacer ring (104) onto shaft.

Now greasing of bearings will be done. Hidrostal recommends to use the following specifications: Staburags NBU 8 EP by Kluber-Lubrication. This grease is of a mineral oil base containing a barium complex as thickener.

Typical characteristics:

Colour	beige	
Apparent dynamic visco. (approx.)	6000	mPas
Operating temperature range	-30..150	° C
Max. temperature (short time)	170	° C
Consistency class (NLGI)	2	
Penetration DIN ISO 2137 (0.1 mm)	280	
Dropping point DIN ISO 2176	> 220	° C
Corrosion protection DIN 51802	0	
RPM-parameter (n x d m)	5×10^5	

Heat inner race only of bearings (514) with induction heater. Place bearing onto shaft.

NOTE: The side of bearing with reliefs in the outer and inner races (where the balls were inserted) MUST be toward the shaft tapered end! Ensure that bearing and spacer are bottomed solidly against shaft shoulder (or snapring): If necessary (not typical) use pipe mandrel or INNER race and tap until solid.

Install another spacer ring (104), then snapring (508). If ring (104) can be rotated by hand after snapring is in place, then there is too much clearance; add shims under snapring until spacer ring (104) is firmly clamped from rotating by hand. To be absolutely sure snapring is fully seated in groove, lightly tap snapring into groove, all around.

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6.3 Install shaft assembly into oil chamber housing as follows:

If bearings are still warm from assembly to shaft, wait until they are cold before proceeding. Heat region of oil chamber housing (504) outside the bearing bore with a "soft" propane torch. Carefully lower shaft through bore; be sure to engage holes in bearing cap (505) onto studs (533). Install lockwashers and nuts on studs (533) and tighten nuts to seat bearings in bore. It is essential that the bearings are fully bottomed in the bore.

6.4 Install upper bearing holder to stator housing as follows:

Push conductivity probe leads through "V" slot between stator and stator housing (if possible, FIRST cover entire length of leads with fiber insulating sleeve).

If the stator is new or rewound, place fiber insulating sleeves 240 mm long over each stator lead and moisture probe lead. (If necessary) cut leads about 16mm longer than insulating sleeves, and strip each lead back about 12mm. Now tighten a small nylon cable - binding strap tightly around the base of all the wires (close to where they come from the winding-head) to firmly fix the insulating sleeves in place.

If the upper bearing holder is new, be sure to install a new grounding connection (520); the post is hammered into place.

Blow off any dirt from top and bottom winding heads with clean, DRY compressed air.

Handpack upper bearing (513) with grease (same specifications as before). Heat inner race only of bearing with induction heater. Place bearing onto shaft. Side of bearing with grease seal toward the rotor fins.

6.5 Install stator housing as follows:

Place O-ring (530) into oil chamber housing (504). Then lower stator housing into bore until it bottoms on locating shoulder. When stator housing is about 2-3 inches from oil chamber casing, hold stator housing at this height, and reach in to connect moisture probe leads to the probes. Now lower stator housing the rest of the way down onto the oil chamber casing.

6.6 Install upper motor cover/cable assembly as follows:

Install insulating sleeves over each wire inside cable cover (should be about 220 mm long); leave 16 mm of each wire outside insulating sleeve and strip 12 mm of insulation off each wire.

If butt-splice connectors are used, first install a short length of larger diameter fiber insulating sleeve, and over that a short length of heat - shrink tubing (large enough to cover the butt - splice connectors) - slide these down over the smaller diameter insulating sleeves.

Reconnect ground lead directly to ground clamp (520). Reconnect power and control leads using crimp - type connectors.

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Now slide the fibre sleeve over the butt - splice connector, and then slide the heat shrink tubing over the fibre sleeve, and shrink the tubing. Or if cap - type connectors or screwed connections are used, cover each connector with a length of fibre sleeve, to insure connectors are completely covered. Bundle all these splices together with nylon cable - ties, and or firmly stuff any excess length of leads up inside the cable cover, to ensure the leads will not fall down and foul the rotor.

NOTE: On motors with a single 7-conductor cable and moisture conductivity probes, one probe lead is connected directly to the ground clamp (520). With all other cables, each probe lead is connected to separate cable lead.

On motors with a control cable 3 x 1.5mm with one lead shielded, the shielded is connected to one probe wire, and the entire lead is connected to the other probe wire.

NOTE: Typical small connectors may be locally available with integral nylon insulation. Do NOT use this type unless manufacturer can guarantee the integral insulation is rated for insulation Class "B" (125°C operating temperature) – some commercially available types are NOT. Therefore, we recommend you use bare connectors, covered after installation with heat - shrink insulation rated Class "B". Use Figlass sleeves.

After securing cable cover to upper motor cover (501) following verification of electrical connections must be made:

a) Using a 500 - Volt DC megger, measure the insulation in each motor and control lead to ground (by meggering conductor -to- ground).

b) Measure the insulation between each motor lead (by meggering conductor - to - conductor) by using a megger as above. Refer to insulation chart Figure 8 for reference values. Do NOT megger between high and low speed conductors of 2 - speed motors.

6.7 Mount upper motor cover.

Place O-ring (524) into upper motor cover (501). Re-install plastic insulating bushing into holes and fix with loctite. Route all stator leads and conductivity probe leads through holes inside upper motor cover, keep light tension on these leads as upper motor cover is lowered toward stator, to ensure no leads are pinched between stator and upper motor cover. Pres upper motor cover onto stator housing. Place lockwashers, then install and tighten fastening screws (532).

IMPORTANT: On motor type Y-nuts 532 MUST be tightened with a torque - wrench to 20 ft - lb. Failure to torque to this value will void any explosion proof rating, if such rating was originally issued with this motor.

6.8 Install upper mechanical seal (516) "C" - type as follows:

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Lay motor down on its side, in order to work on pump end shaft. Lubricate rubber ring around the static (ceramic) face of upper mechanical seal (516) with oil. With a wood pusher, carefully press static face into upper seal bore of oil chamber casing (504) – protect polished surface of seal with cardboard ring supplied as part of packaging of seal. Examine gap between shaft and inner diameter of seal face; when face is correctly installed, gap will be uniform all the way around.

Remove spring from upper mechanical seal. Seal surfaces must be absolutely clean!

Place a few drops of light oil on the rotating (carbon) face of the upper mechanical seal, then lubricate inner bore of rubber part of the seal with oil and put a small amount of oil onto shaft. Also squirt a small amount of oil (about 1ml) through the gap between the shaft and the static face of seal. (When motor is vertical, this will lubricate seal faces at start-up).

Install rotating face (with its rubber part) over shaft, and press gently down length of exposed shaft until carbon face touches ceramic face. It may help to use a small wood "pusher", or better, a plastic pipe mandrel only slightly larger than shaft diameter, to push directly on the RUBBER part of the seal to slide it along the shaft. (Suitable dimensions for such a mandrel are shown in Fig. 26, Section 3).

NOTE: Be sure rubber part lay smoothly on shaft, and has NOT rolled out from under the metal part of the seal.

Put on seal spring, and then put on spring centring ring (these parts come packaged with the mechanical seal). Now compress seal spring and install snapring (545).

6.9 Test for water - tight motor assembly as follows:

Keep motor horizontal at all times: do not raise to vertical until test is done (so oil squirted past the seal in previous step will not make a false "seal" and invalidate this test procedure). Remove plug "MOT" (536) on oil chamber casing: See general note 6 to open tamper - proof seal, if used. Connect this opening (threads: British Standard Parallel, 1/4") to a source of dry nitrogen regulated to 0.5 bar (7 psi).

CAUTION

DO NOT use shop compressed air (unless refrigerant - or desiccant - dried) because of humidity in this source. Then immerse the entire motor (with shaft horizontal) into a test tank filled with clean water and observe all joints for escaping bubbles, which would indicate defective sealing.

NOTE 1: Pressure over 1 bar (14 psi) will lift the faces of the mechanical seal and cause a "false" leak.

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NOTE 2: Sometimes air trapped between flanges or in screw threads can give bubbles even though the O-ring seals are perfect. To determine if this is the case – bubbles from trapped air will become fewer, while a true leak will continue to bubble at the same rate. Watch leak for three to five minutes to determine.

Reassemble any areas with defective sealing. Soften copper washer by annealing and replace plug "MOT". See Section 4.6 to correctly replace tamper - proof seal.

Thoroughly dry all surfaces of the motor with shop compressed air. Pay special attention to area around the mechanical seal.

6.10 Install mechanical sealplate (507) as follows:

Install O-ring (527) on the oil chamber casing (504). Carefully assemble the mechanical sealplate (507) to the casing and fasten it with fastening set (534).

6.11 Install lower seal "C" - type (515) as follows:

Lubricate rubber around static face of lower mechanical seal (515) with oil. Carefully press static face into machined landing of mechanical sealplate (507) – protect polished surface of seal with cardboard ring supplied as part of packaging of lower seal. Examine gap between shaft and inner diameter of seal face. When face is correctly installed, gap will be uniform all the way around.

NOTE: Solid silicon carbide is brittle; pressure should be uniform over entire face, not concentrated at one or two points. Suggest pushing in by hand, using special tool (Figure 26) to provide uniform pressure. A rubber washer between this tool and seal face is recommended, to further avoid damage to seal face.

File groove edges if necessary. Place a few drops of light oil on the rotating face of the lower seal, then lubricate inner bore of rubber part of the seal with oil and put a small amount of oil onto shaft.

Also squirt a small amount of oil (about 1ml) through the gap between the shaft and the static face of the seal (When motor is vertical, this will lubricate seal faces at start-up).

Install rotating face (with its rubber part) over shaft, and press gently down length of exposed shaft until carbon face touches ceramic face. It may help to use a small wood "pusher", or better, a plastic pipe mandrel only slightly larger than shaft diameter, to push directly on the RUBBER part of the seal to slide it along the shaft. (Suitable dimensions for such a mandrel are shown in Fig. 26, Section 3). Be sure rubber part lay smoothly on shaft, and has NOT rolled out from under the metal part of the seal. Put on seal spring, then put on spring centring ring (these parts come packaged with the mechanical seal). Now compress seal spring and install snapring (546).

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6.12 Test for water - tight seal chamber assembly as follows:

In a similar manner to step 9 above, connect source of dry nitrogen to plug "OIL", (ensuring all other plugs are closed tight) and test, as before.

Reassemble any areas with defective sealing. Soften all copper sealing washers by annealing, prior to final tightening of all plugs.

NOTE: Plug "OIL" does not require tamper - proof seal.

6.13 Refill oil as per Section 2.2.3.2 for instruction manual.

NOTE: Required oil is of extremely low viscosity. Recommended oil from U.S. suppliers is Shell Pella A or Gulf Mineral Seal Oil 896.

Specific gravity at 20° C	0.812	g/ml
Viscosity at 20° C	6.75	mm2/s (cst)
Viscosity at 40° C	3.52	mm2/s (cst)
Solidification point	-38.0°	C
Flash point	132.0°	C
Burning point	142.0°	C
Evaporation energy	251.0	kJ/kg
Solubility in water	none	

6.14 Reassemble hydraulic parts per Section 3.2.2 of instruction manual.

6.15 Clean surfaces with solvent, and repaint assembled pump with 2-part epoxy.

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5. COMPLETE DISASSEMBLY STEPS, MOTOR SIZE CZ

5.1a Removal by "C"-Hydraulic - execution see instruction manual Section 3.2.1, Remove plug "oil" (536) and drain out oil per Section 2.2.3.1.

Place motor vertically, resting the back cover on wood blocks to allow clearance for shaft tip.

5.1b Removal by "B"-Hydraulic - execution as follows:

Place the unit into a horizontal position on a workbench. The suction cover (402) can be separated from the casing (400) by removing the nuts (417). Watch for the spacer-rings (414).

Check the surface of the suction cover for wear. Removal of impeller (401) see section 3.2.2. Pull off the rotating part of the lower seal "U-Type" (515) by hand from the shaft (503). Remove nuts and pull off the volute casing (400) - stationary seal part (515) assembly. Examine the seal (515) and the O-Ring for any damages.

Place motor vertically, resting the oil chamber casing (504) on wood blocks to allow clearance for shaft tip.

5.2 Disassemble motor top end and remove cable set as follows:
Place motor with shaft in vertical position, cable end up. Remove screws (532) and slowly lift cable cover (501) from the motor.
If stuck, lift the motor 1/2" by the upper bearing holder (501). Rap the upper bearing holder (501) with a rubber mallet until remainder of motor falls away, thus loosening holder. (Pry with screw driver to assist, if necessary.)

5.3 Remove back cover (507) now. Be careful to not damage stationary face of lower mechanical seal (it can chip if the shaft knocks against it hard).

Remove upper (motorside) mechanical seal (516) as follows:
After unfastening the snap ring (545), pulling off the spacer (554), carefully pull the rotating part of the seal (516) from the shaft.

5.4 Remove stator with stator housing as follows:
Carefully and slowly lift stator housing (557) straight up, until wire connections to the two conductivity probes (578) can be reached.
Undo these wire connections, then lift the stator housing the rest of the way off the motor. Be very careful to not damage winding heads (especially against rotor fins).
Once the stator is removed from the motor, always keep the motor VERTICAL until the shaft is removed. Do NOT lay the motor horizontal or at any angle, because without the stator in place to limit the angular deflection of the shaft, it is possible that the weight of the rotor could apply excessive bending moment through the bearings -- and then the bearing balls could indent the bearing races.
Now turn tie-rods (532) off from oil chamber casing (504).

5.5 If necessary to rewind motor, we recommend to replace. Is no possibility therefor, see Section 6.1.

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5.6 Remove shaft with all bearings as follows:
Lift entire assembly by shaft. Then rap on part 504 with lead hammer until it falls away.

5.7 Disassemble bearings from shaft as follows:
Remove snapring (508) and spacer ring (104)
Now remove upper spacer ring (104). Use a 3 arm bearing puller to pull entire bearing stack off the shaft. If available, do it by applying a hydraulic press. Using bearing puller, remove bearing (513) from opposite end of shaft.

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6. COMPLETE ASSEMBLY STEPS, MOTOR SIZE Z

6.1 Press stator into housing as follows:

Heat stator housing (557) in oven to expand inner bore. (temperature: 250°C). Then lower the stator (502) into stator housing. Take care of the measure 65mm on top end of the stator housing to the upper plain of the stator packet.

Important: You will find one "V" slot the entire length of the stator, on the outside circumference of the stator.

In case stator does not go down, press stator in with hydraulic press, but do not press directly against winding head. Use large diameter pipe sleeve pressing against the steel stampings of the stator core inserted between upper winding head and stator housing.

6.2 Mount lower bearings to shaft as follows:

Refer to cutaway drawings for proper location and orientation of spacers and bearings on lower end of shaft.

First, prepare the shaft as follows: examine the two snapring grooves on the shaft lower end: if there are any sharp edges, slightly round them off with a fine file. Now install a snapring (508) into the groove closest to the rotor.

Place spacer ring (104) onto shaft.

Now greasing of bearings will be done. Hidrostal recommends to use the following specifications: Staburags NBU 8 EP by Kluber-Lubrication.. This grease is of a mineral oil base containing a barium complex as thickener.

Typical characteristics:

Colour	beige	
Apparent dynamic visco. (approx.)	6000	mPas
Operating temperature range	-30..150	° C
Max. temperature (short time)	170	° C
Consistency class (NLGI)	2	
Penetration DIN ISO 2137 (0.1 mm)	280	
Dropping point DIN ISO 2176	> 220	° C
Corrosion-protection DIN 51802	0	
RPM-parameter (n x d m)	5 x 10	

Heat inner race only of bearing (514) with induction heater. Place bearing onto shaft. **NOTE:** The side of bearing with reliefs in the outer and inner races (where the balls were inserted) MUST be toward the shaft tapered end! Ensure that bearing and spacer are bottomed solidly against shaft shoulder (or snapring): if necessary (not typical) use pipe mandrel on INNER race and tap until solid. Spacer ring (104) has to be firmly clamped from rotating by hand. To be absolutely sure snapring is fully seated in groove, lightly tap snapring into groove, all around.

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6.3 Install shaft assembly into oil chamber housing as follows:
If bearings are still warm from assembly to shaft, wait until they are cold before preceding. Heat region of oil chamber housing (504) outside the bearing bore with a "soft" propane torch. Carefully lower shaft through bore. It is essential that the bearings are fully bottomed in the bore.

6.4 Install upper bearing holder to stator housing as follows:
Push conductivity probe leads through "V" slot between stator and stator housing (if possible), FIRST cover entire length of leads with fibre insulating sleeve.

If the stator is new or rewound, place fibre insulating sleeves 240 mm long over each stator lead and moisture probe lead. (If necessary) cut leads about 16mm longer than insulating sleeves, and strip each lead back about 12mm. Now tighten a small nylon cable - binding strap tightly around the base of all the wires (close to where they come from the winding - head) to firmly fix the insulating sleeves in place. If the upper bearing holder is new, be sure to install a new grounding connection (520): the post is hammered into place.

Blow off any dirt from top and bottom winding heads with clean, DRY compressed air. Handpack upper bearing (513) with grease (same specifications as before). Heat inner race only of bearing with induction heater. Place bearing onto shaft. Side of bearing with grease-seal goes toward the rotor fins. Turn tie-rods (532) into winding-bores of oil chamber housing (504). **NOTE:** No edge of part (532) has to be shown against the shaft (503).

6.5 Install stator housing (557) as follows:

Place O-Ring (530) into oil chamber housing (504). Then lower stator housing into bores until it bottoms on locating shoulder. When stator housing is about 2-3 inches from oil chamber casing, hold stator housing at this height, and reach in to connect moisture probe leads to the probes. Now lower stator housing the rest of the way down into the oil chamber casing.

6.6 Install upper motor cover/cable assembly as follows:

Install insulating sleeves over each wire inside cable cover (should be about 220mm long); leave 16mm of each wire outside insulating sleeve and strip 12mm of insulation off each wire.

If butt-splice connectors are used, first install a short length of larger diameter fibre insulating sleeve, and over that a short length of heat-shrink tubing (large enough to cover the butt-splice connectors) - slide these down over the smaller diameter insulating sleeves.

Reconnect ground lead directly to ground clamp (520). Reconnect power and control leads using crimp-type connectors. Now slide the fibre sleeve over the butt-splice connector, and then slide the heat shrink tubing over the fibre sleeve, and shrink the tubing. Or if cap-type connectors or screwed connections are use, cover each connector with a length of fibre sleeve, to insure connectors are completely covered. Bundle all these splices together with nylon cable-ties, and/or firmly stuff any excess length of leads up inside the cable cover, to ensure the leads will not fall down and foul the rotor.

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NOTE: On motors with a single 7-conductor cable and moisture conductivity probes, one probe lead is connected directly to the ground clamp (520). With all other cables, each probe lead is connected to a separate cable lead.

On motors with a control cable of 3 x 1,5mm with one lead shielded, the shield is connected to one probe wire, and the centre lead is connected to the other probe wire.

NOTE: Typical small connectors may be locally available with integral nylon insulation. Do NOT use this unless manufacturer can guarantee the integral insulation is rated for insulation Class "B" (125°C operating temperature) – some commercially available types are NOT. Therefore, we recommend you use bare connectors, covered after installation with heat-shrink insulation rated Class "B". Use Figlass sleeves.

After securing cable cover to upper motor cover (501) following verification of electrical connections must be made:

a) Using a 500 - Volt DC megger, measure the insulation in each motor and control lead to ground (by meggering conductor -to - ground).

b) Measure the insulation between each motor lead (by meggering conductor - to conductor) by using a megger as above. Refer to insulation chart Figure 8 for reference values. Do NOT megger between high and low speed conductors of 2 - speed motors.

6.7 Mount upper motor cover.

Place O-Ring (524) into upper motor cover (501). Re-install plastic insulating bushing into holes and fix with loctite. Route all stator leads and conductivity probe leads through holes inside upper motor cover; keep light tension on these leads as upper motor cover is lowered toward stator, to ensure no leads are pinched between stator and upper motor cover. Press upper motor cover onto stator housing. Place lockwashers, then install and tighten fastening screws (532).

IMPORTANT: On motor type Y nuts 532 MUST be tightened with a torque-wrench to 20 ft-lb. Failure to torque to this value will void any explosion-proof rating, if such rating was originally issued with this motor.

6.8 Install upper mechanical seal (516) "U-Type" as follows:

Lay motor down on its side, in order to work on pump-end shaft. Lubricate rubber ring around the static (ceramic) face of upper mechanical seal (516) with oil. With a wood pusher, carefully press static face into upper seal bore of oil chamber casing (504) – protect polished surface of seal with cardboard ring supplied as part of packaging of seal. Examine gap between shaft and inner diameter of seal face; when face is correctly installed, gap will be uniform all the way around.

Seal surfaces must be absolutely clean!

Place a few drops of light oil on the rotating (carbon) face of the upper mechanical seal, then lubricate inner bore of rubber part of the seal with oil and put a small amount of oil onto shaft.

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Also squirt a small amount of oil (about 1ml) through the gap between the shaft and the static face of the seal. (When motor is vertical, this will lubricate seal faces at start-up).

Install rotating face (with its rubber part) over shaft, and press gently down length of exposed shaft until carbon face touches ceramic face by hand. Now put spacer-ring (554) and install snapring (545). Check the tight and correct fit of the seal by turning the shaft by hand.

6.9 Test for water-tight motor assembly as follows:

Keep motor horizontal at all times; do not raise to vertical until test is done (so oil squirted past the seal in previous step will not make a false "seal" and invalidate this test procedure).

Remove plug "MOT" (536) on oil chamber casing: See general note 6 to open tamper-proof seal, if used. Connect this opening (threads: British Standard Parallel, 1/4") to a source of dry nitrogen regulated to 0.5 bar (7 psi).

CAUTION

DO NOT use shop compressed air (unless refrigerant - or desiccant - dried) because of humidity in this source. Then immerse the entire motor (with shaft horizontal) into a test tank filled with clean water and observe all joints for escaping bubbles, which would indicate defective sealing.

NOTE 1: Pressure over 1 bar (14 psi) will lift the faces of the mechanical seal and cause a "false" leak.

NOTE 2: Sometimes air trapped between flanges or in screw threads can give bubbles even through the O-Ring seals are perfect. To determine if this is the case – bubbles from trapped air will become fewer, while a true leak will continue to bubble at the same rate. Watch leak for three to five minutes to determine.

Reassemble any areas with defective sealing. Soften copper washer by annealing and replace plug "MOT". See Section 4.6 to correctly replace tamper-proof seal.

Thoroughly dry all surfaces of the motor with shop compressed air. Pay special attention to area around the mechanical seal.

6.10

a) Install wearplate (507) by "C" - Hydraulic - execution as follows:

Install O-Ring (527) on the wearplate (507).

Install lower seal "U" - type (515) as follows:

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Lubricate rubber around static face of lower mechanical seal (515) with oil. Carefully press static face into machined landing of wearplate (507) – protect polished surface of seal with cardboard ring supplied as part of packaging of lower seal. Examine gap between shaft and inner diameter of seal face. When face is correctly installed, gap will be uniform all the way around.

File groove edges if necessary. Place a few drops of light oil on the rotating face of the lower mechanical seal, then lubricate inner bore of rubber part of the seal with more oil.

Push rotating part gently over shaft (503). Mount the impeller (401) by using conical sleeve (434) and impeller bolt (415). For further details see "Q-type instruction manual for submersible pumps" Section 3.1.

b) Install "B" - Hydraulic - execution as follows:

Grease and insert O-ring (209) into groove of the volute casing (400). Carefully assemble the casing to the oil chamber casing (504) and fasten it with lockwashers and nuts.

6.11 Install lower seal "U" - type (515) as follows:

Lubricate rubber around static face of lower mechanical seal (515) with oil. Carefully press static face into machined landing of volute casing (400). Protect polished surface of seal face. When face is correctly installed, gap will be uniform all the way around.

Place a few drops of light oil on the rotating face of the lower mechanical seal, then lubricate inner bore of rubber part of the seal with more oil. Push rotating part gently over shaft.

Mount the impeller (401) by impeller bolt (415). Grease and insert O-ring (406) into groove of the suction cover (402).
Assemble suction cover by lockwashers and nuts (417) to the volute casing (400). Adjust impeller clearance by spacer rings (414), thus clearance between liner and impeller amounts 0.2 mm. For any further details see "Q-type instruction manual for submersible pumps" Section 3.1.

6.12 Test for water-tight seal chamber assembly as follows:

In a similar manner to step 9 above, connect source of dry nitrogen to plug "OIL", (ensuring all other plugs are closed tight) and test, as before.

Reassemble any areas with defective sealing. Soften all copper sealing washers by annealing, prior to final tightening of all plugs.

NOTE: Plug "OIL" does not require tamper - proof seal.

6.13 Refill oil as per Section 2.2.3.2 of instruction manual.

NOTE: Required oil is of extremely low viscosity. Recommended oil from U.S. suppliers is Shell Pella A or Gulf Mineral Seal Oil 896.

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Specific gravity at 20° C	0.812	g/ml
Viscosity at 20° C	6.75	mm2/s (cst)
Viscosity at 40° C	3.52	mm2/s (cst)
Solidification point	-38.0°	C
Flash point	132.0°	C
Burning point	142.0°	C
Evaporation energy	251.0	kJ/kg
Solubility in water	none	

6.14 Reassemble hydraulic parts per Section 3.2.2 of instruction manual.

6.15 Clean surfaces with solvent, and repaint assembled pump with 2-part epoxy.

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LIST OF PARTS Q-MOTOR

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POS	DESCRIPTION	CODE	MATERIAL* a	MATERIAL* b/c**
104	Spacer ring P.S.	1RD	K	K
106	Bearing spacer	1RD	K	K
112	Woodruff key	2FK	L	F
121	Angular contact ball bearing	8LW	-	-
126	Lock nut for shaft		L	L
127	Lock washer for 126		O	O
157	Spacer ring	1RD	K	K
165	Impeller flange	2SF	B	C
166	Impeller nut	2FM	K	F
167	Impeller locking washer for 165	2FF	K	F
209	O-ring for 507		Q	Q
400	Volute casing	4G1	A	C
401	Impeller	411	B/D	C
402	Suction cover	421	A	C
403				
404				
405	Inspection opening	451	A	-
406	O-ring for 402 or 421		Q	Q
407				
408	Wear ring	4R.	A/D	C
409	O-ring for 405		Q	Q
410				
411	Set of shims or wire 200-400		K	F
412				
413	Adjusting bolt		F	F
414	Spacer ring		K	F
415	Impeller bolt	4B.	H	F
416	Suction casing	4H.	A	C
417	Fastening set		H	F
418				
419	Fastening set		H	F
420	Fastening set		H	-
421	Liner	4K.	A/D	C
422	Regulation nut	4V1	F	F
423	Plug		N	F
424	Plug		N	F
425				
426				
427				
428				
429				
430	O-ring		Q	Q
431	O-ring		Q	Q
432				
433	Bush impeller/impeller bolt	4BZ	H	F
434	Bush shaft/impeller	4ZW	H	F
500	Junction box cover	5DK	A	C
501	Upper motor cover	5DM	A	A
502	Motor stator	5ES	-	-
503	Shaft (Rotor)	5WO(SER)	H	F/H
504	Oil chamber casing	5GO	A	A/F
505	Lower bearing cap P.S.	5DL	A	A
506	Retaining ring		K	K
507	Back cover/mech. seal plate	5GD/1PM	A	C
508	Spacer ring	5RS	O	O
509	Fastening set 500-501		H	F
510	O-ring for 557 P.S. ex-proof old type		Q	Q
511	Back cone	1K.	A/D	C
512	Lower ball bearing P.S.	8LW	-	-
513	Upper ball bearing cable side	8LW	-	-
514	Double row angular contact ball bearing	8LW	-	-
515	Mechanical seal P.S.	8DM	-	-
516	Mechanical seal M.S.	8DM	-	-
517	Humidity relay	5EU	-	-
518	Cable	5EK	-	-
519	Terminal board		-	-
520	Ground cable connection (earth)		K	K
521	Terminal connectors ex-proof		-	-
522	Terminal connectors		-	-
523	Cable entry assembly (intermittent fitting)	5EE (5EZ)	-	-
524	O-ring for 501		Q	Q
525	O-ring for 500		Q	Q
526	O-ring for 558 on top		Q	Q
526	Steel ring		J	F
527	O-ring for 200 M.S.		Q	Q

* For material explanations see sheet of section "ENGINEERING DATA"

** a: Standard material execution
b: All internal wetted parts stainless steel
c: All wetted parts stainless steel depending on size

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LIST OF PARTS Q-MOTOR

Dat: 01.02.93 | No: 93-TU 4531/2 | File: T-LSTPRT

POS.	DESCRIPTION	CODE	MATERIAL* a	MATERIAL* b/c**
528	O-ring for 519		Q	Q
529	O-ring for 558 bottom		Q	Q
530	O-ring for 504 M.S.		Q	Q
531	O-ring for 505		Q	Q
532	Fastening set 557-501 (small Motors)	5FB	H	F
533	Fastening set 504-505		H	F
534	Fastening set 507-557/504		H	F
535	Fastening set 501-519		H	F
536	Plug with gasket		F-C	F
537	Fastening set 561		H	F
538	Fastening set 504-557		H	F
539	Snap ring for 534 (C-Type)		O	-
540	Distance bolt for 519		K	K
541	O-ring for 540		Q	Q
542	Grease retaining disc P.S.	5SF	K	K
543	Holding ring for 519		K	K
544	Snap ring for 553		O	O
545	Snap ring for 516 - M.S.		O	O
546	Snap ring for 515 - P.S.		O	F
547	O-ring for 598 (400-557)		Q	Q
548	Plug for lubricating hole		F-P	F
549	Oil glass		-	-
550	Driving pin for 560		G	G
551				
552	Plug for flushing connection 581		N	F
553	Oil seal sleeve	5DB	J	J
554	Spacer (if no oil impeller)	5KD	K	K
555	Oil seal sleeve		Q	Q
556	Ring screw		N	F
557	Stator housing	5GM	A	A/F
558	Cooling jacket	5KG	K	F
559	Spring ring for 558	5RF	K	F
560	Impeller for circ. of cooling liquid	5KI	A	A
561	Guidance sheet	5KB	K	K
562	Snap ring for ventilator		O	O
563	Ventilator cap		-	-
564				
565	O-ring for 566-598		Q	Q
566	Oil elbow		A	-
567	cable bush		Q	Q
568	Fastening set 575		H	F
569	Fastening set 577		H	F
570	O-ring for 575		Q	Q
571	Temperature probe	5ET	-	-
572	Float switch	5ES	-	-
573	Snap ring 574		O	O
574	Cover disc Mot. 6 + 7	5DA	K	K
575	Cable cover (probe, Mot. 6-7)	5DK	A	-
576	Shims for 507-504, 507-511		K	F
577	Probeholding		K	K
578	Moisture detector	8EF	-	-
579	Fastening set 593-300		M	-
580	O-ring for 593 gear side		O	O
581	Pipe for 507 old types		M	-
582	Inset for 557 ex-proof old types		A	A
583	Grease disc M.S.	5SS	K	K
584	Spacer for 503 standard bearing		K	K
585	Spacer for 557 standard bearing		K	K
586	Small plate for ground cable (earth)		P	P
587	Spacer P.S.		K	K
588	Grease disc, cable side		K	K
589	Snap ring for 588		O	O
590	Cable connection		-	-
591	Carrying plate for 590		-	-
592	Winding		-	-
593	Motor support		A	-
594	Snap ring for 595		O	-
595	Heat shield		-	-
596	Name plate ex-proof		F	F
597	Name plate	-	F	F
598	Oil tubes (ellbow for oil)	5KR/5BO	A/P/K	P/F
599	Fastening set 598		H	F
640	Fastening set 646-400		H	F
642	Rubber seal	6AD	Q	Q
646	Gliding shoe	6AS	A	C

* For material explanations see sheet of section "ENGINEERING DATA"

** a: Standard material execution
b: All internal wetted parts stainless steel
c: All wetted parts stainless steel depending on size

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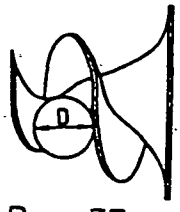
SUBMERSIBLE PUMPS
TAUCHPUMPEN

D0DQ-M/D100-M

DNYA4 50Hz



D = 75mm

MAX.8,4AMP FOR QUICK THERMAL PROT. SETTING INCLUDES CONTINUANS OVERLOAD FACTOR. (INCLUDING MECH. SEAL FRICTION) STANDARDS.
40°C MAX. AMBIENT TEMP.; TEMP. CONTROL; LEAKAGE CONTROL;
1400 RPM ; 380...420V ±5%, 50CYL.
DATA OF CURVES ACCORDING ISO 2548 CLASS "C", ANNEX B.
MECH. SEALS FRICTION IS INCL. IN MOTOR EFFICIENCY DATAS.

THERMO BLOCK AUF MAX.8,4AMP EINSTELLEN. DIESER WERT ENTHAELT UEBERLASTFAKTOR. (INKL. REIBUNGSVERLUST DER MECH. DICHTUNG). STANDARD.
40°C MAX. UMGEBUNGS TEMP.; TEMP. WAECHTER; LECKAGE WAECHTER;
1400 UPM ; 380...420V ±5%, 50HZ
KURVENDATEN GEMAESS ISO 2548 KLASSE "C" ANNEX B.
REIN HYDR. WIRKUNGSGRAD. REIBUNGSVERLUSTE DER MECH. DICHTUNG SIND IM WIRKUNGSGRAD DES MOTORS ENTHALTEN.

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SECTIONAL DRAWINGS Q-HYDRAULIC
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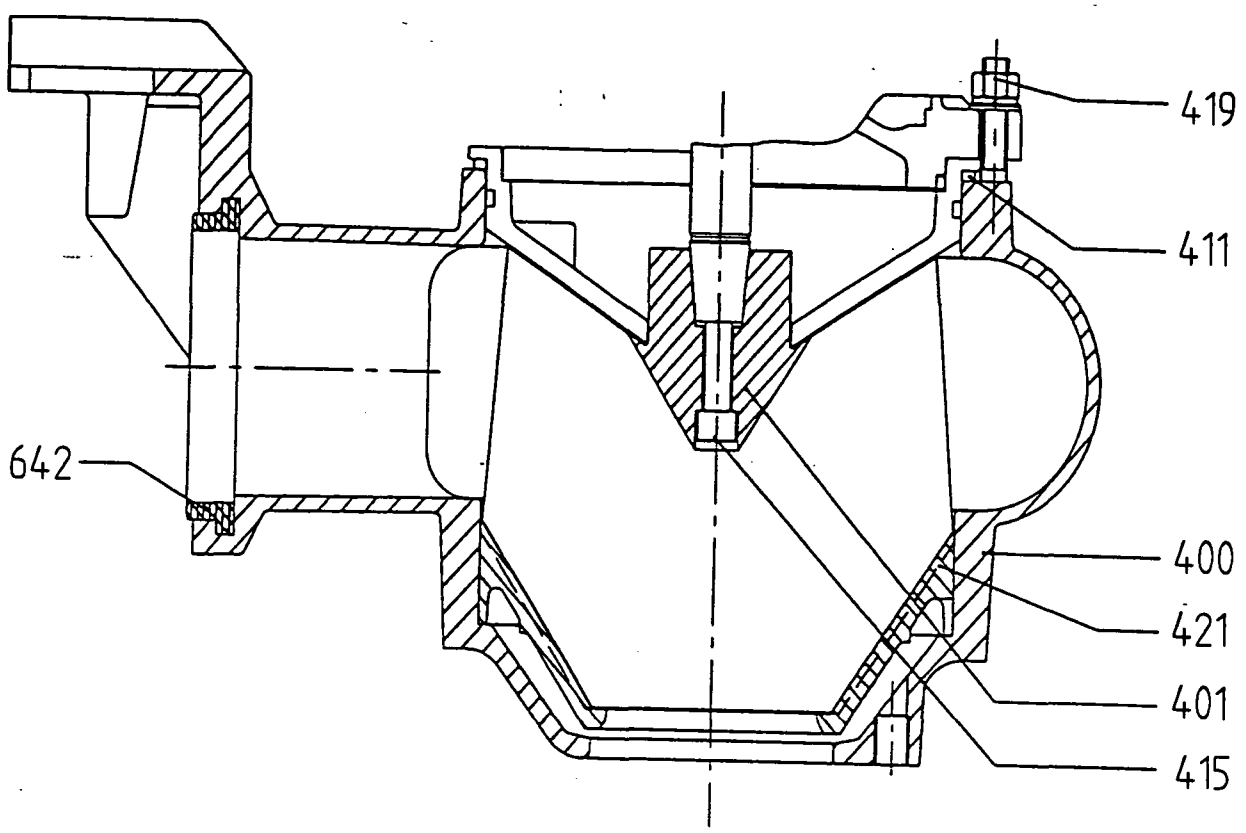

PART	DESCRIPTION	MATERIALS OF CONSTRUCTION 1
400	VOLUTE	GREY CAST IRON
401	IMPELLER	NODULAR IRON
411	SHIMS	STEEL
415	IMPELLER BOLT	STAINLESS STEEL A4
419	FASTENING SET	RUSTLESS STEEL
421	LINER	GREY CAST IRON
642	RUBBER SEAL	NITRILE

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SECTIONAL DRAWINGS MOTOR
SCHNITTZEICHNUNGEN MOTOR
DNX..

DNXA. DNXS.
DNXB. DNXY.
DNXR. DNXX.

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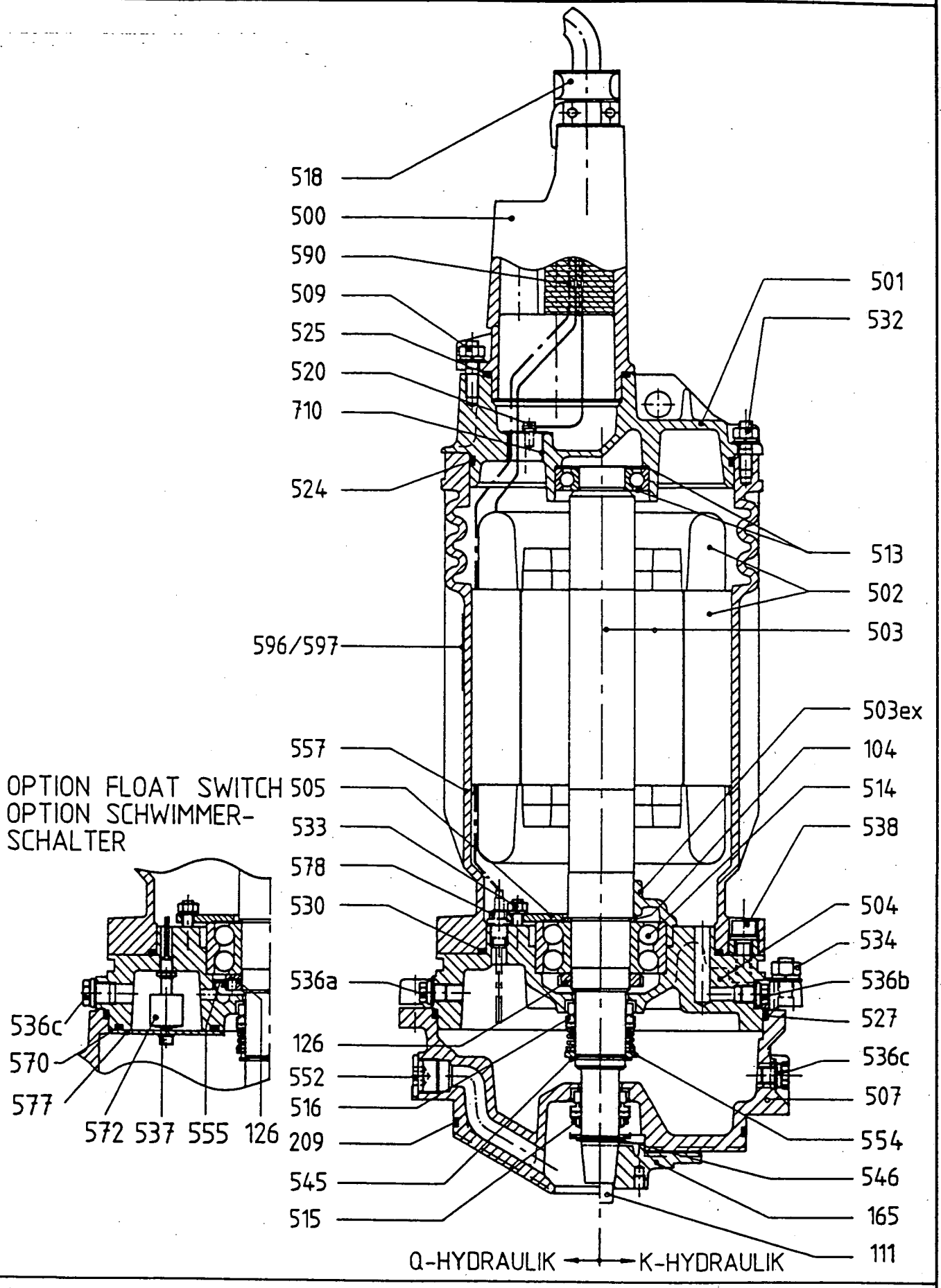

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